

## Circular Tool and Dynamic Approach to Grow the Entrepreneurship of Macroeconomic Metabolism

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**Abstract :** It is expected that close to 7 billion people will live in urban areas by 2050. In order to improve the sustainability of the territories and its transition towards circular economy, it's necessary to understand its metabolism and promote and guide the entrepreneurship answer. The study of a macroeconomic metabolism involves the quantification of the inputs, outputs and storage of energy, water, materials and wastes for an urban region. This quantification and analysis representing one opportunity for the promotion of green entrepreneurship. There are several methods to assess the environmental impacts of an urban territory, such as human and environmental risk assessment (HERA), life cycle assessment (LCA), ecological footprint assessment (EF), material flow analysis (MFA), physical input-output table (PIOT), ecological network analysis (ENA), multicriteria decision analysis (MCDA) among others. However, no consensus exists about which of those assessment methods are best to analyze the sustainability of these complex systems. Taking into account the weaknesses and needs identified, the CiiM - Circular Innovation Inter-Municipality project aims to define an uniform and globally accepted methodology through the integration of various methodologies and dynamic approaches to increase the efficiency of macroeconomic metabolisms and promoting entrepreneurship in a circular economy. The pilot territory considered in CiiM project has a total area of 969,428 ha, comprising a total of 897,256 inhabitants (about 41% of the population of the Center Region). The main economic activities in the pilot territory, which contribute to a gross domestic product of 14.4 billion euros, are: social support activities for the elderly; construction of buildings; road transport of goods, retailing in supermarkets and hypermarkets; mass production of other garments; inpatient health facilities; and the manufacture of other components and accessories for motor vehicles. The region's business network is mostly constituted of micro and small companies (similar to the Central Region of Portugal), with a total of 53,708 companies identified in the CIM Region of Coimbra (39 large companies), 28,146 in the CIM Viseu Dão Lafões (22 large companies) and 24,953 in CIM Beiras and Serra da Estrela (13 large companies). For the construction of the database was taking into account data available at the National Institute of Statistics (INE), General Directorate of Energy and Geology (DGEG), Eurostat, Pordata, Strategy and Planning Office (GEP), Portuguese Environment Agency (APA), Commission for Coordination and Regional Development (CCDR) and Inter-municipal Community (CIM), as well as dedicated databases. In addition to the collection of statistical data, it was necessary to identify and characterize the different stakeholder groups in the pilot territory that are relevant to the different metabolism components under analysis. The CIIM project also adds the potential of a Geographic Information System (GIS) so that it is be possible to obtain geospatial results of the territorial metabolisms (rural and urban) of the pilot region. This platform will be a powerful visualization tool of flows of products/services that occur within the region and will support the stakeholders, improving their circular performance and identifying new business ideas and symbiotic partnerships.

**Keywords :** circular economy tools, life cycle assessment macroeconomic metabolism, multicriteria decision analysis, decision support tools, circular entrepreneurship, industrial and regional symbiosis

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