

NORMATIVE ECOSYSTEMS AND SMART GOVERNANCE FOR INTEGRATION OF ARTIFICIAL INTELLIGENCE IN THE CIRCULAR ECONOMY

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The circular economy is approached in the Republic of Moldova mainly through strategic documents that establish general principles, but without operational mechanisms and without an integrated regulatory framework capable of supporting digital monitoring and institutional interoperability. The expansion of technologies, based on artificial intelligence can contribute to the efficient management of resources, monitoring production flows, preventing waste and leveraging data for public decisions oriented towards sustainability. The purpose of the research is to analyze how normative ecosystems and smart governance can facilitate the integration of artificial intelligence into priority areas of the circular economy in the Republic of Moldova, highlighting the role of cooperation between the public sector, the private sector and research, highlighting the role for technology transfer and the development of innovative solutions, oriented towards sustainability and resilience.

The research is based on the analysis of national strategic documents, including the *White Paper on Artificial Intelligence and Data Governance*, circular economy programs, including the *Program for Promoting the Green and Circular Economy in the Republic of Moldova for the period 2024-2028*, as well as the digital agenda, correlated with European good practices and *OECD recommendations on data governance and responsible artificial intelligence*. The study examines institutional interoperability, digital monitoring mechanisms and adaptive regulatory tools, focusing on sectors with circularity potential: waste management, sustainable agriculture, industry, energy and green logistics.

The results highlight that the adoption of artificial intelligence remains fragmented due to the lack of operational standards, unclear responsibilities, and the absence of a framework for assessing the impact of artificial intelligence on sustainability. In this context, cooperation between authorities, the private sector, non-governmental organizations and academic and research institutions become essential for technology transfer, testing of technologies in a controlled regime and the development of efficient data-based governance mechanisms. Developing adaptive regulatory frameworks and regulatory testbeds for artificial intelligence can accelerate the experimentation of innovative circular economy technologies and their safe and responsible deployment. These measures enable the practical implementation of circular economy principles, reduce the gap between strategies and outcomes, and create an adaptive regulatory ecosystem.

Through this approach, artificial intelligence becomes not only a technological tool, but also a mechanism for facilitating innovation and intersectoral cooperation, supporting the transformation of declarative strategies into concrete, efficient and sustainable actions. The results of the study provide a framework for formulating public policies oriented towards sustainability, innovation and technology transfer, highlighting how collaboration between diverse actors can accelerate the Republic of Moldova's transition towards a digitalized circular economy. The study suggests that the implementation of artificial intelligence can function as an adaptive mechanism in a sustainable economy, in which intelligent governance oversees and optimizes economic processes while respecting the national regulatory framework and European Union standards, maintaining the balance between growth and sustainability.

Keywords: *artificial intelligence, circular economy, smart governance, normative ecosystems, adaptive regulation, sustainability*

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