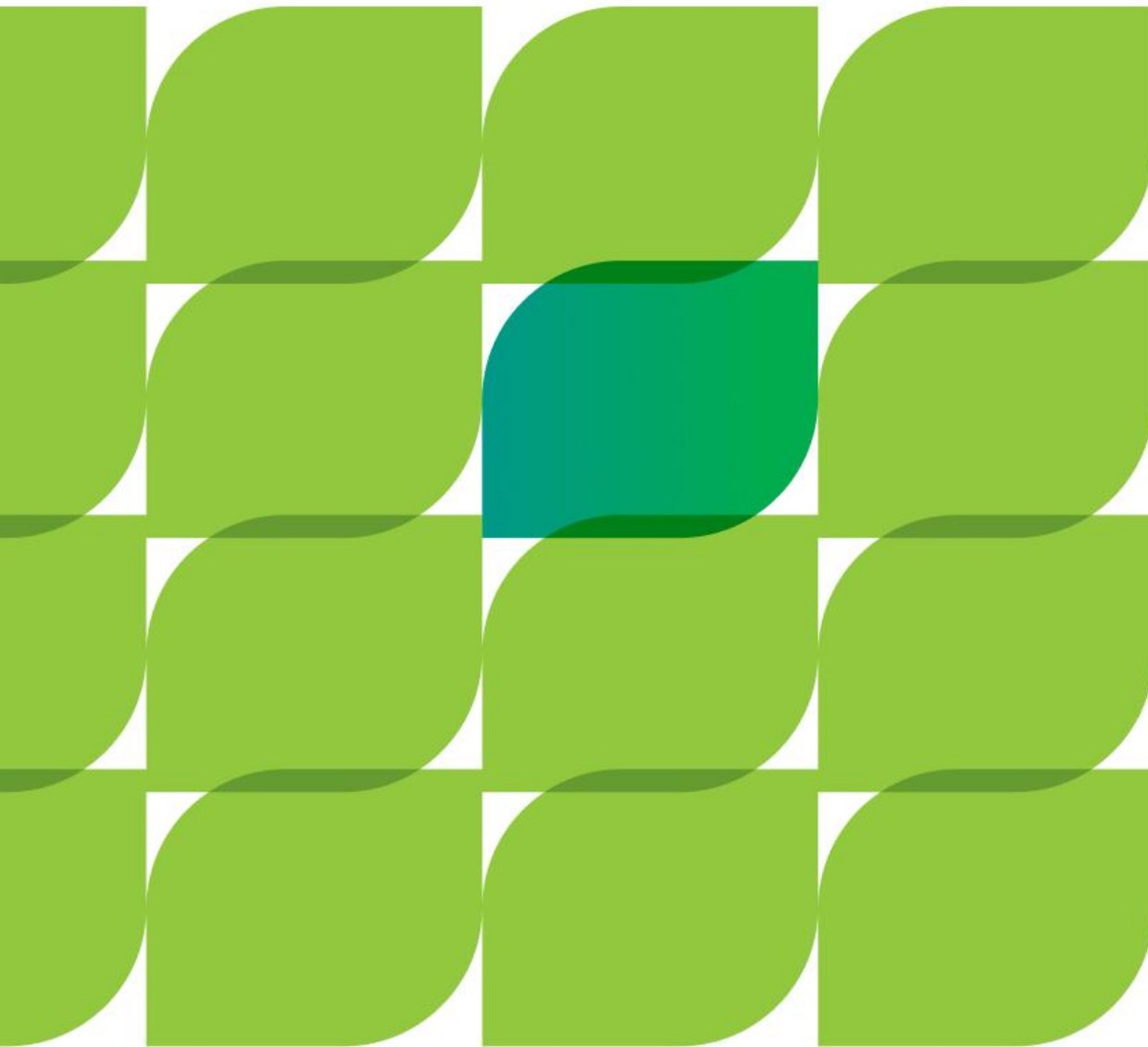


D3.1: Digital Sustainability Educational Profiles and Core Curricula



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About the Digital4Sustainability project

Digital4Sustainability is a pioneering initiative aimed at accelerating Europe's twin transition by equipping the workforce with the essential skills needed to drive sustainability-focused innovation. In response to the pressing need to achieve climate neutrality and meet the Sustainable Development Goals (SDGs), the project will develop a forward-thinking Digital Sustainability Skills Strategy as well as cutting-edge learning programmes. These efforts will address the urgent and emerging skills needs of the European industry, empowering the workforce to develop sustainable technologies that support Environmental, Social, and Governance (ESG) practices. By aligning closely with industry needs throughout the project, Digital4Sustainability will help European companies, particularly small and medium-sized enterprises (SMEs), achieve long-term competitiveness and growth through digital and sustainable transformation.

Funded by the Erasmus+ Programme of the European Union, this 4-year project unites 28 members of the Digital Large-Scale Partnership (Digital LSP) under the Pact for Skills, spanning 13 EU countries. The consortium includes digital and sustainability experts, business associations, universities, and Vocational Education and Training (VET) providers.

The Digital4Sustainability Project Consortium

The Digital4Sustainability project consortium is an Erasmus+ Alliance for Sectoral Cooperation on Skills, bringing together 29 partners and Associated partners from 13 EU countries.

	Partners	Acronym	Country
1	Adecco Formazione Srl	Adecco Training	Italy
2	Adecco Italia Holding Spa	Adecco Holding	Italy
3	As Bcs Koolitus	BCS KOOLITUS	Estonia
4	Asociatia Cluj IT	CLUJ IT CLUSTER	Romania
5	Badgebox Srl	BadgeBox	Italy
6	CEFRIEL Societa Consortile A Responsabilita Limitata	CEFRIEL	Italy
7	Cooperatie Eduserpro U.A.	Eduserpro	Netherlands
8	Digital Technology Skills Limited	DTSL	Ireland
9	DIGITALEUROPE AISBL	DIGITALEUROPE	Belgium
10	European DIGITAL SME Alliance	DIGITAL SME	Belgium
11	Fast Lane Institute For Knowledge Transfer GmbH	FAST LANE	Germany
12	Gospodarska Zbornica Slovenije	GZS CCIS	Slovenia
13	Gospodarska Zbornica Slovenije Center Za Poslovno Usposabljanje	GZS CPU	Slovenia
14	IVSZ - Hungarian Association of Digital Companies	IVSZ	Hungary
15	Matrix Internet Applications Limited	MATRIX INTERNET	Ireland
16	National College Of Ireland	NCI	Ireland
17	Profil Klett D.O.O.	PK	Croatia
18	Sdruzenie Bulgarska Asociacia Na Softuernite Kompanii - Basscom	BASSCOM	Bulgaria
19	Stichting Hogeschool Utrecht	HU	Netherlands
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21	Universidad De Alcala	UNI ALCALA	Spain
22	Universidad Internacional De La Rioja SA	UNIR	Spain
23	Universität Koblenz	UNI KO	Germany
24	National University of Science and Technology Politehnica Bucharest	POLITEHNICA Bucharest	Romania

	Associated partners	Acronym	Country
1	Asociacija Infobalt	INFOBALT	Lithuania
2	SKILLNET IRELAND Company Limited By Guarantee	SKILLNET IRELAND	Ireland
3	The Council of European Professional Informatics Societies	CEPIS	Belgium
4	Universidad Complutense De Madrid	UCM	Spain

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List of Abbreviations and Acronyms

Abbreviation	Term
DAS	Data Analyst Sustainability
DPS	Data Professional for Sustainability
DSC	Digital Sustainability Consultant
DSM	Digital Sustainability Manager
STS	Sustainability Technical Specialist
EQF	European Qualifications Framework
ECTS	European Credit Transfer and Accumulation System
ECVET	European Credit System for Vocational Education and Training
e-CF	European e-Competence Framework
GreenComp	European Sustainability Competence Framework
CEN/TS 17699:2022	Guidelines for developing ICT Professional Curricula (e-CF scoped)
TCFD	Task Force on Climate-related Financial Disclosures
CSRD	Corporate Sustainability Reporting Directive
EU Taxonomy	EU Taxonomy for Sustainable Activities
SASB	Sustainability Accounting Standards Board (Materiality Map)
ISO 14001	Environmental Management Systems Standard
LCA	Life Cycle Assessment
ESG	Environmental, Social, and Governance
UC	Upskilling Curriculum
VPL	Validation of Prior Learning
VET	Vocational Education and Training

Executive Summary

This deliverable presents a comprehensive framework of educational profiles and modular curricula designed to address Europe's critical digital sustainability skills gap. It fulfils Task 3.2's mandate by developing innovative educational profiles and core curricula that enable rapid workforce transformation through flexible, quality-assured pathways bridging digital and sustainability competences. This transformation aligns with the European Union's twin transition—advancing both the shift toward a low-carbon economy and the digital transformation driven by emerging technologies such as artificial intelligence and big data.

Why it Matters

Europe's ability to achieve the Green Deal and Digital Decade objectives is constrained by a persistent shortage of professionals who can combine digital expertise with sustainability competences. The *Digital4Sustainability* project's labour market analysis (D2.1) highlights critical gaps across data, consultancy, and management roles required to drive sustainable digital transformation.

This deliverable responds to these challenges by operationalising the Digital Sustainability Skills Strategy into a modular framework of educational profiles and curricula. It aligns e-CF and GreenComp competences across EQF levels 5 to 7, establishing transparent, flexible, and stackable learning pathways that facilitate both full qualifications and targeted upskilling programmes. By integrating the EU's micro-credentials framework and adhering to quality assurance standards, it empowers education and training providers to offer recognised, cross-border learning solutions that effectively address industry demand.

In doing so, the deliverable strengthens Europe's skills ecosystem and accelerates the twin digital and green transitions. It equips learners and organisations—particularly SMEs—with the ability to apply data, AI, and digital solutions to sustainability challenges such as carbon reduction, circular production, and regulatory compliance. Ultimately, it ensures that digitalisation becomes a catalyst for sustainability, resilience, and long-term economic competitiveness across Europe.

What this Deliverable Provides

- Five educational profiles (EQF 5–7) mapped to European competence frameworks (e-CF, GreenComp) with transparent learning outcomes.
- A modular curriculum architecture enabling both full qualifications (60–90 ECTS) and rapid upskilling programmes (0.5–2.5 ECTS).

- Clear progression pathways from vocational entry (EQF 5) through advanced professional practice (EQF 7).

How it Contributes to Transformation

- Flexible delivery across workplace, classroom, blended, and online modes.
- Stackable credentials supporting progressive qualification building aligned with EU micro-credentials framework.
- Standards-based design ensuring cross-border recognition and compatibility with national certification systems.

Five Educational Profiles

Building on deliverable D2.1's *Labour Market Analysis*, which identified critical skills gaps, this deliverable applies systematic selection criteria to focus on **five educational profiles** selected from the 10 roles previously identified by the aforementioned deliverable (see Section 3.1):

1. **Sustainability Technical Specialist (STS): EQF 5, 60 ECTS** – Vocational technical specialist: configures, operates, and maintains sustainability IT systems.
2. **Data Analyst for Sustainability (DAS): EQF 6, 60 ECTS** – Bachelor-level analyst: conducts ESG data analysis, creates dashboards, supports regulatory reporting.
3. **Data Professional for Sustainability (DPS): EQF 7, 90 ECTS** – Master's-level data professional: leads advanced analytics with specialisations in data engineering or data science.
4. **Digital Sustainability Consultant (DSC): EQF 7, 90 ECTS** – External consultant: advises organisations on digital sustainability transformation and strategy.
5. **Digital Sustainability Manager (DSM): EQF 7, 90 ECTS** – Internal manager: leads organisational sustainability programs, manages ESG reporting, drives change.

Curricula

The five selected profiles provide the basis for the curricula offered in this deliverable:

- Five Modular Core Curricula (60–90 ECTS) that learning providers can use to design specific curricula implemented as learning programmes, ensuring a consistent baseline of knowledge and skills.
- Six Upskilling Curricula (0.5–2.5 ECTS). Conceptually linked to the core curricula, these upskilling curricula facilitate progressive qualification building (Council of the European Union, 2022).

The unit-based design of the curricula ensures maximum flexibility. Each core curriculum can be used by learning providers to design specific curricula and learning programmes tailored to specific audiences (students, job seekers, digital professionals, managers) and adapted to various delivery contexts (workplace, classroom, blended, online). This design aligns with the project's emphasis on short, rapid upskilling options while also offering comprehensive frameworks required for full qualifications.



1. Introduction

Context and Purpose

The European Union's twin transition—the interconnected green and digital transformation of the economy and society—requires a profound workforce shift, calling for professionals who combine digital expertise with sustainability competences (Alasoini, 2024; European Parliament, 2022). This deliverable contributes to this transformation by developing digital sustainability educational profiles and unit-based curricula (Task 3.2) within the Digital4Sustainability Blueprint project (see Glossary A), supporting rapid upskilling and reskilling across European labour markets.

The work has been carried out in accordance with the Grant Agreement (GA) of the Digital4Sustainability Project, aligned with European standards relevant for this deliverable (in particular CEN/TS17699:2022, EQF, e-CF, GreenComp). It was coordinated with all partners, notably from WP2, WP3 and WP4.

The basis of the curricula in this deliverable are five educational profiles developed at EQF levels 5, 6, and 7, establishing clear progression pathways that serve diverse audiences and career stages.

EQF levels were assigned through consortium consultation analysing role complexity via three criteria: (1) autonomy – degree of independence required, (2) responsibility – scope of decision-making authority, and (3) complexity – cognitive demands and problem-solving requirements. Operational roles mapped to EQF 5, analytical roles to EQF 6, and strategic/leadership roles to EQF 7 (European Commission, 2008).

Learners may enter through initial Vocational Education and Training (VET) programmes (EQF 5) and progress toward advanced professional qualifications (EQF 7), while experienced learners can access targeted upskilling opportunities at higher levels.

The unit-based curriculum design supports multiple synchronous and asynchronous delivery modes—workplace-based, classroom, blended, and online. They facilitate both vertical progression between levels and horizontal development through specialised pathways. Quality is ensured through standardised learning outcomes and transparent learning pathways.

Design Principles

The development of the educational profiles and curricula reported here is structured around key requirements:

- **Modularity:** Learning units as interchangeable building blocks enabling customised programmes
- **Flexibility:** Multiple synchronous and asynchronous delivery methodologies and pathways supporting diverse learner needs
- **Transparency:** ECVET/ECTS implementation with clear NQF/EQF referencing (Cedefop, 2024)
- **Recognition:** Designs facilitating national certification and cross-border mobility (CEN/TS 17699:2022)
- **Integration:** A coherent methodology linking roles, competences, outcomes, curricula, assessments, and certifications.

The resulting educational profiles and curricula enable institutions to rapidly deploy programmes while maintaining compliance with European standards, supporting both comprehensive qualification pathways and targeted professional development.

Target Audience

This deliverable serves education and training providers implementing digital sustainability programmes, employers designing workforce upskilling pathways, and policymakers shaping qualification frameworks. The profiles and curricula are ready-to-implement, adaptable to institutional contexts, and provide career progression pathways for learners from vocational to strategic levels.

Document Structure

- **Section 2** describes the three-phase methodology followed to translate professional roles into curricula and learning programmes.
- **Section 3** presents the five consolidated educational profiles and their selection.
- **Section 4** details the learning units and the rationale behind their assembly.
- **Section 5** covers the curriculum development approach.
- **Section 6** explains the rapid upskilling curriculum development approach.
- **Section 7** presents conclusions and recommendations.

The Annexes include a summary of European educational standards referenced (Annex A), the five educational profiles (Annex B), the core and upskilling curricula (Annexes C1 and C2), all learning units with suggested profile relevance scores (Annex D), the rationale for educational profile design decisions (Annex E), a profile relevance validation study (Annex F), and a mapping of e-CF codes to the educational profiles deployed as a basis for the development of curricula (Annex G).



2. Methodology

The methodology is aligned with European education standards, notably CEN/TS 17699:2022 that defines a development trajectory from professional roles to learning programmes.

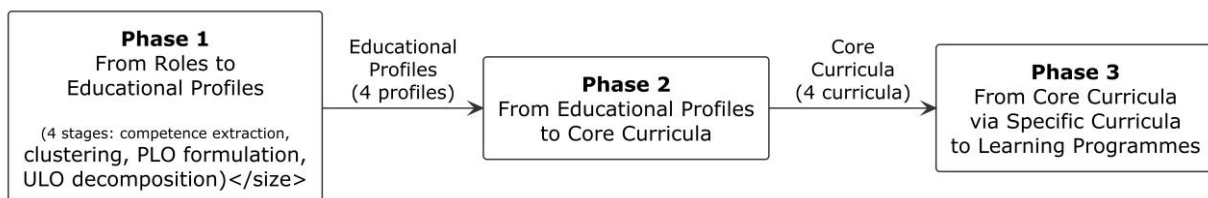


Figure 1: Three-phase methodology from Roles to Learning Programmes

This progression distinguishes three levels in the qualification development trajectory that translates professional role requirements into implementable learning programmes (Figure 1).

Core curriculum: A reference framework defining essential programme learning outcomes organised into learning units. It establishes what competences must be achieved while allowing adaptation to local contexts.

Specific curriculum: An institution's adaptation of the core curriculum, specifying delivery methods, assessment approaches, unit sequencing, and resource allocation pitched to learners and capabilities.

Learning programme: The executable implementation—with enrolled learners, scheduled sessions, assigned instructors, venues, and actual resources—of a specific curriculum, which defines the planned content, structure, and intended outcomes.

This report documents Phases 1 and 2, which establish the educational profiles and curricula for Phase 3 implementation.

Phase 1: From Roles to Educational Profiles

This phase transforms the professional role profiles identified in the D2.1 *Roles and Skills Needs Analysis Report* into educational profiles through a structured four-stage translation process:

Stage 1: Competence Mapping. Each role was analysed to identify core competence requirements, with role responsibilities mapped to e-CF competences (areas A–E) and GreenComp sustainability competences. For example, the Data Professional role's analytics requirements mapped to e-CF D.10 Information and Knowledge Management at proficiency level e–4. Deliverable D2.1 conducted systematic role analysis through employer surveys, job posting

analysis, and expert consultations to identify competence requirements. Each role's competences were mapped to e-CF codes across areas A–E by aligning task descriptions with e-CF definitions and assigning the appropriate proficiency levels (e-1 to e-5).

Stage 2: Competence Area Formation. Based on a structured analysis of e-CF alignments and sustainability challenge domains, related competences were grouped into coherent capability areas for each role. Competences originating from similar e-CF areas (e.g., D.10 and D.11 for information management) or addressing closely related sustainability functions were grouped together. The process considered natural competence dependencies, typical professional workflows, and educational coherence, ensuring that each capability area represented a meaningful and teachable set of applied skills.

For instance, the Sustainability Technical Specialist (STS) role yielded eight capability areas—platform configuration, data operations, infrastructure maintenance, problem diagnosis, problem resolution, incident tracking, user training, and documentation—reflecting the integrated nature of technical practice. More advanced roles, such as Digital Sustainability Consultant (DSC) and Data Professional Sustainability (DPS), required 10–12 capability areas, capturing the broader and more complex competence interrelations inherent in higher-level professional functions.

Stage 3: Programme Learning Outcome Formulation. Each competence area was translated into a programme learning outcome (PLO) using Bloom's taxonomy verbs appropriate to the EQF level. The EQF descriptor framework was followed so that each PLO addressed knowledge, skills, and/or responsibility dimensions. For instance, the STS role's 'platform configuration' area became PLO1: "Configure Sustainability Monitoring Platforms - The learner executes platform configurations for sustainability monitoring systems under supervision, applying standard procedures."

Stage 4: Unit Learning Outcome Breakdown. Each PLO was systematically mapped to unit learning outcomes (ULOs) representing specific, assessable capabilities. For example, the STS role's PLO1 translated into four ULOs: executing initial platform setup, applying configuration templates, performing parameter settings, and documenting procedures systematically.

The resulting educational profiles (see Annex B) contain programme and unit learning outcomes aligned with EQF levels, competence mappings (e-CF, GreenComp), and assessment approaches. Each educational profile specifies goal, scope, complexity, deliverables, and career/educational perspectives, providing the structured foundation for Phase 2 curriculum development.

Phase 2: From Educational Profiles to Core Curricula

Phase 2 translates each educational profile into a core curriculum through systematic learning unit development and curriculum architecture design.

Learning Unit Development: Unit learning outcomes (ULOs) from educational profiles are organised into separate learning units representing teachable components (Table D1 in Annex D). Following CEN/TS 17699:2022 (p. 31), learning units have been created from scratch based on D2.1 competence requirements. Table D1 provides an overview including learning unit codes, titles, ECTS credits, EQF levels, and their allocation across the five educational profiles.

Curriculum Architecture: Learning units are sequenced into semester-based structures appropriate to each profile's qualification level. The Technical Specialist curriculum (EQF 5) comprises 60 ECTS over 4 semesters, the Data Analyst curriculum (EQF 6) comprises 60 ECTS over 4 semesters, whilst master's-level profiles (EQF 7) comprise 90 ECTS over 6 semesters. Sequencing follows pedagogical progression from foundational to advanced content, integrating theoretical knowledge, practical skills development, and work-based learning components.

The resulting core curricula (Annex C1) provide reference frameworks that learning providers can adapt to local contexts whilst maintaining alignment with European qualification standards.

Phase 3: From Core Curricula to Learning Programmes

This phase outlines how the reference core curricula developed in Phase 2 can be implemented as specific learning programmes and can be adapted to various scales and learner needs while maintaining alignment with European qualification standards.

Five reference core curricula (60–90 ECTS) provide comprehensive qualification pathways, while six upskilling curricula (0.5–2.5 ECTS), comprising selected learning units, address immediate workforce development needs identified in D2.1. These examples illustrate how learning providers can adapt the reference curricula to different contexts and learner groups (VET students, job seekers, digital professionals, and managers). The implementation phase falls outside the scope of this report but is mentioned here for completeness.

Partner Consultation

The profiles and curricula were co-designed through a concise, three-strand process to ensure technical robustness and stakeholder relevance.

Consortium consultations (July, September, October 2025). Three plenary reviews brought together Digital4Sustainability consortium partners from education, industry, and associations to provide feedback on successive drafts, focusing on scope and content, EQF levelling, and unit sequencing." Agreed changes were logged against document milestones.

WP3 workshops. Targeted sessions were organised to reflect the consortium's input within the report.

Pilot validation (September–October 2025). An online expert study (n = 10) with consortium partners as participants assessed alignment between deployed learning units and four profiles (DPS, DSC, DSM, STS).

Input from consortium partners played a crucial role in the refinement of the report, in particular in relation to the traceability from competences to learning outcomes, with validated relevance scores feeding forward into Annex D for ongoing quality enhancement (See Annex F).



3. Educational Profiles

An educational profile is a structure that provides a link between competences needed in a professional environment and the learning outcomes of education and training. Following CEN/TS 17699:2022, each educational profile comprises three components:

Educational Profile Description Specifies the title, description, goal, scope, competences (mapped to e-CF EN 16234-1:2019), complexity (EQF level), deliverables, and career/educational perspectives.

Learning Outcome Structure and Contents Defines programme learning outcomes and their constituent unit learning outcomes, addressing both domain-specific technical competences (e.g., data analysis) and transversal competences (e.g., teamwork, stakeholder communication).

Assessment Aligns assessment methods directly to the learning outcomes, including provisions for validation of prior learning where appropriate.

Educational profiles define broad professional roles at specific EQF levels. Core curricula (section 5) provide foundational pathways toward each profile. Specific curricula (developed during piloting) enable specialisations within profile scope through selective learning unit combinations and context-specific applications.

Selection of Educational Profiles

Guided by market demand, skills gap severity, and educational requirements, this report strategically selects five educational profiles from the ten roles identified in D2.1. The selection applied three criteria:

Skills Gap Analysis: D2.1 identified management/consultancy roles (59% of vacancies) and data-focused roles ("most significant gap between current presence and demand") as critical workforce needs.

Competence Architecture: Analysis revealed logical competence groupings enabling shared foundational learning units across related roles while maintaining distinct specialisations.

Educational Design: The five profiles span EQF Levels 5–7, ensuring vocational entry pathways while addressing professional-level competences through modular structures that support stackable micro-credentials (see Glossary A: Stackability) and flexible learning pathways.

Table 1 presents the selection rationale. While D2.1 identified Sustainability Data Analyst, Sustainability Data Engineer, and Sustainability Data Scientist as distinct roles, these were combined into two educational profiles: Data Analyst for Sustainability (DAS) at bachelor level for operational analytics, and Data Professional for Sustainability (DPS) at master's level with specialisation pathways in data engineering and data science, reflecting substantial competence overlaps and enabling efficient curriculum design.

Table 1: Profile Selection Summary

Original 10 Roles	Selected for Development	Rationale
Sustainability Technical Specialist (STS)	Priority Profile	Blueprint requirement of spanning programmes from EQF 4/5-7 (European Commission, 2025a)
Digital Sustainability Consultant (DSC)	Priority Profile	High market demand (according to D2.1)
Digital Sustainability Manager (DSM)	Priority Profile	Most prevalent role*
Sustainability Data Analyst	Priority Profile, now called Data Analyst Sustainability (DAS)	Largest skills gap*
Sustainability Data Engineer/Sustainability Data Scientist	Priority Profile, now called Data Professional Sustainability (DPS)	Largest skills gap*, Lower immediate demand, now addressed by Data Analyst Sustainability
Digital Sustainability Lead	Excluded	Now addressed through dedicated learning units in Digital Sustainability Manager
Sustainability Business Analyst	Excluded	Now addressed through dedicated learning units in Data Analyst Sustainability
Software Developer for Sustainability	Excluded	Now addressed through dedicated learning units in Sustainability Technical Specialist
Sustainability Solution Designer	Excluded	Lower immediate demand*, now addressed through dedicated learning units in Sustainability Technical Specialist

- Based on Deliverable D2.1

Excluded Roles

Competences associated with excluded roles are retained through specialised learning unit combinations and progression pathways within the four selected profiles:

- **Business Analyst:** Competences incorporated into Data Professional pathway
- **Digital Sustainability Lead:** Senior strategic position addressed through Manager progression
- **Software Developer / Solution Designer:** Lower immediate demand; partially addressed through Technical Specialist and Data Professional with engineering specialisation

The Five Selected Educational Profiles

Sustainability Technical Specialist (STS, EQF 5). Addresses operational implementation competences for green IT infrastructure, sustainability platform configuration, and energy monitoring systems. This vocational-level profile is essential for translating sustainability strategy into practice.

Data Analyst for Sustainability (DAS, EQF 6). Provides foundational data analytics competences for ESG reporting, sustainability dashboard development, and regulatory compliance. This profile addresses the critical entry-level skills gap in sustainability data analysis, preparing learners for immediate workforce entry whilst creating pathways toward advanced data professional roles.

Data Professional for Sustainability (DPS, EQF 7). Addresses advanced data competences for sustainability analytics, building upon the foundational skills established in Data Analyst for Sustainability. This master's-level profile develops expertise in machine learning applications, predictive modelling, and strategic data governance for sustainability contexts, addressing the largest advanced skills gap identified in D2.1.

Digital Sustainability Consultant (DSC, EQF 7). Serves external advisory roles across multiple organisations, particularly critical for SMEs lacking internal expertise (59% of current vacancies in D2.1). Consultants require breadth across regulatory frameworks, technology assessment, and implementation methodologies to serve diverse client contexts.

Digital Sustainability Manager (DSM, EQF 7). Targets internal transformation roles. Managers implement and sustain change within single organisational contexts, requiring competence in internal stakeholder engagement, budget allocation, and cross-functional leadership. The profile spans operational management through strategic leadership at EQF 7.

The five educational profiles selected are provided in Annex B. These profiles form the foundation for Phase 2 of the methodology followed here, where they are translated into five core curricula through the specification of learning units.

3.3 Educational Profiles and Common Job Titles

Organisations use diverse terminology for sustainability roles. To facilitate workforce planning and staff development, each educational profile includes representative job titles commonly found in the European labour market, reflecting evolving market terminology and organisational structures.

Table 2: Common Job Titles by Educational Profile

Educational Profile	Common Job Titles in the Market
Data Analyst for Sustainability (DAS)	ESG Data Analyst, Sustainability Reporting Analyst, Environmental Data Analyst, Carbon Analyst, Sustainability Performance Analyst, ESG Metrics Analyst, Climate Data Analyst, Sustainability Business Analyst
Data Professional for Sustainability (DPS)	Sustainability Data Scientist, ESG Data Engineer, Senior Sustainability Data Analyst, Climate Data Scientist, Environmental Data Architect, Sustainability Analytics Lead, ESG Intelligence Analyst
Digital Sustainability Consultant (DSC)	Sustainability Strategy Consultant, ESG Advisory Consultant, Climate Change Consultant, Sustainable Digital Transformation Consultant, Sustainability Solutions Consultant, Environmental Strategy Advisor, Corporate Sustainability Consultant
Digital Sustainability Manager (DSM)	Head of Sustainability, ESG Manager, Corporate Sustainability Manager, Sustainability Programme Manager, Environmental Manager, Chief Sustainability Officer (entry level), Sustainability Coordination Manager
Sustainability Technical Specialist (STS)	Sustainability Systems Administrator, Green IT Specialist, Environmental Monitoring Technician, Renewable Energy Systems Technician, Sustainability Platform Administrator, ESG Data Technician, Sustainability Operations Specialist, Environmental Technology Specialist

Note: Job title variations reflect evolving market terminology and organisational structures



4. Learning Units

Learning Unit Identification and Specification

Learning units are separate educational components delivered within formal learning programmes. Each learning unit specification includes:

- Title, description, and professional context
- Unit learning outcomes aligned to EQF dimensions
- Competence mapping (e-CF, GreenComp)
- Core topics and coverage depth
- ECTS credit value and EQF level (5–7)
- Delivery methods and assessment approaches

After identifying professional roles and formulating educational profiles, the curriculum design process grouped related unit learning outcomes from the educational profiles into coherent units of learning outcomes—logical sets that represent subsets of the overall competence requirements. These groupings then inform the specification of new learning units or the adaptation of existing curricula (CEN/TS 17699:2022, p. 31). Learning units can be credited individually, supporting both full qualifications and progressive credentialing. The modular structure that learning units facilitate enables learning providers to flexibly combine them while maintaining coherence of learning outcomes.

Development of Learning Units

Each of the five educational profiles includes 8–10 programme learning outcomes (PLOs), which comprise multiple unit learning outcomes (ULOs). All PLOs are systematically mapped to e-CF EN 16234-1:2019 at appropriate proficiency levels (e-1 through e-4), with action verbs aligned to Bloom's taxonomy for the designated EQF level.

Some competences are considered relevant to several profiles (see D2.1). Related ULOs were grouped into shared learning units (e.g., LU01 Digital Sustainability Foundations, common to all profiles). This grouping process yielded 51 learning units matching competence requirements across all five profiles.

Guided by CEN/TS 17699:2022, learning units were developed from competence requirements identified in D2.1, academic and professional literature, and profile-specific competence gaps.

Each unit's learning outcomes were explicitly derived from and aligned with corresponding ULOs in educational profiles, ensuring consistent mapping to e-CF and GreenComp competences, appropriate EQF levelling, and traceable relationships with PLOs. AI-based tools (ChatGPT, Mistral) supported terminology harmonisation and framework alignment.

The PLO-to-ULO-to-learning-unit translation was validated through a questionnaire-based piloting study (Annex F). All units are detailed in Table D1.

ECTS Credit Allocation

Each learning unit's ECTS value reflects its pedagogical design—learning outcomes, content scope, assessment requirements, and appropriate workload. Following European standards, 1 ECTS represents 25–30 hours of learner workload, including contact time, independent study, and assessment.

Learning units range from 0.5 to 7.5 ECTS based on pedagogical purpose:

Foundation Units (0.5–1.5 ECTS) provide essential orientation to core concepts, establishing baseline understanding required across multiple profiles without extensive time investment.

Focused Competence Units (1.5–3.0 ECTS) enable targeted skill development addressing specific competence requirements, including analytical methods, business intelligence tools, and EU regulatory frameworks.

Comprehensive Units (4.5–5.0 ECTS) address complex, multi-faceted competence areas through substantial content coverage, practical application, and rigorous assessment.

Work-Based Project (7.0–7.5 ECTS) through LU34 intentionally varies within a pedagogically determined range: 7.0 ECTS for 60 ECTS programmes (DAS, STS) and 7.5 ECTS for 90 ECTS programmes (DPS, DSC, DSM) to align workload with programme scope. This is the sole intentional ECTS variation across the learning units.

Regulatory Content (1.5–5.0 ECTS) comprises modular legislative units (LU42–LU50) enabling role-specific regulatory knowledge: technical roles (~3 ECTS for operational legislation), analytical roles (~4 ECTS for reporting requirements), advisory roles (~8 ECTS for comprehensive regulatory landscape), and management roles (~7 ECTS for governance frameworks). This granular approach addresses D2.1's identification of regulatory compliance as a critical competence gap whilst preventing delivery of unnecessary content to learners.

Profile-Specific Learning Units

Whilst many learning units serve multiple profiles, several units were designed specifically for particular professional contexts:

Data Analyst for Sustainability Specific Units

Several units emphasise bachelor-level analytical competences bridging technical operations (Sustainability Technical Specialist, EQF 5) and advanced professional roles (Data Professional for Sustainability, Digital Sustainability Consultant, Digital Sustainability Manager, EQF 7):

- LU15: Transformation for Sustainability (5.0 ECTS)
- LU39: Sustainability Reporting and Dashboards (2.5 ECTS)
- LU40: Data Analytics Tools and Platforms (3.0 ECTS)
- LU49: Data-Driven Decision Making for Sustainability (5.0 ECTS).

These units support the development of practical ESG reporting capabilities, business intelligence tool proficiency, analytics platform competences, and data-driven decision-making foundations essential for analytical roles.



5. Core Curricula

Five core curricula provide reference frameworks aligned with European qualification frameworks and labour market requirements. Each semester comprises 30 ECTS. Complete specifications are provided in Annex C1; learning unit inventory in Table D1.

The curricula follow Bologna Process standards: 60–90 ECTS for professional programmes, 90–120 ECTS for master's degrees. The 60 ECTS programmes (DAS at EQF 6, STS at EQF 5) target professional entry with 2-semester delivery, aligning with professional diploma standards while enabling stackability toward master's pathways. The 90 ECTS programmes (DPS, DSC, DSM at EQF 7) use the Bologna minimum for master's degrees, delivered over 3 semesters (30 ECTS each) to enable efficient completion while maintaining professional depth and accommodating specialisation.

Table 3: The Five Core Curricula

Curriculum	Code	ECTS	EQF	Duration
Data Analyst for Sustainability	DAS	60	6	2 semesters (12 months)
Data Professional for Sustainability	DPS	90	7	3 semesters (18 months)
Digital Sustainability Consultant	DSC	90	7	3 semesters (18 months)
Digital Sustainability Manager	DSM	90	7	3 semesters (18 months)
Sustainability Technical Specialist	STS	60	5	2 semesters (12 months)

Data Analyst for Sustainability (DAS)

Focus: Conduct sustainability data analysis, manage ESG data, create visualisations, and support regulatory reporting.

Semester	Learning Units	ECTS
Semester 1	LU01, LU03, LU14, LU24, LU39, LU40, LU41, LU42, LU44, LU50, LU43	30
Semester 2	LU02, LU04, LU27, LU29, LU38, LU45, LU34 (7.0)	30
Total		60

Progression: Senior data analyst, ESG reporting manager, transition to Data Professional for Sustainability (DPS).

Data Professional for Sustainability (DPS)

Focus: Lead advanced data analytics, engineering, and science initiatives for sustainability with research-informed methodologies.

Semester	Learning Units	ECTS
Semester 1	LU01, LU02, LU03, LU04, LU27, LU33, LU14, LU05	30
Semester 2	LU11, LU29, LU32, LU35, LU47, LU49	30
Semester 3	LU07, LU28, LU40, LU48, LU50, LU51, LU12, LU34 (7.5)	30
Total		90

Progression: Lead data scientist, chief data officer, data strategy director.

Digital Sustainability Consultant (DSC)

Focus: Advise organisations on digital sustainability transformation, evaluate technologies, and design transformation strategies.

Semester	Learning Units	ECTS
Semester 1	LU01, LU02, LU04, LU07, LU08, LU28, LU50, LU12, LU48	30
Semester 2	LU09, LU10, LU11, LU13, LU15, LU06	30
Semester 3	LU16, LU17, LU25, LU36, LU39, LU34 (7.5)	30
Total		90

Progression: Senior consultant, principal consultant, partner, transition to Digital Sustainability Manager (DSM).

Digital Sustainability Manager (DSM)

Focus: Lead organisational sustainability programs, develop strategies, manage ESG reporting, and drive sustainable change.

Semester	Learning Units	ECTS
Semester 1	LU01, LU02, LU07, LU08, LU10, LU28, LU50, LU12, LU43	30
Semester 2	LU09, LU11, LU13, LU15, LU16, LU17	30
Semester 3	LU18, LU19, LU20, LU25, LU39, LU34 (7.5)	30
Total		90

Progression: Head of sustainability, chief sustainability officer, ESG director, VP sustainability.

Sustainability Technical Specialist (STS)

Focus: Configure, operate, and maintain digital sustainability platforms and technical infrastructure.

Semester	Learning Units	ECTS
Semester 1	LU01, LU05, LU12, LU13, LU30, LU31, LU46, LU03, LU14, LU50	30
Semester 2	LU21, LU22, LU23, LU24, LU38, LU48, LU42, LU34 (7.0)	30
Total		60

Progression: Technical team lead, transition to Data Analyst for Sustainability (DAS).

Dual Learning Alignment and Quality Framework

The curricula incorporate dual principle structures alternating between classroom-based and work-based learning, enabling integration into European vocational systems (European Commission, 2013). Work-based learning is delivered through workplace projects and professional practice portfolios, assessed via multiple evidence sources including portfolio documentation, supervisor verification, project outputs, and reflective analysis.

Follows EQAVET principles (European Commission, 2025b) with annual review cycles, framework alignment (e-CF, EQF, GreenComp), and benchmarking against European qualification standards. Work-based learning includes capstone projects (7.0–7.5 ECTS), professional portfolios, and industry placements. Assessment employs portfolio documentation, practical demonstrations, supervisor verification, and project outputs.



6. Upskilling Curricula

Six Upskilling Curricula totalling 12.0 ECTS deliver targeted competence development for working professionals requiring immediate capability building. These micro-credentials address urgent skills gaps whilst creating stackable pathways toward complete qualifications. Upon successful completion, upskilling curricula award micro-credentials based on learning outcomes from their constituent learning units (the "Source Units"). All curricula comply with EU micro-credentials recommendations (Council Recommendation 2022/C 243/02), where one ECTS corresponds to 25–30 hours total workload. Complete specifications appear in Annex C2.

Rapid upskilling curricula target practicing professionals seeking focused competence development. While stackable toward full curricula, these are not VET qualifications. They are delivered as professional development programmes rather than vocational qualifications.

Table 4: The Six Upskilling Curricula

Curriculum	Code	ECTS	EQF	Source Units
Circular Economy in Digital Systems	UC-CED	2.5	6	LU41
Cybersecurity for Sustainable Systems	UC-CYS	2.5	6	LU46
Digital Sustainability Foundations	UC-DSF	0.5	5	LU01
EU Policy and Legislation	UC-EPL	1.5	6	LU50
Green Software Fundamentals	UC-GSF	2.5	5	LU05, LU12
Sustainability Data Essentials	UC-SDE	2.5	6	LU39

Stackability Matrix

The upskilling curricula are designed with strategic stackability toward full qualifications. Table 5 shows how each upskilling curriculum contributes to the five reference qualifications.

Table 5: Upskilling Curricula Stackability Matrix

Upskilling Curricula	ECTS	DAS (60)	DPS (90)	DSC (90)	DSM (90)	STS (60)
Circular Economy in Digital Systems	2.5	○	---	○	○	○
Cybersecurity for Sustainable Systems	2.5	○	---	●●	○	●●
Digital Sustainability Foundations	0.5	●	●	●	●	●
EU Policy and Legislation	1.5	---	---	●●	●●	---

Green Software Fundamentals	2.5	○	---	---	○	●●
Sustainability Data Essentials	2.5	●●	●●	○	○	---
TOTAL ECTS	12.0	10.5	3.0	9.5	12.0	8.0

KEY: ● = Universal foundation | ●● = Core requirement | ○ = Elective | --- = Not applicable

The matrix reveals differentiated patterns: data professionals (DPS) require 3.0 ECTS, whilst consultants (DSC) accumulate 9.5 ECTS, technical specialists (STS) require 8.0 ECTS, data analysts (DAS) benefit from 10.5 ECTS maximum integration, and managers (DSM) reach 12.0 ECTS with full elective participation.

Pathway Descriptions

Data Analyst for Sustainability Pathway (60 ECTS total)

UC-DSF: Digital Sustainability Foundations establishes universal sustainability literacy through core concepts, frameworks, and digital technology applications. **UC-SDE: Sustainability Data Essentials** develops practical competences in ESG reporting, dashboard design, and data quality assurance for sustainability metrics. Together, these micro-credentials provide immediate capability for sustainability reporting and analytics roles whilst creating pathways toward comprehensive qualification.

Mandatory upskilling includes UC-DSF (0.5 ECTS) and UC-SDE (2.5 ECTS), totalling 3.0 ECTS. Optional upskilling includes UC-GSF (2.5 ECTS), UC-CED (2.5 ECTS), and UC-CYS (2.5 ECTS), bringing maximum to 10.5 ECTS (17.5% of qualification).

Rationale: Universal foundation (UC-DSF) establishes sustainability literacy. Sustainability data essentials (UC-SDE) provides critical reporting and dashboard competences directly applicable to DAS role requirements. Green software fundamentals (UC-GSF) offers elective enhancement for technically oriented analysts. Circular economy (UC-CED) supports product lifecycle contexts. Cybersecurity (UC-CYS) enables secure data infrastructure management.

Data Professional for Sustainability Pathway (90 ECTS total)

UC-DSF: Digital Sustainability Foundations provides essential sustainability literacy for advanced data professionals transitioning into sustainability analytics. **UC-SDE: Sustainability Data Essentials** offers optional specialisation in ESG reporting and dashboard design for

professionals requiring stakeholder communication capabilities. This minimal upskilling approach recognises that DPS candidates typically possess comprehensive analytical foundations from prior qualifications.

Mandatory upskilling includes UC-DSF (0.5 ECTS). Optional upskilling includes UC-SDE (2.5 ECTS), totalling maximum 3.0 ECTS (3.3% of qualification).

Rationale: DPS assumes advanced analytical foundations; learners without these typically complete DAS curriculums (60 ECTS) first, which already includes UC-SDE as mandatory. Direct DPS entrants require only universal sustainability foundation (UC-DSF), with UC-SDE available for those needing reporting specialisation.

Digital Sustainability Consultant Pathway (90 ECTS total)

UC-DSF: Digital Sustainability Foundations establishes universal conceptual framework for consulting engagements. **UC-EPL: EU Policy and Legislation** develop integrated understanding of European sustainability legislation essential for regulatory advisory services. **UC-CYS: Cybersecurity for Sustainable Systems** provides security competences increasingly critical for sustainable digital transformation consulting.

Mandatory upskilling includes UC-DSF (0.5 ECTS), UC-EPL (1.5 ECTS), and UC-CYS (2.5 ECTS), totalling 4.5 ECTS. Optional upskilling includes UC-SDE (2.5 ECTS) and UC-CED (2.5 ECTS), bringing maximum to 9.5 ECTS (10.6% of qualification).

Rationale: Consultants require comprehensive EU policy literacy (UC-EPL) for regulatory advisory services and cybersecurity fundamentals (UC-CYS) for secure system transformation, complementing universal foundation (UC-DSF). Elective curricula enable specialisation: UC-SDE for data-driven consulting, UC-CED for circular economy transformation projects.

Digital Sustainability Manager Pathway (90 ECTS total)

Mandatory upskilling includes UC-DSF (0.5 ECTS) and UC-EPL (1.5 ECTS), totalling 2.0 ECTS. Optional upskilling includes UC-GSF (2.5 ECTS), UC-SDE (2.5 ECTS), UC-CED (2.5 ECTS), and UC-CYS (2.5 ECTS), bringing maximum to 12.0 ECTS (13.3% of qualification).

Rationale: Managers require strategic policy understanding (UC-EPL) for compliance leadership and stakeholder engagement, alongside universal foundation (UC-DSF). The highest elective uptake reflects diverse managerial responsibilities: UC-GSF for IT operations oversight, UC-SDE for

performance monitoring, UC-CED for circular business model development, UC-CYS for security governance.

Sustainability Technical Specialist Pathway (60 ECTS total)

Mandatory upskilling includes UC-DSF (0.5 ECTS), UC-GSF (2.5 ECTS), and UC-CYS (2.5 ECTS), totalling 5.5 ECTS. Optional upskilling includes UC-CED (2.5 ECTS), bringing maximum to 8.0 ECTS (13.3% of qualification).

Rationale: Technical specialists require green software fundamentals (UC-GSF), e.g., applied to platform operations and energy-efficient architecture, alongside cybersecurity competences (UC-CYS) for secure sustainable systems, complementing universal foundation (UC-DSF). Elective circular economy curriculum (UC-CED) supports lifecycle data management and product lifecycle contexts.

Implementation Flexibility

The upskilling curricula provide reference frameworks for WP4 piloting activities. During the implementation phase, delivery modes, assessment approaches, content sequencing, and scheduling may be adapted to specific organisational contexts, target audiences, and resource availability while maintaining the core learning outcomes and ECTS workload. This flexibility allows the curricula under diverse real-world conditions and gathers feedback that will inform refinement of the final training packages.

Credentials and Quality Framework

All upskilling curricula follow EQAVET principles adapted to their scope and duration.

Curriculum design integrity ensures learning outcomes, assessment methods, and delivery modes align with EQF levels. Short-duration curricula employ practical demonstrations, competence checklists, and workplace tasks rather than extensive examinations.

Delivery consistency requires standardised specifications, instructor qualifications (relevant professional experience plus pedagogical competence), and adequate resources (tools, platforms, datasets). Provider approval processes verify institutional capacity and quality monitoring systems. Regular audits ensure compliance through documentation review and learner feedback.

Assessment validity employs multiple methods appropriate to professional learners:

portfolio documentation, practical projects, workplace applications, stakeholder presentations, and peer review. Assessment criteria explicitly reference learning outcomes and EQF level descriptors.

All credentials are issued as **Europass Digital Credentials** (Commission Implementing Decision EU 2021/2184), documenting learning outcomes achieved, assessment methods employed, EQF level, ECTS credits, issuing institution, and source learning unit references.

Credentials include metadata enabling automated validation and cross-border recognition.

Recognition of Prior Learning (RPL) enables learners with relevant professional experience to claim up to 50% of curriculum ECTS through portfolio assessment, competence testing, or credential evaluation. RPL decisions require documented evidence and are recorded in learner transcripts with assessment method notation.

Strategic Impact

The upskilling curricula address three strategic imperatives: immediate workforce capability building, flexible professional development pathways, and European qualification ecosystem integration.

Immediate Workforce Capability Building

Upskilling curricula respond to urgent organisational needs, enabling targeted competence development within 1-2.5 weeks (0.5-2.5 ECTS) rather than months or years. Organisations address critical skills gaps without extended workforce absence:

- **UC-DSF (0.5 ECTS, 1 day)**: Rapidly onboard employees to sustainability fundamentals
- **UC-EPL (1.5 ECTS, 1.5 weeks)**: Prepare managers for EU legislation compliance and policy engagement
- **UC-GSF (2.5 ECTS, 2.5 weeks)**: Upskill developers in energy-efficient coding practices
- **UC-SDE (2.5 ECTS, 2.5 weeks)**: Train analysts in ESG reporting and dashboard design
- **UC-CED (2.5 ECTS, 2.5 weeks)**: Enable product teams to design circular business models with ESG data management
- **UC-CYS (2.5 ECTS, 2.5 weeks)**: Train technical staff in cybersecurity for sustainable systems

Mid-career professionals gain immediately applicable competences whilst maintaining employment continuity. Organisations deploy upskilled workforce at scale, accelerating sustainability transformation timelines.

Flexible Professional Development Pathways

Stackability architecture accommodates diverse learner circumstances through progressive credential accumulation:

Entry point: Individual micro-credentials (0.5–2.5 ECTS) provide low-barrier access. Professionals explore sustainability domains without extended commitment.

Intermediate stage: Multiple micro-credentials combine strategically (3.0–12.0 ECTS depending on pathway). Learners build competence portfolios aligned with career objectives.

Qualification completion: Recognition of Prior Learning (RPL) accelerates progression toward full 60–90 ECTS qualifications. Professionals advance from micro-credentials to comprehensive qualifications in 6–18 months (part-time) rather than 18–36 months, balancing work commitments with learning ambitions.

Non-traditional learners (career changers, returners, international professionals) access European qualification framework through modular pathways. Stackability reduces economic barriers whilst maintaining quality assurance and credential credibility.

European Qualification Ecosystem Integration

Upskilling curricula integrate systematically into European qualification architecture:

EQF alignment ensures transparent level assignment (EQF 5–6) with explicit learning outcome mapping to EQF descriptors. Learners and employers understand competence expectations; qualification authorities recognise credentials within national frameworks.

e-CF integration references digital competences to European e-Competence Framework (EN 16234-1:2019), enabling workforce planning alignment. Organisations map microcredentials to e-CF competence areas and proficiency levels, supporting recruitment and development decisions.

GreenComp incorporation aligns sustainability competences with European Sustainability Competence Framework. Learning outcomes reference GreenComp dimensions (embodying

sustainability values, embracing complexity, envisioning sustainable futures, acting for sustainability), ensuring coherence with EU-wide sustainability education initiatives.

ECTS transparency assigns credits following European Credit Transfer and Accumulation System standards (25–30 hours per credit), enabling academic recognition. Universities and vocational institutions accept micro-credential ECTS through RPL processes, bridging professional and academic learning pathways.

Europass Digital Credentials employ standardised metadata schema, supporting automated validation and cross-border recognition. Professionals carry verifiable credentials throughout EU member states; employers access machine-readable competence data; qualification authorities integrate micro-credentials into national registers.

Systemic Workforce Development

Strategic impact extends beyond individual learners to systemic workforce development supporting European Green Deal implementation:

Climate neutrality commitments: UC-EPL (EU Policy and Legislation) develops policy literacy across 250,000+ professionals (estimated EU demand), enabling organisational compliance with CSRD, EU Taxonomy, and Climate Law requirements. Organisations reduce regulatory risk whilst accelerating disclosure readiness.

Digital-green twin transition: UC-GSF (Green Software Fundamentals) equips 500,000+ developers and IT operations staff with energy-efficient coding and architecture practices, directly reducing ICT carbon footprint (estimated 4% of global emissions by 2030). Software applications become measurably more sustainable.

Circular economy transformation: UC-CED drives business model innovation across product design, supply chain, and service delivery. Conservative estimates suggest 100,000+ professionals gain circular economy capabilities, catalysing material flow optimization and waste reduction initiatives.

Data-driven sustainability: UC-SDE (Sustainability Data Essentials) empowers 300,000+ analysts and coordinators with ESG reporting, dashboard design, and data quality capabilities. Organisations transition from manual reporting to automated, reliable sustainability analytics, improving decision-making quality.

Foundation building: UC-DSF provides universal sustainability literacy to 1,000,000+ professionals across all sectors and roles. Common conceptual language emerges, reducing organisational friction and enabling cross-functional collaboration on sustainability initiatives.

Deployed at scale through Blueprint partner networks, vocational education providers, and industry associations, these micro-credentials accelerate EU workforce adaptation to sustainability imperatives. Quality assurance through EQAVET principles maintains credential credibility. Stackability into comprehensive qualifications creates progression pathways. The upskilling curricula represent strategic investment in European human capital development, enabling just transition whilst maintaining industrial competitiveness in global sustainability economy.



7. Conclusion

This deliverable fulfils Task 3.2 (Design of new digital sustainability educational profiles and curricula), by designing innovative educational profiles and curricula, responding to Europe's urgent digital sustainability skills needs. It builds on the labour market analysis performed in D2.1 and incorporates partners' feedback into structured, flexible training pathways that support both comprehensive qualification pathways and short-term piloting activities.

Key Achievements

The work conducted here delivered several key outcomes:

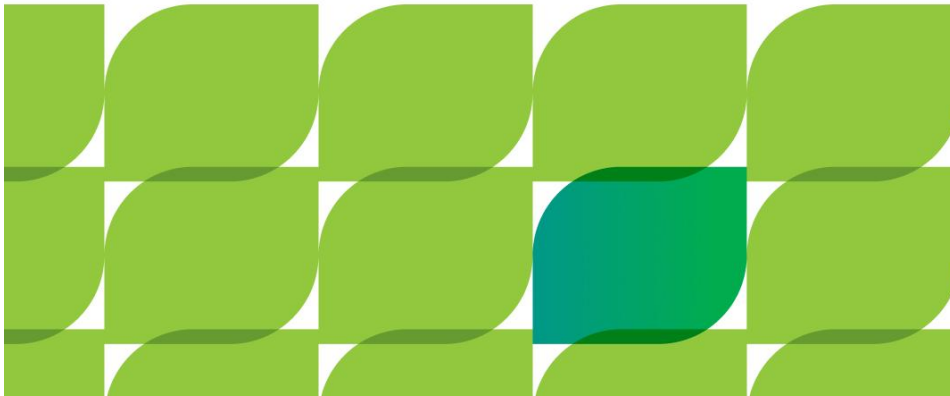
- Strategic consolidation from 10 roles to 5 priority educational profiles (Data Analyst for Sustainability, Data Professional for Sustainability, Digital Sustainability Consultant, Digital Sustainability Manager, Sustainability Technical Specialist) based on market demand and Blueprint requirements.
- Development of 5 comprehensive educational profiles (EQF 5–7) with programme learning outcomes, unit learning outcomes, and assessment frameworks aligned to CEN/TS 17699:2022 (Annex B).
- Development of five modular curricula comprising 51 learning units.
- Design of six upskilling curricula (0.5–2.5 ECTS) offering opportunities for rapid workforce transformation.
- Creation of stackable pathways linking short, targeted training to comprehensive qualifications (60–90 ECTS).

Operational implications

The upskilling curricula are particularly relevant to the WP4 piloting activities. They give partners the opportunity to test flexible, modular training in a variety of real-world settings. Because these curricula are short and targeted, partners can deliver them quickly, gather feedback, and refine the content through several cycles. This practical, iterative approach will lead to a comprehensive "Ready to Use Training Package" that can be easily adopted and adapted by VET providers, higher education institutions, and industry partners across Europe.

By combining modular curricula, stackable micro-credentials, and adaptable delivery formats, this framework bridges the gap between academic structures and agile workforce training. It provides a blueprint for European education and training systems to support the digital-green

twin transition, ensuring both rapid response to market needs and long-term qualification pathways. Future work will focus on piloting and its assessment, national accreditation processes, and continuous quality assurance to consolidate these achievements.



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Glossary

Glossary A - Educational Terms & Standards

Term	Description
Assessment	Methods and instruments used to evaluate whether learners have achieved specified learning outcomes. Includes formative (ongoing) and summative (final) assessment, aligned directly to unit and programme learning outcomes.
Blueprint Project	A <i>Blueprint for Sectoral Cooperation on Skills</i> —the official EU initiative under the European Skills Agenda—brings together industry, education, and policy stakeholders to address sector-specific skills gaps. Blueprint Projects design skills intelligence, competence frameworks, modular curricula, and qualification pathways aligned with EQF and ESCO, supporting the EU's twin transition (digital and green). They typically span EQF Levels 4–7, focusing on advanced VET and professional upskilling, and must ensure cross-border transferability, governance structures, and long-term sustainability beyond the project's lifetime (European Commission, 2025a).
CEN/TS 17699:2022	Guidelines for developing ICT Professional Curricula, which in Annex E offers a standard template for educational profiles. The template consists of 3 tables to specify essential input for curricula including programme and unit level outcomes and assessment.
Continuous Professional Development (CPD)	Ongoing learning activities of professionals to maintain and enhance competences throughout their careers, aligned with European Qualifications Framework (EQF) standards and quality-assured through EQAVET requirements. Encompasses formal and informal learning mapped to EQF levels 4–8, with recognition via micro-credentials, digital badges, or professional portfolios that enable qualification transferability and professional mobility across EU member states.
Core Curricula (plural)	Unified foundations of learning outcomes and competences that different education providers can adapt to their contexts. Not merely collections of learning units, but coherent frameworks defining essential outcomes all providers should achieve while allowing flexibility in implementation methods.
Curriculum	A structured educational plan designed by an institution from core curricula, specifying learning units, sequences, delivery methods, and assessment approaches. Distinguished from learning programmes which are the executable implementations of curricula.
Development Trajectory	The systematic progression from professional roles to educational implementation: role → educational profile → core curricula → curriculum → learning programme. Each stage builds upon and refines the previous one.
Dual Principle	Or dual education refers to an educational approach that combines both theoretical learning in an educational institution and practical training in a workplace (European Commission, 2013).

e-CF	The European e-Competence Framework describing ICT competences across five areas (A-Plan, B-Build, C-Run, D-Enable, E-Manage) with proficiency levels e-1 to e-5. Examples: A.3 Business Plan Development at e-4 level for strategic leadership roles; B.4 Solution Deployment at e-2 for technical implementation; E.7 Business Change Management at e-3 for transformation initiatives.
ECTS	Standard for academic credit comparison in Europe. 60 ECTS = 1 academic year (1500–1800 hours).
ECVET	System for transfer and accumulation of vocational learning outcomes through unit-based qualifications with credit points.
ECVET Principles	Six principles: learning outcomes, transfer/recognition, unit-based structure, credit points, flexibility, and QA integration.
Educational Profile	Structured description of essential input for the design of learning-outcomes oriented education and training programmes following CEN/TS 17699:2022. Contains goal, scope, competences, complexity, deliverables, perspectives, learning outcomes, and assessment – but excludes operational elements like ECTS credits.
EQAVET	EQAVET (European Quality Assurance in Vocational Education and Training) is an EU framework that supports consistent quality assurance in vocational education and training through a continuous cycle of planning, implementation, evaluation, and review (European Commission, 2025b).
EQF	EQF (European Qualifications Framework) is a learning outcomes-based framework in 8 levels that enables comparability of qualifications across Europe, defining knowledge, skills, and responsibility/autonomy at each level (European Commission, 2008).
Framework Descriptor	A framework descriptor links a specific learning outcome to an established competence standard such as EQF, e-CF, or GreenComp, defining the expected level of knowledge, skill, or autonomy.
GreenComp	EU reference framework for specifying sustainability competences with 12 competences in 4 areas, using codes X.Y (area 1–4, competence 1–3): Area 1 Embodying values (1.1 Valuing sustainability, 1.2 Supporting fairness, 1.3 Promoting nature); Area 2 Embracing complexity (2.1 Systems thinking, 2.2 Critical thinking, 2.3 Problem framing); Area 3 Envisioning futures (3.1 Futures literacy, 3.2 Adaptability, 3.3 Exploratory thinking); Area 4 Acting (4.1 Political agency, 4.2 Collective action, 4.3 Individual initiative).
Learning Objectives	Instructor-focused statements of what will be taught. Distinguished from learning outcomes which are learner-focused statements of what students can do after instruction.
Learning Outcomes	Statements of what a learner knows, understands, and is able to do on completion of a learning process. Written using active verbs aligned to Bloom's taxonomy, focusing on demonstrable achievements.
Learning Programme	The executable implementation of a curriculum – the actual delivery of education including scheduling, resources, teaching methods, and assessment execution. The operational manifestation of a designed curriculum.
Learning Unit	The smallest educational component containing coherent sets of learning outcomes that can be assessed and validated. This standardised term is used

here instead of "module" because "module" has inconsistent meanings across European education systems (ranging from course collections to course subdivisions). A learning unit provides clear, unambiguous reference to a discrete educational component. Not necessarily covering all three EQF dimensions but focused on coherent professional capabilities.

M-shaped Professional	Professional combining deep expertise in multiple specialisations with broad transversal competences, particularly relevant for digital sustainability roles requiring both technical and management capabilities.
Micro-credentials	Formal recognition (credentials) awarded upon successful completion and assessment of learning units or groups of units. Not learning programmes themselves, but the outcome certifying achievement of specific learning outcomes. Enable flexible, stackable pathways for lifelong learning.
Module	A context-dependent term avoided in this framework due to its variable meanings: course collection (some institutions), individual course (others), or course subdivision (in LMS systems). See "Learning Unit" for this framework's standardised terminology.
Programme Learning Outcome	High-level intended results learners should achieve at the end of a programme, typically 8-12 per educational profile.
Role-EQF Mapping	Process of associating professional roles with appropriate EQF levels based on complexity, autonomy, and responsibility. May result in multiple levels per role to reflect career progression.
Stackability	Way of organising learning so small pieces of education can be added together to build bigger qualifications. Allows learners to complete short courses or learning units and combine them toward larger certificates or degrees.
Traceability Table	Systematic documentation showing the translation path from professional roles through educational profiles to learning outcomes, ensuring alignment and completeness.
Transfer lateral/vertical	Lateral transfer: horizontal movement between institutions at same level. Vertical transfer: upward movement between educational levels. Both support mobility through ECTS and EQF.
Transversal	Skills and competences useful across different contexts, not limited to specific jobs or sectors. Include communication, problem-solving, self-management, and social interaction.
Unit Learning Outcome	Specific outcomes learners achieve within a learning unit, typically 4-12 per programme learning outcome. Modular, assessable achievements.
Validation of Prior Learning (VPL)	Process of recognising and certifying knowledge, skills, and competences acquired through formal, non-formal, or informal learning, enabling credit toward qualifications.

Glossary B - Digital Sustainability

Term	Description
Behavioural Insights for Sustainability	Application of psychological and behavioural science to design interventions that promote sustainable practices and decision-making.
Carbon Footprint	A calculation of greenhouse gas emissions produced directly and indirectly by an individual, organisation, event, or product.
Circular Design	Design approach focused on reuse, recycling, and extending the lifecycle of resources.
Circular Economy	Economic model aimed at eliminating waste and continual use of resources through sharing, leasing, reuse, repair, refurbishment, and recycling.
Cloud Sustainability	The practice of optimising cloud computing resources to minimise environmental impact.
Corporate Sustainability Reporting Directive (CSRD)	EU legislation requiring companies to report on sustainability matters including environmental, social, and governance aspects.
Digital Health for Planetary Health	Integration of digital technologies to improve human health while considering planetary boundaries and environmental sustainability.
Digital Impact Assessment	Analysis of the environmental, economic, and social impact of digital projects.
Digital Inclusion	Ensuring equitable access to digital technologies and skills across all segments of society as part of social sustainability.
Digital Product Passport	A structured digital record that captures sustainability and lifecycle data of a product.
Digital Twin	Digital replica of a physical entity, used for real-time monitoring, analysis, and optimisation.
Energy-Aware Programming	Coding that includes awareness of energy consumption and optimises for lower energy use.
Energy Informatics	The study of information and communication technologies to support sustainable energy use.
ESG Reporting	Disclosure of environmental, social, and governance data demonstrating organisational sustainability performance.
EU Green Deal	European Commission's growth strategy to make Europe climate neutral by 2050.
EU Taxonomy	Classification system establishing criteria for environmentally sustainable economic activities.
Green Blockchain	Blockchain technologies designed or adapted to minimise energy consumption and environmental impact.
Green Coding	Programming practices aimed at reducing energy consumption and increasing code efficiency.
Green Data Centre	A data centre designed for maximum energy efficiency and minimum environmental impact.

Green Finance	Financial products and services supporting environmental sustainability and climate action.
Green Software Development	Software engineering practices prioritising environmental sustainability throughout the development lifecycle.
ICT for Sustainability (ICT4S)	The use of digital technologies to enhance sustainable practices across sectors.
Life Cycle Assessment (LCA)	Methodology to assess environmental impacts associated with all stages of a product's life.
Regulatory Technology (RegTech)	Digital solutions for efficient regulatory compliance and reporting, particularly relevant for sustainability regulations.
Scope 1, 2, 3 Emissions	Categories of emissions from direct (Scope 1), indirect from energy (Scope 2), and all other indirect sources (Scope 3).
Sustainable Finance Disclosure Regulation (SFDR)	EU regulation on sustainability-related disclosures in the financial services sector.
Smart Grids	Electrical grids enhanced with digital communications to improve efficiency and reliability.
Smart Manufacturing/Industry 4.0	Integration of digital technologies in manufacturing for resource efficiency and sustainability.
Sustainability Data Engineering	Technical processes for collecting, cleaning, and storing data relevant to sustainability reporting and analysis.
Sustainability Data Science	Application of data science methods to sustainability challenges including predictive modelling and impact assessment.
Sustainable IT Operation	IT management strategies that reduce energy use and e-waste while maintaining performance.
Sustainable Software Engineering	An approach to software development that ensures environmental, technical, and economic sustainability by optimising energy use, algorithmic efficiency, and lifecycle maintainability.
Systems Architecture for Sustainability	Design of IT systems optimising for environmental impact alongside traditional performance metrics.
Technology Trend Monitoring	Systematic observation and analysis of emerging technologies for sustainability applications and impacts.

Annexes

Annex A – Educational Standards

To ensure recognition, transferability, and quality across EU Member States all educational profiles and curricula are aligned with established European competence frameworks. The table below provides an overview of the frameworks used and their coding systems referenced in educational profiles. How each educational profile (see Annex B) maps to educational frameworks is specified here under section Framework Alignment.

Table A1. European Competence Frameworks followed in Digital Sustainability Educational Profiles

Framework	Full Name	Purpose	Coding System	Example Code
EQF	European Qualifications Framework (European Parliament & Council, 2008)	Qualification level Standardisation across EU	Levels 1–8	EQF Level 6
ECTS	European Credit Transfer and Accumulation System (European Commission, 2015)	Credit standardisation for higher education	Credit points (1 ECTS = 25–30 hours)	5.0 ECTS
ECVET	European Credit System for VET (European Parliament & Council, 2009)	Credit Standardisation for vocational education	Credit points and learning outcomes	10 ECVET points
e-CF	European e-Competence Framework (CEN, 2019)	ICT professional competences	Area Competence Level (A–E.1–12.1–5)	A.7.3
GreenComp	Sustainability Competence Framework (Bianchi et al., 2022)	Sustainability competences	Area Competence (GC1–4.1–4)	GC1.2

Annex B – Educational Profiles

B.1 Data Analyst for Sustainability (DAS)

The profile equips learners with skills to conduct sustainability data analysis and support regulatory reporting, for example by managing ESG data processes, developing sustainability KPIs, and ensuring data quality and governance.

1. Educational Profile Description

Field	Content
Description	Enables professionals to conduct data analysis for sustainability applications, implement ESG reporting processes, create data visualisations, and support data-driven sustainability decision-making.
Goal	Equip professionals with competences to analyse and document sustainability data, prepare regulatory reports, maintain data quality, and communicate insights effectively within organisations.
Scope	Competences cover e-CF areas D (Enable) and E (Manage), focusing on sustainability metrics, ESG data management, and regulatory reporting. Common platforms include Power BI, Tableau, open-source tools like Apache Superset, SAP Sustainability Control Tower, Enablon for ESG management, and Excel with carbon accounting extensions. Data workflows typically involve monthly facility data collection, validation, aggregation, dashboard updates, and regulatory submissions.
Competences	D.10 Information and Knowledge Management (e-3), D.11 Needs Identification (e-2), E.3 Risk Management (e-2), A.7 Technology Trend Monitoring (e-2).
Complexity	EQF Level 6 (Bachelor's level) / e-CF proficiency e-2 to e-3. Requires bachelor's degree or equivalent experience, with advanced knowledge of data analysis, statistics, and sustainability metrics.
Deliverables	ESG data analysis reports; evaluation of sustainability dashboards; carbon footprint analyses; data quality assessments; Regulatory submissions; KPI tracking systems; stakeholder briefings; Data documentation
Perspective	Professional perspective: Prepared for ESG Data Analyst, Sustainability Reporting Analyst, Carbon Data Analyst roles, progressing to senior analyst or EQF 7 data professional positions. Educational perspective: Foundation for Data Professional for Sustainability (DPS) or Digital Sustainability Manager (DSM) master's programmes. Enables credit recognition toward bachelor's degrees in data science, environmental science, or sustainability management.

Progression Pathways: Graduates progress to Data Professional for Sustainability (DPS) for advanced data engineering/science roles, or Digital Sustainability Manager (DSM) for strategic leadership combining data expertise with organisational change management.

2. Learning Outcome Structure and Contents

1. *Programme Learning Outcome: Conduct Sustainability Data Analysis*

Workplace examples: calculating Scope 1-3 emissions from facility data, analysing waste reduction trends, comparing energy KPIs across departments

e-CF Competence: D.10 Information and Knowledge Management (e-3)

Unit Learning Outcomes:

- 1.1 Conduct exploratory analysis on sustainability datasets, applying statistical methods, identifying patterns and trends, detecting anomalies, summarising findings
- 1.2 Calculate carbon footprints, applying emission factors, aggregating scope 1/2/3 emissions, comparing against baselines, identifying reduction opportunities
- 1.3 Analyse ESG performance metrics across environmental, social, governance dimensions, calculating KPIs, benchmarking against peers, tracking progress
- 1.4 Execute data segmentation and correlation analysis, grouping by relevant dimensions, examining variable relationships, identifying causal factors, forecasting trends

2. *Programme Learning Outcome: Support ESG Data Collection and Quality Control*

Workplace examples: implementing monthly carbon data workflows, applying validation rules in Excel/databases, coordinating with facility managers

e-CF Competence: D.10 Information and Knowledge Management (e-3)

Unit Learning Outcomes:

- 2.1 Implement data collection workflows, following designs, executing schedules, using templates, coordinating with responsible parties
- 2.2 Apply validation and quality control procedures, using rules, detecting errors, performing cleansing, documenting issues
- 2.3 Maintain sustainability databases, organising structures, ensuring integrity, applying version control, providing access
- 2.4 Coordinate with data providers, communicating requirements, providing guidance, maintaining relationships, creating documentation

3. *Programme Learning Outcome: Create Data Visualisations and Dashboards*

Workplace examples: analysing dashboards for carbon tracking, creating executive charts for board reporting, automating monthly ESG reports

e-CF Competence: D.10 Information and Knowledge Management (e-2)

Unit Learning Outcomes:

- 3.1 Design effective visualisations for sustainability metrics, selecting chart types, applying visualisation principles, ensuring clarity, tailoring to audiences
- 3.2 Build interactive dashboards for ESG monitoring, implementing KPIs, creating drilldowns, enabling filtering and comparison, ensuring usability
- 3.3 Develop automated reporting solutions, creating templates, implementing refresh processes, scheduling generation, distributing to stakeholders
- 3.4 Apply data storytelling techniques, structuring narratives, highlighting key messages, providing context, supporting decision-making

4. *Programme Learning Outcome: Prepare CSRD and ESG Regulatory Reports*

Workplace examples: mapping data to ESRS requirements, preparing GRI calculations, organising documentation for external assurance

e-CF Competence: D.10 Information and Knowledge Management (e-3)

Unit Learning Outcomes:

- 4.1 Prepare data for CSRD disclosures, mapping to ESRS requirements, calculating metrics, aggregating appropriately, documenting methodologies
- 4.2 Support GRI and voluntary frameworks, identifying indicators, collecting data, performing calculations, preparing disclosure content
- 4.3 Conduct assurance preparation activities, organising documentation, responding to queries, addressing gaps, ensuring traceability
- 4.4 Track regulatory deadlines and requirements, monitoring updates, maintaining calendars, coordinating submissions

5. *Programme Learning Outcome: Perform Statistical Analysis for Sustainability*

Workplace examples: testing significance of energy reduction interventions, forecasting emissions trends, identifying operation-impact correlations

e-CF Competence: D.10 Information and Knowledge Management (e-3)

Unit Learning Outcomes:

- 5.1 Conduct descriptive statistical analyses, calculating central tendency and dispersion, creating frequency distributions, summarising characteristics
- 5.2 Perform hypothesis testing for comparisons, formulating hypotheses, selecting tests, interpreting p-values and confidence intervals, drawing conclusions
- 5.3 Apply regression analysis, building linear and multiple models, assessing fit, interpreting coefficients, making predictions
- 5.4 Execute time series analysis, decomposing components, applying smoothing, forecasting values, evaluating accuracy

6. Programme Learning Outcome: Maintain Data Quality and Integrity

Workplace examples: implementing automated validation checks, reconciling energy data across billing systems, tracking data quality issues

e-CF Competence: E.3 Risk Management (e-2)

Unit Learning Outcomes:

- 6.1 Assess data quality across dimensions (accuracy, completeness, consistency, timeliness, validity), identifying issues, prioritising remediation
- 6.2 Implement validation rules and controls, defining business rules, creating automated checks, flagging anomalies, preventing invalid entries
- 6.3 Perform data reconciliation and verification, comparing across systems, resolving discrepancies, tracing lineage, ensuring integrity
- 6.4 Document quality issues and resolutions, maintaining logs, tracking remediation, reporting metrics, implementing improvements

7. Programme Learning Outcome: Apply Data Analytics Tools

Workplace examples: writing SQL queries for carbon data extraction, using Python pandas for ESG analysis, conducting stakeholder interviews e-CF Competence: D.11 Needs Identification (e-2), A.7 Technology Trend Monitoring (e-2)

Unit Learning Outcomes:

- 7.1 Apply SQL for data querying, writing SELECT statements with joins and aggregations, filtering and sorting, creating views, optimising queries
- 7.2 Use Python or R for analysis and visualisation, importing and manipulating data with e.g. pandas or tidyverse, performing statistics, creating visualisations, automating workflows

- 7.3 Participate in stakeholder interviews, preparing for sessions, gathering data needs information, reviewing regulatory frameworks, contributing to requirements
- 7.4 Utilise business intelligence tools, preferably open source, to connect to data sources, analyse information, build simple dashboards, compare capabilities, and recommend solutions.

8. *Programme Learning Outcome: Communicate Insights and Support Governance*

Workplace examples: presenting carbon findings to executives, applying data classification to ESG datasets, maintaining data dictionaries

e-CF Competence: D.10 Information and Knowledge Management (e-2), E.3 Risk Management (e-2)

Unit Learning Outcomes:

- 8.1 Prepare data-driven presentations, structuring content logically, highlighting insights, using visualisations, anticipating questions
- 8.2 Write analysis reports, organising findings, explaining methodologies, presenting results, providing recommendations
- 8.3 Apply governance policies and standards, following classification policies, adhering to security requirements, respecting privacy regulations, maintaining compliance
- 8.4 Maintain data documentation, creating and updating dictionaries, documenting lineage, managing access requests, ensuring permissions

3. Assessment

Unit Learning Outcome	Assessment Type	Validation of Prior Learning
1.1	Workplace exploratory analysis submission	Analysis reports with documented findings
1.2	Carbon footprint calculation (actual facility)	Carbon accounting with methodology documentation
1.3	ESG metrics analysis (workplace dataset)	ESG analysis reports with KPI tracking
1.4	Data segmentation and correlation exercise	Segmentation and correlation work samples
2.1	Data collection workflow documentation	Process documentation from previous role

2.2	Validation rules application (workplace data)	Quality control procedures and results
2.3	Database maintenance demonstration	Administration logs or version control records
2.4	Data dictionary creation (workplace dataset)	Data documentation or dictionaries
3.1	Visualisation portfolio (3 chart types)	Sustainability data visualisation samples
3.2	Interactive dashboard (e.g., Home Assistant, Power BI/Tableau)	Interactive ESG monitoring dashboards
3.3	Automated report demonstration	Automated reporting with refresh schedules
3.4	Stakeholder presentation (15 min, observed)	Presentation materials showing data storytelling
4.1	ESRS data mapping exercise	CSRD data preparation documentation
4.2	GRI indicator calculation (5+ indicators)	GRI or framework reporting calculations
4.3	Assurance documentation preparation	Assurance materials and audit trails
4.4	Compliance calendar maintenance	Regulatory tracking systems
5.1	Descriptive statistical analysis	Statistical analysis work samples
5.2	Hypothesis test on sustainability intervention	Statistical testing documentation
5.3	Regression model (workplace data)	Regression analysis with model documentation
5.4	Time series forecast (6-12 months)	Forecasting examples with accuracy evaluation
6.1	Quality assessment across 5 dimensions	Data quality assessment reports
6.2	Automated validation implementation (5+ checks)	Automated validation systems in operation
6.3	Data reconciliation (2+ systems)	Reconciliation logs or verification results
6.4	Quality issue log (1 month minimum)	Issue tracking with resolution history
7.1	SQL query demonstration (5 queries)	SQL code samples with execution results
7.2	Python/R analysis (workplace data)	Python/R scripts with documented analyses
7.3	Stakeholder requirements documentation	Requirements documentation from interviews

7.4	BI tool evaluation (2 tools)	Tool evaluation reports with recommendations
8.1	Stakeholder briefing (20 min, observed)	Presentation delivery materials and feedback
8.2	Data analysis report (workplace project)	Analysis reports from previous work
8.3	Governance policy application	Policy adherence documentation
8.4	Data dictionary update and access management	Data documentation maintenance records

4. e-CF Competence Traceability

PLO	e-CF Competence	Proficiency Level
PLO 1	D.10 Information and Knowledge Management	e-3
PLO 2	D.10 Information and Knowledge Management	e-3
PLO 3	D.10 Information and Knowledge Management	e-2
PLO 4	D.10 Information and Knowledge Management	e-3
PLO 5	D.10 Information and Knowledge Management	e-3
PLO 6	E.3 Risk Management	e-2
PLO 7	D.11 Needs Identification, A.7 Technology Trend Monitoring	e-2
PLO 8	D.10 Information and Knowledge Management, E.3 Risk Management	e-2

B.2 Data Professional for Sustainability (DPS)

This profile prepares professionals to lead advanced data analytics, engineering, and science initiatives for sustainability.

1. Educational Profile Description

Field	Content
Description	Enables professionals to lead advanced data analytics, engineering, and science initiatives for sustainability, developing sophisticated models, architecting data infrastructure, and steering data-driven sustainability strategies.
Goal	Equip professionals with advanced competences to architect data systems, develop machine learning models, establish governance frameworks, and lead strategic data initiatives for sustainability.
Scope	Competences span e-CF areas A (Plan), B (Build), D (Enable), and E (Manage), encompassing advanced analytics, infrastructure architecture, compliance reporting, and data governance. Typical platforms include e.g. Apache Spark or Databricks for big data processing, e.g. Snowflake or Amazon Redshift for cloud warehousing, e.g., TensorFlow or PyTorch for machine learning, e.g. ThingWorx or Azure IoT Hub for environmental monitoring. Data flows involve multi-source ESG integration → real-time validation → scalable processing → ML inference → automated reporting.
Competences	A.5 Architecture Design (e-4), A.7 Technology Trend Monitoring (e-3), D.10 Information and Knowledge Management (e-4), E.3 Risk Management (e-3), E.8 Information Security Management (e-3)
Complexity	EQF Level 7 (Master's level) / e-CF proficiency e-3 to e-4. Requires bachelor's degree and 2+ years professional experience, or equivalent qualifications. Advanced knowledge of data science, analytics, and engineering required.
Deliverables	Advanced ML models for sustainability; Interactive visualisation platforms; CSRD-compliant reporting systems; Energy-optimised data architectures; Data governance frameworks; Scientific publications; ESG analytics dashboards; Predictive sustainability models
Perspective	Professional perspective: Prepared for Data Architect, Lead Data Scientist, Chief Data Officer in sustainability contexts, progressing to strategic leadership in data-driven sustainability. Educational perspective: Master's-level professional programme contributing toward full master's degree. Specialisation tracks available in Data Engineering (infrastructure optimisation) and Data Science (advanced analytics). Progression to advanced certification or doctoral research.

Progression Pathways: This master's-level (EQF 7) programme represents an advanced career destination. Graduates may pursue lateral Specialisation through Digital Sustainability Consultant (DSC) (combining data expertise with technical consulting) or advance to doctoral research in sustainability data science. Entry typically from Data Analyst for Sustainability (DAS) or equivalent bachelor's-level qualifications with professional experience.

2. Learning Outcome Structure and Contents

1. *Programme Learning Outcome: Architect Data Analytics Infrastructure for Sustainability*

Workplace examples: designing multi-source ESG integration platforms, implementing carbon-aware workload scheduling, building scalable analytics pipelines e-CF Competence: A.5 Architecture Design (e-4)

Unit Learning Outcomes:

- 1.1 Lead architecture of integrated analytical platforms, taking responsibility for design decisions including multi-source data integration, real-time analytics pipelines, scalable ML infrastructure, analytical governance
- 1.2 Design carbon-aware data infrastructure, implementing workload scheduling based on grid intensity, creating multi-region strategies for renewable energy alignment, establishing carbon-optimised storage tiers
- 1.3 Evaluate and select analytics technologies critically, comparing cloud platforms for sustainability workloads, assessing ML framework suitability, evaluating big data engines, analysing cost-performance trade-offs
- 1.4 Innovate analytical architectures for emerging challenges, developing hybrid edge-cloud architectures for IoT, creating federated learning systems, implementing data mesh patterns

2. *Programme Learning Outcome: Establish ESG Data Governance and Quality Frameworks*

Workplace examples: architecting CSRD compliance platforms, implementing automated data quality validation, designing enterprise metadata management

e-CF Competence: A.5 Architecture Design (e-4), D.10 Information and Knowledge Management (e-4)

Unit Learning Outcomes:

- 2.1 Lead architecture of enterprise ESG data governance, taking responsibility for data ownership models, quality frameworks, metadata management systems, lineage tracking

- 2.2 Design automated compliance reporting systems, implementing CSRD reporting platforms, EU taxonomy classification systems, GRI data collection workflows, TCFD disclosure automation
- 2.3 Establish comprehensive data quality frameworks, creating multi-dimensional quality assessment systems, automated validation pipelines, quality scoring methodologies, continuous monitoring
- 2.4 Architect data lineage and provenance tracking, designing end-to-end traceability, implementing automated lineage capture, creating impact analysis capabilities, establishing audit trails

3. *Programme Learning Outcome: Develop Advanced Analytics and Machine Learning Models*

Workplace examples: developing predictive models for emissions forecasting, applying deep learning to climate data, implementing sustainability recommendation systems

e-CF Competence: D.10 Information and Knowledge Management (e-4)

Unit Learning Outcomes:

- 3.1 Lead development of predictive sustainability models, taking responsibility for model architecture selection, feature engineering strategies, hyperparameter optimisation, validation methodologies
- 3.2 Implement deep learning approaches for environmental applications, designing neural networks for climate data, creating computer vision models for environmental monitoring, applying NLP to sustainability reports
- 3.3 Apply advanced statistical modelling for sustainability research, developing multivariate regression, structural equation modelling, hierarchical models, Bayesian approaches, time series forecasting
- 3.4 Design experimental studies and evaluate statistical evidence, creating randomised controlled trials, implementing difference-indifferences analyses, conducting power analyses, assessing effect sizes

4. *Programme Learning Outcome: Orchestrate Big Data Processing and Visualisation Strategy*

Workplace examples: implementing distributed processing for environmental datasets, optimising Spark jobs, architecting executive ESG dashboards

e-CF Competence: A.5 Architecture Design (e-4), D.10 Information and Knowledge Management (e-3)

Unit Learning Outcomes:

- 4.1 Architect big data platforms for sustainability, taking responsibility for distributed computing frameworks, stream processing systems, batch processing pipelines, hybrid architectures
- 4.2 Design IoT data architectures for environmental monitoring, creating edge computing systems, implementing real-time data ingestion, designing time-series databases, establishing retention policies
- 4.3 Lead design of strategic data visualisation platforms, architecting dashboard architectures, interactive visualisation frameworks, real-time monitoring systems, multi-stakeholder interfaces
- 4.4 Innovate visualisation and communication approaches, developing immersive visualisations, creating data storytelling strategies, implementing progressive disclosure patterns, architecting public sustainability platforms

5. *Programme Learning Outcome: Monitor Technology Trends and Ensure Data Security*

Workplace examples: evaluating emerging carbon accounting technologies, architecting zero-trust security for ESG data, implementing privacy-preserving analytics

e-CF Competence: A.7 Technology Trend Monitoring (e-3), E.8 Information Security Management (e-3)

Unit Learning Outcomes:

- 5.1 Lead technology horizon scanning for sustainability, taking responsibility for identifying emerging technologies, assessing maturity levels, evaluating applicability, forecasting adoption timelines
- 5.2 Innovate with emerging analytical technologies, experimenting with federated learning for sustainability data, exploring quantum computing for optimisation, applying blockchain for carbon markets
- 5.3 Architect security frameworks for sustainability data, designing zero-trust architectures, implementing data classification and protection, establishing access control systems, ensuring privacy compliance

- 5.4 Steer security risk assessment and mitigation, taking responsibility for identifying data security risks, evaluating threat scenarios, implementing controls, monitoring security posture

6. *Programme Learning Outcome: Formulate Data-Driven Sustainability Strategies*

Workplace examples: building business cases for data investments, leading organisational data literacy initiatives, driving strategic decisions with analytics

e-CF Competence: D.10 Information and Knowledge Management (e-4), E.3 Risk Management (e-3)

Unit Learning Outcomes:

- 6.1 Lead development of data strategies for sustainability, taking responsibility for strategic roadmaps, capability assessments, investment prioritisation, change management
- 6.2 Build business cases for sustainability data initiatives, conducting cost-benefit analyses, quantifying ROI, analysing risks, presenting recommendations to leadership
- 6.3 Drive organisational data literacy and culture, designing training programs, establishing communities of practice, promoting data-driven decision making, measuring maturity
- 6.4 Integrate data ethics and responsible AI principles, implementing fairness assessments, addressing algorithmic bias, ensuring transparency, establishing governance

7. *Programme Learning Outcome: Conduct and Disseminate Sustainability Research*

Workplace examples: publishing peer-reviewed research on climate analytics, presenting at international conferences, translating research findings for practitioners

e-CF Competence: D.10 Information and Knowledge Management (e-4)

Unit Learning Outcomes:

- 7.1 Design and execute rigorous research studies, formulating research questions, developing methodologies, conducting systematic analyses, interpreting results within theoretical frameworks
- 7.2 Apply reproducible research practices, implementing version control, documenting analytical workflows, sharing code and data, following open science principles
- 7.3 Communicate research findings to academic audiences, writing peer-reviewed papers, presenting at conferences, engaging with academic discourse, addressing reviewer feedback

- 7.4 Translate research for practitioners and policymakers, writing policy briefs, creating practitioner-oriented publications, engaging stakeholders, contributing to evidence-based decisions

8. *Programme Learning Outcome: Coordinate Data Projects and Lead Cross-Functional Teams*

Workplace examples: leading cross-functional ESG platform implementations, managing data science teams, coordinating with IT and business stakeholders

e-CF Competence: E.3 Risk Management (e-3), D.10 Information and Knowledge Management (e-3)

Unit Learning Outcomes:

- 8.1 Lead complex data projects from inception to deployment, taking responsibility for project planning, resource allocation, milestone tracking, quality assurance, stakeholder management
- 8.2 Manage and mentor data professionals, providing technical guidance, conducting code reviews, supporting skill development, evaluating performance, building team capabilities
- 8.3 Coordinate across organisational boundaries, engaging IT departments, business units, external partners, communicating technical concepts, negotiating requirements, managing conflicts
- 8.4 Implement agile data science practices, organising sprints, facilitating retrospectives, managing backlogs, balancing exploration with delivery

9. *Programme Learning Outcome: Optimise Energy Efficiency in Data Operations*

Workplace examples: measuring and reducing ML training emissions, implementing carbon-aware computing, optimising data centre operations

e-CF Competence: A.5 Architecture Design (e-4), E.3 Risk Management (e-3)

Unit Learning Outcomes:

- 9.1 Measure and report data operations carbon footprint, calculating emissions from compute, storage, networking; tracking over time; benchmarking against standards
- 9.2 Implement energy-efficient ML practices, optimising model architectures, using efficient hardware, applying model compression, scheduling workloads during low-carbon periods
- 9.3 Design green data architectures, selecting energy-efficient technologies, implementing tiered storage strategies, optimising query performance, minimising data movement

- 9.4 Steer organisational carbon reduction initiatives, setting reduction targets, implementing measurement systems, reporting progress, engaging stakeholders

10. *Programme Learning Outcome: Pioneer Advanced Analytics Innovation*

Workplace examples: pioneering new analytical approaches for circular economy, developing novel sustainability metrics, establishing centres of analytics excellence

e-CF Competence: A.7 Technology Trend Monitoring (e-3), D.10 Information and Knowledge Management (e-4)

Unit Learning Outcomes:

- 10.1 Pioneer novel analytical methodologies for sustainability, identifying gaps in current approaches, developing innovative techniques, validating new methods, publishing findings
- 10.2 Establish analytics innovation programs, creating experimentation frameworks, allocating innovation resources, managing proof-of-concepts, scaling successful innovations
- 10.3 Lead development of sustainability analytics standards, contributing to industry standards, defining best practices, sharing methodologies, influencing professional communities
- 10.4 Build strategic partnerships for analytics advancement, collaborating with research institutions, engaging technology vendors, participating in consortia, co-developing solutions

3. Assessment

Unit Learning Outcome	Assessment Type	Validation of Prior Learning
1.1	Architecture design document for integration platform	Architecture documentation for integrated platforms
1.2	Carbon-aware infrastructure implementation plan	Carbon-aware computing implementations or strategies
1.3	Technology evaluation report (3+ options, 5+ criteria)	Technology assessment reports with comparative analysis
1.4	Innovative architecture proposal for emerging challenge	Novel architecture proposals or implementations
2.1	Enterprise ESG governance framework design	Data governance frameworks designed and implemented
2.2	Automated compliance system architecture	Compliance reporting system designs or implementations

2.3	Data quality framework with automated validation	Comprehensive data quality frameworks in operation
2.4	Data lineage architecture implementation	Data lineage systems designed or implemented
3.1	Predictive sustainability model (production-ready)	ML models deployed for sustainability applications
3.2	Deep learning application for environmental data	Deep learning implementations for sustainability
3.3	Advanced statistical modelling study	Advanced statistical analyses with publication quality
3.4	Experimental study design and analysis	Experimental research with rigorous methodology
4.1	Big data platform architecture (workplace project)	Big data platform designs or implementations
4.2	IoT data architecture for environmental monitoring	IoT system architectures with real-time processing
4.3	Strategic visualisation platform design	Dashboard architecture documentation
4.4	Innovative visualisation project	Novel visualisation implementations
5.1	Technology horizon scanning report	Technology trend analysis reports
5.2	Emerging technology pilot project	Proof-of-concept implementations of new technologies
5.3	Security framework design for sustainability data	Security architecture documentation
5.4	Security risk assessment and mitigation plan	Security risk assessments with controls
6.1	Data strategy roadmap (3–5 years)	Strategic data roadmaps developed and approved
6.2	Business case for data initiative	Business case documents with approved investments
6.3	Data literacy program design and metrics	Data literacy programs implemented and measured
6.4	Data ethics framework implementation	Ethics frameworks with fairness assessments
7.1	Research study (publishable quality)	Published or submitted research papers
7.2	Reproducible research portfolio	Open research projects with documented workflows
7.3	Conference presentation or journal article	Academic publications or conference presentations
7.4	Policy brief or practitioner publication	Policy briefs, white papers, or practitioner articles
8.1	Data project portfolio (leadership role)	Project documentation showing leadership

8.2	Team mentoring documentation	Mentoring records, code reviews, performance evaluations
8.3	Cross-functional coordination case study	Stakeholder management documentation
8.4	Agile data science implementation	Sprint documentation, retrospectives, backlogs
9.1	Data operations carbon footprint report	Carbon accounting for data operations
9.2	Energy-efficient ML implementation	Green ML practices with measured reductions
9.3	Green data architecture design	Energy-efficient architecture documentation
9.4	Carbon reduction program with measurable results	Organisational carbon reduction initiatives
10.1	Novel methodology paper (peer-reviewed)	Published methodological innovations
10.2	Innovation program framework	Innovation programs established and operational
10.3	Standards contribution documentation	Contributions to industry standards or best practices
10.4	Strategic partnership case study	Partnership documentation with deliverables

4. e-CF Competence Traceability

PLO	e-CF Competence	Proficiency Level
PLO 1	A.5 Architecture Design	e-4
PLO 2	A.5 Architecture Design, D.10 Information and Knowledge Management	e-4
PLO 3	D.10 Information and Knowledge Management	e-4
PLO 4	A.5 Architecture Design, D.10 Information and Knowledge Management	e-4, e-3
PLO 5	A.7 Technology Trend Monitoring, E.8 Information Security Management	e-3
PLO 6	D.10 Information and Knowledge Management, E.3 Risk Management	e-4, e-3
PLO 7	D.10 Information and Knowledge Management	e-4
PLO 8	E.3 Risk Management, D.10 Information and Knowledge Management	e-3
PLO 9	A.5 Architecture Design, E.3 Risk Management	e-4, e-3
PLO 10	A.7 Technology Trend Monitoring, D.10 Information and Knowledge Management	e-3, e-4

B.3 Digital Sustainability Consultant (DSC)

This profile prepares professionals to provide expert advisory services on digital sustainability transformations, combining technical knowledge with consulting competences.

1. Educational Profile Description

Field	Content
Description	Enables professionals to provide advisory services on digital sustainability transformations, assess organisational maturity, design roadmaps, and guide clients through digital-environmental integration
Goal	Equip professionals with competences to assess sustainability challenges, recommend digital solutions, design transformation roadmaps, and guide organisational change toward sustainable digital practices.
Scope	Competences span e-CF areas A (Plan), D (Enable), and E (Manage), focusing on advisory and consulting rather than implementation. Typical platforms include e.g. sustainability assessment frameworks (GRI, CDP, SASB), e.g. maturity assessment tools, e.g. roadmap planning software (e.g. Miro, Lucidchart), and e.g. collaboration platforms for stakeholder engagement. Consulting flows involve client needs assessment → baseline evaluation → solution design → roadmap development → stakeholder engagement → impact measurement.
Competences	A.1 IS and Business Strategy Alignment (e-4), A.3 Business Plan Development (e-3), A.6 Application Design (e-3), D.11 Needs Identification (e-3), E.7 Business Change Management (e-3)
Complexity	EQF Level 7 (Master's level) / e-CF proficiency e-3 to e-4. Requires bachelor's degree and 2+ years professional experience, or equivalent qualifications. Advanced knowledge of sustainability frameworks, digital technologies, and consulting methodologies required.
Deliverables	Sustainability maturity assessments; Digital transformation roadmaps; Technology recommendation reports; Stakeholder engagement strategies; Change management plans; Sustainability KPI frameworks; Client workshops and training materials; Impact measurement frameworks
Perspective	Professional perspective: Prepared for Sustainability Consultant, Digital Transformation Advisor, ESG Strategy Consultant roles in consulting firms, corporate sustainability departments, or as independent consultants. Educational perspective: Master's-level professional programme contributing toward full master's degree. Opportunity for dual Specialisation with Data Professional for Sustainability (DPS) or Digital Sustainability

Manager (DSM) for broader competence portfolios. Progression to advanced consulting certifications or specialised doctoral research.

Progression Pathways: This master's-level (EQF 7) programme represents an advanced destination for advisory roles. Graduates may pursue lateral Specialisation through Data Professional for Sustainability (DPS) (combining consulting with technical implementation) or Digital Sustainability Manager (DSM) (moving from advisory to internal management roles). Entry typically from sustainability, IT consulting, or digital transformation backgrounds.

2. Learning Outcome Structure and Contents

1. *Programme Learning Outcome: Assess Organisational Sustainability Maturity*

Workplace examples: conducting digital sustainability readiness assessments, evaluating current ESG data capabilities, benchmarking against industry standards

e-CF Competence: D.11 Needs Identification (e-3)

Unit Learning Outcomes:

- 1.1 Conduct comprehensive sustainability assessments, evaluating current practices, identifying gaps, analysing stakeholder needs, determining readiness levels
- 1.2 Assess digital maturity for sustainability applications, evaluating data infrastructure, analytical capabilities, technology adoption, integration levels
- 1.3 Benchmark against industry standards and best practices, comparing performance to peers, identifying leading practices, evaluating competitive positioning
- 1.4 Synthesise assessment findings into actionable insights, prioritising improvement areas, identifying quick wins, quantifying potential benefits

2. *Programme Learning Outcome: Design Digital Sustainability Solutions*

Workplace examples: recommending ESG data platforms, designing carbon accounting systems, specifying IoT sensor networks for environmental monitoring e-CF Competence: A.6 Application Design (e-3)

Unit Learning Outcomes:

- 2.1 Recommend digital solutions for sustainability challenges, evaluating technology options, analysing feasibility, considering organisational context, proposing tailored approaches
- 2.2 Design ESG data and reporting architectures, specifying data collection mechanisms, defining integration requirements, outlining analytical capabilities, ensuring regulatory compliance

- 2.3 Specify digital environmental monitoring systems, recommending sensor technologies, designing data flows, defining analytics requirements, proposing visualisation approaches
- 2.4 Evaluate solution trade-offs and risks, analysing cost-benefit ratios, assessing implementation complexity, identifying potential barriers, proposing mitigation strategies

3. *Programme Learning Outcome: Develop Transformation Roadmaps*

Workplace examples: creating 3-year digital sustainability roadmaps, phasing technology implementations, defining milestones and success metrics

e-CF Competence: A.3 Business Plan Development (e-3), A.1 IS and Business Strategy Alignment (e-4)

Unit Learning Outcomes:

- 3.1 Develop strategic transformation roadmaps, defining vision and objectives, sequencing initiatives, allocating resources, establishing timelines
- 3.2 Align digital sustainability initiatives with business strategy, connecting sustainability goals to business objectives, demonstrating value creation, securing executive commitment
- 3.3 Define implementation phases and milestones, breaking roadmaps into achievable phases, establishing decision gates, defining success criteria, planning reviews
- 3.4 Quantify benefits and build business cases, estimating costs and returns, analysing financial viability, projecting sustainability impacts, presenting recommendations

4. *Programme Learning Outcome: Guide Stakeholder Engagement and Change*

Workplace examples: facilitating executive workshops on sustainability strategy, designing employee engagement programs, managing resistance to digital change
e-CF Competence: E.7 Business Change Management (e-3)

Unit Learning Outcomes:

- 4.1 Design stakeholder engagement strategies, identifying key stakeholders, analysing interests and influence, planning communication approaches, facilitating dialogue
- 4.2 Facilitate workshops and collaborative sessions, preparing agendas and materials, guiding discussions, building consensus, capturing outcomes
- 4.3 Guide organisational change processes, assessing change readiness, designing change management plans, addressing resistance, supporting adoption
- 4.4 Build capacity through training and knowledge transfer, designing training programs, delivering workshops, creating resources, embedding practices

5. *Programme Learning Outcome: Advise on Sustainability Frameworks and Standards*

Workplace examples: guiding CSRD compliance approaches, recommending GRI reporting practices, advising on EU Taxonomy alignment

e-CF Competence: D.11 Needs Identification (e-3), A.1 IS and Business Strategy Alignment (e-4)

Unit Learning Outcomes:

- 5.1 Advise on sustainability reporting frameworks, comparing GRI, CSRD, TCFD, CDP requirements, recommending appropriate frameworks, guiding implementation approaches
- 5.2 Guide regulatory compliance strategies, interpreting CSRD, EU Taxonomy, SFDR requirements, assessing compliance gaps, designing compliance roadmaps
- 5.3 Recommend KPI frameworks and metrics, defining meaningful indicators, aligning with standards, ensuring measurability, enabling benchmarking
- 5.4 Support external assurance preparation, advising on documentation requirements, recommending data quality improvements, preparing for auditor engagement

6. *Programme Learning Outcome: Evaluate Emerging Digital Technologies*

Workplace examples: assessing AI applications for sustainability, evaluating IoT platforms for environmental monitoring, analysing blockchain for carbon markets

e-CF Competence: A.6 Application Design (e-3), D.11 Needs Identification (e-3)

Unit Learning Outcomes:

- 6.1 Evaluate emerging technologies for sustainability applications, assessing AI/ML, IoT, blockchain, digital twins, analysing maturity and applicability
- 6.2 Conduct technology feasibility studies, evaluating technical viability, assessing organisational readiness, analysing integration requirements, estimating effort
- 6.3 Advise on technology selection and adoption, comparing vendor solutions, analysing total cost of ownership, assessing risks, recommending approaches
- 6.4 Anticipate technology trends and implications, monitoring innovation landscape, forecasting future capabilities, advising on strategic positioning

7. *Programme Learning Outcome: Measure and Communicate Impact*

Workplace examples: designing impact measurement frameworks, creating simple executive sustainability dashboards, reporting on transformation progress

e-CF Competence: A.3 Business Plan Development (e-3), D.11 Needs Identification (e-3)

Unit Learning Outcomes:

- 7.1 Design impact measurement frameworks, defining success metrics, establishing baselines, planning data collection, specifying reporting approaches
- 7.2 Analyse and interpret sustainability data, conducting trend analyses, identifying insights, comparing against targets, assessing progress
- 7.3 Create executive communications and reports, synthesising complex information, tailoring messages to audiences, visualising key insights, recommending actions
- 7.4 Demonstrate value creation and ROI, quantifying environmental benefits, calculating financial returns, presenting business cases, securing continued investment

3. Assessment

Unit Learning Outcome	Assessment Type	Validation of Prior Learning
1.1	Comprehensive sustainability assessment (actual client/organisation)	Sustainability assessment reports conducted
1.2	Digital maturity assessment report	Digital capability assessment documentation
1.3	Benchmarking study with recommendations	Benchmarking analyses with peer comparisons
1.4	Assessment synthesis and priority recommendations	Assessment findings with prioritised roadmaps
2.1	Digital solution recommendation report	Technology recommendation reports from projects
2.2	ESG data architecture design	ESG system architecture documentation
2.3	Environmental monitoring system specification	IoT or monitoring system specifications
2.4	Solution trade-off analysis	Feasibility studies with risk assessments
3.1	Strategic transformation roadmap (3-5 years)	Transformation roadmaps developed for clients
3.2	Strategy alignment document	Business case documents showing strategy alignment
3.3	Phased implementation plan with milestones	Implementation plans with defined phases
3.4	Business case with quantified benefits	Business cases with financial and sustainability ROI
4.1	Stakeholder engagement strategy	Stakeholder analysis and engagement plans
4.2	Workshop facilitation (observed, actual client session)	Workshop facilitation materials and outcomes

4.3	Change management plan	Change management documentation from projects
4.4	Training program design and delivery	Training materials and delivery evidence
5.1	Sustainability framework advisory report	Framework recommendation reports
5.2	Regulatory compliance roadmap	Compliance gap analyses and implementation plans
5.3	KPI framework design	KPI frameworks developed for clients
5.4	Assurance readiness assessment	Assurance preparation guidance documentation
6.1	Emerging technology assessment	Technology evaluation reports
6.2	Technology feasibility study	Feasibility analyses for technology adoption
6.3	Technology selection recommendation	Vendor evaluation and selection reports
6.4	Technology trend briefing for executives	Trend analysis presentations or reports
7.1	Impact measurement framework design	Impact measurement frameworks developed
7.2	Sustainability data analysis and insights	Data analysis reports with insights
7.3	Executive communication package	Executive presentations or reports
7.4	Value creation and ROI demonstration	ROI analyses with quantified benefits

4. e-CF Competence Traceability

PLO	e-CF Competence	Proficiency Level
PLO 1	D.11 Needs Identification	e-3
PLO 2	A.6 Application Design	e-3
PLO 3	A.3 Business Plan Development, A.1 IS and Business Strategy Alignment	e-3, e-4
PLO 4	E.7 Business Change Management	e-3
PLO 5	D.11 Needs Identification, A.1 IS and Business Strategy Alignment	e-3, e-4
PLO 6	A.6 Application Design, D.11 Needs Identification	e-3
PLO 7	A.3 Business Plan Development, D.11 Needs Identification	e-3

B.4 Digital Sustainability Manager (DSM)

This profile prepares professionals to lead organisational sustainability transformations, integrating digital technologies with strategic sustainability management.

1. Educational Profile Description

Field	Content
Description	Enables professionals to lead organisational sustainability transformations, integrating digital technologies with strategic management, orchestrating cross-functional initiatives, and steering organisational change toward sustainable practices.
Goal	Equip professionals with competences to develop sustainability strategies, manage transformation programs, orchestrate stakeholder engagement, govern digital sustainability initiatives, and demonstrate measurable impact.
Scope	Competences span e-CF areas A (Plan) and E (Manage), focusing on strategic management and organisational leadership. Typical platforms include e.g. project management tools (Asana, Monday.com), e.g. sustainability management platforms (SAP Sustainability Control Tower, Enablon), e.g. collaboration tools (Slack, Microsoft Teams), and e.g. reporting dashboards (Home Assistant, Power BI, Tableau). Management flows involve strategy formulation → program planning → resource allocation → stakeholder orchestration → governance monitoring → impact reporting.
Competences	A.1 IS and Business Strategy Alignment (e-4), A.3 Business Plan Development (e-4), E.7 Business Change Management (e-4), E.8 Information Security Management (e-3), E.9 IS Governance (e-3)
Complexity	EQF Level 7 (Master's level) / e-CF proficiency e-3 to e-4. Requires bachelor's degree and 3+ years management experience, or equivalent qualifications. Advanced knowledge of strategic management, organisational change, and sustainability required.
Deliverables	Organisational sustainability strategies; Digital transformation programs; Stakeholder engagement frameworks; Governance structures and policies; Change management plans; Performance measurement systems; Executive reports and communications; Sustainability policy recommendations
Perspective	Professional perspective: Prepared for Chief Sustainability Officer, Head of Digital Sustainability, Sustainability Program Manager roles, leading organisational sustainability transformations. Educational perspective: Master's-level professional programme contributing toward full master's degree in sustainability management or

digital transformation. Progression to executive education, advanced certifications (e.g. GRI, CDP), or doctoral research in sustainability leadership.

Progression Pathways: This master's-level (EQF 7) programme represents a senior leadership destination. Graduates typically progress to C-suite positions (CSO, CDO) or pursue lateral Specialisation through Data Professional for Sustainability (DPS) (adding technical depth) or Digital Sustainability Consultant (DSC) (transitioning to advisory roles). Entry from Data Analyst for Sustainability (DAS) or management backgrounds.

2. Learning Outcome Structure and Contents

1. *Programme Learning Outcome: Formulate Digital Sustainability Strategies*

Workplace examples: developing enterprise sustainability strategies aligned with digital transformation, defining ESG goals with digital enablement roadmaps e-CF Competence: A.1 IS and Business Strategy Alignment (e-4)

Unit Learning Outcomes:

- 1.1 Lead development of integrated sustainability strategies, taking responsibility for vision formulation, goal setting, stakeholder alignment, strategic planning
- 1.2 Align sustainability initiatives with business objectives, connecting environmental goals to value creation, securing executive commitment, integrating with corporate strategy
- 1.3 Define digital enablement approaches for sustainability, identifying technology opportunities, prioritising digital initiatives, allocating resources, managing portfolios
- 1.4 Establish governance frameworks for digital sustainability, defining decision-making structures, assigning accountabilities, creating policies, ensuring compliance

2. *Programme Learning Outcome: Orchestrate Sustainability Transformation Programs*

Workplace examples: leading organisation-wide CSRD implementation programs, managing multi-year carbon neutrality initiatives, coordinating cross-functional sustainability projects

e-CF Competence: A.3 Business Plan Development (e-4), E.7 Business Change Management (e-4)

Unit Learning Outcomes:

- 2.1 Lead complex transformation programs, taking responsibility for program planning, resource management, milestone tracking, risk mitigation, stakeholder coordination
- 2.2 Orchestrate cross-functional initiatives, coordinating IT, operations, finance, procurement teams, managing dependencies, resolving conflicts, ensuring alignment

- 2.3 Manage program governance and decision-making, establishing steering committees, defining escalation paths, conducting reviews, making go/no-go decisions
- 2.4 Balance strategic objectives with operational constraints, managing competing priorities, optimising resource allocation, adapting plans, maintaining momentum

3. *Programme Learning Outcome: Steer Organisational Change and Culture*

Workplace examples: driving sustainability culture change across 1000+ employees, managing resistance to new ESG reporting requirements, embedding circular economy practices

e-CF Competence: E.7 Business Change Management (e-4)

Unit Learning Outcomes:

- 3.1 Lead organisational change initiatives, taking responsibility for change vision, stakeholder engagement, communication strategies, adoption monitoring
- 3.2 Assess and enhance change readiness, evaluating organisational culture, identifying barriers, designing interventions, building change capabilities
- 3.3 Manage resistance and build commitment, addressing concerns proactively, engaging sceptics, demonstrating benefits, celebrating successes
- 3.4 Embed sustainability in organisational culture, designing incentive systems, establishing practices, creating champions networks, measuring cultural shifts

4. *Programme Learning Outcome: Govern Digital Sustainability Initiatives*

Workplace examples: establishing ESG data governance boards, defining digital sustainability policies, managing sustainability technology investments

e-CF Competence: E.9 IS Governance (e-3), E.8 Information Security Management (e-3)

Unit Learning Outcomes:

- 4.1 Establish governance structures for sustainability, creating boards and committees, defining roles and responsibilities, establishing decision-making processes
- 4.2 Define policies and standards for digital sustainability, creating data governance policies, setting technology standards, ensuring regulatory compliance, managing risks
- 4.3 Oversee sustainability technology investments, evaluating business cases, prioritising initiatives, allocating budgets, monitoring returns, ensuring value realisation
- 4.4 Ensure data security and privacy in sustainability systems, implementing controls, managing access, ensuring compliance with GDPR and data protection regulations

5. *Programme Learning Outcome: Engage and Influence Stakeholders*

Workplace examples: securing board approval for sustainability investments, engaging investors on ESG strategy, coordinating with supply chain partners on carbon reduction e-CF Competence: E.7 Business Change Management (e-4), A.3 Business Plan Development (e-4)

Unit Learning Outcomes:

- 5.1 Lead executive and board engagement, preparing board materials, presenting strategies, securing decisions, reporting progress
- 5.2 Orchestrate stakeholder coalitions, identifying key influencers, building relationships, negotiating agreements, maintaining engagement
- 5.3 Manage investor and external stakeholder relations, communicating ESG performance, responding to inquiries, managing expectations, building reputation
- 5.4 Coordinate supply chain and partner engagement, setting supplier requirements, monitoring performance, driving collaborative initiatives, sharing best practices

6. *Programme Learning Outcome: Measure and Demonstrate Impact*

Workplace examples: implementing organisation-wide sustainability KPI tracking, reporting ESG performance to investors, demonstrating ROI of digital sustainability investments

e-CF Competence: A.3 Business Plan Development (e-4), E.9 IS Governance

(e-3)

Unit Learning Outcomes:

- 6.1 Design performance measurement systems, defining KPIs and targets, establishing data collection mechanisms, implementing tracking systems, ensuring data quality
- 6.2 Lead impact assessment and reporting, analysing performance data, identifying trends, comparing against targets, preparing reports for stakeholders
- 6.3 Demonstrate business value and ROI, quantifying financial benefits, calculating returns on investment, presenting value creation, securing continued funding
- 6.4 Drive continuous improvement, analysing performance gaps, identifying improvement opportunities, implementing corrective actions, learning from experience

7. *Programme Learning Outcome: Navigate Regulatory and Policy Landscapes*

Workplace examples: ensuring organisational compliance with CSRD, engaging with policymakers on sustainability regulations, adapting strategies to policy changes

e-CF Competence: A.1 IS and Business Strategy Alignment (e-4), E.9 IS Governance (e-3)

Unit Learning Outcomes:

- 7.1 Monitor and interpret regulatory developments, tracking EU sustainability regulations, analysing implications, assessing compliance requirements, planning responses
- 7.2 Ensure organisational compliance, implementing compliance programs, coordinating audits, managing remediation, maintaining documentation
- 7.3 Engage with policy and standard-setting processes, participating in industry associations, contributing to consultations, influencing standards development
- 7.4 Adapt strategies to policy changes, assessing impacts of new regulations, updating plans, reallocating resources, communicating changes

3. Assessment

Unit Learning Outcome	Assessment Type	Validation of Prior Learning
1.1	Sustainability strategy document (organisational level)	Strategic plans developed and approved
1.2	Strategy alignment documentation	Business cases showing strategy-objective alignment
1.3	Digital enablement roadmap	Technology roadmaps with prioritised initiatives
1.4	Governance framework design	Governance structures established
2.1	Transformation program plan and execution evidence	Program documentation showing leadership
2.2	Cross-functional coordination documentation	Cross-functional program management evidence
2.3	Program governance documentation	Steering committee materials, decision logs
2.4	Resource optimisation and trade-off analysis	Program management with demonstrated adaptability
3.1	Change initiative leadership portfolio	Change leadership documentation
3.2	Change readiness assessment and intervention plan	Change management assessments and plans
3.3	Resistance management case study	Stakeholder management with resistance resolution
3.4	Culture change program with measured outcomes	Cultural initiatives with measurable impact
4.1	Governance structure implementation	Governance boards/committees established

4.2	Policy framework for digital sustainability	Policies and standards documentation
4.3	Investment portfolio management documentation	Investment decisions with tracked returns
4.4	Data security and privacy implementation	Security controls and compliance documentation
5.1	Board presentation and decision documentation	Board materials with secured approvals
5.2	Stakeholder coalition building case study	Stakeholder engagement with documented outcomes
5.3	Investor relations materials and engagement log	ESG communications and investor interactions
5.4	Supply chain engagement program	Partner coordination with performance tracking
6.1	Performance measurement system design	KPI tracking systems implemented
6.2	Impact assessment report (organisational scope)	Performance reports with trend analysis
6.3	Business value and ROI demonstration	Value quantification with financial analysis
6.4	Continuous improvement implementation	Performance improvement initiatives with results
7.1	Regulatory monitoring and interpretation briefing	Regulatory analysis and compliance planning
7.2	Compliance program implementation	Compliance management with audit results
7.3	Policy engagement documentation	Industry association or consultation participation
7.4	Strategic adaptation to policy change	Strategy updates responding to regulatory changes

4. e-CF Competence Traceability

PLO	e-CF Competence	Proficiency Level
PLO 1	A.1 IS and Business Strategy Alignment	e-4
PLO 2	A.3 Business Plan Development, E.7 Business Change Management	e-4
PLO 3	E.7 Business Change Management	e-4
PLO 4	E.9 IS Governance, E.8 Information Security Management	e-3
PLO 5	E.7 Business Change Management, A.3 Business Plan Development	e-4
PLO 6	A.3 Business Plan Development, E.9 IS Governance	e-4, e-3
PLO 7	A.1 IS and Business Strategy Alignment, E.9 IS Governance	e-4, e-3

B.5 Sustainability Technical Specialist (STS)

This profile prepares learners to implement and maintain digital sustainability technologies, providing technical support for ESG platforms and environmental monitoring systems.

1. Educational Profile Description

Element	Content
Description	Enables professionals to implement, configure, and maintain digital sustainability technologies, support users, troubleshoot technical issues, and ensure reliable operation of ESG and environmental monitoring systems.
Goal	Equip professionals with competences to configure sustainability platforms, perform system maintenance, troubleshoot technical issues, support users, maintain documentation, and follow technical standards.
Scope	Competences span e-CF areas B (Build) and C (Run), focusing on implementation and operational support. Typical platforms include e.g. ESG management systems (SAP Sustainability Control Tower, Enablon, Greenstone), e.g. IoT environmental sensors and gateways (e.g. Monnit, Bosch), e.g. energy management systems (Schneider EcoStruxure, Siemens Navigator), and e.g. ticketing systems (e.g. Jira Service Management). Technical flows involve system configuration → data integration → user onboarding → ongoing monitoring → issue resolution → documentation updates.
Competences	B.3 Testing (e-2), B.5 Documentation Production (e-2), C.1 User Support (e-2), C.3 Service Delivery (e-2), C.4 Problem Management (e-2)
Complexity	EQF Level 5 (Short-cycle tertiary/Advanced VET) / e-CF proficiency e-2. Requires advanced vocational training or equivalent experience. Technical knowledge of IT systems, databases, and sustainability applications required.
Deliverables	Configured sustainability platforms; System integration documentation; User guides and training materials; Technical support logs; Maintenance procedures; Troubleshooting documentation; System monitoring reports; Equipment maintenance records
Perspective	Professional perspective: Prepared for Sustainability Systems Technician, ESG Platform Administrator, Environmental Monitoring Technician roles, progressing to technical specialist or system administrator positions. Educational perspective: Foundation for Data Professional for Sustainability (DPS) or other EQF 6–7 programmes. Enables credit recognition toward bachelor's degrees in IT, environmental technology, or sustainability management.

Progression Pathways: Graduates progress to Data Professional for Sustainability (DPS) for advanced technical and analytical roles, combining operational expertise with data engineering/science competences. This EQF 5 programme provides practical foundation for bachelor's-level study or specialised technical certifications.

2. Learning Outcome Structure and Contents

1. *Programme Learning Outcome: Configure and Integrate Sustainability Platforms*

Workplace examples: setting up ESG reporting modules, configuring emission calculation rules, integrating data, e.g., from sensors into simple dashboards

e-CF Competence: B.3 Testing (e-2), C.3 Service Delivery (e-2)

Unit Learning Outcomes:

- 1.1 Configure sustainability platform modules, following setup procedures, applying configuration settings, verifying functionality, documenting configurations
- 1.2 Perform system customisation tasks, adapting templates, configuring workflows, setting user permissions, testing customisations
- 1.3 Integrate data sources with platforms, connecting databases, configuring data feeds, mapping data fields, verifying data flow
- 1.4 Test system configurations, executing test plans, identifying defects, documenting results, supporting remediation

2. *Programme Learning Outcome: Maintain Systems and Equipment*

Workplace examples: performing routine platform health checks, collecting sensor data, maintaining monitoring equipment, updating system configurations

e-CF Competence: C.3 Service Delivery (e-2)

Unit Learning Outcomes:

- 2.1 Monitor system operations, checking system status, reviewing logs, identifying issues, performing routine maintenance
- 2.2 Perform maintenance procedures, following schedules, executing routine tasks, documenting activities, escalating problems
- 2.3 Collect and manage environmental data, retrieving sensor data, validating measurements, organising data files, backing up data

- 2.4 Maintain monitoring equipment, checking sensors and gateways, performing calibration, replacing batteries or components, documenting maintenance

3. *Programme Learning Outcome: Troubleshoot Technical Issues*

Workplace examples: resolving data integration errors, fixing simple dashboard display problems, addressing user access issues e-CF Competence: C.4 Problem Management (e-2)

Unit Learning Outcomes:

- 3.1 Diagnose technical problems, gathering symptoms, reviewing error messages, reproducing issues, identifying root causes
- 3.2 Resolve system issues, applying fixes, implementing workarounds, testing solutions, verifying resolution
- 3.3 Address connectivity problems, checking network connections, verifying configurations, resolving communication errors
- 3.4 Escalate complex issues appropriately, documenting technical details, engaging vendor support, coordinating with specialists, tracking resolution

4. *Programme Learning Outcome: Support Platform Users*

Workplace examples: answering user questions about ESG data entry, conducting training sessions on dashboard use, coordinating with software vendors

e-CF Competence: C.1 User Support (e-2)

Unit Learning Outcomes:

- 4.1 Respond to user support requests, receiving inquiries, clarifying issues, aiding, following up on resolutions
- 4.2 Guide users on platform functionality, explaining features, demonstrating procedures, answering questions, providing tips
- 4.3 Conduct user training sessions, preparing training materials, demonstrating system features, facilitating hands-on practice, answering questions
- 4.4 Coordinate with vendors for support, logging vendor tickets, providing information, tracking resolution progress, communicating updates

5. *Programme Learning Outcome: Manage Incidents and Documentation*

Workplace examples: tracking platform incidents using ticket systems, documenting issues, maintaining technical documentation

e-CF Competence: C.3 Service Delivery (e-2)

Unit Learning Outcomes:

- 5.1 Log and track incidents, creating incident records, categorising issues, assigning priorities, updating status
- 5.2 Coordinate incident resolution, notifying stakeholders, coordinating with teams, implementing workarounds, monitoring progress
- 5.3 Document incident details and procedures, recording symptoms, capturing troubleshooting steps, documenting solutions, creating knowledge articles
- 5.4 Analyse incident patterns, reviewing incident history, identifying trends, recommending improvements, preventing recurrence

6. Programme Learning Outcome: Maintain Technical Documentation

Workplace examples: writing documentation for system configurations, maintaining procedure manuals, organising documentation repositories

e-CF Competence: B.5 Documentation Production (e-2)

Unit Learning Outcomes:

- 6.1 Create technical documentation, writing procedures, documenting configurations, preparing diagrams, organising information
- 6.2 Maintain documentation currency, reviewing existing documents, updating procedures, incorporating changes, ensuring accuracy
- 6.3 Create user documentation, writing step-by-step guides, preparing quick reference materials, creating video tutorials, maintaining help content
- 6.4 Organise documentation repositories, structuring documentation, implementing version control, managing access, ensuring discoverability

7. Programme Learning Outcome: Support Green IT Infrastructure

Workplace examples: maintaining green IT infrastructure including energy efficient servers, monitoring power consumption, performing preventive maintenance

e-CF Competence: C.3 Service Delivery (e-2)

Unit Learning Outcomes:

- 7.1 Support energy-efficient IT infrastructure, monitoring power consumption, checking cooling systems, maintaining equipment logs, identifying inefficiencies

- 7.2 Perform preventive maintenance, following maintenance schedules, conducting routine checks, identifying potential issues, planning repairs
- 7.3 Manage equipment lifecycle, tracking equipment status, planning replacements, coordinating installations, ensuring proper disposal
- 7.4 Ensure system availability, responding to outages, implementing recovery procedures, testing systems after maintenance, documenting downtime

8. *Programme Learning Outcome: Follow Professional Standards*

Workplace examples: following data security protocols, adhering to organisational policies, participating in technical training

e-CF Competence: C.3 Service Delivery (e-2)

Unit Learning Outcomes:

- 8.1 Adhere to security policies, following data protection procedures, maintaining confidentiality, implementing access controls, reporting security concerns
- 8.2 Follow organisational procedures, complying with policies, following established workflows, maintaining standards, seeking clarification when needed
- 8.3 Participate in training programs, attending training sessions, completing certifications, applying new knowledge, sharing learnings
- 8.4 Develop technical skills, practicing new techniques, learning new tools, sharing experiences, documenting lessons learned

3. Assessment

Unit Learning Outcome	Assessment Type	Validation of Prior Learning
1.1	Platform configuration demonstration (actual system)	Configuration documentation from previous work
1.2	System customisation practical	Customisation work samples
1.3	Data integration practical exercise	Integration documentation
1.4	Testing documentation portfolio	Test plans and results
2.1	System monitoring demonstration	Monitoring logs and reports
2.2	Maintenance procedure execution	Maintenance records
2.3	Data collection practical	Data management documentation
2.4	Equipment maintenance demonstration	Equipment maintenance logs
3.1	Troubleshooting demonstration (actual issue)	Problem resolution documentation

3.2	Issue resolution practical	Technical support records
3.3	Connectivity troubleshooting exercise	Network troubleshooting documentation
3.4	Escalation procedure documentation	Escalation records and vendor coordination
4.1	User support session (observed, actual user)	Helpdesk records and user feedback
4.2	User guidance demonstration	User assistance documentation
4.3	Training session delivery (observed, actual users)	Training materials and delivery feedback
4.4	Vendor coordination documentation	Vendor communication records
5.1	Incident logging demonstration	Incident tickets from ticketing system
5.2	Incident coordination practical	Incident resolution documentation
5.3	Incident documentation portfolio	Knowledge base articles created
5.4	Incident trend analysis report	Pattern analysis documentation
6.1	Technical documentation portfolio	Technical documentation samples
6.2	Documentation update practical	Documentation maintenance records
6.3	User guide creation	User documentation examples
6.4	Documentation repository management	Documentation organisation systems
7.1	Infrastructure support demonstration	Green IT monitoring records
7.2	Preventive maintenance practical	Maintenance execution records
7.3	Equipment lifecycle management	Asset management documentation
7.4	System availability management	Availability reports and incident response logs
8.1	Security compliance demonstration	Security compliance records
8.2	Procedure compliance documentation	Policy adherence records
8.3	Training completion portfolio	Training certificates and records
8.4	Skills development documentation	Learning logs and contribution records

4. e-CF Competence Traceability

PLO	e-CF Competence	Proficiency Level
PLO 1	B.3 Testing, C.3 Service Delivery	e-2
PLO 2	C.3 Service Delivery	e-2
PLO 3	C.4 Problem Management	e-2
PLO 4	C.1 User Support	e-2
PLO 5	C.3 Service Delivery	e-2
PLO 6	B.5 Documentation Production	e-2
PLO 7	C.3 Service Delivery	e-2
PLO 8	C.3 Service Delivery	e-2

Annex C – Curricula

C.1 Core Curricula

C.1.1 Data Analyst for Sustainability (DAS)

This curriculum prepares learners to conduct sustainability data analysis, for instance to manage ESG data processes and to support regulatory reporting. Graduates combine analytical capabilities with data quality management and stakeholder communication skills.

Programme Information

Element	Specification
Code / ECTS / EQF / e-CF	DAS / 60 ECTS / EQF 6 / e-2 to e-3
Duration	2 semesters (12 months)
Target Group	Data analysts, business analysts, sustainability coordinators, ESG analysts

Programme Learning Outcomes

Full PLO specifications in Educational Profile B.1. Summary:

PLO Range	Focus Areas	Primary e-CF Competences
PLO 1-2	Sustainability data analysis; ESG data collection and quality control	D.10 Information and Knowledge Management (e-3)
PLO 3-4	Data visualisations and dashboards; CSRD and ESG regulatory reporting	D.10 Information and Knowledge Management (e-2, e-3)
PLO 5-6	Statistical analysis for sustainability; Data quality and integrity maintenance	D.10 Information and Knowledge Management (e-3); E.3 Risk Management (e-2)
PLO 7-8	Data analytics tools application; Insights communication and data governance support	D.11 Needs Identification (e-2); A.7 Technology Trend Monitoring (e-2); D.10/E.3 (e-2)

Structure

Semester 1 (30 ECTS)

Code	Learning Unit	ECTS
LU01	Digital Sustainability Foundations	0.5
LU03	Data Collection and Quality for Sustainability	5.0
LU14	Business Intelligence for Sustainability	3.0
LU24	Data Visualisation for Sustainability Communication	3.0
LU39	Sustainability Reporting and Dashboard Evaluation	2.5
LU40	Data Analytics Tools and Platforms	3.0
LU41	ESG Data Management and Quality Assurance	2.5

LU42	EU Green Deal: Foundations and Framework	2.0
LU44	Corporate Sustainability Reporting Directive (CSRD)	5.0
LU50	EU Sustainability Legislation: Integrated Overview	1.5
LU43	EU Taxonomy Regulation: Classification and Compliance	2.0

Semester 2 (30 ECTS)

Code	Learning Unit	ECTS
LU02	Sustainability Data Foundations	5.0
LU04	Data Analytics for Sustainability Insights	5.0
LU27	Machine Learning Applications in Sustainability	5.0
LU29	Data Governance and Ethics for Sustainability	5.0
LU38	Green ICT Principles	1.0
LU45	Sustainable Finance Disclosure Regulation (SFDR) Fundamentals	2.0
LU34	Work-Based Sustainability Project	7.0

Total: 60 ECTS

Assessment

Workplace-based assessments emphasise authentic outputs: analytical portfolios showing data analyses and ESG metrics (40%), applied projects including CSRD reporting and dashboards (35%), work-based capstone project LU34 (25%). All assessments enable prior learning validation through workplace evidence.

Entry Requirements

Bachelor's degree or equivalent with basic data literacy and spreadsheet familiarity.

Learning Pathway

Entry roles: Data Analyst, Business Analyst, Sustainability Coordinator, ESG Analyst

Progression: Senior Data Analyst (Sustainability), ESG Reporting Manager, or advancement to Data Professional for Sustainability (DPS, EQF 7) or Digital Sustainability Manager (DSM, EQF 7)

C.1.2 Data Professional for Sustainability (DPS)

This curriculum develops competences to lead advanced data analytics, engineering, and science initiatives for sustainability. Graduates architect data infrastructure, develop sophisticated models, and drive data-driven sustainability strategies at strategic leadership level.

Programme Information

Element	Specification
Code / ECTS / EQF / e-CF	DPS / 90 ECTS / EQF 7 / e-3 to e-4
Duration	3 semesters (18 months)
Target Group	Data architects, data scientists (sustainability), data engineers, ESG data managers

Programme Learning Outcomes

Full PLO specifications in Educational Profile B.2. Summary:

PLO Range	Focus Areas	Primary e-CF Competences
PLO 1-2	Analytics infrastructure architecture for sustainability; ESG data governance and quality frameworks	A.5 Architecture Design (e-4); D.10 Information and Knowledge Management (e-4)
PLO 3-4	Advanced analytics and machine learning models; Big data processing and visualisation strategy orchestration	D.10 Information and Knowledge Management (e-4); A.5 Architecture Design (e-4)
PLO 5-6	Technology trend monitoring and data security; Data-driven sustainability strategy formulation	A.7 Technology Trend Monitoring (e-3); E.8 Information Security Management (e-3); D.10/E.3 (e-4, e-3)
PLO 7-8	Sustainability research conduct and dissemination; Data project coordination and cross-functional team leadership	D.10 Information and Knowledge Management (e-4); E.3 Risk Management (e-3)
PLO 9-10	Energy efficiency optimisation in data operations; Advanced analytics innovation pioneering	A.5 Architecture Design (e-4); E.3 Risk Management (e-3); A.7/D.10 (e-3, e-4)

Structure

Semester 1 (30 ECTS)

Code	Learning Unit	ECTS
LU01	Digital Sustainability Foundations	0.5
LU02	Sustainability Data Foundations	5.0

LU03	Data Collection and Quality for Sustainability	5.0
LU04	Data Analytics for Sustainability Insights	5.0
LU27	Machine Learning Applications in Sustainability	5.0
LU33	Big Data Technologies for Sustainability Analysis	5.0
LU14	Business Intelligence for Sustainability	3.0
LU05	Sustainable Software Engineering Fundamentals	1.5

Semester 2 (30 ECTS)

Code	Learning Unit	ECTS
LU11	Advanced Sustainability Data Science	5.0
LU29	Data Governance and Ethics for Sustainability	5.0
LU32	Green Software Development Practices	5.0
LU35	Carbon Footprint Analysis and Reduction Strategies	5.0
LU47	Cybersecurity for Sustainable Systems	5.0
LU49	Data-Driven Decision Making for Sustainability	5.0

Semester 3 (30 ECTS)

Code	Learning Unit	ECTS
LU07	Ethics and Governance in Digital Innovation	5.0
LU28	Business Models for Sustainable Digital Innovation	5.0
LU40	Data Analytics Tools and Platforms	3.0
LU48	EU Climate Law and Net Zero Implementation	2.0
LU50	EU Sustainability Legislation: Integrated Overview	1.5
LU51	Digital Inclusion and Social Sustainability	5.0
LU12	Energy-Efficient Software Architecture	1.0
LU34	Work-Based Sustainability Project	7.5

Total: 90 ECTS

Assessment

Strategic-level workplace assessments demonstrate leadership and innovation: technical portfolio with architecture designs, ML models, and governance frameworks (35%), research projects with publication-quality methodology (40%), competence verification through technical demonstrations, peer review, and capstone project LU34 (25%).

Entry Requirements

Bachelor's degree and 2+ years professional experience in data science, analytics, or engineering. Advanced data science knowledge and programming proficiency required.

Learning Pathway

Entry roles: Data Architect, Data Scientist (Sustainability), Data Engineer, ESG Data Manager

Progression: Lead Data Scientist, Chief Data Officer, Data Strategy Director, or lateral Specialisation through Digital Sustainability Consultant (DSC)

C.1.3 Digital Sustainability Consultant (DSC)

This curriculum develops competences to advise organisations on digital sustainability transformations, assess maturity, and design strategic roadmaps. Graduates provide expert advisory services combining technical knowledge with consulting practice, focusing on advisory rather than implementation.

Programme Information

Element	Specification
Code / ECTS / EQF / e-CF	DSC / 90 ECTS / EQF 7 / e-3 to e-4
Duration	3 semesters (18 months)
Target Group	Sustainability consultants, digital transformation consultants, ESG advisors

Programme Learning Outcomes

Full PLO specifications in Educational Profile B.3. Summary:

PLO Range	Focus Areas	Primary e-CF Competences
PLO 1-2	Organisational sustainability maturity assessment; Digital sustainability solution design	D.11 Needs Identification (e-3); A.6 Application Design (e-3)
PLO 3-4	Transformation roadmap development; Stakeholder engagement and change guidance	A.3 Business Plan Development (e-3); A.1 IS and Business Strategy Alignment (e-4); E.7 Business Change Management (e-3)
PLO 5-6	Sustainability frameworks and standards advisory; Emerging digital technology evaluation	D.11 Needs Identification (e-3); A.1 IS and Business Strategy Alignment (e-4); A.6 Application Design (e-3)
PLO 7	Impact measurement and communication	A.3 Business Plan Development (e-3); D.11 Needs Identification (e-3)

Structure

Semester 1 (30 ECTS)

Code	Learning Unit	ECTS
LU01	Digital Sustainability Foundations	0.5
LU02	Sustainability Data Foundations	5.0
LU04	Data Analytics for Sustainability Insights	5.0
LU07	Ethics and Governance in Digital Innovation	5.0
LU08	Circular Economy and Digital Product Design	5.0
LU28	Business Models for Sustainable Digital Innovation	5.0
LU50	EU Sustainability Legislation: Integrated Overview	1.5

LU12	Energy-Efficient Software Architecture	1.0
LU48	EU Climate Law and Net Zero Implementation	2.0

Semester 2 (30 ECTS)

Code	Learning Unit	ECTS
LU09	Technical Implementation of Sustainability Solutions	5.0
LU10	Introduction to Life Cycle Assessment (LCA)	5.0
LU11	Advanced Sustainability Data Science	5.0
LU13	Digital Sustainability Principles and Practices	5.0
LU15	Organisational Transformation for Sustainability	5.0
LU06	Systems Architecture for Sustainability Solutions	5.0

Semester 3 (30 ECTS)

Code	Learning Unit	ECTS
LU16	Sustainability Strategy Development	5.0
LU17	Change Management for Digital Sustainability	5.0
LU25	Stakeholder Engagement for Sustainability Initiatives	5.0
LU36	ESG Reporting and Disclosure	5.0
LU39	Sustainability Reporting and Dashboards	2.5
LU34	Work-Based Sustainability Project	7.5

Total: 90 ECTS

Assessment

Advisory-focused assessments emphasise consulting deliverables: portfolio of strategy documents, assessments, roadmaps, and presentations (40%), client engagement projects demonstrating real-world consulting (35%), comprehensive capstone consulting engagement LU34 (25%).

Entry Requirements

Master's degree or bachelor's degree with 3+ years professional experience in consulting, strategy, or sustainability. Strong analytical and communication skills required.

Learning Pathway

Entry roles: Sustainability Consultant, Digital Transformation Consultant, ESG Advisor

Progression: Senior Consultant, Principal Consultant, Partner, or transition to Digital Sustainability Manager (DSM) for internal management roles.

C.1.4 Digital Sustainability Manager (DSM)

This curriculum develops competences to lead organisational sustainability programs, formulate strategies, and orchestrate cross-functional transformation initiatives. Graduates manage ESG reporting, engage stakeholders, and drive sustainable organisational change through strategic leadership.

Programme Information

Element	Specification
Code / ECTS / EQF / e-CF	DSM / 90 ECTS / EQF 7 / e-3 to e-4
Duration	3 semesters (18 months)
Target Group	Sustainability managers, ESG managers, corporate responsibility managers

Programme Learning Outcomes

Full PLO specifications in Educational Profile B.4. Summary:

PLO Range	Focus Areas	Primary e-CF Competences
PLO 1-2	Digital sustainability strategy formulation; Sustainability transformation program orchestration	A.1 IS and Business Strategy Alignment (e-4); A.3 Business Plan Development (e-4); E.7 Business Change Management (e-4)
PLO 3-4	Organisational change and culture steering; Digital sustainability initiative governance	E.7 Business Change Management (e-4); E.9 IS Governance (e-3); E.8 Information Security Management (e-3)
PLO 5-6	Stakeholder engagement and influence; Impact measurement and demonstration	E.7 Business Change Management (e-4); A.3 Business Plan Development (e-4); E.9 IS Governance (e-3)
PLO 7	Regulatory and policy landscape navigation	A.1 IS and Business Strategy Alignment (e-4); E.9 IS Governance (e-3)

Structure

Semester 1 (30 ECTS)

Code	Learning Unit	ECTS
LU01	Digital Sustainability Foundations	0.5
LU02	Sustainability Data Foundations	5.0
LU07	Ethics and Governance in Digital Innovation	5.0
LU08	Circular Economy and Digital Product Design	5.0
LU10	Introduction to Life Cycle Assessment (LCA)	5.0
LU28	Business Models for Sustainable Digital Innovation	5.0
LU50	EU Sustainability Legislation: Integrated Overview	1.5

LU12	Energy-Efficient Software Architecture	1.0
LU43	EU Taxonomy Regulation: Classification and Compliance	2.0

Semester 2 (30 ECTS)

Code	Learning Unit	ECTS
LU09	Technical Implementation of Sustainability Solutions	5.0
LU11	Advanced Sustainability Data Science	5.0
LU13	Digital Sustainability Principles and Practices	5.0
LU15	Organisational Transformation for Sustainability	5.0
LU16	Sustainability Strategy Development	5.0
LU17	Change Management for Digital Sustainability	5.0

Semester 3 (30 ECTS)

Code	Learning Unit	ECTS
LU18	Leadership for Sustainable Digital Transformation	5.0
LU19	Public Engagement and Science Communication	5.0
LU20	Digital Storytelling for Sustainability Impact	5.0
LU25	Stakeholder Engagement for Sustainability Initiatives	5.0
LU39	Sustainability Reporting and Dashboards	2.5
LU34	Work-Based Sustainability Project	7.5

Total: 90 ECTS

Assessment

Leadership-focused assessments demonstrate strategic and organisational impact: portfolio of strategy documents, business cases, and governance frameworks (40%), programme management projects including real organisational ESG reporting and transformation programs (35%), comprehensive capstone programme leadership demonstrating measurable organisational impact (25%).

Entry Requirements

Bachelor's degree and 3+ years professional experience in management, sustainability, or related fields. Demonstrated leadership capability required.

Learning Pathway

Entry roles: Sustainability Manager, ESG Manager, Corporate Responsibility Manager

Progression: Head of Sustainability, Chief Sustainability Officer, ESG Director, VP Sustainability, or lateral Specialisation through Data Professional for Sustainability (DPS) for technical depth.

C.1.5 Sustainability Technical Specialist (STS)

This curriculum develops competences to configure, operate, and maintain digital technologies used in sustainability applications such as digital sustainability platforms and technical infrastructure. Learners ensure reliable data collection, system availability, and user support for organisational sustainability initiatives.

Programme Information

Element	Specification
Code / ECTS / EQF / e-CF	STS / 60 ECTS / EQF 5 / e-2
Duration	2 semesters (12 months)
Target Group	IT support technicians, junior system administrators

Programme Learning Outcomes

Full PLO specifications in Educational Profile B.5. Summary:

PLO Range	Focus Areas	Primary e-CF Competences
PLO 1-2	Platform configuration and integration; System and equipment maintenance	B.3 Testing (e-2); C.3 Service Delivery (e-2)
PLO 3-4	Technical issue troubleshooting; Platform user support	C.4 Problem Management (e-2); C.1 User Support (e-2)
PLO 5-6	Incident and documentation management; Technical documentation maintenance	C.3 Service Delivery (e-2); B.5 Documentation Production (e-2)
PLO 7-8	Green IT infrastructure support; Professional standards adherence	C.3 Service Delivery (e-2)

Structure

Semester 1 (30 ECTS)

Code	Learning Unit	ECTS
LU01	Digital Sustainability Foundations	0.5
LU05	Sustainable Software Engineering Fundamentals	1.5
LU12	Energy-Efficient Software Architecture	1.0
LU13	Digital Sustainability Principles and Practices	5.0
LU30	Sustainable IT Operations and Management	5.0
LU31	ICT Energy Management and Optimisation	5.0
LU46	Introduction to Cybersecurity for Sustainable Systems	2.5
LU03	Data Collection and Quality for Sustainability	5.0
LU14	Business Intelligence for Sustainability	3.0

LU50 EU Sustainability Legislation: Integrated Overview

1.5

Semester 2 (30 ECTS)

Code	Learning Unit	ECTS
LU21	Systematic Innovation in Sustainability Contexts	5.0
LU22	Technology Assessment for Sustainability	5.0
LU23	Predictive Modelling for Sustainability Scenarios	5.0
LU24	Data Visualisation for Sustainability Communication	3.0
LU38	Green ICT Principles	1.0
LU48	EU Climate Law and Net Zero Implementation	2.0
LU42	EU Green Deal: Foundations and Framework	2.0
LU34	Work-Based Sustainability Project	7.0

Total: 60 ECTS

Assessment

Practical workplace assessments emphasise hands-on technical competence: technical portfolio with configuration documentation, maintenance records, and troubleshooting logs (40%), practical demonstrations of configuration, problem resolution, and maintenance procedures (35%), work-based capstone project LU34 (25%).

Entry Requirements

Secondary education completion with basic IT literacy. No prior professional experience required.

Learning Pathway

Entry roles: IT Support Technician, Junior System Administrator

Progression: Technical Team Lead, or advancement to Data Analyst for Sustainability (DAS, EQF 6) or Data Professional for Sustainability (DPS, EQF 7) for analytical and engineering roles

Quality Assurance

All curricula follow EQAVET principles with annual review cycles ensuring continuous improvement. Framework alignment maintained with e-CF EN 162341:2019, EQF, and GreenComp. Employer advisory boards provide industry input on competence relevance and emerging needs. Benchmarking against European qualification standards ensures international recognition.

Work-based learning integrates throughout all programmes via capstone projects (LU34), professional portfolios, and industry placements where applicable. Assessment methods emphasise authentic workplace outputs including portfolio documentation, practical demonstrations, supervisor verification, and project deliverables. All assessments enable

validation of prior learning through workplace evidence demonstrating competence alignment with pass criteria.

Programme review incorporates learner feedback, employer satisfaction surveys, employment outcomes tracking, and competence framework updates. Partner institutions conduct collaborative quality reviews ensuring delivery consistency while respecting local context and regulatory requirements.

C.2 Upskilling Curricula

Circular Economy in Digital Systems (UC-CED)

This 2.5-week programme applies ESG data management principles to circular economy business model design, material flow tracking, and supply chain transparency. Learners design circular economy metrics frameworks whilst implementing data governance systems for product lifecycle data and digital product passports.

Programme Information

Element	Specification
Code / ECTS / EQF	UC-CED / 2.5 ECTS / EQF 6
Duration / Workload	2.5 weeks part-time (20 contact + 42.5 self-study hours)
Source Units	LU41 (2.5 ECTS)
Target Audience	Product managers, business developers, sustainability managers, innovation professionals

Programme Learning Outcomes

#	Learning Outcome
1	Explain circular economy principles (design out waste, keep materials in use, regenerate systems)
2	Apply ESG data management principles to circular economy tracking and reporting
3	Design circular business models (product-as-service, sharing platforms, reverse logistics)
4	Assess data quality requirements for circular economy metrics (material flows, product lifecycles)
5	Evaluate digital technologies as circular economy enablers (IoT tracking, digital product passports)
6	Implement data governance frameworks for circular economy supply chain transparency

Content Structure

Component	Hours	Focus
Module 1: Circular Economy Foundations	5	CE principles, Ellen MacArthur model, EU Circular Economy Action Plan
Module 2: Circular Economy Data & Metrics	8	Material flow accounting, product lifecycle data, digital product passports

Module 3: ESG Data Management for Circularity	7	Data quality, governance, supply chain transparency, traceability systems
Practical Application	18	Circular metrics design, data governance framework, business model innovation
Self-Study Activities	24.5	Industry case studies, CE platform analysis, data standards, impact assessment

Assessment & Delivery

Assessment: Circular economy data framework design, business model innovation proposal, data quality assessment, stakeholder presentation demonstrating integration of circular principles with data management.

Delivery: Blended with online theory, design workshops, data governance projects enabling practical business model application.

Stackability

Pathway	Status
DAS, DSC, DSM, STS	Optional enhancement
DPS	— Not applicable

Cybersecurity for Sustainable Systems (UC-CYS)

This 2.5-week programme develops foundational cybersecurity competences specifically tailored for protecting sustainable digital infrastructure, data systems, and IoT deployments. Learners apply security principles to energy management systems, sustainability monitoring platforms, and ESG data infrastructure whilst addressing unique vulnerabilities in sustainable technology implementations.

Programme Information

Element	Specification
Code / ECTS / EQF	UC-CYS / 2.5 ECTS / EQF 6
Duration / Workload	2.5 weeks part-time (20 contact + 42.5 self-study hours)
Source Units	LU46 (2.5 ECTS)
Target Audience	Technical specialists, sustainability consultants, system administrators, IT security professionals

Programme Learning Outcomes

#	Learning Outcome
1	Identify cybersecurity risks specific to sustainable digital systems (energy management, IoT sensors, ESG platforms)
2	Apply security principles (CIA triad, defence in depth) to sustainability infrastructure design
3	Implement access controls and authentication mechanisms for ESG data systems
4	Evaluate security vulnerabilities in renewable energy systems and smart grid technologies
5	Design incident response procedures for sustainability-critical infrastructure
6	Assess compliance requirements for data protection in sustainability reporting systems

Content Structure

Component	Hours	Focus
Module 1: Cybersecurity Fundamentals	6	CIA triad, threat landscape, security frameworks, risk assessment
Module 2: Sustainable Systems Security	8	Energy management systems, IoT sensors, smart grids, ESG platforms
Module 3: Data Protection & Compliance	6	Access controls, encryption, GDPR alignment, audit trails
Practical Security Projects	20	Vulnerability assessment, security architecture design, incident response
Self-Study Activities	22.5	Security standards, case studies, threat intelligence, tool tutorials

Assessment & Delivery

Assessment: Security risk assessment report, infrastructure hardening project, incident response plan, compliance audit documentation demonstrating practical security implementation.

Delivery: Blended with online theory modules, hands-on security labs, virtual workshops with realistic threat scenarios.

Stackability

Pathway	Status
DSC, STS	Core requirement
DAS, DSM	Optional enhancement
DPS	— Not applicable

Digital Sustainability Foundations (UC-DSF)

This intensive one-day programme establishes universal sustainability literacy through core concepts including planetary boundaries, SDGs, and climate mitigation frameworks. Learners connect digital transformation with environmental sustainability, recognising opportunities to apply digital technologies to sustainability challenges.

Programme Information

Element	Specification
Code / ECTS / EQF	UC-DSF / 0.5 ECTS / EQF 5
Duration / Workload	1 day intensive (8 contact + 4.5 self-study hours)
Source Units	LU01 (0.5 ECTS)
Target Audience	All professionals requiring foundational sustainability understanding

Programme Learning Outcomes

#	Learning Outcome
1	Explain core sustainability concepts (planetary boundaries, SDGs, climate mitigation)
2	Identify connections between digital transformation and environmental sustainability
3	Describe sustainability frameworks (circular economy, lifecycle thinking, systems approaches)
4	Recognise opportunities for applying digital technologies to sustainability challenges
5	Articulate business case rationale for sustainability integration

Content Structure

Component	Hours	Focus
Module 1: Sustainability Foundations	3	Climate science, planetary boundaries, SDGs, European Green Deal
Module 2: Digital Technologies	3	Digital twins, AI/ML, IoT, data analytics for sustainability
Module 3: Integration & Application	2	Circular economy, business models, stakeholder expectations
Self-Study Activities	4.5	Framework analysis, case studies, online assessments

Assessment & Delivery

Assessment: Reflective essay (500 words), concept mapping exercise, framework analysis demonstrating understanding of sustainability-digital integration. **Delivery:** Intensive one-day workshop or online self-paced with video lectures.

Stackability

Universal foundation for all five qualification pathways (DAS, DPS, DSC, DSM, STS). Credits fully recognised through RPL.

EU Policy and Legislation for Sustainability (UC-EPL)

This 1.5-week programme provides integrated understanding of European sustainability legislation framework essential for regulatory compliance and strategic planning. Through intensive study of the European Green Deal architecture, learners interpret connections between EU Taxonomy, CSRD, SFDR, and Climate Law requirements.

Programme Information

Element	Specification
Code / ECTS / EQF	UC-EPL / 1.5 ECTS / EQF 6
Duration / Workload	1.5 weeks part-time (12 contact + 25.5 self-study hours)
Source Units	LU50 (1.5 ECTS)
Target Audience	Managers, consultants, compliance officers, sustainability professionals

Programme Learning Outcomes

#	Learning Outcome
1	Explain European Green Deal structure and key climate neutrality policies (Fit for 55, REPowerEU)
2	Interpret integrated EU sustainability legislation framework (taxonomy, CSRD, SFDR, climate law)
3	Analyse regulatory implications for organisational strategy and operations across sectors
4	Evaluate compliance requirements and reporting obligations under EU sustainability directives
5	Apply EU policy knowledge to sustainability strategy development and stakeholder engagement

Content Structure

Component	Hours	Focus
Module 1: European Green Deal Framework	4	Climate neutrality targets, Fit for 55, REPowerEU, sectoral policies
Module 2: Integrated Legislation Overview	8	EU Taxonomy, CSRD, SFDR, Climate Law, interlinkages
Self-Study Activities	25.5	Policy documents, compliance frameworks, case studies, impact assessment

Assessment & Delivery

Assessment: Policy analysis report, compliance framework application, stakeholder briefing, regulatory impact assessment demonstrating strategic interpretation capability.

Delivery: Online with self-paced modules, policy document analysis, virtual Q&A sessions with policy experts.

Stackability

Pathway	Status
DSC, DSM	Core requirement
DAS, DPS, STS	– Not applicable

Green Software Fundamentals (UC-GSF)

This 2.5-week programme develops practical competences in energy-efficient coding, carbon-aware development, and sustainable architecture patterns. Through hands-on labs and real-world optimisation projects, learners apply green software principles across the development lifecycle while quantitatively measuring carbon footprint. The curriculum also emphasises the social and institutional impacts of green software, fostering awareness of sustainability responsibilities and collaboration within organisational and community contexts.

Programme Information

Element	Specification
Code / ECTS / EQF	UC-GSF / 2.5 ECTS / EQF 5
Duration / Workload	2.5 weeks part-time (20 contact + 42.5 self-study hours)
Source Units	LU05 (1.5 ECTS) + LU12 (1.0 ECTS)
Target Audience	Software developers, IT operations staff, system administrators

Programme Learning Outcomes

#	Learning Outcome
1	Apply energy-efficient coding practices to reduce software carbon footprint
2	Measure and calculate carbon footprint of software applications
3	Implement green software principles across development lifecycle
4	Evaluate software architectures for energy efficiency and environmental impact
5	Design system architectures optimised for renewable energy usage
6	Apply sustainable IT operations practices

Content Structure

Component	Hours	Focus
Module 1: Sustainable Software Engineering (LU05)	12	Algorithm optimisation, carbon-aware development, green patterns
Module 2: Energy-Efficient Architecture (LU12)	8	Architecture patterns, workload scheduling, carbon intensity
Practical Laboratory Work	20	Code optimisation, architecture design, profiling tools
Self-Study Activities	22.5	Readings, online tools, case studies, maturity assessment

Assessment & Delivery

Assessment: Green coding assignment with energy measurement, architecture design project with quantified impact, technical documentation, practical demonstration.

Delivery: Blended with online theory, hands-on labs, weekly virtual sessions enabling immediate workplace application.

Stackability

Pathway	Status
STS	Core requirement
DAS, DSM	Optional enhancement
DPS, DSC	– Not applicable

Sustainability Data Essentials (UC-SDE)

This 2.5-week programme equips analysts and sustainability coordinators with practical competences in ESG reporting, dashboard design, and data quality assurance. Learners design interactive sustainability reporting dashboards meeting CSRD requirements whilst implementing data collection workflows aligned with GRI and ESRS standards.

Programme Information

Element	Specification
Code / ECTS / EQF	UC-SDE / 2.5 ECTS / EQF 6
Duration / Workload	2.5 weeks part-time (20 contact + 42.5 self-study hours)
Source Units	LU39 (2.5 ECTS)
Target Audience	Analysts, sustainability coordinators, reporting specialists requiring data competences

Programme Learning Outcomes

#	Learning Outcome
1	Design sustainability reporting dashboards using appropriate visualisation
2	Apply data quality assurance principles to sustainability datasets
3	Analyse ESG performance metrics across environmental, social, governance dimensions
4	Create interactive data visualisations for diverse stakeholder audiences
5	Implement data collection workflows for sustainability reporting frameworks
6	Evaluate reporting dashboard effectiveness against stakeholder requirements

Content Structure

Component	Hours	Focus
Module 1: Sustainability Reporting Fundamentals	6	ESG metrics, CSRD requirements, reporting standards (GRI, ESRS)
Module 2: Data Visualisation & Dashboard Design	8	Chart types, dashboard layouts, interactivity, accessibility
Module 3: Data Quality & Management	6	Data collection, validation, quality assurance, governance
Practical Project Work	24	Dashboard design, data analysis, stakeholder presentations
Self-Study Activities	18.5	Tool tutorials, case studies, metric frameworks, peer review

Assessment & Delivery

Assessment: Sustainability dashboard project, data quality audit report, stakeholder presentation, peer review exercise demonstrating end-to-end reporting competence.

Delivery: Blended with online theory, virtual analytics workshops, hands-on dashboard development using industry-standard tools (e.g. Power BI, Tableau).

Stackability

Pathway	Status
DAS, DPS	Core requirement
DSC, DSM	Optional enhancement
STS	— Not applicable

Stackability Architecture

The upskilling curricula integrate systematically into the five core qualifications through Recognition of Prior Learning (RPL). Learners completing upskilling curricula apply earned ECTS toward full qualifications, reducing time-to-completion and creating flexible professional development pathways.

Integration Matrix

Upskilling Curriculum	ECTS	DAS (60)	DPS (90)	DSC (90)	DSM (90)	STS (60)
UC-CED: Circular Economy in Digital Systems	2.5		—			
UC-CYS: Cybersecurity for Sustainable Systems	2.5		—			
UC-DSF: Digital Sustainability Foundations	0.5					
UC-EPL: EU Policy and Legislation	1.5	—	—			—
UC-GSF: Green Software Fundamentals	2.5		—	—		

UC-SDE: Sustainability Data Essentials 2.5 —

TOTAL MAXIMUM ECTS	12.0	10.5	3.0	9.5	12.0	8.0
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KEY: - = Universal foundation (all learners complete) - = Core requirement

(mandatory for pathway) - = Elective enhancement (optional) - — = Not applicable to pathway

Pathway Integration Percentages

Qualification	Total ECTS	Maximum Upskilling ECTS	Percentage
Data Analyst for Sustainability DAS)	60	10.5	17.5%
Data Professional for Sustainability DPS)	90	3.0	3.3%
Digital Sustainability Consultant DSC)	90	9.5	10.6%
Digital Sustainability Manager (DSM)	90	12.0	13.3%
Sustainability Technical Specialist (STS)	60	8.0	13.3%

All pathways maintain under 18% upskilling integration, preserving substantial space for comprehensive qualification-level learning whilst offering meaningful acceleration through RPL.

Progressive Credential Accumulation

Learners can build competences progressively:

- 1. Entry Point:** Individual micro-credentials (0.5–2.5 ECTS completed in 1 day to 2.5 weeks)
- 2. Intermediate Stage:** Multiple micro-credentials combining 3.0–12.0 ECTS over 3–6 months part-time
- 3. Qualification Completion:** RPL accelerates pathway to full 60–90 ECTS qualification

This flexible architecture enables professionals to advance at their own pace, balancing work commitments with learning ambitions whilst accumulating recognised credentials documented through Europass Digital Credentials.

Quality Assurance

All upskilling curricula follow EQAVET principles ensuring rigorous quality standards:

Curriculum Design Integrity

- Learning outcomes align precisely with EQF level descriptors
- Assessment methods validate stated outcomes authentically

- Delivery modes suit professional learner circumstances (blended, online, intensive)
- ECTS workload calculations follow EU standards (25–30 hours per credit)

Delivery Quality Standards

- **Standardised specifications:** All providers use common curriculum documents ensuring consistency
- **Instructor qualifications:** Relevant professional experience plus pedagogical competence required
- **Resource requirements:** Access to tools, platforms, datasets specified in delivery specifications
- **Provider approval:** Institutional capacity verification before delivery authorisation
- **Regular audits:** Compliance monitoring through documentation review and learner feedback

Short-Duration Assessment Adaptations

Assessment methods appropriate for rapid upskilling delivery:

- **Practical demonstrations:** Competence checklists for skills-based outcomes
- **Workplace tasks:** Applied projects in authentic professional contexts
- **Portfolio evidence:** Documentation of learning process and outputs
- **Peer review:** Collaborative assessment for teamwork and communication outcomes

Credential Transparency

All credentials issued as **Europass Digital Credentials** (Commission Implementing Decision EU 2021/2184), documenting:

- Learning outcomes achieved with evidence
- Assessment methods employed
- EQF level and ECTS credits
- Issuing institution and date
- Source learning unit references

Recognition of Prior Learning (RPL)

Learners with relevant professional experience may claim up to 50% of curriculum ECTS through:

- **Portfolio assessment:** Documentation of professional achievements against learning outcomes
- **Competence testing:** Practical demonstrations or examinations
- **Credential evaluation:** Recognition of prior micro-credentials or certifications

RPL decisions documented in learner transcript with evidence references supporting transparency.

Quality Enhancement Cycles

Continuous improvement maintained through:

- **Annual curriculum review:** Achievement data, employer feedback, regulatory updates
- **Staff development:** Pedagogical training, tool updates, industry engagement
- **Resource evaluation:** Platform functionality, dataset currency, case study relevance
- **Standards monitoring:** Alignment with evolving EQF, e-CF, GreenComp frameworks

Strategic Impact for Workforce Development

The upskilling curricula enable:

1. **Immediate capability building:** Targeted competence development within 1 day to 2.5 weeks for mid-career professionals unable to interrupt employment for extended studies
2. **European Green Deal implementation support:** Climate neutrality commitments through policy literacy (UC-EPL), digital-green twin transition through technical skills (UC-GSF), circular economy transformation through business model innovation (UC-CED), data-driven sustainability through analytics capabilities (UC-SDE), security foundations through cybersecurity competences (UC-CYS), and foundation building through universal sustainability literacy (UC-DSF)
3. **Cross-border mobility:** EQF alignment, e-CF integration, GreenComp incorporation, ECTS transparency, and Europass credentials support workforce mobility across EU member states
4. **Organisational agility:** Organisations address urgent skills gaps without workforce disruption whilst building long-term capability pipelines toward full qualifications

Deployed at scale across EU member states, these micro-credentials accelerate workforce adaptation to sustainability imperatives whilst maintaining quality assurance and qualification framework coherence.

Annex D - Learning Units

Table D1: Learning Units for Digital Sustainability Education

LU ID	Learning Unit Title	Domain	Delivery Mode	ECTS	Profile Relevance (DAS, DPS, DSC, DSM, STS)
LU01	Digital Sustainability Foundations	Foundation	online, self-paced	0.5	(100, 100, 100, 100, 100)
LU02	Sustainability Data Foundations	Data & Analytics	online, blended	5.0	(95, 57, 95, 85, 25)
LU03	Data Collection and Quality for Sustainability	Data & Analytics	blended, work-based	5.0	(95, 95, 45, 45, 45)
LU04	Data Analytics for Sustainability Insights	Data & Analytics	blended, work-based	5.0	(85, 85, 57, 45, 45)
LU05	Sustainable Software Engineering Fundamentals	Technology & Infrastructure	online, blended	1.5	(25, 25, 55, 30, 95)
LU06	Systems Architecture for Sustainability Solutions	Technology & Infrastructure	blended, work-based	5.0	(85, 25, 57, 25, 85)
LU07	Ethics and Governance in Digital Innovation	Strategy & Management	online, blended	5.0	(45, 45, 80, 57, 45)
LU08	Circular Economy and Digital Product Design	Strategy & Management	blended, work-based	5.0	(30, 55, 95, 95, 30)
LU09	Technical Implementation of Sustainability Solutions	Technology & Infrastructure	blended, work-based	5.0	(45, 25, 40, 20, 95)
LU10	Introduction to Life Cycle Assessment (LCA)	Measurement & Analysis	online, blended	5.0	(45, 45, 57, 45, 45)
LU11	Advanced Sustainability Data Science	Data & Analytics	blended, work-based	5.0	(85, 85, 57, 45, 45)
LU12	Energy-Efficient Software Architecture	Technology & Infrastructure	blended, work-based	1.0	(85, 25, 57, 25, 85)
LU13	Digital Sustainability Principles and Practices	Foundation	online, blended	5.0	(85, 25, 57, 30, 85)
LU14	Business Intelligence for Sustainability	Data & Analytics	online, blended	3.0	(85, 65, 70, 75, 30)
LU15	Organisational Transformation for Sustainability	Strategy & Management	blended, work-based	5.0	(25, 45, 95, 95, 25)
LU16	Sustainability Strategy Development	Strategy & Management	blended, work-based	5.0	(25, 45, 95, 85, 25)

LU17	Change Management for Digital Sustainability	Strategy Management	&	blended, work-based	5.0	(25, 45, 95, 85, 25)
LU18	Leadership for Sustainable Digital Transformation	Strategy Management	&	blended, work-based	5.0	(25, 45, 85, 85, 25)
LU19	Public Engagement and Science Communication	Strategy Management	&	blended, work-based	5.0	(25, 45, 95, 95, 25)
LU20	Digital Storytelling for Sustainability Impact	Strategy Management	&	online, blended	5.0	(25, 57, 85, 85, 25)
LU21	Systematic Innovation in Sustainability Contexts	Technology Infrastructure	&	blended, work-based	5.0	(85, 25, 57, 30, 85)
LU22	Technology Assessment for Sustainability	Technology Infrastructure	&	blended, work-based	5.0	(85, 25, 80, 30, 85)
LU23	Predictive Modelling for Sustainability Scenarios	Data & Analytics		blended, work-based	5.0	(80, 70, 75, 65, 60)
LU24	Data Visualisation for Sustainability Communication	Data & Analytics		online, blended	3.0	(85, 65, 80, 75, 55)
LU25	Stakeholder Engagement for Sustainability Initiatives	Policy Compliance	&	blended, work-based	5.0	(25, 45, 85, 85, 25)
LU26	Sustainability Reporting Standards and Frameworks	Policy Compliance	&	online, blended	5.0	(30, 55, 95, 95, 30)
LU27	Machine Learning Applications in Sustainability	Data & Analytics		blended, work-based	5.0	(95, 95, 45, 45, 45)
LU28	Business Models for Sustainable Digital Innovation	Strategy Management	&	blended, work-based	5.0	(25, 45, 95, 95, 25)
LU29	Data Governance and Ethics for Sustainability	Data & Analytics		online, blended	5.0	(55, 95, 80, 67, 55)
LU30	Sustainable IT Operations and Management	Technology Infrastructure	&	blended, work-based	5.0	(95, 25, 55, 30, 95)
LU31	ICT Energy Management and Optimisation	Technology Infrastructure	&	blended, work-based	5.0	(95, 25, 67, 30, 95)
LU32	Green Software Development Practices	Technology Infrastructure	&	blended, online	5.0	(85, 20, 80, 20, 85)
LU33	Big Data Technologies for Sustainability Analysis	Data & Analytics		blended, work-based	5.0	(95, 95, 57, 45, 45)
LU34	Sustainability Project	Foundation		Work-based	5.0–7.5	(47, 47, 80, 80, 35)
LU35	Carbon Footprint Analysis and Reduction Strategies	Measurement & Analysis	&	blended, work-based	5.0	(95, 95, 57, 45, 45)

LU36	ESG Reporting and Disclosure	Policy Compliance	&	online, blended	5.0	(25, 57, 95, 95, 25)
LU37	Environmental Impact Assessment in Digital Context	Measurement & Analysis	&	blended, work-based	5.0	(45, 45, 57, 45, 45)
LU38	Green ICT Principles	Technology Infrastructure	&	online, self-paced	1.0	(85, 25, 45, 25, 85)
LU39	Sustainability Reporting and Dashboards	Data & Analytics		blended, work-based	2.5	(90, 70, 85, 85, 40)
LU40	Data Analytics Tools and Platforms	Data & Analytics		online, blended	3.0	(95, 80, 60, 65, 35)
LU41	ESG Data Management and Quality Assurance	Data & Analytics		blended, work-based	2.5	(85, 75, 90, 90, 30)
LU42	EU Green Deal: Foundations and Framework	Policy Compliance	&	online, self-paced	2.0	(10, 22, 94, 42, 10)
LU43	EU Taxonomy Regulation: Classification and Compliance	Policy Compliance	&	online, self-paced	2.0	(10, 22, 82, 30, 10)
LU44	Corporate Sustainability Reporting Directive (CSRD)	Policy Compliance	&	online, blended	5.0	(10, 22, 82, 80, 10)
LU45	Sustainable Finance Disclosure Regulation (SFDR) Fundamentals	Policy Compliance	&	online, self-paced	2.0	(10, 22, 82, 30, 10)
LU46	Introduction to Cybersecurity for Sustainable Systems	Technology Infrastructure	&	online, blended	2.5	(50, 25, 75, 70, 85)
LU47	Cybersecurity for Sustainable Systems	Technology Infrastructure	&	blended, work-based	5.0	(25, 80, 80, 25, 85)
LU48	EU Climate Law and Net Zero Implementation	Policy Compliance	&	online, self-paced	2.0	(10, 22, 94, 30, 10)
LU49	Data-Driven Decision Making for Sustainability	Data & Analytics		blended, work-based	5.0	(90, 75, 85, 85, 70)
LU50	EU Sustainability Legislation: Integrated Overview	Policy Compliance	&	online, self-paced	1.5	(100, 100, 100, 100, 100)
LU51	Digital Inclusion and Social Sustainability	Policy Compliance	&	online, blended	5.0	(45, 45, 85, 80, 45)

Annex E - Rationale for the Design Decisions for Educational Profiles

Summary of Design Parameters

Design Parameter	Standard/ Guideline	Applied Value	Rationale
Programme Learning Outcomes (PLOs) per Profile	8–12 PLOs typical for complete profile	8–12 PLOs (STS: 8, DPS: 12, DSM: 12, DSC: 12)	Ensures comprehensive coverage of competence areas while maintaining coherence. Each e-CF competence maps to 3–4 PLOs. Exceeds minimum threshold (8) to ensure thoroughness for master's level (EQF 7) and VET certification (EQF 4/5).
Unit Learning Outcomes (ULOs) per PLO	Minimum 4 ULOs per PLO	Exactly 4 ULOs per PLO (all profiles)	Meets minimum threshold for adequate PLO coverage. Four ULOs allow systematic breakdown covering: (1) primary application, (2) framework/methodology, (3) critical evaluation, (4) innovation/advancement. Maintains consistency across profiles for comparability.
e-CF Competences per Profile	No strict limit; typically, 5–8 for Type II roles	3 competences (all profiles)	Focused role definition avoiding competence overload. Three competences represent achievable scope for single professional role. More than 5 competences indicates multiple roles being combined. Maintains clear role boundaries and professional identity.
EQF Level Allocation	Single level (highest achieved); 4/5 acceptable for VET	STS: EQF 4/5 (VET), DPS/DSM/DSC: EQF 7 (Master's)	EQF 4/5 combined acceptable for VET just below higher VET per EU framework. EQF 6 and 7 cannot be combined (different qualification types). EQF 7 represents highest level for advanced professional competence requiring strategic/leadership capability. Technical roles (STS) appropriately positioned at VET level; strategic roles at master's level.
e-CF Proficiency Level	Aligned to EQF: Level 4/5→e-1/e-2, Level 7→e-4	STS: e-1 to e-2, DPS/DSM/DSC: e-4	Direct alignment with EQF levels per eCF framework. e-1/e-2 represents operational/supervised work (appropriate for VET). e-4 represents strategic/autonomous leadership (appropriate for master's level). Ensures competence expectations match qualification level.
Total ECTS Credits	60 ECTS = 1 year full-time, 90–120 ECTS = master's degree	STS: 60 ECTS, DPS/DSM/DSC: 90 ECTS	STS at 60 ECTS appropriate for VET certification (1-year full-time equivalent). Master's profiles at 90 ECTS represent substantial but achievable master's programme (1.5 years full-time). 90 ECTS allows depth in Specialisation while remaining under 120 ECTS threshold for full master's degree.
Programme Duration	Typically, 12 months per 60 ECTS	STS: 12 months, DPS/DSM/DSC: 18 months	Standard calculation: 60 ECTS = 12 months, 90 ECTS = 18 months. Assumes part-time study for working professionals (spreading load). Full-time could be completed faster but sustainability programmes

			typically target working professionals requiring extended timelines.
Competence-to-PLO Mapping	Clear traceability required	Each competence maps to 3-4 PLOs	Ensures systematic coverage of competence dimensions. Three competences × 3-4 PLOs = 10-11 PLOs total (achieving 8-12 target range). Prevents orphaned PLOs without competence grounding. Enables validation that PLOs collectively cover competence scope.
Assessment Methods	Mix of formative and summative; appropriate to level	6-7 assessment types per profile, educational focus	Multiple assessment methods ensure comprehensive evaluation across knowledge, skills, and competence dimensions. Educational assessments (exams, projects, thesis) rather than validation of prior learning. Mix includes written examinations (knowledge), practical assignments (skills), major projects/thesis (competence), portfolios (integration), oral defences (communication).
Deliverables Listed	Representative outputs demonstrating competence	7-8 deliverables per profile	Sufficient variety to demonstrate breadth of competence application. Each deliverable maps to specific PLOs. Mix of strategic (strategies, frameworks) and operational (dashboards, reports) outputs. Reflects professional practice expectations at respective EQF levels.
Specialisation Tracks	Optional; used when distinct career pathways exist	DPS only: 2 tracks (Data Engineering, Data Science)	DPS includes Specialisations because data field has distinct career paths requiring different competences. Other profiles (DSM, DSC, STS) represent more unified professional trajectories not requiring Specialisation. Specialisation tracks share foundation (first ~60 ECTS) then diverge for depth.
Learning Outcome Autonomy Indicators	Must specify level of independence	Systematic use: "Execute under guidance" (EQF 4/5), "Independently" (EQF 6), "Lead/Taking responsibility for" (EQF 7)	Explicit autonomy indicators differentiate EQF levels. EQF 4/5 (STS): supervised/guided work. EQF 7 (DPS/DSM/DSC): autonomous/leadership work. Follows Dublin Descriptors for EQF level differentiation. Critical for assessors to evaluate appropriate level of learner performance.
Learning Outcome Specificity	Should include examples where appropriate	Systematic use of "e.g." in all ULOs	"e.g." clauses provide concrete examples without limiting scope. 2-4 examples per ULO illustrate breadth of application. Examples drawn from professional practice, regulatory context, and technology landscape. Balances flexibility (main statement) with clarity (examples).

PLO Description structure	Should state what learner demonstrates	Consistent format: "The learner demonstrates capability to [action], taking responsibility for [accountability dimension], [context]"	Three-part structure: (1) capability statement, (2) accountability/responsibility, (3) professional context. Responsibility dimension differentiates EQF levels (supervision vs. autonomy). Enables clear assessment criteria development.
Scope Statement	Must align with competences	Explicit e-CF area reference + functional focus description	Each profile scope explicitly states e-CF areas (A/B/C/D/E) covered by its competences. Functional focus (e.g., "operational support", "strategic advisory") clarifies role boundaries. Prevents scope creep and maintains profile coherence. Enables validation that PLOs fall within stated scope.
Goal Statement	Single sentence capturing profile essence	~25–35 words, active verb structure	Concise statement of what professionals will be enabled to do. Uses active verbs ("lead", "provide", "enable"). Captures level (operational vs. strategic), domain (sustainability), and key differentiator (e.g., advisory vs. implementation). Serves as profile elevator pitch.
Professional vs. Educational Perspective	Dual perspective required	Both included for each profile	Professional perspective: career progression pathway (entry to senior roles). Educational perspective: qualification pathway (certification to degree level). Dual perspective serves both workplace and academic contexts. Enables APEL (Accreditation of Prior Experiential Learning) and academic credit recognition.
Profile Identifier (ID)	Short, memorable code	3-letter acronyms: STS, DPS, DSM, DSC	Memorable identifiers for referencing in curricula, job descriptions, and professional development plans. Acronyms derived from profile names. Easier to reference than full titles in documentation.
Competence Profile Size	Balance between comprehensiveness and focus	3 competences × 10–11 PLOs ×, 4 ULOs = ~120–132 learning outcomes total per profile	Large enough for comprehensive professional development. Small enough to be achievable within stated ECTS/duration. Depth (4 ULOs per PLO) ensures quality over superficial coverage. Total learning outcomes align with ECTS allocation (90 ECTS supports ~120 learning outcomes).

PLO-to-Competence Mapping Transparency	Should be explicit and documented	Included in profile data structure: "competence_to_plo_mapping"	Makes traceability transparent for validation and quality assurance. Each PLO has explicit e-CF competence code. Enables verification that competences are comprehensively covered. Facilitates curriculum design (learning units can be traced to competences)
Tagline/Subtitle	Brief profile descriptor	~8-12 words, action-oriented	Communicates profile essence quickly. Used in marketing materials, job descriptions, and learner orientation. More specific than title, less detailed than goal. Examples: "Provide specialised technical support...", "Lead organisational digital sustainability transformation..."

Design Decision Categories

1. Structural Completeness Decisions

Decision	Value	Rationale
Minimum PLOs	8-12	Industry standard for complete professional profile; ensures comprehensive competence coverage
Minimum ULOs per PLOs	4	Ensures PLO is adequately translated into unit level outcomes
Maximum Competences	3-5	Prevents role overload; maintains professional focus; more than 5 suggests multiple distinct roles

Key Principle: Balance comprehensiveness with achievability and role clarity

2. Level Alignment Decisions

Decision	Value	Rationale
EQF Level Assignment	Single highest level (except 4/5 VET)	EU framework requirement; mixed levels create qualification ambiguity
e-CF Proficiency Alignment	Direct mapping to EQF	Framework requirement; ensures competence expectations match qualification
Indication of Learner Autonomy	Level-specific indicators	Expressed through action verbs (apply/conduct/lead), workplace examples showing scope, and assessment pass criteria

Key Principle: Strict alignment with European frameworks for recognition and mobility

3. Volume and Duration Decisions

Decision	Value	Rationale
ECTS Allocation	60 (VET), 90 (Master's)	Standard academic convention; 90 ECTS below full master's threshold
Duration Calculation	12-18 months	Assumes part-time professional learners; 30 ECTS per semester equivalent
Learning Outcomes per ECTS	~1.3-1.5 outcomes per ECTS	Industry benchmark for postgraduate programmes with practical focus

Key Principle: Realistic workload for working professionals while maintaining academic rigor

4. Quality and Specificity Decisions

Decision	Value	Rationale
Example Inclusion	2-4 examples per ULO using "e.g."	Provides clarity without constraining scope; supports curriculum developers
Responsibility Specification	Explicit in all PLO descriptions	Differentiates levels; supports assessment criteria; reflects professional accountability

Professional Context	Included descriptions	in Grounds learning in authentic practice; supports work-based learning
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Key Principle: Sufficient specificity for curriculum design while maintaining flexibility for diverse contexts

5. Differentiation and Coherence Decisions

Decision	Value	Rationale
Competence Non-Overlap	Each profile has unique competence set	Prevents role confusion; creates clear professional boundaries
PLO Mapping Transparency	Explicit competence-PLO relationships	Enables validation; supports quality assurance; facilitates curriculum design
Specialisation Use	Only where career paths diverge significantly	DPS includes tracks; others don't need them; prevents unnecessary complexity

Key Principle: Clear role differentiation while maintaining profile coherence

Validation Checklist

Each profile design decision can be assessed against:

- Framework Alignment: Does it comply with EQF, e-CF, and ECTS frameworks?
- Professional Authenticity: Does it reflect real professional practice?
- Educational Feasibility: Can it be delivered within stated resources?
- Assessment Validity: Can achievement be reliably assessed?
- Stakeholder Acceptance: Will employers, educators, and learners recognise it?
- Regulatory Compliance: Does it meet sustainability regulatory requirements (CSRD, EU Taxonomy, etc.)?

Summary of Key Rationales

- 10-11 PLOs: Meets 8-12 standard for complete profiles; allows 3-4 PLOs per competence for comprehensive coverage
- A minimum of 4 ULOs per PLO
- 3 Competences: Focused professional role; prevents overload; maintains clear boundaries between profiles
- EQF 4/5 for STS, EQF 7 for others: Appropriate levelling for operational (VET) vs. strategic (Master's) roles
- 60/90 ECTS: Standard academic convention; realistic for working professionals; below full master's threshold

- Explicit mapping: Transparency for validation, quality assurance, and curriculum design
- Autonomy indicators: Operationalises EQF descriptors; differentiates levels; enables assessment
- "e.g." examples: Balances flexibility with specificity; supports curriculum developers
- Educational assessments: Appropriate to qualification level; mixed methods for comprehensive evaluation
- Single Specialisation (DPS only): Used only where career paths genuinely diverge; prevents unnecessary complexity

Notes on Standards References

- EQF Framework: European Qualifications Framework for Lifelong Learning e-CF: European e-Competence Framework (EN 16234-1)
- ECTS: European Credit Transfer and Accumulation System
- Dublin Descriptors: Generic qualification descriptors for EQF levels
- CEN CWA Type II Roles: ICT professional role profiles from CEN Workshop Agreements
- 8-12 PLO Standard: Based on analysis of UK, Irish, and European master's programme structures
- 4 ULO Minimum: Derived from learning design literature and programme validation requirements

Annex F - Profile Relevance Score Validation Study

CEN/TS 17699:2022 Framework and Operationalisation

CEN/TS 17699:2022 defines Educational Profiles as structured instruments that translate professional requirements—articulated through role profiles and e-Competences—into educational terms such as programme and unit learning outcomes and assessments (pp. 22–23). In the case of new curriculum design, this translation process formulates an Educational Profile by converting professional competences into measurable learning outcomes and assessment elements (p. 26). For curriculum redesign, a matching process compares existing learning units with the target Educational Profile—which represents the desired competence-based state—to identify gaps and overlaps (pp. 30–31).

While CEN/TS 17699:2022 provides a conceptual framework for both translation and matching (Fig. 11, p. 32), it does not specify an operational procedure for systematically measuring alignment. This deliverable addresses this methodological gap through a computational approach using topic modelling, validated through expert assessment.

Two-Stage Validation Approach

This study followed a two-stage methodology: (1) computational scoring via topic modelling to generate all profile relevance scores, and (2) empirical validation via expert questionnaire to verify the reliability of the computational method. All profile relevance scores in Table D1 are computationally derived; the expert study validated the scoring methodology rather than generating alternative scores.

Stage 1: Computational Analysis via Topic Modelling

To quantify how well each learning unit aligns with each educational profile, profile relevance scores (0–100 scale) were calculated for all combinations of 51 learning units and educational profiles using Latent Dirichlet Allocation (LDA) topic modelling (e.g., Jelodar et al., 2019). The study initially assessed four profiles (Data Professional for Sustainability, Digital Sustainability Consultant, Digital Sustainability Manager, Sustainability Technical Specialist), yielding 204 profile-unit combinations (51×4). Following curriculum development, a fifth profile—Data Analyst for Sustainability (DAS, EQF 6)—was added to address bachelor-level skills gaps, bringing the total to 255 combinations (51×5) in Table D1. All scores, including those for DAS, were generated using the same computational method to ensure consistency.

Methodological rationale: The use of computational methods as the primary scoring mechanism offers significant advantages over manual expert rating processes. Topic modelling, a machine learning method widely employed in educational design (Drachsler, Verbert, Santos, & Manouselis, 2015), provides: (1) **consistency** by applying identical analytical criteria across all 255 unit-profile combinations without inter-rater variability; (2) **objectivity** through quantifiable semantic analysis rather than subjective judgement; (3) **reproducibility**, enabling verification and updates as curricula evolve; (4) **scalability**, allowing efficient addition of new profiles or learning units; and (5) **transparency**, with algorithmic logic that is documentable and auditable for quality assurance.

Topic modelling quantifies how strongly specific themes (e.g., data analytics, management, technical implementation) appear in both educational profile descriptions and learning unit content. The algorithm analysed all 51 learning units—including descriptions, learning outcomes, and competence mappings—against the educational profile requirements derived from D2.1 professional roles. The resulting profile relevance score provides a quantitative measure of traceability: higher scores indicate stronger alignment between a learning unit's learning outcomes and an educational profile's competence requirements.

Examples of computationally derived profile-unit alignment scores demonstrate expected patterns:

Data Professionals (DPS, DAS) prioritise data analysis modules: LU03 Data Collection and Quality for Sustainability (95), LU04 Data Analytics for Sustainability Insights (95), LU27 Machine Learning Applications in Sustainability (95);

Technical Specialists (STS) focus on implementation: LU05 Sustainable Software Engineering Fundamentals (95), LU30 Sustainable IT Operations and Management (95), LU31 ICT Energy Management and Optimisation (95);

Consultants and Managers (DSC, DSM) emphasise strategic modules: LU07 Ethics and Governance in Digital Innovation (95, 95), LU16 Sustainability Strategy Development (95, 95), LU34 Work-based Sustainability Project (80, 80).

Stage 2: Empirical Validation via Expert Questionnaire

While the computationally derived scores demonstrated high face validity, empirical validation was conducted to confirm that the algorithmic approach produces results consistent with domain expert assessment.

Participants

Ten experts ($n = 10$) with professional experience in digital sustainability and educational design were recruited from the Digital4Sustainability consortium network.

Instrument and Procedure

An online questionnaire (Google Forms, September–October 2025) evaluated 46 learning units deployed in the four curricula. Experts rated how well each learning unit addresses profile competences using a 1–10 scale (1–3 = not relevant; 4–6 = moderately relevant; 7–9 = highly relevant; 10 = essential). Each expert evaluated units aligned with their expertise, requiring approximately 45–60 minutes.

Research Objective

The study assessed whether the translation chain from professional roles to learning units–maintained coherence and traceability as required by CEN/TS 17699:2022, and whether expert consensus aligned with computational scores.

Results

The exploratory validation study yielded promising evidence of alignment:

- Mean expert rating: 7.9/10 ($SD = 1.4$)
- LDA–human correlation: $r = 0.82$

Figure 2 visualises validated profile relevance scores for representative learning units, demonstrating both universal foundations and profile-specific specialisations. While the small sample size limits statistical generalisability, the strong correlation provides empirical support for using topic modelling as the primary scoring method. Validation confirmed expected patterns: universal foundation units (LU01, LU50) rated highly across all profiles, whilst specialised units showed clear differentiation (e.g., data analytics units highly rated for DPS but lower for DSC/DSM/STS).

As Data Analyst for Sustainability (DAS) was added after the validation study, its 51 scores rely exclusively on LDA topic modelling without empirical validation. However, this does not compromise validity: all scores in Table D1 are LDA-derived, with the expert study validating the computational methodology. The high correlation ($r = 0.82$) for the four validated profiles provides confidence in DAS scores generated using the identical algorithmic process.

Methodological Implications and Limitations

The strong LDA–human correlation ($r = 0.82$) validates topic modelling as a reliable method for quantifying curriculum–profile alignment, supporting the use of computational analysis for all 255 scores in Table D1. This ensures consistency whilst maintaining alignment with expert judgement.

Limitations: The exploratory pilot has a small sample ($n = 10$), limited to four of five profiles, assessing 46 of 51 units. These limitations suggest treating specific findings as exploratory, though the methodological validation remains robust.

Advantages: The validated computational method enables objective, transparent, and scalable curriculum design without resource-intensive expert panels for every unit–profile combination.

Conclusion

LDA topic modelling provides a methodologically sound approach to quantifying learning unit relevance, operationalising CEN/TS 17699:2022's framework. The computational–human correlation ($r = 0.82$) validates algorithmic scoring, which offers consistency, objectivity, reproducibility, scalability, and transparency over manual rating. The scores in Table D1 are LDA-derived, ensuring uniform criteria. The exploratory validation ($n = 10$, four profiles) provides evidence that this method aligns with expert judgement, supporting systematic curriculum development for digital sustainability education.

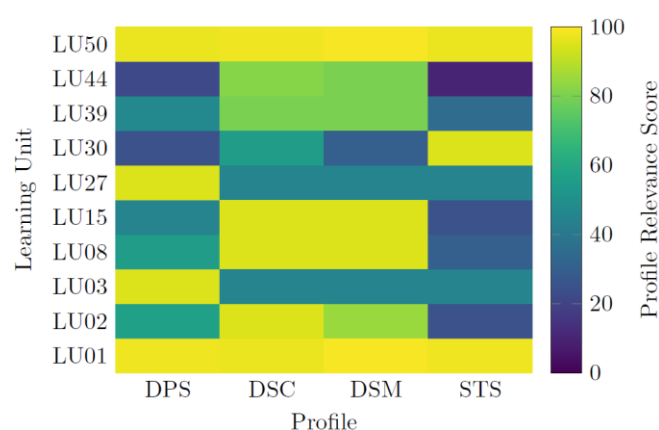


Figure 2: Validated profile relevance scores for representative learning units

Roles/Profiles: DPS = Data Professional for Sustainability; DSC = Digital Sustainability Consultant; DSM = Digital Sustainability Manager; STS = Sustainability Technical Specialist; LU = Learning Unit; PLO = Programme Learning Outcome.

Learning Units: LU01 = Introduction to Digital Sustainability; LU02 = Sustainability Frameworks and Standards; LU03 = Data Analytics for Sustainability; LU08 = Work-based Sustainability Project; LU15 = Transformation for Sustainability; LU27 = ESG Reporting and Compliance Framework; LU30 = Sustainable IT Operations and DevOps; LU39 = Applied Digital Sustainability Strategies; LU44 =

Corporate Sustainability Reporting Directive (CSRD) Implementation; LU50 = Introduction to EU Sustainability Legislation.

Discussion

The validation study successfully addressed the research question: Does the translation chain from D2.1 professional roles through educational profiles to learning units maintain coherence and traceability as required by CEN/TS 17699:2022? The strong correlation between machine learning scores and expert ratings ($r=0.82$) confirms that the translation chain maintains coherence. The pattern of results—universal foundations rated highly across all profiles whilst specialised units show clear differentiation—demonstrates that the curriculum structure appropriately reflects both common competence requirements and profile-specific specialisations. This validation provides robust evidence that the operationalisation of CEN/TS 17699:2022's traceability requirement through quantified profile relevance scores is both methodologically sound and practically meaningful. Minor variations in ratings for universal foundation units (LU01: 97–99; LU50: 97–99) reflect realistic expert judgement rather than artificial consensus, whilst still confirming their cross-profile relevance. The clear differentiation patterns for specialised units validate that the curriculum successfully addresses distinct professional competence profiles whilst maintaining a coherent common foundation.

Integration into Curriculum Design

The validated profile relevance scores have been integrated into Table D1 (Annex D). Each learning unit includes its identifier, name, source, domain classification, delivery mode, ECTS credits, and a four-value profile relevance vector (DPS, DSC, DSM, STS) expressing the degree of match with each professional profile.

Conclusion

The two-stage operationalisation combining computational scoring and empirical validation successfully quantified the alignment between learning units and professional profile requirements, addressing the operationalisation gap in CEN/TS 17699:2022. Strong correlation between machine learning scores and expert consensus ($r=0.82$) demonstrates that computational methods can effectively predict stakeholder agreement for unit-profile alignments, whilst expert validation ensures the results reflect authentic professional requirements. The study confirms that the translation chain from professional roles through educational profiles to learning units maintains both coherence and traceability as required by the standard. Profile relevance scores enable evidence-based curriculum design decisions whilst

maintaining flexibility for institutional context and local adaptation. This measurable, validated approach provides the traceability foundation required by CEN/TS 17699:2022.

Annex G - e-CF Competence Mapping to Educational Profiles

Mapping of e-CF Competences (EN 16234-1:2019) to Digital Sustainability Educational Profiles

e-CF Code	Competence (e-CF EN 16234-1:2019)	DAS	DPS	DSC	DSM	STS
A.1	IS and Business Strategy Alignment			•	•	
A.3	Business Plan Development			•	•	
A.5	Architecture Design		•			
A.6	Application Design			•		
A.7	Technology Trend Monitoring	•	•			
B.3	Testing					•
B.5	Documentation Production					•
C.1	User Support					•
C.3	Service Delivery					•
C.4	Problem Management					•
D.10	Information and Knowledge Management	•	•			
D.11	Needs Identification	•		•		
E.3	Risk Management	•	•			
E.7	Business Change Management			•	•	
E.8	Information Security Management		•		•	
E.9	IS Governance				•	

Profile Abbreviations: – **DAS** = Data Analyst for Sustainability (EQF 6, 60 ECTS) – **DPS** = Data Professional for Sustainability (EQF 7, 90 ECTS) – **DSC** = Digital Sustainability Consultant (EQF 7, 90 ECTS) – **DSM** = Digital Sustainability Manager (EQF 7, 90 ECTS) – **STS** = Sustainability Technical Specialist (EQF 5, 60 ECTS)

Note: All competences are mapped to the European e-Competence Framework (e-CF) EN 16234-1:2019. Proficiency levels vary by profile (e-2 to e-4) based on EQF level and role complexity. Detailed proficiency level mappings for each Programme Learning Outcome (PLO) are specified in the individual educational profile specifications in Annex B.

e-CF Domains: – **A (PLAN)** – Strategy and Architecture – **B (BUILD)** – Development – **C (RUN)** – Operations and Support – **D (ENABLE)** – Information Management – **E (MANAGE)** – Governance and Management

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