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STRATEGIC PRIORITIES FOR THE CIRCULAR TRANSFORMATION OF UKRAINE'S INDUSTRIES

The circular transformation of Ukraine's industry is a strategic prerequisite for post-war recovery, resource security and integration into the European economic area. The industrial model remains highly material- and energy-intensive and is still dominated by the linear logic of extraction, production, consumption and disposal. UNIDO estimates that more than 90% of industrial waste in Ukraine is landfilled, while material productivity is more than ten times lower than the EU benchmark – about EUR 0.26 per kilogram of material consumption compared with approximately EUR 3 per kilogram in the EU [1]. This gap reduces productivity, increases exposure to resource and energy shocks and weakens competitiveness in markets where environmental performance increasingly affects trade and investment decisions.

Industrial enterprises are central to this transition because they concentrate material flows, energy use, waste generation and long-term capital allocation. Reconstruction may either reproduce resource-intensive and carbon-intensive production trajectories or establish the technological basis for circularity and decarbonisation. The war has intensified constraints through damage to assets, logistics and energy infrastructure, while simultaneously creating an opportunity to redirect investment towards resource-efficient technologies, circular infrastructure and low-carbon capacity [2]. Therefore, circular transformation should be treated as a structural reconfiguration of industrial development, integrating sustainability-oriented innovation, business-model change, institutional coordination and technological modernisation [3; 4; 5].

Sectoral prioritisation can be based on the UNIDO triple-linkage model combining sectoral development (SD), resilience (R) and circular economy potential (CE). SD reflects economic significance, R captures resource dependence and adaptive capacity, and CE accounts for material and carbon footprints and the potential to close resource loops [1]. The assessment highlights manufacturing as the highest-priority sector, while

other industries show different combinations of development value, resilience constraints and circularity potential (Fig. 1).

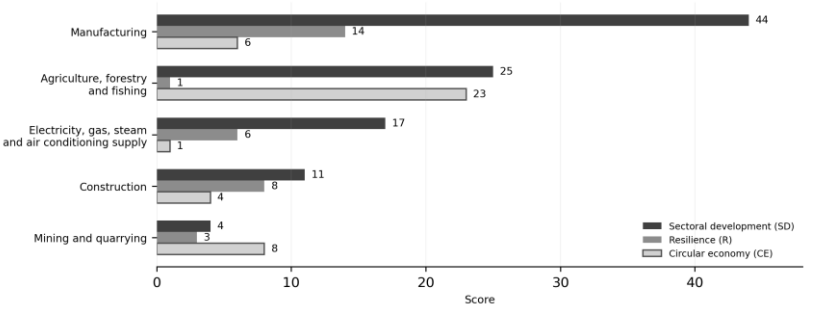


Figure 1. Prioritisation of the circular transformation of Ukraine's industries according to the UNIDO model (scores)

Source: developed by the author based on UNIDO analytics [1]

Manufacturing has the highest aggregate priority, combining substantial value creation with considerable environmental pressure and circular-economy potential.

In addition, mining and quarrying scores lower but remains critical as the initial link in material flows and a source of inputs for processing industries. This confirms the need for value-chain coordination and is reinforced by the gap between Ukraine's baseline conditions and EU-oriented benchmarks (Table 1).

Table 1

Target indicators for the green transition of Ukraine's industry in the strategic EU perspective

Indicator	Baseline	EU 2030	Required change
CO_2 intensity, CO_2/USD 1 GDP	2.1	0.9	−57.1%
GHG emissions per capita, t CO_2/person	5.5	2.5	−54.5%
GHG: basic metals, Mt CO_2	0.76	0.342	−55%
GHG: agriculture, Mt CO_2	21.8	9.81	−55%
GHG: construction, Mt CO_2	11.3	5.09	−55%
Material consumption, t/person	11.2	8	−28.6%
Waste landfilling	90%	10%	−88.9%
Food-production waste, t	4,159	3,743	−10%

Source: compiled by the author based on UNIDO [1]

The benchmarks require systemic technological transformation. Five priorities are critical.

First, resource efficiency should increase material productivity, reduce losses, expand secondary raw-material use and recover valuable components from industrial and technogenic waste.

Second, decarbonisation should combine energy efficiency, electrification, low-carbon technologies, closed-loop water systems and environmentally oriented CAPEX.

Third, industrial symbiosis should enable by-products, secondary minerals, scrap, residual heat and water to circulate between firms and sectors.

Fourth, digital monitoring and data-driven management should support material-flow control, predictive maintenance, energy optimisation and product/carbon traceability.

Fifth, market and regulatory adaptation should align industrial products and management systems with EU requirements for sustainability, pollution prevention, resource efficiency and circularity [2; 7].

Together, these priorities reduce dependence on scarce resources and strengthen industrial resilience. Thus, a resilient circular business model should be considered as an adaptive system of value creation, delivery and capture that integrates circular resource flows, low-carbon technologies, digital management, inter-firm cooperation and sustainability-oriented investment in order to minimize dependence on primary resources, maintain operational continuity under external disruptions, and generate long-term economic, environmental and strategic value**.**

Implementation should be sequenced across time horizons. In the short term (1–2 years), enterprises should establish measurable environmental and climate targets and ESG KPIs, conduct material, energy and water audits, and introduce rapid efficiency and waste-return measures. In the medium term (3–5 years), CAPEX should be redirected towards low-carbon technologies, secondary materials, energy recovery, closed internal loops, industrial symbiosis and digital resource management. In the long term (5–10 years), enterprises should move towards low-carbon technological systems, circularity of critical material flows, eco-design and integration into European green supply and value chains (Fig. 2).

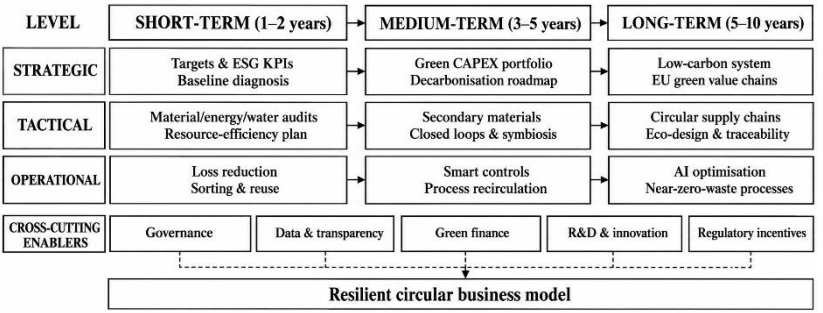


Figure 2. Strategizing the greening of an industrial enterprise

Source: developed by the author

Strategizing circular transformation means coordinating technological modernisation, resource management, investment priorities and market adaptation as one long-term process. Its cross-cutting prerequisites are effective governance, reliable data and transparency, green finance, partnerships, research and innovation, and consistent regulatory incentives. The expected result is a resilient circular business model in which lower material, energy and carbon intensity is combined with higher resource productivity and long-term competitiveness [6].

At the industrial-policy level, these priorities should be embedded in Ukraine's reconstruction architecture and EU accession trajectory. Public support should favour projects that simultaneously improve resource productivity, reduce carbon exposure and strengthen supply-chain resilience. Coordinated incentives for industrial modernisation, circular infrastructure, industrial symbiosis and traceability systems can convert environmental compliance into a driver of productivity and market access. Accordingly, the circular economy should be viewed not only as an environmental framework, but also as a strategic mechanism for industrial renewal, regional resilience and the formation of new value chains.

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