

DESIGN AND TECHNOLOGY. PEOPLE, SYSTEMS, ENVIRONMENT

**PNRR - Evaluation, Design, Technology: Economic-
environmental Sustainability from a Life Cycle Perspective.**

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Politecnico di TORINO [P.iva/CF:00518460019]
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Context of the research activity	<p>The research is developed within the Project "MICS - Made in Italy Circolare e Sostenibile" in the context of PNRR, funded by the European Union. The research aims to contribute to the shift towards Circular Economy for made-in-Italy industrial productions using/producing natural fibers as wastes. It focuses on developing a methodology for the economic-environmental sustainability evaluation of possible reuse/recycling scenarios based on methods and tools (and selected indicators) from a life cycle perspective.</p> <p>Progetto finanziato nell'ambito del PNRR - PNRR M4C2, Investimento 1.3 - Avviso n. 341 del 15/03/2022 - PE0000004 3A-ITALY Made in Italy circolare e sostenibile - E13C22001900001</p>
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	<p>The research is included in the Project "MICS - Made in Italy Circolare e Sostenibile" in the context of PNRR, funded by the European Union – Next Generation EU. It aims to contribute to the shift towards Circular Economy for made-in-Italy industrial productions using/producing natural fibers as wastes. It focuses on the experimentation of new solutions for textiles by using sustainable natural fibers and by defining scenarios for reusing fibrous wastes from textile and agro-industrial chains towards new low environmental impact materials and products. More specifically, assuming the effectiveness of circularity according to a holistic sustainability viewpoint as a central aspect, the focus is on life cycle approaches for the economic-environmental sustainability evaluation.</p> <p>Operatively, the research finds the fundamentals of the methodologies and related applicability issues, tools, and evaluation models consolidated in the real estate appraisal and project valuation discipline. Among these are the</p>
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Objectives

approaches for the valuation of the financial feasibility of investments, such as the Discounted Cash-flow Analysis, the consolidated estimative approaches, particularly the cost value assessment procedures, the multicriteria decision-aiding approaches, the market (demand and supply) analysis, and consumers behavior analysis, the hedonic approach for analyzing the pricing processes.

On these bases, the research shifts towards the circular economy viewpoint by exploring the Life Cycle Costing (LCC) approach potentialities to reach the research aims. The methodological foundations of LCC are assumed as described in the Standard ISO 15686:2008- part 5: Life Cycle Costing. This standard, related to the construction sector, illustrates the LCC methodology, which can be adopted in different scales (building/system/component/material) and represents the methodological reference for other applicability sectors. Thus, as a preliminary step, the state-of-the-art and the scientific background emerging from the literature on the topic referred to other sectors/supply chains/products are explored. Moreover, the Global Cost calculation, which is the core of LCC, is assumed as described in Standard EN ISO 15459-1:2007, Energy Performance of Buildings—Economic Evaluation Procedure for Energy Systems in Buildings, and the Guidelines Accompanying Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012 Supplementing Directive 2010/31/EU.

Besides the conventional LCC approach, attention is posed to the environmental LCC (e-LCC) and social LCC (S-LCC), opening to calculating environmental impacts and externalities due to a production process at different scales. Special attention is posed to the LCC and LCA (Life Cycle Assessment) joint approaches application, according to a methodological and operative viewpoint.

A scenario evaluation and ranking methodology is developed using selected, ad hoc, implemented economic-environmental indicators. These last are based (for example) on the Global Cost and Whole Life Carbon calculation for the economic-environmental sustainability valuation, employing the results of recent studies focused on selecting the cost-optimal solution among alternative technological scenarios. The potential impacts on social sustainability of the reuse of wastes/byproducts scenarios are explored. Furtherly, potential market impacts are considered in the presence of different market behaviors (demand, supply, prices, dynamics) and a possible value increase.

Precisely, the methodology for scenario analysis of processes and products is developed (and tested for verifying its effective applicability in product chains) for supporting the decision-making among alternative technological solutions in the early stages of eco-design.

Valorization of wastes from textile and agro-industrial chains for the production of new competitive products and the creation of new industrial supply chains are some of the research's most relevant weighted economic impacts. A crucial step of the study involves attention to the economic chain of local products and the knowledge of the related processes beyond sources and data of each production chain (quantity, costs, processes) necessary for developing the evaluation methodology.

Skills and competencies for the development of

The candidate should have knowledge and competencies on:

- Knowledge gained through a course of study related to the research topics;
- knowledge of methods for assessing economic, environmental, and social sustainability, mainly through life cycle approaches (e.g., LCC), encompassing environmental components and externalities;
- competence and knowledge of financial approaches (such as Discounted Cash-flow Analysis), real estate market analysis approaches, and cost

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assessment procedures;

- skills in the use of the Adobe Suite and Microsoft Office package, and skills in the perspective of the use of software for LCC and LCC+LCA applications;
- knowledge of English and Italian language (oral and written)