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USING SEMANTIC FIELD ANALYSIS TO UNDERSTAND THE PERCEPTION OF CIRCULARITY IN REGIONS

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Purpose: The purpose of this research is to identify the meanings attributed to the circular economy (CE) by Polish regions at the NUTS-2 level. It explores how CE is characterised in regional development strategies up to 2030, examining the associations and actions linked to CE, and analysing the differences and similarities between regional definitions and the national framework provided by the Polish CE Roadmap.
Design/methodology/approach: A semantic field analysis was conducted on regional development strategies (2030) and the Polish CE Roadmap. The study examined 12 regions that defined CE, comparing their definitions with the national framework. Semantic categories-equivalents, descriptors, associations, oppositions, actions of the subject, and actions towards the subject-structured the analysis.
Findings: Definitions varied significantly among regions. While some view CE as an economic model, others consider it an element of such a model. CE is commonly linked to extending resource lifecycles, minimising waste, and addressing economic and environmental challenges. Regional definitions often supplemented the national framework by adding categories such as actions or oppositions, which are absent in the national definition.
Research limitations/implications: The study focuses on explicit CE definitions, excluding broader contextual references. Future research should examine full strategy documents and assess the alignment between regional and national strategic goals.
Practical implications: Harmonising CE definitions at regional and national levels could enhance policy implementation and provide clearer guidance for regional governments. Cross-sectoral collaboration and unified frameworks are essential for effective CE management.
Social implications: Coherent CE definitions can improve public understanding and acceptance, fostering greater societal engagement in circular practices. Regional adaptation can address local challenges while promoting sustainable development.
Originality/value: This paper applies semantic field analysis to CE definitions, addressing a gap in research on CE multi-level governance. It offers insights for policymakers and public sector managers on improving CE institutionalisation and aligning regional and national strategies.
Keywords: circular economy, regional policy, semantic analysis, public sector management, regional development
Category of the paper: research paper.

1. Introduction

Implementing a Circular Economy (CE) in regions addresses the challenges of environmental degradation and the depletion of natural resources, making this process one of the most significant trends in contemporary regional development (Leipold and Petit-Boix, 2018). The European Union (UE), alongside China, holds a pioneering position in implementing CE, developing policies and strategies that support circular transformation (Geng et al., 2009; Reike, Vermeulen and Witjes, 2018; Cramer, 2022). In particular, the European Green Deal and the Circular Economy Action Plan (CEAP) play a crucial role in promoting the shift from a linear economy to a closed-loop resource system. CEAP, by necessitating the implementation of CE at national, regional, and local levels, significantly influences economic transformation. This is evidenced by the fact that over half of CE initiatives are applied in economic practice across various administrative levels (Sileryte et al., 2020; Mhatre et al., 2021; COM (2023), 2023).

However, there is a lack of studies that comprehensively present circular economic transformation at the regional level (Avdiushchenko, 2018; Meglin, Kytzia, Habert, 2022), integrate regional and central approaches (Ranta, Keränen and Aarikka-Stenroos, 2020; Christensen et al., 2022; Kruse and Wedemeier, 2023), and expand the definitional overview of the circular economy concept. The diversity in approaches to defining CE, stemming from differences in governance levels and local contexts, highlights the need for further research on the semantic coherence of this concept, particularly regarding its implementation at the regional level (Homrich et al., 2018; Scarpellini et al., 2019).

Studies of the bioeconomy, a concept related to CE, in Polish regions underline a clear research gap in this area, further emphasising the necessity of deeper analyses in the regional context (Sobol, 2022). Similar conclusions can be drawn from the analysis of regional CE aspects in the Małopolska region, where the need for research on the semantic coherence of this concept in practical implementation has been identified (Smol et al., 2018). While existing analyses of regional strategies related to CE provide valuable insights, they do not focus on the issue of semantic coherence, despite indicating significant variations in CE implementation across regions (Ćwiklicki et al., 2024; Ćwiklicki, Mirzyńska, Żabiński, 2024).

This article addresses these research gaps, contributing to the international discourse on CE institutionalisation by employing a semantic perspective. This approach represents an innovative methodology for studying CE in Poland. Semantic field analysis enables the examination of the definitional coherence of the CE concept between the central and regional levels, addressing a significant gap in existing academic literature. Considering that unclear or conflicting definitions across different governance levels and policy areas may lead to inconsistencies and hinder the effective implementation of policy measures (Eberl, Gordeeva, Weber, 2021; Shawoo, 2023), this study responds to the need to analyse how key concepts are understood

and defined in practice. The analysis of how Polish regions define CE in alignment with the national approach set out in the CE Roadmap is a key element in implementing policy.

Consequently, the main aim of this study is to identify the meanings attributed to CE by Polish regions (NUTS-2 level). This research seeks to answer the following questions:

1. How is CE characterised in the strategies of Polish regions up to 2030?
2. With what associations and actions is CE linked?
3. What are the differences and similarities between the definitions of CE in regional strategies and the Polish CE Roadmap?

2. Literature review

2.1 Circular economy: a review of definitions

The concept of Circular Economy (CE) is dynamic, evolving as it finds applications in economic practice, adopting various perspectives and creating new fields of meaning (Blomsma, Brennan, 2017) There is no single, consistent definition of CE, even in the academic world (Yuan, Bi, Moriguichi, 2006; Lieder, Rashid, 2016).

Analyses indicate that CE is often treated as an economic vision aimed at transforming the traditional linear model of production and consumption into a circular system characterised by maximising resource use and minimising waste (Kirchherr, Reike, Hekkert, 2017). The foundation of this concept lies in managing resources and materials efficiently and sustainably, optimising their use in production and consumption cycles, and reducing dependence on primary natural resources (Ghosh, Bhola, Sivarajah, 2022; Alizadeh et al., 2023) Similarly, Kirchherr and co-authors (Kirchherr, Urbinati, Hartley, 2023) emphasise that a key aspect of circularity is closing material loops, which involves maintaining resources in use for as long as possible. Accordingly, scientific literature often derives CE from the "R" framework—reuse, reduce, recycle, rethink (Yuan, Bi, Moriguichi, 2006; Lieder, Rashid, 2016; van Buren et al., 2016; Ghosh, Bhola, Sivarajah, 2022; Alizadeh et al., 2023)

CE is a concept of growing importance (Kirchherr, Reike, Hekkert, 2017; Murray, Skene, Haynes, 2017; Kirchherr, Urbinati, Hartley, 2023) particularly in the context of sustainable development goals (Ghisellini et al., 2018; Schöggl, Stumpf, Baumgartner, 2020; del Río et al., 2021; Ghosh, Bhola, Sivarajah, 2022) and climate policy. Some studies (Blomsma, Brennan, 2017) suggest that it could serve as a framework for strategies aiming at socially just and environmentally responsible development. CE is linked to numerous economic areas—state, regional, business, and consumer activities (Ghisellini et al., 2018) - and discussed from the perspective of cooperation with emerging trends such as design (Alizadeh et al., 2023), technology and digitalization (Bressanelli et al., 2022) or decoupling (Ghisellini et al., 2018).

The primary challenge in defining CE lies in the variations in detail and scope of interpretation. Authors like Alizadeh (2023) and Ghosh (2022) limit their focus to general conceptual principles that highlight directional changes in the economy, while Kirchherr et al. (2023) and Bressanelli et al. (2022) delve into more detailed implementation mechanisms, incorporating technological and operational aspects of circularity. The lack of conceptual coherence also manifests in viewing CE either as an instrument (a tool for policy-making to build an economic system) or as a system in itself (del Río et al., 2021). Moreover, the significance attributed to CE varies depending on the context: in China, it is treated as a national political goal, whereas in the European Union, it is regarded as a tool for promoting bottom-up policies in environmental protection and waste management (Ghisellini et al., 2018). Despite these differences, the shared denominator remains the idea of reducing resource consumption and transforming the economy into a more sustainable system, positioning CE as a future-oriented model capable of addressing climate, social, and economic challenges (Blomsma, Brennan, 2017; Ghisellini et al., 2018).

From the perspective of institutionalising this concept within European policy, the most critical document is the 2015 European Commission Communication "Closing the loop – An EU action plan for the Circular Economy" (COM 2015). CE is defined in this document as "a system of maintaining the value of products and materials in circulation and minimising waste, aiming to create an innovative, competitive, and resource-efficient economy addressing climate and environmental challenges" (COM 2015, 12). While introducing a definition, this document encompasses a broad range of activities and stakeholders under the CE framework, highlighting the need for coordinated circular actions. Regions and member states play a key role in implementing CE, aligning their efforts with EU legal frameworks and leveraging funds for projects supporting circularity (COM 2015).

Implementing CE at the regional level faces numerous barriers arising from its complexity and the multi-level governance mechanisms within the EU. Publications on CE highlight that its implementation in administrative regions remains under-researched, necessitating greater academic attention to better understand the dynamics of this process (Arsova, Genovese, Ketikidis, 2022). Although Poland benefits from a clear administrative division at the regional level, enabling more precise coordination of activities, experiences from other countries reveal that circular actions often remain uncoordinated and inconsistent with national and EU policies (Avdiushchenko, 2018; Cramer, 2020, 2022).

At the same time, efforts to standardise CE implementation should consider specific local and regional conditions, including the level of socio-economic development and environmental initiatives undertaken (Avdiushchenko, 2018). A differentiated approach is particularly significant given the administrative divisions between countries, which influence how CE strategies are implemented at the regional level (Koop, van Leeuwen, 2017; Merli et al., 2020).

2.2 Circular economy in regional strategies

Effective implementation of the CEin regions requires the involvement of a broad range of stakeholders representing different levels of governance and social sectors. The EU plays a pivotal role in this process, setting goals and directions for transformation through the CEAP, such as achieving climate neutrality by 2050 (Kovacic, Strand, Völker, 2019; COM (2023), 2023). Member states, including national and regional authorities, are responsible for adapting these strategies to local conditions, necessitating effective coordination of actions across various administrative levels (Kinnunen et al., 2021; Kruse, Wedemeier, 2023).

In Poland, the key document outlining national CE policy is the 2019 "CE Roadmap: Transformation Towards a Circular Economy". It defines CE and highlights specific areas for action, including sustainable industrial production, sustainable consumption, bioeconomy, and new business models. It also outlines general principles for implementing, monitoring, and financing the transition (CE Roadmap 2019, 29–39).

In this process, local authorities act as intermediaries between policies and local communities, facilitating the more effective implementation of circular initiatives. Enterprises, as key economic actors, influence the efficiency of CE goals by introducing innovative solutions such as industrial symbiosis and eco-design, which enhance the potential of regional economies (Ghisellini, Cialani, Ulgiati, 2016). At the same time, regional residents, as recipients and users of these solutions, play a crucial role in their social acceptance and effectiveness, which requires educational initiatives and raising awareness about the benefits of the circular transformation (Smol et al., 2018).

The mere existence of policy instruments is insufficient for the effective implementation of CE in regions. Both bottom-up and top-down initiatives must be engaged, supported by clearly defined goals and progress monitoring systems (Winans, Kendall, Deng, 2017; Smol et al., 2018). Stakeholder concentration and waste management infrastructure availability, particularly in regions with significant industrial potential, are critical success factors. Equally important, however, are cooperation models in less-developed areas, which can benefit from cross-sector synergies (Mattiussi, Rosano, Simeoni, 2014; Niang, Bourdin, Torre, 2023).

The efficiency of the transition to CE depends on regions' ability to create synergy patterns among stakeholders and on the level of engagement of local communities. This approach allows for identifying priority actions and effectively allocating resources while considering local conditions (Igić et al., 2020; Pavloudakis et al., 2023). Collaboration among all groups involved in the process—from EU administration to residents—is fundamental to the practical implementation of circular strategies.

A key document describing this process is the regional development strategy. These documents serve as tools for implementing plans related to CE, as they combine formal-legal requirements with the flexibility to adapt actions to regional specifics. Regional governments play a crucial role in programming and implementing intra-regional policies, based on clearly

defined administrative and territorial competencies (Dymek, 2020; Sabal, 2023). The strategic and operational goals contained within these strategies, along with indicators for their realisation, enable the practical implementation of CE principles in line with the EU's cohesion policy (Churski, 2023). Regional strategies not only fulfil a formal function but also enable the integration of different levels of governance, which is critical in the context of the multi-level governance required for CE (Stimson, Stough, Roberts, 2006).

3. Methods

Given that language contributes to understanding decision-making mechanisms and how specific concepts shape public policy formulation (Gormley, 2007), and that predicting the political feasibility of proposals requires considering the semantic perception of key related concepts (May, 1986) this study employs the method of semantic field analysis.

Semantics, which examines the meaning of words, phrases, and sentences to convey the sense encoded in language (Yule, 2010, p. 112), is thus a suitable method for studying meanings embedded in definitions. Semantic fields refer to groups of words that are conceptually related and form a shared semantic space (Nerlich, Clarke, 2000). Their analysis focuses on examining relationships between linguistic signs and their meanings to understand how language reflects social and cultural reality (Robin, 1980). This approach utilises logical and formal methods to describe connections between linguistic elements and their real-world references, enabling the development of systematic theories of meaning (Lepore, Stone, 2007).

Semantic analysis plays a crucial role in theoretical linguistics, aiding in understanding the mechanisms through which language conveys abstract concepts, emotions, and social values (Zimmermann, 2015). Moreover, semantics intersects with other disciplines such as philosophy and psychology, exploring the influence of context on the interpretation of meanings (reference). This approach facilitated identifying meanings and relationships associated with the concept of the CE in strategic documents of Polish regions up to 2030. The primary material for analysis comprised the regional development strategies up to 2030, sourced from the Public Information Bulletin portals of individual regional governments. These documents serve as official sources of information on development plans, strategic goals, and regional policy priorities, making them a reliable basis for analysis. To ensure data completeness, full versions of the strategies for each region were collected, resulting in 16 documents with an average length of 131 pages. Additionally, the document CE Roadmap: was obtained, and its definition of CE was extracted to serve as a reference point for the analysis.

After collecting the documents, several key analytical steps were undertaken, following the approach proposed by Robin et al. (1980): **(I) Semantic analysis of the CE definition** provided in the CE Roadmap (the national definition). **(II) Identification of keywords**

associated with the core concept of CE, including [gospodarka o obiegu zamkniętym – eng. closed loop economy – the most common name for CE in Poland], [circular economy – eng. version], [cyrkularność – eng. circuality], [obieg zamknięty – eng. closed loop], [gospodarka cyrkularna- eng. Circular economy]. Fifteen strategy texts contained one or more of these phrases, while the West Pomeranian region was the only one not to use any term commonly associated with CE. **(III) Extraction of CE definitions**: Highlighted sections were analysed to identify the definiendum and definiens. Three regions (Lubelskie, Podlaskie, Śląskie) did not include a definetion of CE, leading to their exclusion from the analysed dataset; thus, the number of analysed texts was reduced to 12. **(IV) Content categorisation** of definitions into six key categories: subject identification, associations, oppositions, equivalents, synonyms, actions by the subject, and actions towards the subject. **(V) Comparison with the national definition**: a comparative analysis was conducted to identify consistencies and discrepancies between the definitions of individual regions and the national definition, as well as collectively across all regions. The analysis focused on parts of the definitions according to their categories from the semantic analysis.

The results present the semantic analysis of the national CE definition, regional definitions grouped by semantic field categories, and a comparison of the categories in the national definition with those in the regional definitions. This structured approach enabled a systematic examination of how the concept of CE is framed at the national and regional levels, providing insights into linguistic and conceptual consistencies and divergences.

4. Results

4.1. Semantic field of the national definition

The results of the semantic analysis of the CE definition are presented in Table 1. This table is an integral part of the document CE Roadmap … and is included as its first element in the introduction. The definition is concise in nature, containing an equivalent, two fragments identified as descriptors, and two as associations.

The national understanding of CE defines this concept primarily as an economic model. This distinction is significant in highlighting the overarching role of the model compared to a mere tool. The defining characteristic of this model is the fulfilment of one of two principles—a sufficient condition.

At the core of its associations are:

a) raw materials, resources, materials, products, and
b) waste.

Table 1.
Semantic analysis of the CE definition

	The CE definition "Circular economy is..."
Equivalent	a model of economic development
Descriptors	in which the following fundamental principles are fulfilled: a) the added value of raw materials/resources, materials, and products is maximised, or b) the amount of waste generated is minimised, and any waste produced is managed in accordance with the waste management hierarchy
Associations	- while ensuring efficiency, - prevention of waste generation, preparation for reuse, recycling, other recovery methods, and disposal

Source: author's analysis based on CE Roadmap (2019).

Actions directed towards these elements—maximising the value of [a] or minimising the amount of [b] in accordance with the waste management hierarchy—are what qualify the economic model as CE. CE is accompanied by economic elements, such as ensuring efficiency, and specific actions concerning waste, including the "R" actions—reuse and recycle.

4.2. Semantic fields of regional definitions

The analysis of the semantic fields of the CE concept for the regions allowed for the identification of categories within each definition and a collective summary of what CE signifies for Polish regions. None of the collected definitions included all semantic categories. The most frequently occurring were equivalents [CE is], followed by descriptors [CE is characterised by…] and associations [CE is connected with/occurs with]. Oppositions and actions towards the subject appeared the least frequently. The frequency of occurrence of these categories across all 12 regional definitions is summarised in Table 2.

4.3. Equivalents

In the strategies, regions used various terms to describe the Polish term of CE (pol. Gospodarka o obiegu zamkniętym): "gospodarka o obiegu zamkniętym" (ang. closed loop economy) (R1, R9), the English equivalent "circular economy" (R2, R11), "economic concept" (R4), "economic model" (R6, R7, R13), "modern waste economy" (R8), "a panacea for reshaping the current system" (R9), "zero waste economy" (R15), "configuration of the economy's functioning" (R13), and "a significant element of a low-emission, resource-efficient, innovative, and competitive economy" (R9).

In the national definition, CE is described as an "economic model," which aligns with the equivalents used by three regions. Terms such as "economic concept" and "configuration of the economy's functioning" can also be considered partially consistent. Equivalents such as "circular economy" and its English translation are synonyms of the examined term, adding no analytical value.

Table 2.
Semantic categories in definition of CE in polish regions

No.	Region name	Source	Equivalents	Descriptors	Oppositions	Associations	Actions of the subject	Actions towards the subject
R1	Dolnośląskie	(SRWD 2019)	1	1	1	1	1	0
R2	Kujawsko pomorskie	(SRWKM 2020)	1	0	0	0	1	0
R3	Lubelskie	(SRWLUBE 2021)	No CE definition in the region's strategy					
R4	Lubuskie	(SRWLUBU 2021)	1	1	0	1	1	0
R5	Łódzkie	(SRWŁ 2021)	0	1	0	1	1	1
R6	Małopolskie	(SRWMAŁ1 2020)	1	1	0	1	0	1
R7	Mazowieckie	(SRWMAZ 2022)	1	1	0	1	0	1
R8	Opolskie	(SRWO 2021)	1	0	0	1	0	0
R9	Podkarpackie	(SRWPODK 2020)	1	1	1	1	1	0
R10	Podlaskie	(SRWPOD 2020)	No CE definition in the region's strategy					
R11	Pomorskie	(SRWPOM 2021)	1	1	1	1	1	0
R12	Śląskie	(SRWŚL 2020)	No CE definition in the region's strategy					
R13	Świętokrzyskie	(SRWŚW 2019)	1	1	1	1	1	1
R14	Warmińsko - mazurskie	(SRWWM 2020)	0	1	0	0	0	0
R15	Wielkopolskie	(SRWW 2020)	1	0	0	0	1	0
SUM OF CATEGORIE			**10**	**9**	**4**	**9**	**8**	**4**
R16	Zachodniopomorskie	(SRWZ 2019)	No CE definition in the region's strategy					

Source: author's analysis.

"Modern waste economy" narrows the scope of meaning compared to the national definition by focusing solely on waste, as does "zero waste economy." Referring to CE as "a significant element" simultaneously narrows and specifies its role relative to the CE Roadmap. Defining CE as "a panacea" introduces a potentially elevated tone to the definition, exceeding the boundaries of the national framework.

4.4. Descriptors

The primary element characterising CE is understanding this concept through the lens of waste and resources. Extending the duration materials and resources remain in the economy and minimising waste generation were identified as features of CE by six regions (R4, R6, R7, R9, R11, R13). Regions R6 and R13 expanded this characterisation by referencing the "R" principle—reuse and recycling—as well as prevention, recovery, or disposal of waste. They also emphasised efficiency in using resources, materials, and products. In the characterisation

provided by R6, waste is to be understood as a resource. Meanwhile, R13 stressed the universality of CE across the state's organisational structures—"at all levels of territorial organisation of the state.

The characterisation introduced by R5 presents the issues of waste and resources differently. CE is associated with the reuse of waste in a production process other than the one in which it originated and the rational use of resources from the perspective of "minimising the consumption of non-renewable resources." Regions R5, R13, and R14 also characterised CE through the lens of extending the lifecycle of waste/products.

For three regions, CE was characterised by its role in supporting the environment (R1, R5, and R13). CE is described as "environmentally friendly" and as characterised by "minimising the negative environmental impact of the process associated with CE." R13 recognised CE as a transformation that brings environmental, economic, and social benefits.

A distinct approach to defining CE was presented by R14. It listed various concepts associated with CE in the region, including eco-innovation, resource-efficient economy, green entrepreneurship, cleaner production, and extending the lifecycle of products currently on the market. These are considered descriptors.

The national definition does not characterise CE as a model defined by its role in supporting the natural environment. It does not use other existing concepts or ideas to define CE, as R14 did. The descriptors in the national definition strictly relate to the circularity of materials and resources and the minimisation of waste. Therefore, only six regions (R4, R6, R7, R9, R11, R13) can be considered fully consistent with the national definition. Although R1 uses the term "efficient" in its description—a term included in the national definition—it does not provide a characterisation consistent with the national definition. R5, while addressing waste, interprets waste management differently than the national definition

4.5. Oppositions

Within the analysed definitions, oppositions to CE were rarely introduced by the regions**. When oppositional terms were included, they primarily referred to: "linear economy" (R1 and R13) and the principles of "take – make – use – dispose" (R1, R9, R13). Additionally, attention was drawn to a contrast between CE and current economic realities, using terms such as "the previously prevailing system," "the current economic model," and "traditional economy, past and present methods of resource utilisation.

The national definition does not include a category identified as oppositions**. The four definitions that introduced oppositions expanded the semantic field of the CE definition they presented.

4.6. Associations

CE is primarily associated with economic and environmental issues. The availability of natural resources was an association with CE for four regions (R5, R6, R9, R11), each focusing

on different aspects: the negative social and economic impacts of depleting resources (R5), dependence on resource suppliers from third countries (R9), rising resource prices (R6), and as a complex geopolitical issue, such as restricted access to resources due to armed conflicts and supply-demand dynamics (R11).

Connections were also made between CE and the natural environment (R9), climate change (R6), and more specifically, environmental pollution (R11) and waste disposal (R13). Three regions linked CE with sustainable development (R1, R7, R9), and one region associated it with low-emission development (R1). Among these connotations, R13's strategy stands out, associating CE with "a new economic model combining economic, environmental, and social issues" (Świę...). This region was the only one to reference European environmental and economic policies in its definition.

Associations with CE also extended to meso- and micro-levels**. CE was linked to opportunities for enterprises (R5), product lifecycle stages (R4), and the waste management system (R8).

The associations presented include concepts describing a broader context than those contained in the national definition. None of the regions used the term "efficiency" as an association with CE, nor did they refer to R-type actions such as recycling. The proposal most aligned with the national definition was made by R8, which included associations such as "efficiency of use" and "waste reduction." However, these terms are not synonymous with those used in the national definition, leading to their classification as partially consistent.

4.7. Actions of the subject

CE activities are described in the regions exclusively in positive terms. Primarily, they are associated with enhancing the competitiveness of economic entities (R1, R9, R13), developing new business opportunities and innovations (R1, R9, R13), and increasing the efficiency of consumption and production (R1, R9). According to the R1 definition, CE serves to protect enterprises from resource shortages and the associated price instability. One region (R13) highlighted CE's impact on creating new products, while another (R5) focused on shifting consumption models towards more conscious and responsible practices.

Another element considered in the definitions is CE's positive impact on the natural environment (R4, R11) and slowing climate change through reducing the carbon footprint (R2). Four regions linked CE activities with resources. These connections emphasised the rational use of resources (R4, R11), the creation of so-called closed loops (R9), and a range of specific actions such as implementing blue-green infrastructure solutions, improving air quality, and reducing urban heat islands (R15).

The national definition does not include a category identified as actions of the subject**. The expansion of the CE definition by the regions to include activities does not contradict the national definition but rather extends or specifies the concept.

4.8. Actions towards the subject

Actions towards the subject were less frequently referenced in the strategies' definitions**. This classification was noted in only four definitions. These included: technological modernisation (R5); actions related to product lifecycle stages, such as resource extraction, design, production, consumption, repair, product regeneration, and waste collection (R6); reduction of waste mass and the elimination of inefficient waste disposal methods (R7). R13 dedicated considerable attention to this category. The actions listed by this region included the development of advanced technology and organisational solutions, comprehensive economic restructuring based on product lifecycle stages, building public ecological awareness, environmental education, and fostering a local community ethos of respecting natural and cultural resources to protect and preserve them for future generations.

The national definition does not include a category identified as actions towards the subject. However, these actions do not contradict the national definition; instead, they complement and enrich it.

4.9. CE in regions – collective image

Considering the frequency of words and concepts within the semantic fields enabled the reconstruction of a shared definition for CE. Two semantic categories that appeared in fewer than half of the definitions were excluded from this reconstruction.

CE is defined as an economic model or a component of an economic model associated with waste management. It is characterised by extending the time materials and resources remain in the economy and minimising waste generation, which can be linked to prolonging the lifecycle of waste/products. The existence of CE is tied to economic and environmental challenges, in cluding resource depletion and environmental degradation. CE positively impacts the economic sphere by increasing innovation and competitiveness among enterprises and transforming production models.

Table 3.
Convergences of Semantic Field Categories of Regional Definitions with the National Definition

	Consistent	Partially consistent	Inconsistent
Equivalents	R6 R7, R13	R4	R8, R9
Descriptors	R4, R6, R7, R9, R11 R13		R1, R5, R14,
Oppositions	-	-	-
Associations		R8	R1, R4, R5 R6, R9, R10, R11, R12, R13
Actions of the subject	-	-	-
Actions towards the subject	-	-	-

Source: author's analysis.

The regional definition of CE is not identical to the definition provided in Poland's CE Roadmap. Regional definitions often narrow or expand specific categories. Most regions also added categories that are absent in the national definition. A comparative summary of these differences is presented in Table 3.

In two categories—equivalents and descriptors—R6 and R7 were the most consistent with the national definition, i.e., Małopolskie and Mazowieckie. The remaining regions should be considered partially consistent, such as R4 (Lubuskie), or entirely inconsistent.

5. Discussion

The comparative analysis of the semantic fields of CE definitions at the national and regional levels highlights the need for further research on the coherence of this concept across regions (Ranta, Keränen, Aarikka-Stenroos, 2020; Christensen et al., 2022; Kruse, Wedemeier, 2023). The differences in defining CE between the CE Roadmap and regional strategies in Poland point to potential challenges in transferring central assumptions to lower levels of administration. As previous studies have indicated (Yuan, Bi, Moriguichi, 2006; Lieder, Rashid, 2016), the lack of consistency in defining key concepts such as CE can pose a significant barrier to their institutionalisation, which is also evident in the analysis of Polish regions. The differences between regional and national definitions stem from attempts to adapt CE to regional specificities, which is crucial for implementing this concept (Avdiushchenko, 2018) and therefore understandable. However, the specificities of regions are not reflected in the analysed definitions.

The dual meaning of CE (Ghisellini, Cialani, Ulgiati, 2016) is visible in the strategies of Polish regions. For some, CE is equivalent to an economic model, while for others, it is an element of an existing model. The national definition, which describes CE as a model, aligns with more recent scientific publications that assign systemic significance to the concept (Alizadeh et al., 2023). Descriptors, the category with the highest degree of alignment with the national definition, are focused on the idea of material circularity within the economy. The emphasis on waste management, visible in most regions, reflects their practical approach to CE. The importance of waste management infrastructure, as highlighted by Niang et al. (2023) and Mattiussi et al. (2014) confirms its role as a key success factor for this model.

The lack of overlap in the association category between the compared definitions does not imply that regions fail to recognise elements identified in the national definition as linked to CE. As Geeraerts observes, semantic fields do not have strictly defined boundaries; their scope and interpretation can be subject to debate, meaning that the connections between associations and

descriptors may be fluid. The non-restrictive nature of the semantic method represents a research limitation noted by the author. To verify the semantic fields of the definitions, conducting a context analysis is a potential future research direction.

The alignment of definitions in regions with strong academic and business potential, such as R6 and R7, can be interpreted as an effect of advanced implementation in these areas (Ćwiklicki et al., 2024). Research confirms that CE develops better in cities and regions with a high concentration of knowledge (Smol et al., 2018; Niang, Bourdin,Torre, 2023). In these two regions, the cities of Warsaw and Kraków, Poland's two largest urban centres, exert significant influence on their surroundings. This suggests the possibility of a reverse effect—regional approaches may influence the national definition of CE, warranting further study.

The national definition does not include all the components distinguished by semantic field theory. In regional definitions, these components were often described as actions of the subject or occasionally as oppositions or actions towards the subject. Regions' independent inclusion of semantic categories absent in the national definition allows for a broader contextualisation of the CE concept. At the same time, as noted in studies on the importance of conceptual coherence in policy implementation (Eberl, Gordeeva, Weber, 2021; Shawoo et al., 2023), such inconsistency may become a barrier to the institutionalisation of CE in Poland.

In the past, proposed ideas emphasising the economic sector's focus on environmental issues have experienced conceptual dilution, which has hindered their successful implementation (Engelman, 2013; Loiseau et al., 2016; Janoušková et al., 2019) To obtain a comprehensive understanding of the semantic fields of the concept, it is necessary to analyse entire documents, comparing fragments with one another. Selecting only the parts designated as CE definitions for analysis constitutes another research limitation. Future research directions include analysing the coherence of CE-related provisions in regional strategies and the CE Roadmap.

The expansion of CE definitions by regions focused primarily on economic opportunities, followed by environmental benefits. CE is primarily understood as an economic concept and, secondarily, as an environmental or social one. Actions of the subject identified in the definetions were consistent within the regional definitions' associations. Regions described problems associated with CE in the association category, while in the action category, they indicated CE's impact on these problems.

The broad connections between CE and economic, social, and even geopolitical issues align with observations on the development of CE as a comprehensive and universal concept (Ghisellini, Cialani, Ulgiati, 2016; Blomsma, Brennan, 2017). The most frequently mentioned actions included in regional definitions focused on supporting entrepreneurship and production, fostering innovation, and increasing market competitiveness. Kirchherr (2023) and Reike (Reike, Vermeulen, Witjes, 2018) highlight the growing role of business models in implementing CE, and this observation is confirmed in the analysis.

Regions often expanded definitions to include operational actions such as implementing innovative technologies, extending product lifecycles, or developing green entrepreneurship.

This approach, consistent with Bressanelli (2022) strengthens the practical aspects of CE but may be challenging to harmonise with broader national frameworks.

These findings indicate the need for further integration of regional and national approaches, which would enable more coherent implementation of CE goals in Poland. Hatti-Kaul et al (2020) emphasise that such integrated approaches require both ex-ante policy evaluation and an analysis of potential trade-offs between different policy goals. This context is missing from the presented studies. An analysis of the alignment between regional and national strategic goals is therefore proposed as a future research direction, especially since no clearly defined goal was found in the analysed definitions. This direction is particularly important because, as noted by Smol et al. (2018) and Winans et al. (2017), the lack of a transparent and stakeholder-understandable goal for translating the concept into economic practice hinders its implementtation.

The analysed definitions also lack emphasis on the EU's role in driving CE implementation, despite research indicating that this pressure significantly influences the institutionalisation of the model (Kovacic, Strand and Völker, 2019; Ćwiklicki, Mirzyńska, Żabiński, 2024). The limited use of the term "sustainable development" in associations with CE, as well as in the definitions themselves, is also surprising given research by Ghosh (2022), del Rio (2021), and Schöggl (2020)

6. Conclusion

The aim of this study was to determine the meanings that Polish regions attribute to the circular economy (CE). To achieve this objective, three research questions were posed:

1. How is CE characterised in the strategies of Polish regions up to 2030?
2. With what associations and actions is CE linked?
3. What differences and similarities exist between the way CE is defined in regional strategies and the Polish CE Roadmap?

The study analysed 12 regions that defined CE in their strategies up to 2030. Three regions did not provide a definition of CE despite using the term in their strategies, while one region did not include the term CE at all.

The results of the analysis showed that the meaning of CE in Polish regions varies and depends on the region. Some regions treat CE as an economic model, while others see it as an element of such a model. CE is characterised by the extension of the time materials and resources remain in the economy and the minimisation of waste generation. Some regions also linked CE with the concept of extending the lifecycle of waste/products in the economy.

In most regions, CE is associated with the economic sphere—issues of natural resources—and the environment, particularly its degradation. Regions highlighted CE's influence on production and enterprises. Frequently mentioned actions of CE included its impact on the innovation and competitiveness of entities. Only a few regional definitions included oppositional terms or actions towards CE. CE was positioned in opposition to the "current," "traditional," or "linear" model. Actions towards CE included technological modernisation and activities related to the product lifecycle. One region characterised action towards CE in a social context, mentioning education and upbringing.

The definitions of individual regions in Poland are not consistent with the definition included in the Polish CE Roadmap. Exceptions are the strategies of Małopolskie and Mazowieckie regions. The national definition consists of equivalents and descriptors, with minor inclusion of associations, while regional definitions have varying structures, either supplementing or narrowing the CE definition.

Evaluating the coherence of concepts at different levels of EU policy implementation is a crucial element in analysing potential barriers to the institutionalisation of such concepts. As people represent reality through language, they become co-creators of its shaping (Jørgensen and Phillips, 2002, 9) Therefore, the way CE is defined will not only affect executive documents at the regional level but also influence public awareness and perception of the concept among residents.

This study addresses the gap in semantic analyses of the CE concept and its implementation at various state levels, partially contributing to knowledge about circularity in Poland. The findings provide practical recommendations for public sector managers and those responsible for implementing CE in practice. Above all, it is essential to create a shared definitional framework that will enable the harmonisation of policies at the national and regional levels.

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