Repository

Section 15 - Hydrogen, Sustainability & Circularity

Topic 106 – Policy and Standards for Circular Hydrogen Infrastructure

Dissemination Level: Public

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Erasmus + EU Solidarity Corps

101194163 - H2VE - ERASMUS-EDU-2024-PEX-COVE

Document Information

Issued by	Bochum University of Applied Sciences (BUAS)
Issue Date	24/07/2026

Document History

Version	Date	Modifications made by
01	28/05/2026	Bochum University of Applied Sciences (BUAS)

Authors

Version	Date	Full Name (Organization)
01	28/05/2026	Emmanuel Effah (BUAS)

1. Repository Introduction

This document is part of the H2VE Repository, a structured collection of learning resources and materials developed to support Centres of Vocational Excellence (CoVEs) and training providers in delivering high-quality, up-to-date hydrogen education. The thematic clusters and sub-topics covered in this repository were jointly compiled by all H2VE project partners as part of Deliverable D5.1 - Educational Training Material Specification Document. Each document corresponds to a specific sub-topic within a broader thematic cluster and follows a standardized structure comprising a document header, learning context, core content, curated digital tools, and assessment guidance, where applicable. The aim is to provide trainers and educators with general resources as well as modular content that can be integrated into existing curricula or adapted to specific training contexts. A list of underlying resources and sources is provided at the end of each document to allow for further exploration and verification of the material presented.

2. Topic Overview

Regulatory frameworks and standards are increasingly shaping how circular economy practices are implemented across hydrogen infrastructure. This topic covers key EU frameworks and instruments, such as the Ecodesign for Sustainable Products Regulation, Critical Raw Materials Act, and relevant standards addressing recyclability, extended producer responsibility, and material traceability. Learners gain an understanding of how regulatory requirements shape circular design and end-of-life practices across the hydrogen value chain, and how compliance with emerging standards is becoming a driver for circularity in industrial practice. This regulatory grounding helps contextualize the technical and engineering strategies addressed elsewhere in this thematic cluster.

3. Learning Resource Overview

1. Learning Context	**Prerequisites:** • Completed Topics 99 –105 or understanding of H sustainability and circularity • Basic familiarity with EU legislative processes and the role of the European Commission, Parliament, and Council
2. Content	• **EU Regulatory Framework for Circular Hydrogen** The regulatory landscape builds in layers: the EU Green Deal sets the overarching climate-neutrality frame; the EU Hydro-

	gen Strategy (2020) establishes production targets (10 Mt domestic plus 10 Mt imported renewable hydrogen by 2030); REPowerEU (2022) accelerates these targets in response to energy security concerns; the Circular Economy Action Plan (2020) drives EPR, eco-design, and waste-hierarchy policy; the ESPR (Regulation 2024/1781) mandates disassembly, repairability, recyclability, and the Digital Product Passport; and the Critical Raw Materials Act (2024) sets extraction, processing, and recycling benchmarks for strategic materials. • **Extended Producer Responsibility (EPR)** EPR shifts end-of-life management costs onto producers rather than waste operators or taxpayers. For hydrogen equipment manufacturers, this creates a financial incentive to design for recycling and favours leasing or service-based models that keep end-of-life responsibility with the OEM. As of May 2026, EPR is not yet explicitly mandated for industrial hydrogen equipment under EU law — this is expected to be defined through forthcoming ESPR delegated acts. • **Relevant Standards** ISO 14040/14044 provides the established LCA methodology framework; ISO 14075:2024 is the newly introduced international standard for Social LCA; ISO 14001 supplies the organisational Environmental Management System context for implementing LCA findings. Alongside these, sector-specific reference documents — FC-HyGuide (2011) and the SH2E FCH-LCA/LCSA guidelines (2022–2024) — offer established, if non-ISO, methodological guidance specific to hydrogen and fuel cell systems.
3. Digital Tools	-
4. Assessment Guidance	**Assessment Methods** • Policy mapping exercise: students complete the regulation-activity matrix and write a 300 - word summary of which H_2 lifecycle stage is least covered by current EU regulation and what gap should be addressed. • Policy brief (750 words): targeted at an EU policymaker. Students argue for one specific regulatory improvement to accelerate circular Hydrogen infrastructure (e.g., mandatory EPR for electrolysers, a dedicated ESPR delegated act for

	Hydrogen equipment, or a CRM recycling certificate scheme). **Sample Questions** 1. What is Extended Producer Responsibility (EPR) and how might it be applied to fuel cell systems in the EU? 2. Explain the role of the Digital Product Passport under ESPR and how it could support end-of-life management of hydrogen electrolysers. 3. The EU Critical Raw Materials Act sets a 25% recycling target for strategic materials. Identify two regulatory or technical barriers that currently prevent this target being met for iridium from PEM electrolysers. **Evaluation Criteria** • Accurate identification and description of relevant regulations (35%) • Quality of gap analysis and critical policy reasoning (40%) • Clarity and structure of written communication (25%)
5. References	• European Commission. (2020). A hydrogen strategy for a climate-neutral Europe. https://energy.ec.europa.eu/system/files/2020-07/hydrogen_strategy_0.pdf • European Commission. (2020). Circular economy action plan. https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en • European Parliament & Council. (2024). Regulation (EU) 2024/1781 (ESPR). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1781 • European Commission. (2024). Critical Raw Materials Act. https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en • ISO. (2024). ISO 14075: Environmental management, Principles and framework for social life cycle assessment. International Organization for Standardization. • Clean Hydrogen Partnership. (2024). SH2E project, Guidelines for LCSA of FCH systems. https://sh2e.eu/