Digital Twins for Climate Resilience

Executive Summary — Digital Resilience Real Cases / Experiences Report (D2.1)

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This executive summary presents the key messages of the Digital Resilience Real Cases / Experiences Report (D2.1). The report combines a multi-country needs analysis with a curated corpus of real-world implementations to determine how digital twins can bolster climate resilience across the construction and civil-infrastructure domain. By bringing together learner and practitioner perspectives with field-tested practices, the document outlines a pragmatic pathway from concept to applied competence.

Stakeholder feedback indicates high awareness of digital-twin concepts but a shortfall in sustained, hands-on experience. Respondents emphasise the value of case-based learning anchored in climate-resilience scenarios, foundational materials that clarify terminology and architecture, and practical guidance that connects tools to decisions in real projects. Preferences converge on learning experiences that are modular, applied, and oriented toward measurable improvements in design, operations, and risk-informed governance.

The real-case analyses surface recurring barriers and enabling practices. Common challenges include data availability and interoperability, cybersecurity and privacy, computational demands, real-time synchronisation, legacy-process integration, cost constraints, and skills gaps. Successful initiatives counter these through disciplined data-management and sharing practices, incremental scaling from focused use cases, and judicious use of cloud and edge resources. They integrate workflows that combine BIM, sensing, and analytical models; formalise governance through standards and guidelines; and rely on cross-functional teams to sustain adoption and trust.

These findings translate into clear curriculum implications. Training should interleave fundamentals (data, models, feedback loops), data competencies (quality assurance, semantics, interoperability), and computational tooling (simulation, BIM integration, and real-time monitoring). Climate-specific application strands should include energy and resource efficiency, stress-testing of assets under extreme events, and adaptation planning. Equally important are organisational integration, communication of insights to decision-makers, and baseline cyber-risk awareness. Overall, D2.1 provides an evidence-based foundation for DigitalResilience training that prioritises actionable competence over theory and positions digital twins as a practical lever for resilient design, operations, and governance under climate stress.

Note: The full report is available in English.