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Integrating E-governance and Circular Economy European case studies for Ukrainian territorial communities' recovery

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Introduction

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Estimated recovery and reconstruction needs of Ukraine (World Bank)

- Reconstruction requires efficient material and financial resource management.
- Ukraine already has advanced digital public services.
- Circular resource management remains insufficiently integrated with digital governance.

RQ: *How can European digital circular economy instruments support the recovery and financial resilience of Ukrainian territorial communities?*

Research Methodology

European Cases

Five digital circular economy platforms across Europe

Evidence Base

Official statistics, legal documents, platform data and stakeholder estimates

Scenario Modelling

European adoption indicators applied to Ukrainian denominators

Framework Design

Integration of five functions into one governance architecture

European Digital Circular Economy Tools

Digital function	Case and country	Maturity stage	Role	Adoption evidence
Statistical monitoring and dashboards	DEFRA WasteDataFlow United Kingdom (England)	Mature national infrastructure	National waste data reporting system for municipalities	Reported: 321 local authorities submitted full reports Estimated total: 321 local authorities in England **Adoption: 100% adoption**
Regulatory monitoring of waste transport	e-SIR Spain	Early implementation	National waste shipment traceability platform	Reported: >70 000 waste shipment notifications registered up-to 2024 since launch Estimated total: ≈1.5 mil. waste shipments annually are expected estimation. **Adoption: ≈5% coverage in early implementation stage**
Accounting and reporting systems	GPAIS Lithuania	Operational regulatory system	National product, packaging and waste accounting registry	Reported: ≈3 000 registered companies in the system Estimated total: ≈95 000 active companies in Lithuania, who obligated to be registered **Adoption: ≈3% of total companies (note: system targets only obligated entities)**
Market redistribution of secondary materials	Materiaalitori Finland	Emerging market platform	Digital secondary materials marketplace	Reported: >1 700 registered companies Estimated total: ≈607 659 officially registered companies in Finland **Adoption: ≈0.3% of companies**
Building asset inventories	Madaster Netherlands (EU expansion)	Pilot	Materials passport platform for buildings	Reported: >1 000 000 m² of registered real estate Estimated total: ≈4 billion m² of estimated total building stock of Netherlands **Adoption: ≈0.0003% of building stock (pilot phase scale)**

Key insight: European platforms address different stages of material circulation, from regulatory reporting to reuse and secondary markets.

Ukrainian Implementation Scenarios

Digital Function (based on European cases)	Ukrainian Denominator Description	Ukrainian Denominator	Adoption Rate, %	Extrapolated Ukrainian Scope
Statistical monitoring and dashboards	Estimated number of non-occupied territorial communities in Ukraine (excluding fully or partially occupied communities, and those which in active combat zone or potentially could be in active combat zone)	1081 territorial communities.	100% adoption	≈1081 communities reporting to national dashboard.
Regulatory monitoring of waste transport	Enterprise-generated waste volume used as proxy denominator	≈ 450 mil. tonnes	≈5% coverage in early implementation stage	≈22.5 mil. tonnes under digital traceability.
Accounting and reporting systems	Estimated number of active enterprises in Ukraine (derived from regional statistics share calculations)	283 824 enterprises	≈3% of total companies (estimated amount of only obligated entities)	≈8514 enterprises should be obligated to participate in the registry..
Market redistribution of secondary materials	Estimated number of active enterprises in Ukraine (derived from regional statistics share calculations)	271 875 small enterprises	≈0.3% of companies	≈850 firms participating in circular marketplace
Building asset inventories	Registered damaged or destroyed residential objects in the Ukrainian Register of Damaged and Destroyed Property	247 819 objects	≈0.0003% of building stock (pilot phase scale)	≈100 pilot buildings with digital materials passports

Key insight:
The implementation scale should differ by function, regulatory requirements and institutional readiness.

Digital Circular Governance Framework



This layer transforms integrated digital information into evidence-based decisions on procurement, investment, regulation and resource allocation. By improving transparency and resource efficiency, the framework aims to strengthen territorial communities' financial resilience while promoting material reuse, waste reduction and circular reconstruction.

The feedback mechanism connects monitoring results with continuous improvements in governance and implementation. It enables public authorities to adjust regulations, economic incentives and system parameters based on observed performance and changing reconstruction needs.

This is the central component of the framework, integrating five functional modules: Circulation, Traceability, Registry, Monitoring and Marketplace. Together, they collect, standardise and exchange information on materials, assets and waste flows, creating a coordinated digital environment for circular resource management.

Ukraine's existing digital platforms provide the institutional and technological foundation for the proposed framework. Building on these systems can support integration with existing public services and avoid unnecessary duplication, although additional technical and institutional connections are required.

Conclusions

- Digital circular economy tools demonstrate different adoption patterns. Mandatory reporting systems can achieve broad institutional coverage, while voluntary marketplaces and materials passport platforms require gradual implementation and stakeholder engagement.
- European experience provides a basis for Ukrainian implementation scenarios. Results illustrate the potential scale of five digital functions, ranging from nationwide municipal monitoring to targeted pilot projects and secondary-material marketplaces.
- The proposed framework connects five complementary digital functions through standardised classifications, interoperable data exchange and existing Ukrainian digital public infrastructure.
- Digital circular governance can support more informed reconstruction decisions. Integrated material-flow information can improve transparency, support procurement and investment planning, and enable more efficient allocation of recovery resources.
- Financial and environmental benefits require further empirical validation. The proposed framework identifies pathways toward circular reconstruction and stronger financial resilience, but its effectiveness must be tested through practical implementation.

Directions for future researches

- Developing of comparable longitudinal indicators of digital circular economy adoption, verify target populations and improve the reliability of implementation estimates.
- To test Digital Circular Governance model by using simulating methods, focusing on data interoperability, material classifications, access rules and practical reuse decisions.
- To evaluate implementation costs, expected benefits, administrative capacities, regulatory requirements and incentives for public and private stakeholders.
- To measure changes in resource efficiency, material reuse, waste reduction and territorial communities' financial resilience following implementation.

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