Supporting a Regional strategy for a Circular Economy in South Tyrol, Italy

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Ministero della Transizione Ecologica – Progetti di ricerca a support dei processi di elaborazione e attuazione delle strategie regionali e provinciali per lo sviluppo sostenibile

The SEC project | Strategy for Circular Economy

The SEC project aims to contribute to the transition to a circular economy (CE), in the Autonomous Province of Bolzano – South Tyrol.

Focus: potential synergies between key local economic sectors in terms of waste management and re-use

Specific objective: to support the Province by ***providing insight and tools to support the transition***, and by ***promoting the exchange of knowledge and resources across stakeholders***.

In particular, the project:

- Provides the **state-of-the-art** on CE at EU, national and Province level;
- Illustrates the **application of tools and methods** in the support of the transition to a CE;
- **Engages local stakeholders** (interviews & workshop) to understand the perception, interest and practices, and to promote awareness, in the context of a CE in the Province;
- Drawing on the analyses and stakeholder feedback, provides **recommendations** on the research, policy and practice needs to pave the way to a CE;
- Contributes to the development of an **online portal and a trading platform**, to promote the exchange of knowledge and resources on CE.

Timeframe September 2020 – June 2022

Who we are

Eurac Research is a private research center in Bolzano, with +500 international multidisciplinary collaborators, in 11 institutes.

Institute for Renewable Energy

Applied research on advanced energy systems, based on renewable sources.

+100 collaborators and 6 research groups:

- Urban and Regional Energy Systems Group

  Development of strategies for a sustainable energy transition; supporting decision-making; economic and financial evaluation of energy transition solutions; environmental impact assessment; smart cities.

Institute for Regional Development

Applied solutions to promote processes of socio-ecological and economic transformation and regeneration, to support the development of mountain regions and rural areas.

28 collaborators and 3 research groups:

- Rural economy

  Potential for sustainable growth; strategies for sustainable bioeconomy and circular economy; innovative collaboration between urban and rural areas; entrepreneurship (PME).

The paper: an overview

It illustrates an **integrated approach** merging quantitative and qualitative analyses - geographic information systems (GIS), material flows analysis (MFA) and life-cycle analysis (LCA) + stakeholder engagement process grounded in semi-structured interviews (SSIs).

Contribution

- supporting the public administration with materials, illustration of tools and provision of policy recommendations;

- increasing the awareness and the promotion of CE opportunities to key stakeholders - which is crucial to successfully develop and implement effective policies and strategies in the region.

Paper structure

Introduction

The project scope and strategy

Background: integrated approaches to the CE

Materials and methods

Quantification of residual biomass from forestry and agriculture; Characterizing construction and demolition material flows; Life-cycle energy and GHG analysis of building insulation materials; The stakeholders' involvement.

Main results

Discussion, recommendations and future research

Conclusions

The paper: an overview

Integrated approaches to support CE

Mixed methods (MM) indicate the combination of different methodologies and approaches, with the aim of better framing the research questions as well as validating the research outputs (*Creswell et al., 2010; Mertens et al., 2012*)

Various applications of MM to explore CE (industrial symbiosis, identification of waste flows, consumers' behavior, definition of policies and strategies…)

Significant drawbacks exist! (Data validation, prioritization of methods, researcher's biases…)

Participatory approaches → Role of economic and institutional actors is crucial to address the complexity of supply chains (*de Jesus et al., 2018*) and to identify both opportunities and barriers to circularity (*Farooque et al., 2019*)

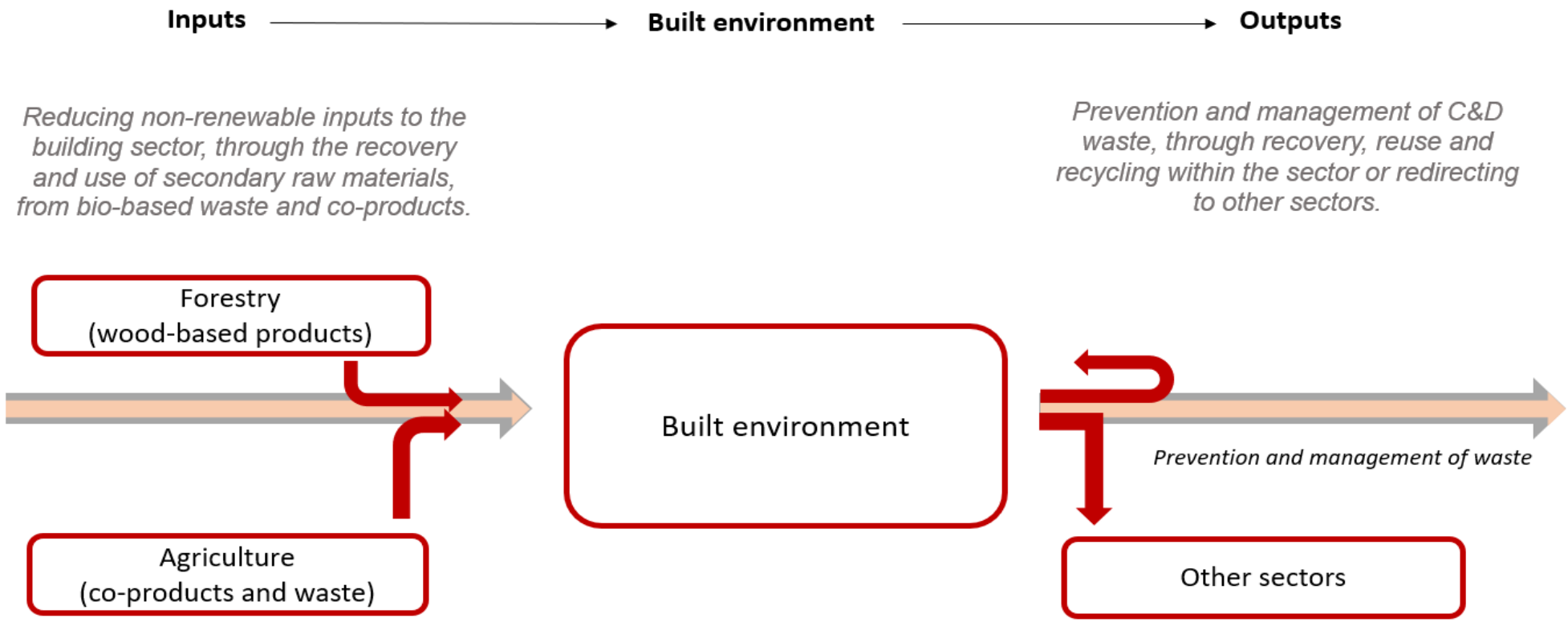
Understanding the potential relationships between stakeholders, especially in a well spatially-defined regional context, is crucial to establish CE strategies (*Reed et al., 2009*)

The paper: an overview

Why focusing on bioeconomy (agriculture and forestry) and the building sector?

Agriculture and forestry represent two key sectors for the economy of South Tyrol

In 2019 the building sector contributed to 36% of final energy demand and 39% of greenhouse gas (GHG) emissions worldwide (*Ürge-Vorsatz et al., 2020*)



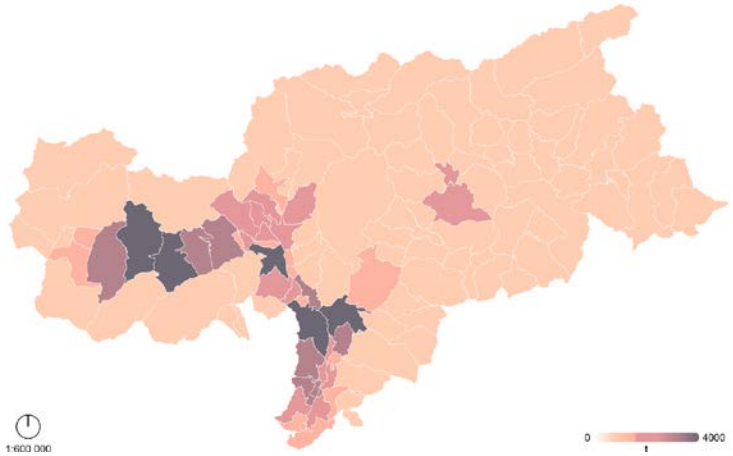
Semi-quantitative approach

a. Quantification of residual biomass from forestry and agriculture (>300.000 t per year)

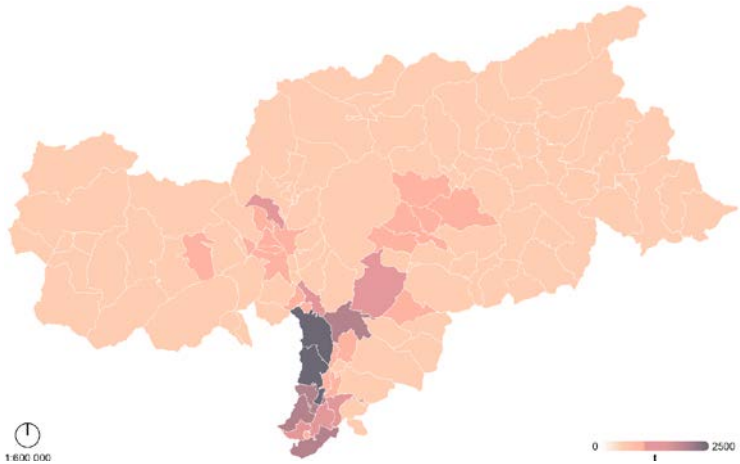
Residual biomass coefficients of agricultural products (Source: Riva, 2013).

Orchards (t/ha)	Vineyards (t/ha)	Arable crops (t/ha)
4,2	0,8	1,0

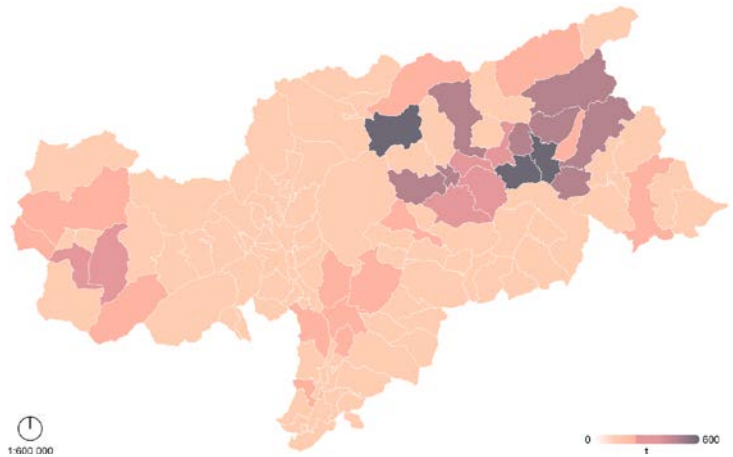
$$Residual\ forestry\ biomass = coppiced\ wood + left\ firewood + branches$$



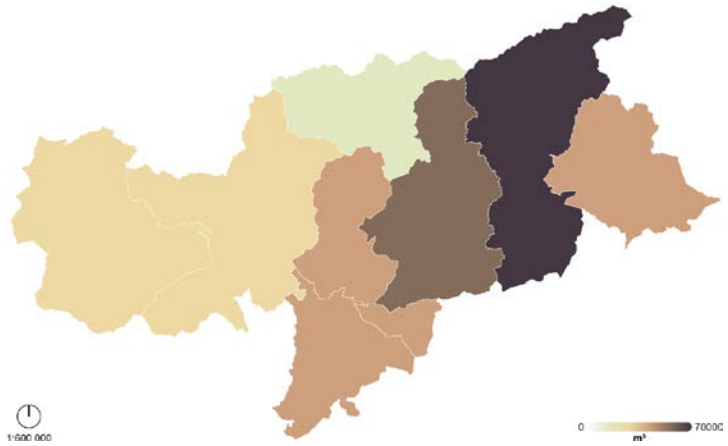
Residual biomass (orchards)



Residual biomass (vineyards)



Residual biomass (arable crops)

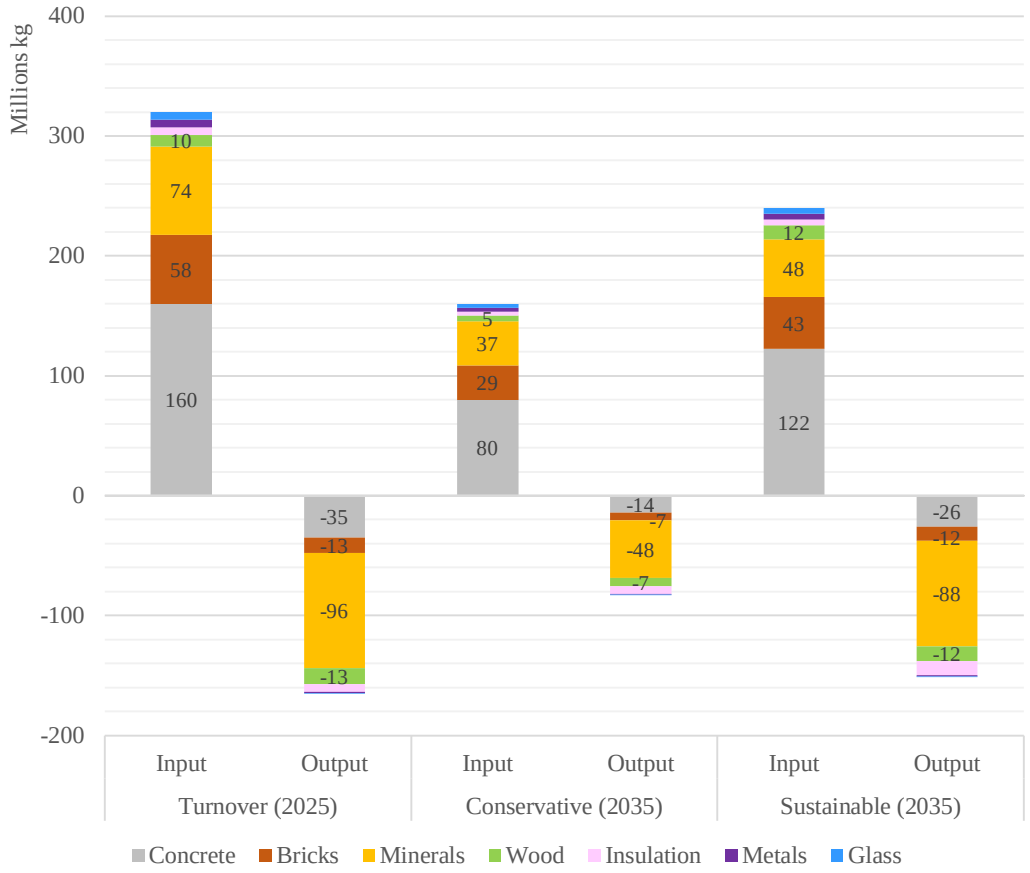


Residual biomass from forestry activities

Semi-quantitative approach

b. Characterizing construction and demolition material flows

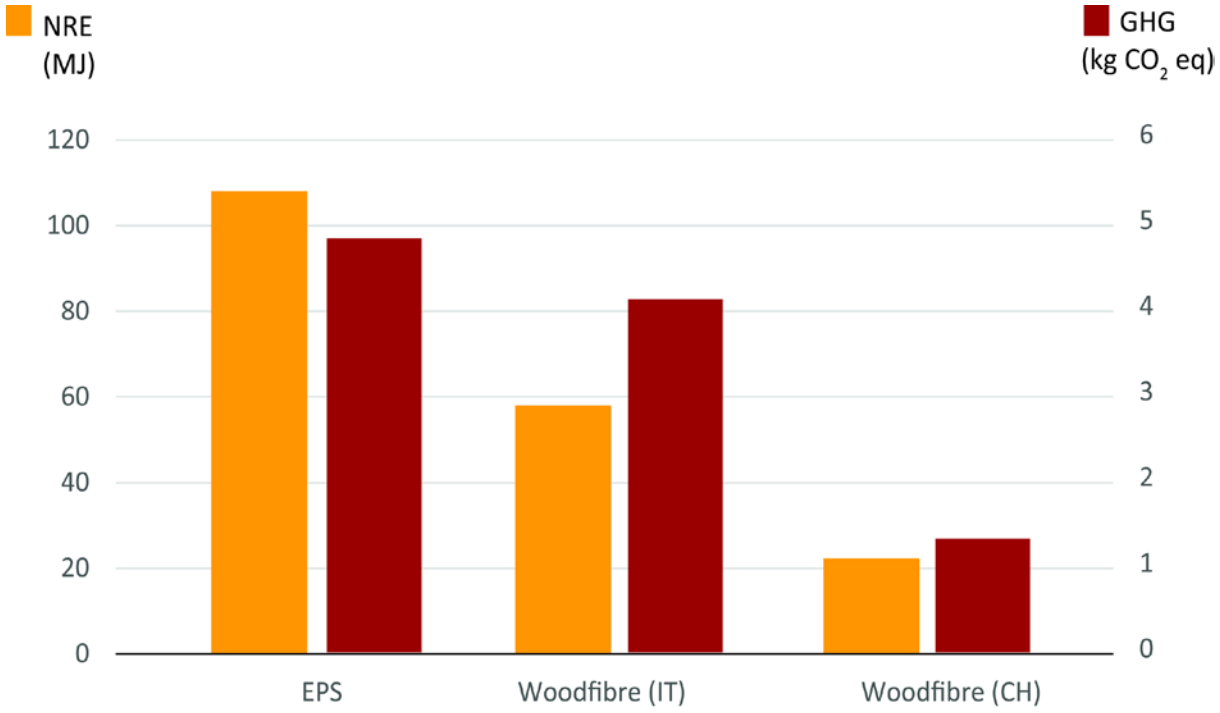
Scenario	Renovation rate	Description
Turnover	1,20% retrofits 0,30% demolitions 1,00% new buildings	It assumes a continuation of the current incentivization policy for the retrofitting of the existing building stock in Italy
Conservative	0.60% retrofits 0,15% demolitions 0,50% new buildings	It simulates the end of the incentivization scheme (and absence of state support) for the requalification and construction of buildings
Sustainable	1,50% retrofits 0,20% demolitions 0,75% new buildings	It represents a solution that foresees the continuation of the policies on fiscal incentives that boost the retrofitting interventions (particularly those using renewable and/or low carbon materials) while discouraging new construction



Semi-quantitative approach

c. Analysis of building insulation materials

A life cycle (LC) energy analysis and GHG analysis were performed to quantify potential benefits of replacing conventional insulation with local bio-based materials. Specifically, a common panel in Extruded Polystyrene (EPS) was compared with locally produced wood fiber board.

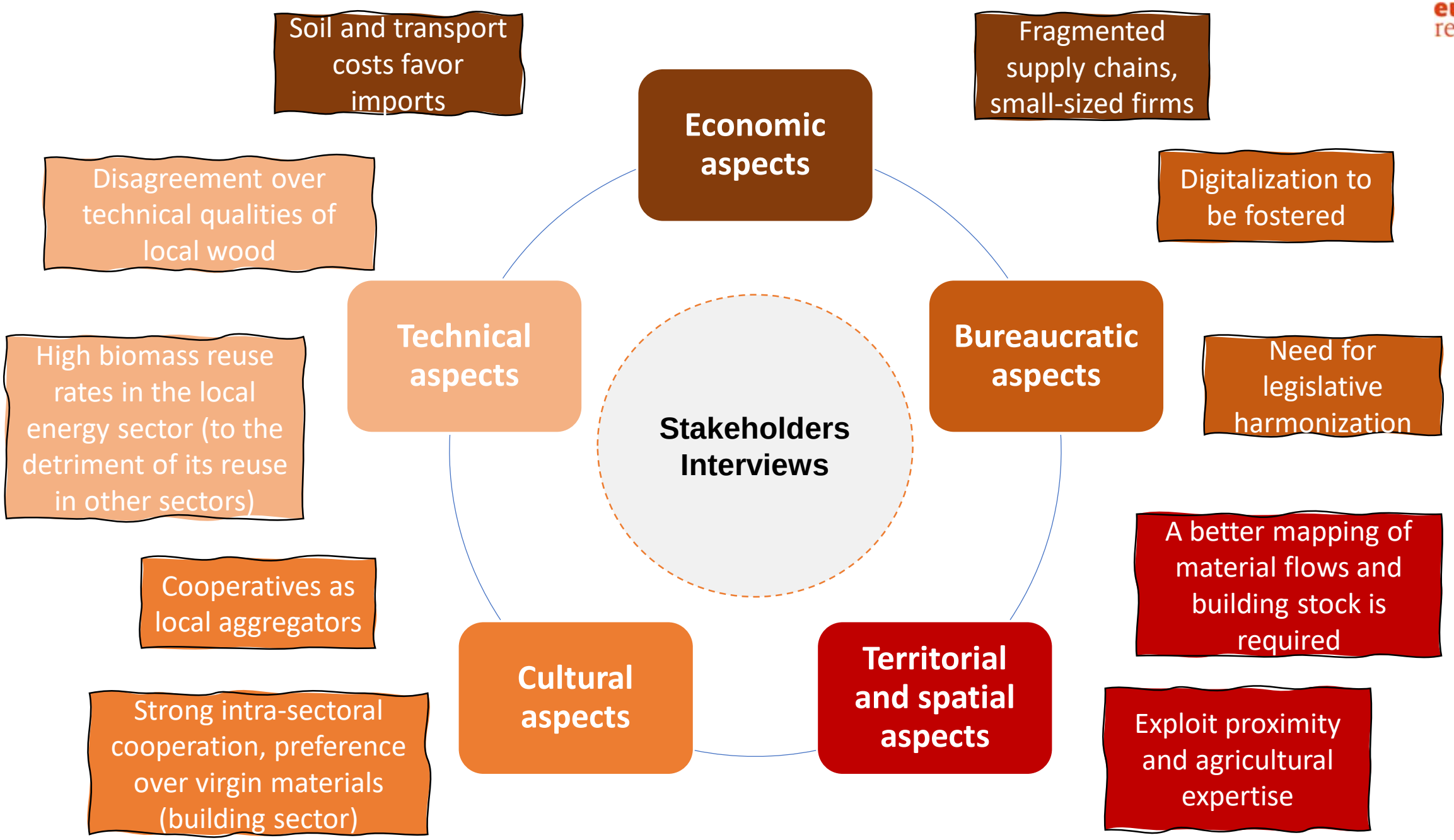


In the LC energy and GHG analysis, the EPS panel was associated with 108 MJ and 4.8 kg CO_2 eq; and the wood fiber alternatives had considerably lower results. **The wood fiber produced with the Italian electricity mix showed a reduction of 42% and 15% in non-renewable energy (NRE) and GHG emissions, respectively**. Additional benefits can be obtained if hydropower-based electricity is used in the manufacturing process: in this case it had a further reduction of 35% and 34% in NRE and GHG respectively, comparing with the panel produced with the national electricity mix. The results confirm that bio-based insulation materials, derived from the recovery of wood residues, have significant potential to lower embodied energy and GHG emissions associated with construction materials.

Qualitative approach

d. The involvement of stakeholders through semi-structured interviews

Macro-areas	Topics to investigate
Current knowledge of CE and related practices	Information, prior knowledge, possible initiatives, best practices, tools and opinions regarding the concepts of sustainable development and CE from stakeholders
	Familiarity with the concept of CE and sustainability
	Current prevention and waste management practices
	Material flows and production processes associated with the organization
Reflections and insights	Factors promoting or hindering the implementation of circular economy actions in the reference sectors (agriculture, forestry and construction)
	Data concerning flows of organic byproducts or C&D waste (respectively for organizations belonging to bioeconomy or to the building sector)
	Expected cost from the establishment of CE practices in South Tyrol
Expectations from SEC	Understanding which of the strategies and potential benefits of CE are of most interest to business and the community


Soil and transport costs favor imports
Fragmented supply chains, small-sized firms
Economic aspects
Digitalization to be fostered
Disagreement over technical qualities of local wood
Technical aspects
Bureaucratic aspects
Stakeholders Interviews
High biomass reuse rates in the local energy sector (to the detriment of its reuse in other sectors)
Need for legislative harmonization
Cooperatives as local aggregators
A better mapping of material flows and building stock is required
Cultural aspects
Territorial and spatial aspects
Strong intra-sectoral cooperation, preference over virgin materials (building sector)
Exploit proximity and agricultural expertise

Integration of results: policy recommendations and conclusions

Recognize the opportunity for more circular synergies between bioeconomy and the building sectors

- There is an untapped potential of biomass to re-use in South Tyrol, while flows of C&D waste are underestimated
- **Bio-based materials in the local building sector might help reducing the environmental impact**

Adapt the local economic system

- Fragmented supply chains and firm size: circularity vs. competitiveness
- Think of CE as a long-term and economically viable strategy

Aim at process facilitation

- Inter-sectoral cooperation has to be enhanced and strengthened
- Digitalization, as well as dissemination and training activities, is crucial → expand opportunities beyond established practices (i.e., district heating)
- Adapt, harmonize and simplify normative and bureaucratic aspects

Examine the technical aspects more in depth

- Different opinions on the use of local wood
- Improve product design for an improved separation and sorting of materials

Address possible trade-offs with other sectors

- An example can be provided by the competitive use of land between forestry and tourism (Sgroi, 2020).

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Thank you.