Article

Governance Model for a Territory Circularity Index

Elena Rangoni Gargano [1,*,†]**, Alessia Cornella** [1,2,†] **and Pasqualina Sacco** [1]

1   Fraunhofer Italia—IEC, Via Alessandro Volta 13/A, 39100 Bolzano, Italy
2   EURAC Research—Institute for Renewable Energy, 39100 Bolzano, Italy
*   Correspondence: elena.gargano.r@gmail.com; Tel.: +39-34-6625-2759
†   These authors contributed equally to this work.

Abstract: In a world that seeks to reduce the environmental impact of urban areas and implement the Circular Economy, governance is seen as a key to the ecological transition and the achievement of Sustainable Development Goals. How can we use data, knowledge, and resources at our disposal to put into practice a governance model that implements the Circular Economy of territories? This study devised this model. The comparative assessment of enablers and barriers presented in the literature review conducted allowed for the categorisation of indicators related to the literature sample, leading to the creation of a "Territory Circularity Index" composed of four thematic areas. The index was then incorporated into an innovative governance model intended to serve as a practical tool for local governments and policy makers. In the context of the Circular Economy and Sustainable Development, a "Flexible Governance Model" tailored to the territory could effectively contribute to the creation of coherent policies, an open and transparent process, and facilitated consultation with local stakeholders. The evaluation of the results indicates the potential of the "Flexible Governance Model for a Territory Circularity Index" in promoting effective mechanisms for implementing the circular economy, based on the dual quantitative and qualitative approach from which the model originated. The research could be particularly important for various stakeholders: researchers, policy makers, entrepreneurs, and governments.

Keywords: governance; circular economy; circular territories; index; circularity

1. Introduction

Discourses around circular territories and their governance models are gaining traction both in academia and daily practice. According to a definition by [1], a circular city is "a city that practices circular economy principles to close resource loops, in partnership with the city's stakeholders to realize its vision of a future-proof city". The application of the Circular Economy (CE) principles through governance practices in urban contexts is worth investigating for several reasons. First, urban areas represent the leading drivers of linear production and waste models, as well as constituting the primary centres of economic activity [2]. Because of their increased social and economic weight, cities are putting unprecedented strain on the environment: urban areas are responsible for the consumption of over 70% of globally produced resources and energy, 70% of overall GHG emissions, and for the generation of over 70% of waste [3]. It is, therefore, difficult to imagine a CE-driven remodelling of the extant socio-economic order without specific attention placed on urban settings and how they are managed. Furthermore, from a more research-driven perspective, urban contexts are a useful unit of analysis because they can be taken to represent a scaled-down representation of higher-level macro trends [4].

CE stands as an interdisciplinary approach to redesigning the fundamental structures supporting our linear production, consumption, and disposal mechanisms in favour of more responsible and sustainable socio-economic systems [5]. Despite numerous diverging definitions, CE is generally understood as a paradigmatic shift in the "take-make-dispose" consumption patterns central to modern consumerism [6]. CE theories envisage the slowing

down of the linear consumption model to encourage the reuse of materials so that the output of one consumption process may constitute the input in other production processes, thus looping consumption patterns and, ultimately, designing out waste [7]. Because of the entrenched nature of the "take-make-dispose" model in all aspects of capitalism, transitioning away from this pattern entails a restructuring of economic, social, ecological, technical as well as cultural/ethical components [8] informing governance actions. As a side effect, the implementation of circular models helps foster material efficiency, promote the mitigation of resource depletion, and improve the minimisation of waste [6].

Increased attention placed on circular models has given rise to a vast body of literature aimed at analysing trends and CE modelling [9]. An overview of the literature highlights how EU-level standards for CE assessment constitute a common point of departure in academic literature for the development of a variety of circularity indices [10]. Several authors work EU-detailed standards into circularity models that can be applied to specific national, regional, or urban contexts [9,11–14]. However, many of the developed models contain blind spots that require addressing: their flexibility and adaptability are often limited, they frequently provide narrow opportunities for customisation and they present difficulties in reproducibility. Additionally, many authors report experiencing a lack of data availability as a hurdle in the advancement of circularity [9,15]. A supplemental set of studies moves beyond circularity assessment and shifts towards models that can help pinpoint barriers and opportunities in CE plans implemented by EU cities and regions [16]. Parallelly, an additional line of academia is intent on carrying out an analysis of macro-level circularity by focusing on components such as material recycling [17], resource longevity [18], material efficiency [19,20], policy design [21], supply networks [22], and decision-making [23]. Published work in the field of policymaking presents extra commonalities: grey literature places less emphasis on quantifiable metrics and chooses to carry out observation-based assessments aimed at enhancing the CE implementation. Documents such as OECD reports [24–27] focus on assessing social, normative, and political projects as well as civil society initiatives while not specifically delving into indices; when indices are present, this type of study relies on indicators that are then applied to geographical contexts.

The main objective of this research paper is to create a flexible governance model that territories (whether individual cities or agglomerations of municipalities) can use to implement circular economy initiatives. To this end, the paper is structured as follows. The Introduction lays the foundation for the quantitative and qualitative analysis and broadly contextualises the research in question with clear references. The Literature Review focuses on a quantitative collection of data related to the subject matter, focusing on barriers and drivers to CE implementation in territories and on the existence of indices and indicators for measuring urban circularity. The Methodology provides the explanation and processes the authors have followed for the creation of the governance model hereby presented. The Discussion summarises the findings of the study and highlights its usefulness in the context of local governance. An index derived from the extrapolation of the literature results is proposed here, as well as their interconnection with those derived from the survey conducted by the authors. Finally, with an innovative approach, the authors propose a new model of urban governance for the achievement of circular economy goals. This model makes use of the authors' multidisciplinary approach, the results of the literature review and the surveys conducted on Italian cities, as well as the timely analysis of barriers and drivers of the CE. The Conclusions provide some concluding remarks and introduce the opportunities for the empirical application of the index.

2. Literature Review

The authors, aware of the difficulty in practically applying CE to a specific territory, intended to analyse the state of the art in this regard, approaching it with the following research questions:

What is the state of the art in evaluating circular economy in territories?
What are the barriers and drivers for implementing a circular economy in territories?

To answer the research questions, the study has followed the process explained below (Table 1).

Table 1. Number and type of literature sources collected that propose indicators to evaluate circularity in territories.

Literature Review		
	Literature Review	Survey Review
Research question	What is the state of the art to evaluate a circular economy in territories?	What are the barriers and drivers for implementing a circular economy in territories?
Collection	Scopus, Web of Science, and Google Scholar	ICESP (Italian Circular Economy Stakeholder Platform) Survey
Quantity	200 sources collected 100 sources filtered 50 sources analysed 15 sources containing indices for circular territories 30 categories of flexible indicators defined	150 Italian cities contacted 30 Italian cities analysed Numerous Barriers and Drivers

2.1. Collection of Relevant Sources to Evaluate Circular Economy in Territories

To answer the research question *"What is the state of the art to evaluate circular economy in cities?"* the study focused on keywords and started by combining terms. The first literature collection was executed by utilising databases such as Scopus and Web of Science to identify relevant academic literature. Later, source collection was added through Google Scholar for academic sources and Google search engine for grey literature. In this case, documents in English, Italian, and French (1) were selected. The collection of grey literature includes policy papers, articles, and institutional websites. The diverse nature of the documents was ensured to support a diversity of sources for greater applicability. The keywords for the literature collection were: "Circular Economy", "Circular Economy index", "Circular City", "Circular Economy [name of city]", "Circularity index [name of city]", "Circolarità [name of city]", "Indici circolarità [name of city]". Documents were selected also based on the date of publication to ensure an updated account. Because of the interdisciplinary nature of CE, the authors chose to not carry out further screening to exclude literature addressing other topics associated with CE; intersectionality between CE topics and other sustainability-related areas was not viewed as having any type of negative impact on the outcome of the study.

2.1.1. Categorisation Indices from the Literature Review

Having collected the sources, the research classified data across categories. This process enabled the production of a customised methodology [28]. The review is conducted by categorisation across 21 variables: *Year of publication*; *Type of source*; *Geographical area*, *Geographical level of application*; *Barriers*; *Drivers*; *Circularity index*; *Territory circular index*; *Sustainable Circular Index*; *Category of impact*; *Metrics*; *Grouping*; *SDGs considered*; *SDG connection*; *Sectors involved*; *Actors involved*; *Initiatives*; *Existing tools*; *Circular services*; *Circular laws and policies*; *Flexible or Customized metrics*.

After the categorisation, the authors analysed barriers and drivers, the presence of indices and indicators, and their flexibility. The collected data derives from existing literature on the European landscape and from semi-structured interviews detailing the experience of Italian cities as part of a research conducted by ICESP, the Italian Platform of Stakeholders of the Circular Economy [29] with the involvement of Fraunhofer Italia—IEC. The study benefits from the participation of public entities representing 28 Italian cities, thus providing an essential contribution to the state of CE adoption in Italy.

2.1.2. Flexible Indicators from the Literature Review

The review process resulted in the identification of 15 indices for circularity, which includes 30 flexible indicators applicable in territories: *Produced Waste*; *Recycled/Recovered Waste*; *Hazardous Waste*; *Economic Performance*; *Certifications*; *Material Productivity*; *Material consumption*; *Material Inputs and Outputs*; *Material Sourcing*; *Research & Development (R&D) Investments*; *Job Creation*; *Energy Consumptions*; *Energy Intensity*; *Energy Efficiency*; *Procure-*

ment Practices; Symbiosis; Land Occupation; Land Consumption; Water Intensity; Water Demand; Water Consumption; End of Life Recycling Rate; Environmental Footprint; Distributed Value; Emission of Particles; Air Emissions; Emission Reduction; Fundings; Local Communities; Public Policy; Building Management.

The selected indicators are both qualitative and quantitative. On the one hand, quantitative indicators serve to collect statistical and structured data, easily measured and compared. On the other hand, qualitative data collects information that attempts to describe a subject rather than measure it.

Many of the identified indicators are cross-sectional and vastly applicable, while others are indicative of a willingness to customise assessments in relation to the specificity of settings: some territories wished to focus on sectors (e.g., mineral waste) or account for their geographical specificities (e.g., forest biomass consumption). The collected metrics came from grey literature and academic papers. Where grey literature presented a good rate of publication in 2021, papers showed an earlier thematic investigation in 2019 and 2020. As is clearly visible from the graph reporting total results (Figure 1), there was an increase in the overall volume of literature addressing CE topics starting in 2018, with a maximum level reached in 2021.
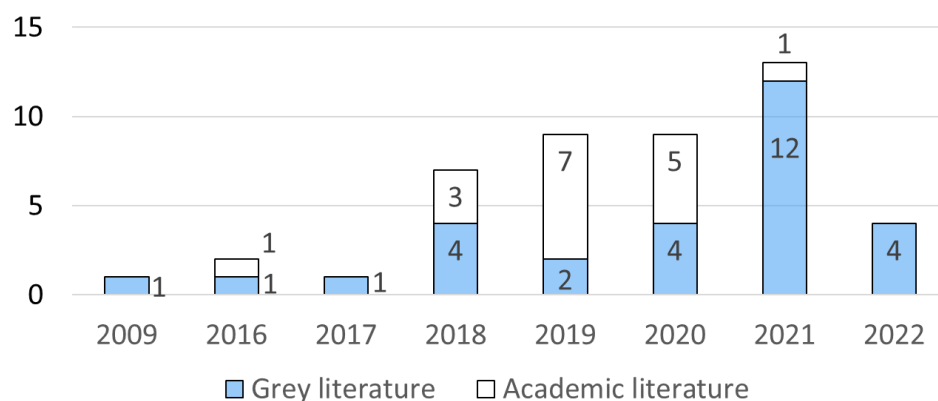
Figure 1. Number and type of literature sources collected that propose indicators to measure circularity in territories.

The most considered scaling contexts in the literature illustrate how metrics applicable at the city level prevailed over metrics applicable at the regional and national levels. The literature shows how only less than half of the documents out of the total contain an index. Within them, only a few expressly use specific indicators in an aggregate form, while the remaining disaggregated a set of parameters that are normally assessed through a scoring system. The absence of an index was more common in the grey literature promoted by local institutions, while documents produced at higher levels of governance were more likely to contain an econometric model.

2.2. Collection of Barriers and Drivers to Implement Circular Territories

To answer the research question "*What are the barriers and the drivers for implementing circular economy in cities?*" the study provides a systematic review of CE barriers and drivers in Italian cities. The Italian case study benefits from the direct contribution of local governments and public actors and provides insight into implementation dynamics. Findings suggest that Italy is characterised by significant disparities in CE performance, with some cities ranking quite high and adopting innovative approaches to circularity while others performed poorly [29]. The review resulted in an assessment of barriers and enablers to CE implementation as derived from a combination of the results from the literature review and surveys.

2.2.1. Nominations of Types of Barriers from Surveys

For this study, barriers to CE implementation were grouped to assess the frequency of their occurrence: Lack of collaboration and awareness; Absence of regulation and standardisation; Undersupplies of funds; Deficits of expertise; Low flexibility; Shortage of political support; Lack of consumer interest; Insufficiency of instruments; Other. According to the findings, a deficit of regulations and standardisation is the most common barrier to the effective implementation of CE practices. The second most common one is the absence of collaboration across different sectors and actors, while the third entry is a lack of awareness. Low flexibility and insufficient political support are the fourth most occurring, indicating the inability to create social, normative, and economic infrastructures. The absence of funds and instruments constitutes other significant obstacles along with lack of consumer interest and market rigidities.

According to the ICESP surveys [29], Italian urban contexts are witnessing conflicting forces: on one hand, Italy is experiencing growing interest in CE, while, on the other hand, concrete barriers hinder its implementation. Larger urban contexts present several commonalities regarding barriers: insufficiency of resources and instruments is reported as being one of the primary ones, along with lack of funds, absence of integration, and of normative support. Similarly, cities report experiencing failure in collaboration networks and information sharing, as well as hindrances in CE-oriented education. Additionally, difficulties in reducing landfilled waste are highlighted. Mid-sized and small Italian cities report scarcities of funds and investments, inadequacies of entities that promote citizen engagement, lacunas in normative support, and the need for effective communication. Further, barriers linked to sharing initiatives, failure in a structured form of collaboration, lack of awareness, and integration also constitute obstacles. When it comes to the political view, an absence of adequate programming, political barriers and missing incentives are identifiable at most levels. Overall, the Italian context presents many commonalities when it comes to hindrances in CE implementation at the city level.

2.2.2. Drivers from Surveys

In analysing surveys of Italian cities, economic factors are the most discussed drivers to enable territories to manage the material flow and reduce costs [7]. In this sense, CE-oriented business models that enable value addition through resource and knowledge sharing can also be considered [11,15]. Some interviewed cities have policies aimed at producing direct and indirect positive economic effects by leveraging taxation and financial support or are instead trying to develop customised tools for better coordination. These policies aim to improve waste collection systems, limit water use, and monitor environmental factors. Another set of initiatives involves land redevelopment and building conversion. Some territories prefer to focus on material innovation to reduce the environmental impact of urban areas, while others are implementing substantial changes to promote electrification or resilient green spaces [29].

The research highlights the importance of sharing the meaning of synergies between sectors, the promotion of relationships among stakeholders, and the potential of a multi-sectoral system. Cooperation provides an opportunity for cities to facilitate CE through a collective approach among stakeholders and levels of government [27]. Knowledge sharing and training show the need for awareness [30–32]. Thus, education is another driver in Italian cities [7,31,33–36]. Moreover, of importance is the principle of the "product as service" [11,29,33,34], which refers to services as an alternative to physical goods that require the use of resources and production processes; by relying on nonphysical services, production and consumption are reduced.

Much of the results assess the potential of looping actions to address water scarcity and promote energy recovery from organic waste to sustain urban metabolism [35], as well as mitigate the negative effects of urban population growth and help avoid waste redundancies [35]. Environmental goods are also a primary set of drivers such as reversing

fossil fuels, reducing pollution, preventing biodiversity loss, and pursuing a zero-waste economy, which have long been staples in circular economy discourses [7,9,13,14,36–38].

3. Methodology

3.1. Research Approach

The vision underlying this research process is like the concept of Circular Economy: by its very nature CE, dealing with complex systems, must be approached by strategies with the following characteristics:

- Interdisciplinary = drawing from different disciplines to redefine the analysed problem and achieve results based on a new understanding of complex situations.
- Systemic and specific = a method to manage a complex system with a global point of view, aiming at a better understanding of complexity.
- Quantitative and qualitative.

3.2. Methodology's Structure

The previous literature review led the authors to understand both stakeholders' difficulties in implementing CE and the drivers for overcoming barriers. In addition, it showed how circularity is evaluated in territories and how Italian cities govern it.

The study intends to overcome the gaps that territories are having in governing and assessing circularity by proposing a flexible governance model to guide them in the transition towards CE through stakeholder engagement, the analysis of enabling factors and barriers related to their territory, and the use of a flexible circular index. To do so, the methodology was inspired by different approaches [28] and divided into stages.

3.3. Development of the Flexible Governance Model and its Territory Circularity Index

The process of developing a flexible governance model to guide cities in the transition has followed two steps of creation. Firstly, the research focused on analysing barriers and drivers of circular economy in territories. Secondly, it tried to consider the line to follow once a territory decides to embark on a sustainable and circular transition. Below, the process has been explained (Table 2).

Table 2. Description of the development of the Territory Circularity Index and Flexible Governance model.

|	Creation of the Territory Circularity Index
Purpose	Given the difficulties of stakeholders in implementing the circular economy and its calculation and management by territorial entities evinced in the literature, the authors propose a flexible index for evaluating territorial circularity.
Method	In creating the Territory Circularity Index, the results obtained from the literature review (drivers, barriers, and indices) were aggregated and analysed. From the analysis, it resulted in the creation of four groups for the development of circularity in a territory, referred to by the authors as sub-indices. The four derived sub-indices consider the most frequently considered indicators, divided according to the four categories of barriers identified as the most difficult to overcome to achieve circularity. This index is flexible as it can be adapted to the city or territorial reality analysed, as the indicators and actions contained in the four sub-indices are not binding.
	Development of the Flexible Governance Model
Purpose	The study aims at proposing a flexible and adaptable model to governate and guide territories in the transition to circularity through stakeholder engagement, analysis of enabling factors and barriers related to their local area.
Method	Aware of the barriers highlighted previously, the model follows the evolution needed by the territorial administrator to reach sustainable and circular development. The model takes into consideration the characteristics of the quadruple helix governance strategy and the results collected in the literature to guide cities in an inclusive and flexible transition. The model has put in the centre the Territory Circularity Index and, from the outside, starts defining a strategy either top-down or bottom-up, trying to understand the maturity of the territory. Later, the model considers the factors to be considered, enabling the environment and preparing the right condition for the territory, aggregating the identified barriers of the previous literature.

The governance model proposed by the authors draws from a Quadruple Helix governance model [39]. For this reason, cities wishing to embark on a path toward circularity are led to define a quadruple governance strategy that simultaneously involves actors from the spheres of Government, Research, Industry and, finally, Civil Society. To measure the CE of cities, once the proposed governance model is applied, the authors considered it essential to aggregate the results obtained from the literature review (drivers, barriers, and indices) to develop an index (named Territory Circularity Index by the authors) for the analysis of the circular economy that fits the territory and the needs of its stakeholders. For

a better understanding, the in-depth methodology of the governance strategy is described in session "4.4. Flexible Governance Model for a Territory Circularity Index".

4. Discussion

4.1. Barriers and Drivers for a Territory Circularity Index

The image below (Figure 2) provides a representation of crossing identified drivers and barriers from the literature review and surveys. The analysis bought to the creation of four action groups to develop circularity in a territory. Later they were referred to as sub-indices for a final index that can measure a complete circularity.
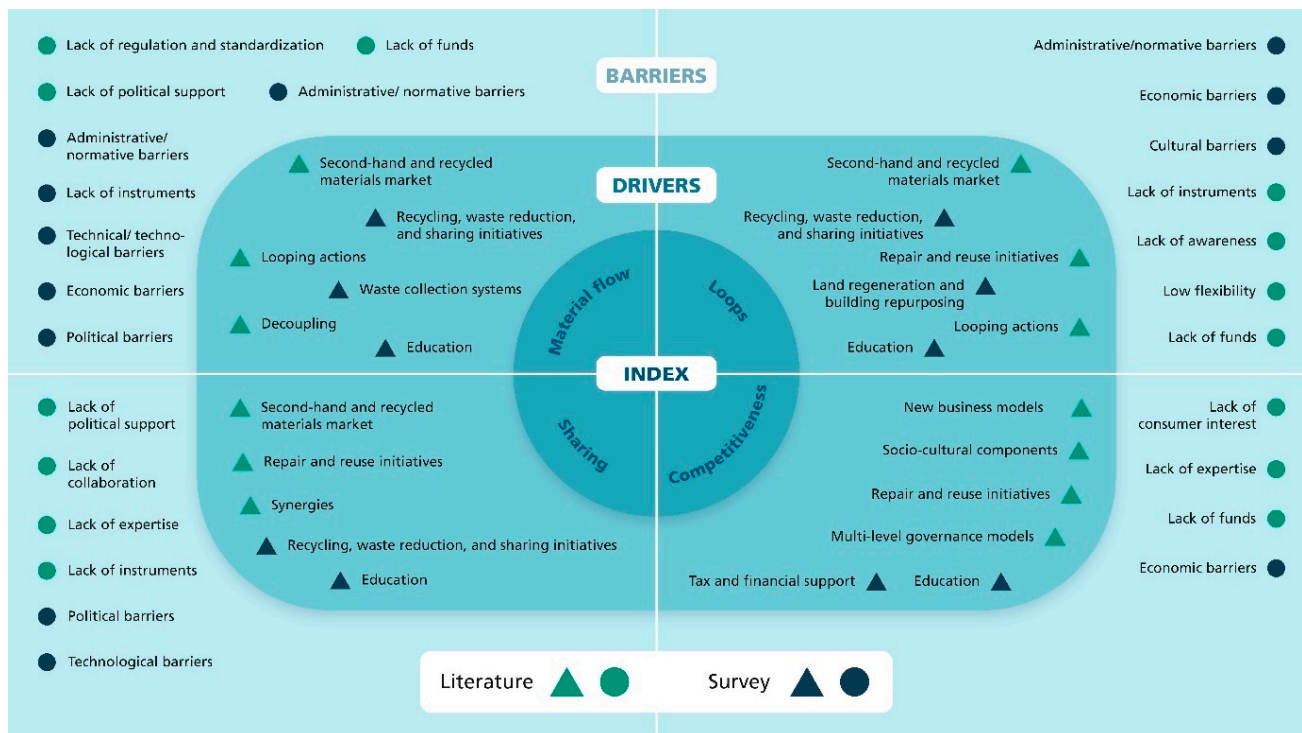
Figure 2. The figure describes the barriers and drivers collected and summarised in the literature and surveys. The data were grouped into four areas, which were further converted into four sub-indices.

The outer rectangle contains barriers deriving from the literature review (green dots) and from surveys (blue dots). Barriers are then organised within the four quadrants corresponding to the four sub-indices: the material flow index, the loops index, the competitive index, and the sharing index based on their pertinence to each area. Repetition of certain barriers across multiple quadrants is not uncommon, as the same element can constitute a barrier towards the implementation of multiple processes. The inner rounded rectangle contains the identified drivers and organises them within the four quadrants corresponding to the four sub-indices. Green triangles indicate *drivers* identified in the literature, and blue triangles represent drivers as derived from the surveys. The crossing of drivers/barriers with the index itself allows for enhanced customisation, a more focalised approach to reaching objectives, and a more evident correlation between available means and expected results. In fact, decision-makers may choose to start with an assessment of drivers and barriers in their own urban socio-economic order and make decisions based on where their drivers/barriers fall in the scheme.

The sub-indices defined incorporate 30 flexible indicators from the literature review and select the most appropriate for each area. Not all the indicators found were included in the four sub-indices. The Territory Circularity Index aims to maintain and re-elaborate some of the key concepts inferred from the literature and surveys without forgoing the introduction of some original features. The final index was devised with the intent of

ensuring simplicity of use, primarily thanks to its division into four thematic areas, which will be analysed below.

4.2. The Structure of the Territory Circularity Index

The Territory Circularity Index (Figure 3) has been defined by data analysed throughout the research phase. The four final sub-indices intended to represent the most frequently considered indicators in the literature review, then divided according to the four categories of barriers identified as the most difficult to achieve to reach territorial circularity. The final index tries to express a simple route for implementing circularity, sustainability, positive economic growth, and social inclusion, especially when crossed with empirical data deriving from drivers and barriers.
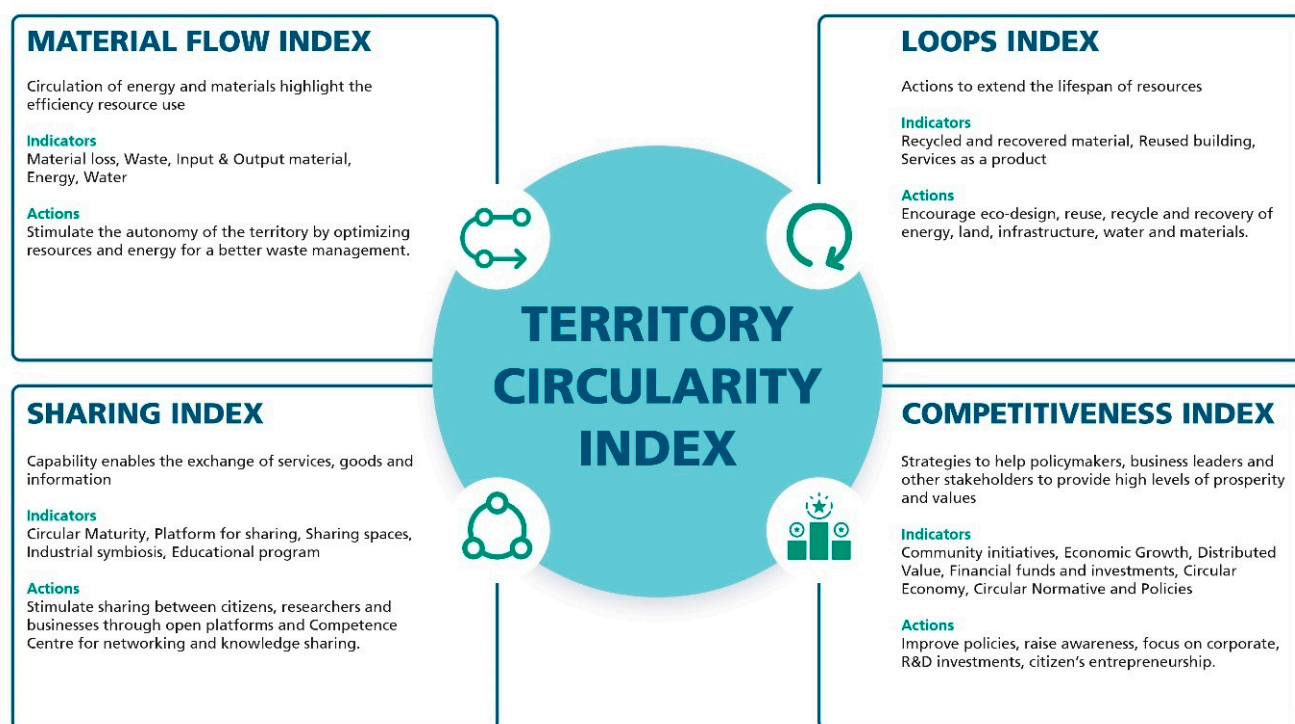
Figure 3. The Territory Circularity Index is divided into four sub-indexes. Each sub-index can be described with connections to possible actions and indicators.

The four sub-indices can be described as follows:

- The "Material flow index"—calculates the circulation of materials and energy with the aim of assessing the efficiency of resource use. The indicators used to assess the material flow are material loss, material input & output, rates of energy use, and rate of water use.
- The "Loops Index"—quantify the effectiveness of actions aimed at lengthening the life span of resources to design out the disposal phase of production and consumption patterns, thus "looping" processes. Indicators used to assess the effectiveness of looping actions include material recycling/recovery rate, building reuse and retrofitting, industrial symbiosis and activities relying on the principle of substituting products with services.
- The "Competitiveness Index"—assesses the existence of strategies to help policy makers, business leaders, and other stakeholders in encouraging prosperity and positive values that correlate with CE. This is the component of the Territory Circularity Index that most explicitly accounts for social, cultural, and ethical components. Indicators in this index include community initiatives, economic growth, distributed value, circular funds and investments, norms, and policies.

- The "Sharing Index"—describe a city's ability to engage in the exchange of goods, services, and information and is underpinned by indicators assessing circular maturity, platforms for sharing, sharing spaces, circular cooperation, and educational programs.

When considering the Territory Circularity Index, the authors highlight how CE-driven goals at the local and urban levels can and should be rooted in overarching sustainability goals. To this end, connections can be established between the most common indicators and the Sustainable Development Goals (SDGs), so that the Territory Circularity Index may be anchored to the UN's Agenda 2030. The SDGs that can be considered in large numbers are SDG 12 (Responsible consumption and production), linked to the "*Material flow index*", "*Competitiveness Index*", "*Loops Index*", and "*Sharing Index*"; SGD 11 (Sustainable cities and communities), linked to the "*Competitiveness Index*", and "*Sharing Index*"; SDG 6 (Clean water and sanitation), linked to the "*Material flow index*", "*Loops Index*" and "*Sharing Index*"; SDG 7 (Affordable and clean energy), linked to the "*Material flow index*", "*Loops Index*" and "*Sharing Index*".

4.3. Flexible Governance Model for a Territory Circularity Index

The transition to CE is not without its obstacles. Public entities at the city level often find themselves having to sift through large volumes of information, something which impedes effective decision making. Direct interaction with local governments for the present study highlights the need for a model that can help governance actors in implementation practices. These results suggested the necessity to contextualise the Territory Circularity Index into the urban governance landscape.

In designing a circular territorial strategy, systemic change and new forms of governance are required, as well as shared strategies, common territorial plans, funding, and partnerships [29]. Good territorial management requires an inclusive, collaborative approach to establish an effective circular strategy. According to the surveys, Italian cities have been looking to adopt an integrated approach to CE by involving different sectors from a variety of municipal spheres, such as environment, economic development, urban waste, heritage, public works, social policies, education, energy, IT services, infrastructure, mobility and green areas, public services, agriculture, production activities, trade, district heating, water services, public lighting, land planning and management, community policies, forestry activities [29]. The outcome of surveys across Italian cities highlights the importance of defining specific circular laws and policies to support this transition. Urban contexts are shown to rely on multi-level governance for regulations that support their efforts in implementing circular practices and to structure the basis for targeted funding. In general, circular laws and policies analysed fall into the category of 'softer' norms aimed at incentivising CE practices through voluntary efforts and 'hard' laws aimed at discouraging transgressions of these regulations [10]. The difficulties identified in the literature confirm the need to consider a variety of stakeholders when defining the circularity of a city. In this sense, it is considered relevant to underline the significance of moving from a Triple Helix to a Quadruple Helix Model [39]. Thus, a territory interested in embarking on a path towards circularity will define a quadruple governance strategy that simultaneously involves actors from Government (policymaking and finance), Academia (research and development), Industry (entrepreneurs, services, and places to test new circular model) and Civil society (citizens).

The model below (Figure 4) is predicted to be effective in helping local entities and decision makers. The graph is organised in three macro areas represented by the three different colour shades.
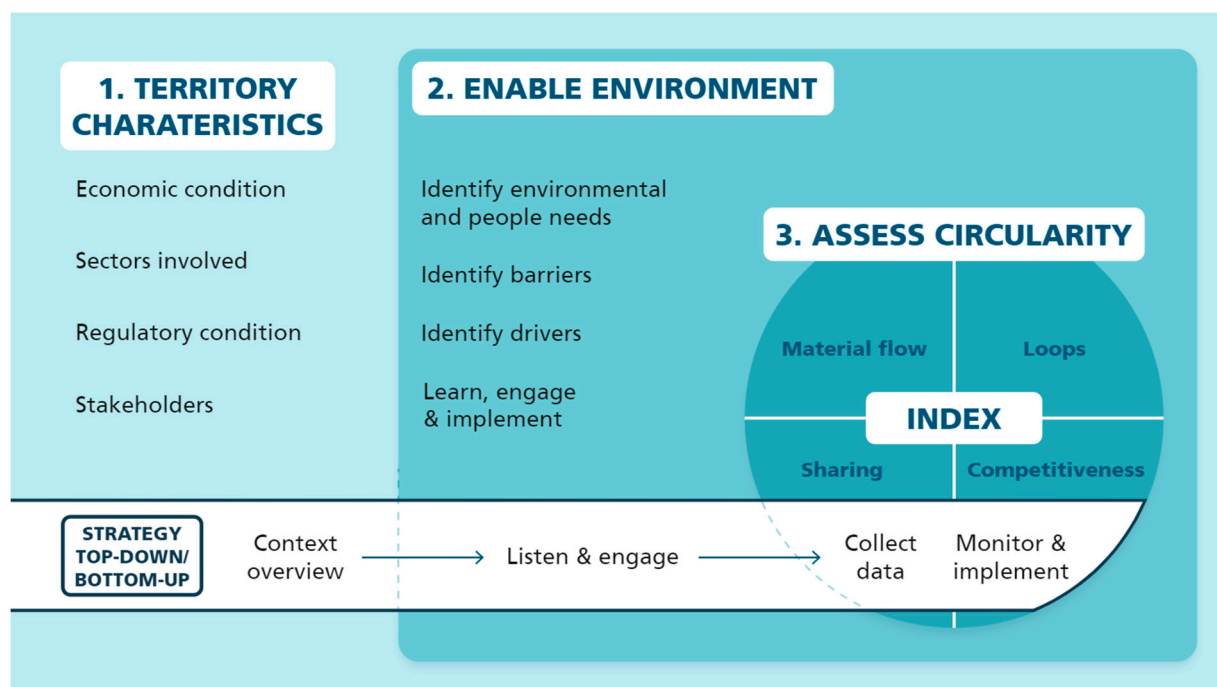
Figure 4. Graphic representation of the innovative circular governance strategy called "Flexible Governance Model" by the authors.

The white band on the bottom of the figure cross the governance model and guides operations and actions to be implemented at the different levels of the three macro areas: territory characteristics, enable environment, and assess circularity. These correspond to different levels of granularity based on phases of implementation going from the attainment of a context overview and listening and engagement practices, ending with data collection and implementation and monitoring activities. The band and consequent succession of operations are to be understood as bidirectional: a succession from outer to inner segments indicates the implementation of top-down and bottom-up governance actions; a succession from inner to outer segments is indicative of bottom-up tendencies. The outer rectangle serves to outline the *territory characteristics* that will be the base of the CE implementation. It examines:

- Economic conditions, i.e., whether the area has or intends to allocate resources and funds to CE, the economic fabric of the area, the range of factors that increase the economic growth of the city or region, etc.
- Sectors involved, i.e., if funds or regulations should be directed towards certain sectors, which sectors should be involved in the change, etc.
- Regulatory conditions, i.e., whether regulations on CE exist or whether it is worth considering introducing them, assessing how conducive existing regulations are to the implementation of circularity, etc.
- Stakeholders, i.e., which actors are to be involved in the circularity of the territory and with which priorities and expectations, etc.

The rounded rectangle in the middle represents the *enabling environment*. In this phase it is necessary to:

- Identify territorial needs, i.e., by means of a questionnaire or by collecting information through stakeholders, etc. In this iteration, it is important to consider all types of stakeholders to broaden inclusiveness and increase opportunities.
- Identify and analyse barriers, i.e., barriers identified by the different stakeholders.
- Identify and examine drivers, i.e., which drivers will be put in place to support the circularity of the territory and overcome the identified barriers.

- Learn, engage, and implement, i.e., supporting territorial awareness and engagement through conferences or events to inform and form the stakeholders.

The inner circle guides territories to assess circularity. Cognizant of the different opportunities and challenges that the area has set for itself, a flexible and customised index is defined. In doing so, indicators are selected not only based on their flexibility and applicability but also according to the sectors and objectives of the territory. This assessment phase includes the collection of data depending on the indicators chosen for every sub-index, the monitoring of this data in the long term and the implementation of the circular economy. Other than the necessary intermediate results, the primary outcome of the study exceeds its original objective: the Territory Circularity Index produced is both internally and externally flexible and customisable. The variety of indicators underpinning the index can be adapted to the conditions of the urban context. The index can be crossed with a variety of external factors conditioning its applicability and success, such as specific barriers and drivers or the priorities of global governance guidelines.

4.4. Testing the Governance Model in South Tyrol

After designing the governance model on a theoretical basis, the authors deemed it necessary to test it with territorial actors in the Italian province of South Tyrol through the creation and dissemination of a questionnaire. This investigation followed the structure of the governance model. First, it sought to identify the context, the maturity of the territory regarding CE, and the stakeholders. After that, it sought to understand the importance of various aspects of CE, as well as the specificity of the barriers and drivers for the various stakeholders. Finally, to assess the feasibility of using this governance model in South Tyrol, the authors tested the willingness of the involved stakeholders to collect and disclose data. This survey also served to confirm the results obtained in the literature review.

The research involved a group of approximately 40 stakeholders. It reached several kinds of stakeholders, from the primary, secondary and tertiary sectors, public sectors, some multi-utilities, civil society, and research institutes. The authors' aim was to test the functionality of the model by involving as many territorial actors as possible. First, the existing stakeholders in the area were divided into three macro-categories: public institutions: local territorial authorities, functional agencies, participated companies, etc.; organised groups: pressure groups, territorial associations, etc.; and unorganized groups: citizens and the community. After this initial mapping phase, the stakeholders to be involved in the area under consideration were identified. Stakeholders to be involved can be identified through different methodologies; the authors considered it appropriate to identify them for their capacity of influence in the area considered and for the interest they exert [40]. Once the factors of influence of each identified stakeholder and their level of interest were defined, they were cross-referenced and finally identified and contacted.

For this research, the analysis of the results of the questionnaire focused mainly on the importance of the different aspects of CE for the different types of stakeholders identified, considering it appropriate to understand where it is best to leverage in the implementation of CE. Moreover, since the study aimed to understand how CE can be effectively implemented in the territories, the results of the questionnaire focused on the analysis of barriers and drivers to CE implementation for the stakeholders involved.

The results (Figure 5) show that most of the stakeholders consider the aspect of material recovery and reuse essential or very important, while another large percentage of respondents also consider the aspects of prolonging the life of resources and support through investments essential. Only a smaller percentage also indicated the factor of sharing information and resources as very important.
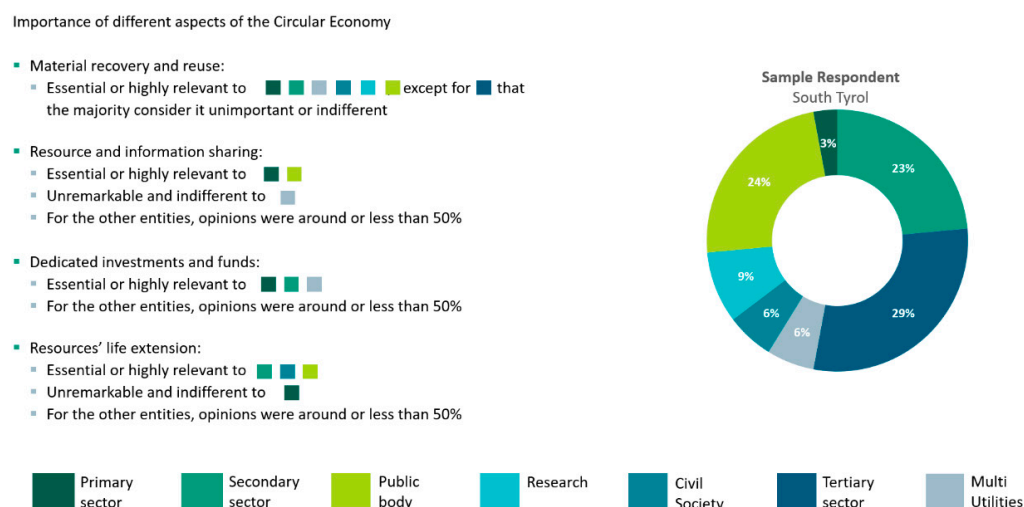
Figure 5. Importance of the different aspects of CE for the identified South Tyrolean stakeholders' categories to whom the questionnaire was submitted.

The results clearly show that there is a good awareness of the topic of circularity in practically all stakeholder categories, even though this awareness is often linked to the reuse of materials and funds for possible transition projects towards circularity, whereas there appears to be little understanding of the importance of sharing information and resources. According to the authors, therefore, the effective implementation of a circular governance model will have to be based on active engagement and learning approaches among stakeholders. Sharing, in fact, would save several economic resources through the partaking of equipment, waste materials, data and expertise, allowing for faster evolution through collaboration.

As for barriers and drivers (Figure 6), the results show that the greatest facilitators of the transition to the CE are related to economic aspects and defiscalisation. In smaller numbers, we find facilitators such as bureaucracy and circularity training. On the contrary, the most important factors preventing the realisation of a circular economy are the scarcity of training courses on the topic and the absence of information, regulations and standards, the absence of tools to facilitate circularity (of services or goods), the scarcity of funds to invest in circularity projects and the lack of experts. In smaller numbers, we find that barriers also include political support, cultural barriers, lack of stakeholder flexibility and poor collaboration.
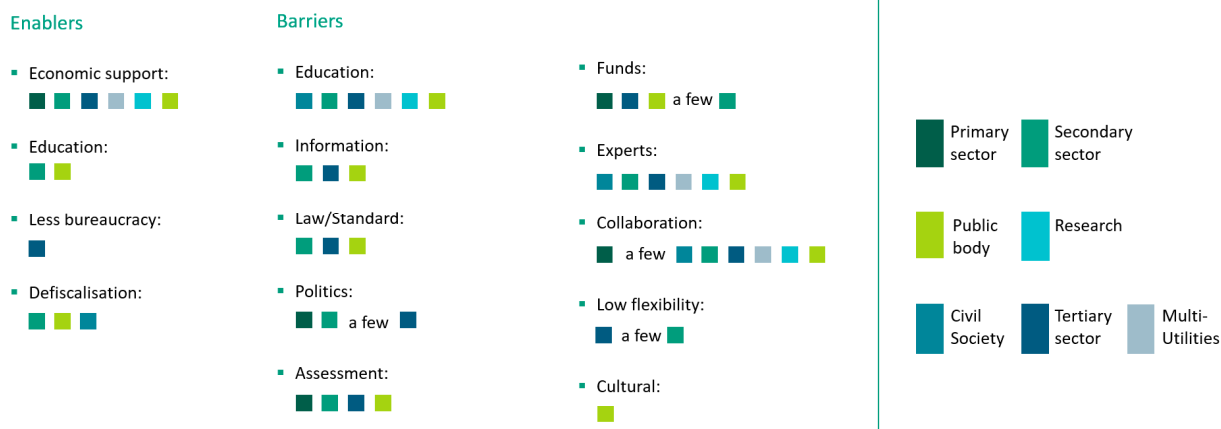
Figure 6. Analysis of barriers and drivers to the implementation of CE for the identified South Tyrolean stakeholders' categories to whom the questionnaire was submitted.

5. Conclusions

Governance is seen as the system governing a country's economy and politics at all levels [41]. To ensure good governance, this system must be able to include in the planning process the interests of all stakeholders in the area, recognising their legal rights and assuring them of their obligations and needs.

Over the past few years, governance related to the concepts of Circular Economy and Sustainability has been defined and used in many ways in different contexts. Despite suggestions and insights in the literature, there is still no flexible governance model that can be used independently by local governments to implement circular economy initiatives and best practices at the territorial level.

Despite commitments expressed at the national and European levels, traditional models of governance toward circularity are dominated by the regulatory control of formal state institutions and, therefore, not well equipped to respond to the complex nature of the circular economy and the challenges that individual territories face in implementing it.

To tackle the complex issues related to the environmental impact that territories have on sustainable development, a strategic and systematic approach was needed to provide an appropriate framework for an integrated governance vision of all components engaged in the CE implementation process. The answer was provided by the authors through the creation of a qualitative and original governance model associated with a territorial circularity index.

The results of the present study indicate the success of a flexible governance model in capturing the multifaceted nature of the CE and the distinctiveness of local needs. Starting with a literature review to identify common traits and patterns for measuring circularity in territories, the authors proceeded to develop a model. The presented governance model incorporates a circularity index at its core, thus becoming a practical tool for administrations and policy makers who can be followed step by step toward circularity that is perfectly suited to the type of territory (mountainous, coastal, urban), the needs being analysed during the transition, and the barriers encountered. The aggregate index has to be reached by analysing the territorial context, the market and the needs expressed by stakeholders. The index is thus composed of four sub-indexes that facilitate its collection and focus of data, highlighting the flow of materials, lifespan of resources, economic resources used, and sharing actions.

One of the major limitations of the present research is the presence of cultural "conditioning" that focuses on the resolution of a global problem to a European view.

This study contributes to qualitative and original research important for researchers, policy makers and governments. The results provide a replicable and flexible governance model, and it gives a coherent picture of the topic, highlighting some weaknesses regarding CE implementation that should be addressed. Future research in the field, to be considered a natural extension of this study, is now being implemented. The authors are now testing the Territory Circularity Index within the governance model of the Italian landscape, grasping the different levels of sustainability and circularity of the Italian regions. This would make it possible to identify territories' barriers and highlight areas where certain policies and investments need to be implemented.

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