

Establishing a framework to assess the contribution of regional research topics to sustainable development goals (SDGs)

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Abstract

This study proposes a novel scientometric framework to assess the regional research contributions towards Sustainable Development Goals (SDGs), using the Region of Murcia, Spain, as a case study. By leveraging bibliometric and social network analysis, the framework aims to enrich university and regional policy-making with data-driven insights. The methodology identifies and maps micro-research topics to SDGs, showcasing how regional scientific output aligns with global sustainability objectives. The findings reveal Murcia's unique research emphases and contributions, particularly in Biomedical and Health Sciences and Life and Earth Sciences, differing significantly from broader European trends. This approach not only highlights the region's research strengths and areas of specialization but also underscores the potential of targeted scientometric analysis in guiding science, technology, and innovation policies towards achieving SDGs.

Keywords: scientometrics; topic modelling; sustainable development goals; Region of Murcia.

1. Introduction

The Sustainable Development Goals (SDGs) are a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030. Adopted by all United Nations Member States in 2015, the SDGs are a collection of 17 interlinked global goals designed to be a roadmap for realizing a more prosperous and sustainable future for everyone (United Nations 2015). These goals encompass a broad range of social, economic, and environmental development issues, from health, education, and gender equality to climate change, ocean conservation, and urban sustainability. Unlike their predecessors, the Millennium Development Goals (MDGs), the SDGs are unique for their inclusive approach, targeting not just developing countries but all countries, and emphasizing the interconnectedness of global challenges (Sachs 2012). The success of the SDGs requires a collaborative effort across countries, sectors, and societies, making them a pivotal framework for international development in the 21st century. From the outset, given this global orientation and significance, scholars and practitioners alike are delving into the various dimensions of the SDGs, scrutinizing their advancement, obstacles, and strategies for accomplishment, highlighting the vital importance of research and innovation in addressing complex worldwide challenges (Griggs et al. 2013).

Research has extensively addressed the topic of the Sustainable Development Goals (SDGs) from diverse

perspectives, where scientometrics plays a pivotal role in the monitoring and evaluation not only of the various proposals but also of the engagement and efforts that researchers, universities, and nations invest in the SDGs (Salvia et al. 2019; Sweileh 2020; Pizzi et al. 2020; Confraria, Ciarli and Noyons 2024). This approach allows for a comprehensive understanding of how the global research workforce contributes to achieving these goals. This plurality of research through the lens of scientometrics encompasses areas of interest such as the interconnections between the SDGs (Fonseca, Domingues and Dima 2020), their influence on university agendas (Sianes et al. 2022), and the main topics of research (Rafols et al. 2021). Despite the proven utility of scientometrics and its methods for these purposes, there remains a lack of approaches that are valuable in specific contexts by integrating this variety of methods in a way that can be replicated by institutions for decision-making. This gap underscores the need for a more nuanced application of scientometric techniques to fully capture the impact of the SDGs on research agendas and scientific policies (Rafols 2019).

Building upon this critical insight, the objective of this work is to establish an initial methodological framework that leverages scientometrics for the study of the SDGs, aiming to enrich university policy-making processes with robust data-driven insights. This novel framework, inspired by the transformative potential of the SDGs as demonstrated by Romero Goyeneche et al. (2022), employs bibliometric and social

network analysis to not only illustrate scientific knowledge production's role in implementing the SDGs but also to evaluate and manage scientific production, research topics, actor involvement, and their relationships, as suggested by [Cassi et al. \(2017\)](#). Intended to influence science, technology, and innovation policies—particularly those aimed at transformative innovation—this approach offers a strategic tool for enhancing decision-making processes within universities. It encourages a paradigm where scientometric insights do more than just inform; they catalyse policies that resonate with the SDGs' principles and goals, thus optimizing the contribution of academic institutions to sustainable development and transforming the science, technology, and innovation system of specific regions.

The paper is structured as follows: Initially, we delve into Section 1.1, providing a detailed backdrop against which our research is framed, highlighting its unique characteristics and the rationale for its selection. This is followed by the Section 2, which is divided into two parts: data collection and the methodological proposal, explaining the innovative approach we have adopted for identifying and analysing scientific publications relevant to the SDGs. Next, the Section 3 is presented in two sub-sections, Sections 3.1 and 3.2, where we dissect the findings from our methodology application, offering insights into the research landscape of the Region of Murcia and its alignment with the SDGs. Finally, the Section 4 synthesizes the implications of our findings, emphasizing their relevance to policy-making, regional research capabilities, and the broader quest for sustainable development.

1.1 The case of the Region of Murcia

To demonstrate its true potential, this work applies its methodological framework to a real-world case study, focusing on a specific location, the Region of Murcia. This region is in the southeast of Spain, is one of the 17 autonomous communities in the country. These communities have specific administrative and legislative competencies, granting them a certain degree of independence in various areas, including education, health, and cultural promotion. Particularly in the field of science and research, Murcia, like other autonomous regions, can formulate its own strategies and policies while also aligning with national objectives ([Jefatura del Estado 2022](#)). Over the years, Murcia has leveraged this autonomy to establish a unique scientific footprint. Since 1997, the region has been diligently tracking its scientific, technological, and innovation metrics, spanning areas like international collaboration, Research and Development (R&D) recruitment, patent outputs, and societal research impacts¹.

Under the guidance of the Seneca Foundation's Science and Technology Observatory (Observatorio de Ciencia y Tecnología de la Fundación Séneca), this data has informed Research & Development + innovation (R&D + i) policies in Murcia. Initiatives such as the RITTS 4,452 Strategy ([Fundación Séneca 2003](#)) and consecutive Regional Science, Technology, and Innovation Plans were developed based on this analysis. Presently, the emphasis is on the Smart Specialization Strategies, RIS3Mur ('Estrategia de Investigación e Innovación para la Especialización Inteligente de la Región de Murcia (RIS3Mur)' 2014) and RIS4 ('Estrategia de Investigación e Innovación para la Especialización Inteligente y Sostenible de la Región de Murcia 2021-2027 (RIS4)' 2020), for the period 2021–7. These strategies, giving priority to digital transformation, sustainability, and innovation enhancement, are tailored to

highlight Murcia's distinct strengths and prospective growth sectors. Opportunities for R&D + i collaboration between the Spanish State and the Autonomous Communities have been expanded through the Supplementary R&D + i Plans. Co-financed with Next Generation EU funds, these plans foster territorial synergies via research, innovation, and knowledge transfer networks in several scientific-technical domains. In this context, the Murcia Region leads the Marine Sciences Supplementary R&D + i² Plan and contributes to the Agri-food Plan,³ with key objectives aligned with the SDGs, emphasizing ecosystem conservation, environmental sustainability, and climate change mitigation.

Across Europe, regions and cities are experimenting with and disseminating practices, often engaging a broad spectrum of stakeholders and citizens, on optimal methods to localize the Sustainable Development Goals (SDGs) in their policies and financial plans ([CoR-OECD Survey 2019](#)). The Region of Murcia has proactively set forth a Sustainable Development Strategy ([Gobierno de la Región de Murcia 2022](#)) and a 2030 Agenda Implementation Plan where Murcia is among the Spanish regions that have kickstarted all the axes of the 2030 Agenda essential for regional implementation. It has excelled in governance and strategic advancements related to the 2030 Agenda and uses regional legal standards to contribute to the SDGs. Notably, normative impact reports accompanying legislative drafts now integrate the projected impact on the SDGs ([Región de Murcia. Consejería de Transparencia, Participación y Administración pública 2020](#)).

Historical analyses of the science, technology, and innovation system in the Region of Murcia have largely adhered to the traditional scheme revolving around bibliometric indicators of scientific production. Methodologies from various European strategic instruments, especially smart specialization and innovation, have guided these assessments ([Fundación Séneca 2003](#)). This approach has supplied continuous insights into primary indicators of regional research and innovation activity connected to scientific outputs ([Cabezas Clavijo et al. 2014](#)). Additionally, these assessments have expanded to include altmetric data at the institutional level, allowing for a broader evaluation of the social impact of research conducted within Murcia, showcasing the region's commitment to measuring research influence beyond traditional academic citations ([Torres-Salinas, Clavijo and Contreras 2013](#)). While these evaluations have been comprehensive, they remain confined within a specific scope, as indicated by the data sources employed.⁴

As highlighted by the findings of the Steering Research and Innovation for Global Goals project ([Ciarli et al. 2022](#)), the misalignment between science, technology, and innovation (STI) activities and the Sustainable Development Goals (SDGs) can significantly hamper progress towards achieving these goals. Addressing this gap necessitates an exploration of the intricate relationships between STI and the SDGs, employing a suite of analytical tools from various disciplines. This cross-disciplinary approach is essential for dissecting these relationships across different types of actors, geographical areas, and time frames. Given the current shortfall in evaluative mechanisms that leverage the SDGs' full potential, coupled with an urgent need for an in-depth understanding of research domains within the Region of Murcia, our innovative methodology aims to pinpoint micro-topics via scientific publications and map them onto the SDGs. This technique, which generates a comprehensive thematic

breakdown of scientific contributions over time, not only enables comparative analysis within the broader context of the European Union but also steers science and technology policies towards augmenting their impact on the SDGs. This strategy underscores the imperative for integrated frameworks that both illuminate and incentivize the alignment of research and innovation ecosystems with global sustainability objectives (Martin 2013; Schot and Steinmueller 2018), thereby contributing to a more coherent and targeted approach to fostering sustainable development.

1.2 Objectives

Our main objective is to propose a methodological framework to explore the research contribution of a region to the Sustainable Development Goals (SDGs). In addition, to demonstrate this potential and validate the reliability of this methodology, a case study is conducted in the Region of Murcia (Spain). The specific objectives are detailed below:

- 1) To introduce a method for mapping the micro-research topics that a region contributes to within a given SDG.
- 2) To test the method through a case study with the Region of Murcia (Spain), mapping the main research topics within a specific SDG and the actors contributing the most to it.
- 3) Compare the results with those of the European Union (EU-15) to showcase the differences and highlight those specific research fronts of the Region of Murcia.

2. Methodology

2.1 Data

The dataset obtained from Web of Science addresses the following query: indexes from the main collection of Web of Science (SCI, SSCI, and AHCI), period from 2000 to 2022, types being Article and Review, and location being the Region of Murcia and EU-15. In total, 39,012 publications were retrieved for the Region of Murcia and 10,477,999 for the EU-15 during that period. Of these, 31,904 publications from the Region of Murcia were assigned to the Sustainable Development Goals (SDGs), a process facilitated using InCites.⁵ In recent years, major academic databases like Web of Science and Scopus have incorporated the United Nations Sustainable Development Goals (SDGs) as part of their thematic classification systems. Our study uses the InCites Schema Scope, a systematic framework designed specifically for mapping scientific publications directly to relevant SDGs. This schema employs a category-to-category mapping system that connects each SDG with associated Micro Citation Topics. Since its introduction in January 2022 and a significant update in April 2024, the schema has enhanced the clustering algorithm to improve the accuracy of publication assignments to Micro Citation Topics. A total of 1,627 Micro Citation Topics have been assigned to various SDGs, with some topics overlapping across multiple goals, leading to 1,981 instances due to this duplication. For instance, SDG 3 'Good Health and Well-being' has the most topics assigned, totalling 1,153, highlighting its extensive research scope. In contrast, SDG 17 'Partnerships for the Goals' has the fewest, with only 8 topics, indicating its more focused scope.

Once we had classified the SDGs according to InCites, we proceeded to analyse the microtopics. Next, the micro-level topic was determined for each publication, using the

classification developed by the Centre for Science and Technology Studies (CWTS).⁶ This classification of micro-level topics is the foundation for the Micro Citation Topics in InCites, though the latter is a derived and revised outcome,⁷ thereby reducing the original 4,215 topics to 2,487. In our case, the use of the CWTS classification over that of InCites is because this system provides a map of science of the micro-level topics, which can be used to map the research fronts and boundaries of an entity. It is important to note that due to the methods used, which are primarily based on the clustering of citation networks, not all publications are assigned a micro-level topic or an SDG. However, these instances are in the minority.

2.2 Methodological proposal

In this study, we introduce a methodological proposal centred on a detailed mapping of specific research fronts, which allows for the delineation of the particularities and primary contributions of a region to research in general and in relation to the development of a specific SDG. In this instance, the region under analysis is the Region of Murcia, with the EU-15 serving as a broader framework representing the general trends of the scientific system within which this region is situated. To materialize this approach, we implemented an overlay map on the micro-level topics (Rafols, Porter and Leydesdorff 2010), projecting the number of publications each topic holds. By comparing the distribution of these topics between the Region of Murcia and the broader European context, the overlay map acts as a visual tool to pinpoint the specific research areas where the Region of Murcia and the EU-15 are active. Such a comparison offers an immediate and intuitive understanding of the disparities between them. This, in turn, allows for the identification of particular research themes where the Region of Murcia makes a unique contribution compared to the general European trend. Using scientific maps as a foundation, these differences are thoroughly examined, not just in terms of raw numbers, but in the distribution and concentration of topics. Extending this methodology to the SDGs further illuminates the specific research areas wherein the Region of Murcia distinctly contributes to the advancement of a particular SDG.

However, when using the CWTS classification, we lack a precise and comprehensive description of each micro-level topic, but rather a set of descriptors. Therefore, in order to carry out a more useful analysis, a more detailed and complete description of the research covered was assigned to each micro-level topic. This process was carried out using ChatGPT (GPT-4). A prompt was developed in which our need to transform related keywords into a specific research topic was specified. The entire methodological process is summarized in Fig. 1. Finally, we should point out the limitations in interpreting the data. It is important to recognize that the SDGs function as a classification system. In this unique context, their scientific accuracy may vary, and in no case do they directly reflect a scientific contribution towards achieving the SDGs. However, the principal role of this classification is to highlight a region's capability to conduct research on specific topics that are part of the published agendas. As such, the SDGs operate similarly to any other classification system.

Supplementary material has been created that offers expanded and detailed views of Figs 2 and 3 included in this

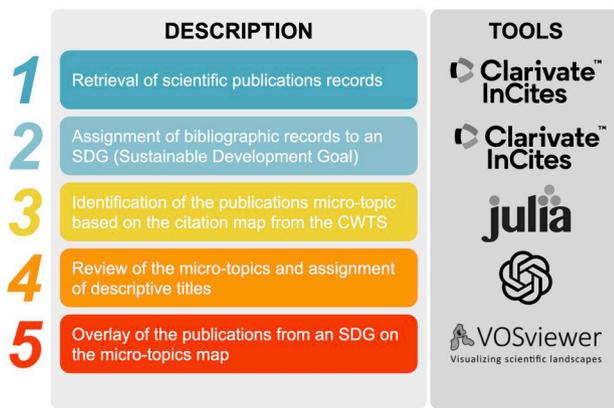


Figure 1. Summary of the methodological proposal.

article. These figures are available on Zenodo at the following link: <https://zenodo.org/records/14524641>.

3. Results

3.1 Overall analysis

To offer a contextual understanding of the Region of Murcia's research landscape, we have drawn upon key bibliometric indicators. These metrics encompass the total number of documents produced, the Category Normalized Citation Impact (CNCI), the proportion of publications in top-tier (%Q1) journals, the percentage of international collaborations (%Int. coll.), and the extent of open access (%OA) publications.

Over the span from 2000 to 2022, Murcia's evolution in research output and influence is evident (Table 1). The region has witnessed sustained growth in its research contributions, increasing from 3,436 documents in the period 2000–4 to 14,273 by 2018–22. Moreover, the increase in the CNCI value to 1.15 in the latest period implies that the research originating from Murcia holds an influence that is above the global average. The nearly 10% increase in publications in journals ranked in the first quartile (Q1) of their respective Journal Citation Reports (JCR) categories reflects the improvement in research excellence within the region. Further, the surge in international collaborations from just over 23% to nearly 48% showcases Murcia's expanding research ties on the global stage. Coupled with a remarkable growth in open access publications, which has quadrupled in this period, these trends underscore the Region of Murcia's rising prominence and adaptability in the wider European and global research panorama.

When examining the distribution of micro-level topics between the EU-15 and the Region of Murcia (Table 2), notable differences and trends emerge. For the EU-15, the Biomedical and Health Sciences (BHS) dominate with 40.71% of publications (3,978,503 publications), followed by the Physical Sciences and Engineering (PSE) at 25.69% (2,510,548 publications). The Region of Murcia, however, shows a higher percentage of publications in the BHS at 41.75% (15,755 publications), but a distinct drop in the PSE domain with only 12.60% (4,757 publications). Life and Earth Sciences (LES) in Murcia represent 25.63% (9,674 publications), a significant increase compared to the 15.20% (1,485,599 publications) seen in EU-15. Meanwhile, Mathematics and Computer

Science (MCS) and Social Sciences and Humanities (SSH) show less pronounced variations between the two regions.

This data underscores Murcia's pronounced emphasis on the Biomedical and Health Sciences and the Life and Earth Sciences, while it appears to place less focus on the Physical Sciences and Engineering when compared to the wider European landscape. However, this merely indicates whether the overarching research focus between the two systems is centred on the same areas; it does not necessarily suggest that Murcia's specific research topics align with European trends. This distinction becomes evident when contrasting the micro-level topic maps of the Region of Murcia with those of Europe (Fig. 2). As observed, there are areas in Murcia with a notably reduced presence compared to Europe, such as research related to PSE. In Murcia, research is centred ~556 micro-level fields, compared to Europe's 1,131, and publications in this domain account for 13% as opposed to Europe's 26%. Additionally, certain micro-level topics in Murcia display a marked dominance, allowing for the identification of specific research front that stand out in comparison to the broader European map.

Examining the Table 3 reveals interesting contrasts between the Region of Murcia's research emphasis and the broader research distribution in Europe across various areas. In the Social Sciences and Humanities, the prominence of 'Sports Psychology' in Murcia is notable, representing 7.04% of the area's focus, a stark contrast to the 0.70% in Europe. This trend of distinct focus continues across other fields. For instance, in Biomedical and Health Sciences, 'Strength and Endurance Training' receives considerable attention in Murcia at 3.41% compared to Europe's 0.39%. The same pattern is evident in Physical Sciences and Engineering, with 'Electrochemical Processes' at 3.93% in Murcia versus Europe's 0.13%. Additionally, in the realm of Mathematics and Computer Science, 'Functional Analysis' in Murcia stands out at 4.84%, contrasting with Europe's 0.30%.

The highlighted differences between the Region of Murcia and the broader European context serve as a testament to Murcia's distinctive research trajectory. Such divergences can be attributed to a myriad of factors, from unique regional necessities and available resources to specialized expertise cultivated within the area. It becomes evident that Murcia has not only identified specific arenas of research where it can excel and create a niche but has also consciously or organically veered away from some of the predominant European research trends. This deep dive into Murcia's research landscape provides invaluable insights into the broader efforts and directions a specific region can adopt, making it easy to pinpoint areas of specialization and deviation from larger European norms. It is worth noting that this overarching methodology, which sheds light on general research trajectories, can be seamlessly applied to Sustainable Development Goals (SDGs) to further elucidate how Murcia's contributions are aligned with these global objectives and its particular contribution to them.

3.2 SDG analysis

Table 4 elucidates how research publications related to the Sustainable Development Goals (SDGs) are distributed between the Region of Murcia and the wider European context. At a cursory glance, the numbers between Murcia and EU-15 seem broadly aligned for several SDGs, especially for overarching goals such as 'Good Health and Well-Being', where

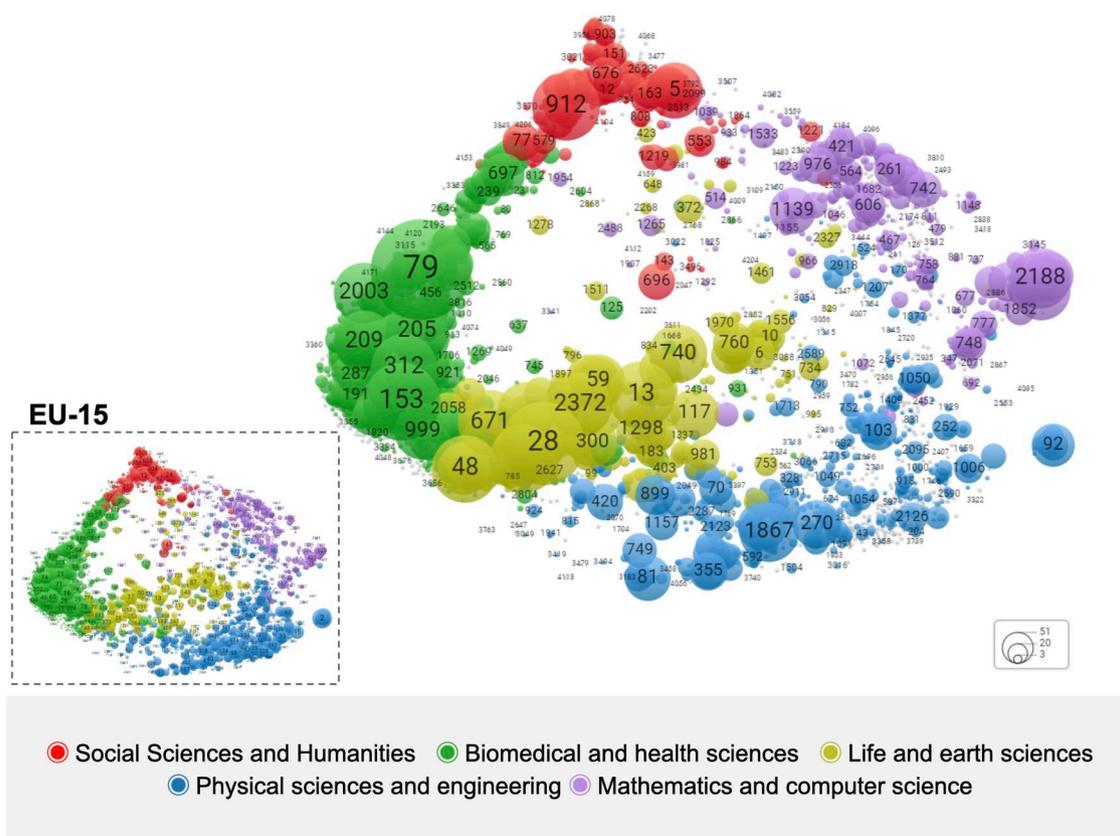


Figure 2. Micro-level topics map of the Region of Murcia and Europe (EU-15). For an expanded view, see Figure S1 at: <https://zenodo.org/records/14524641>.

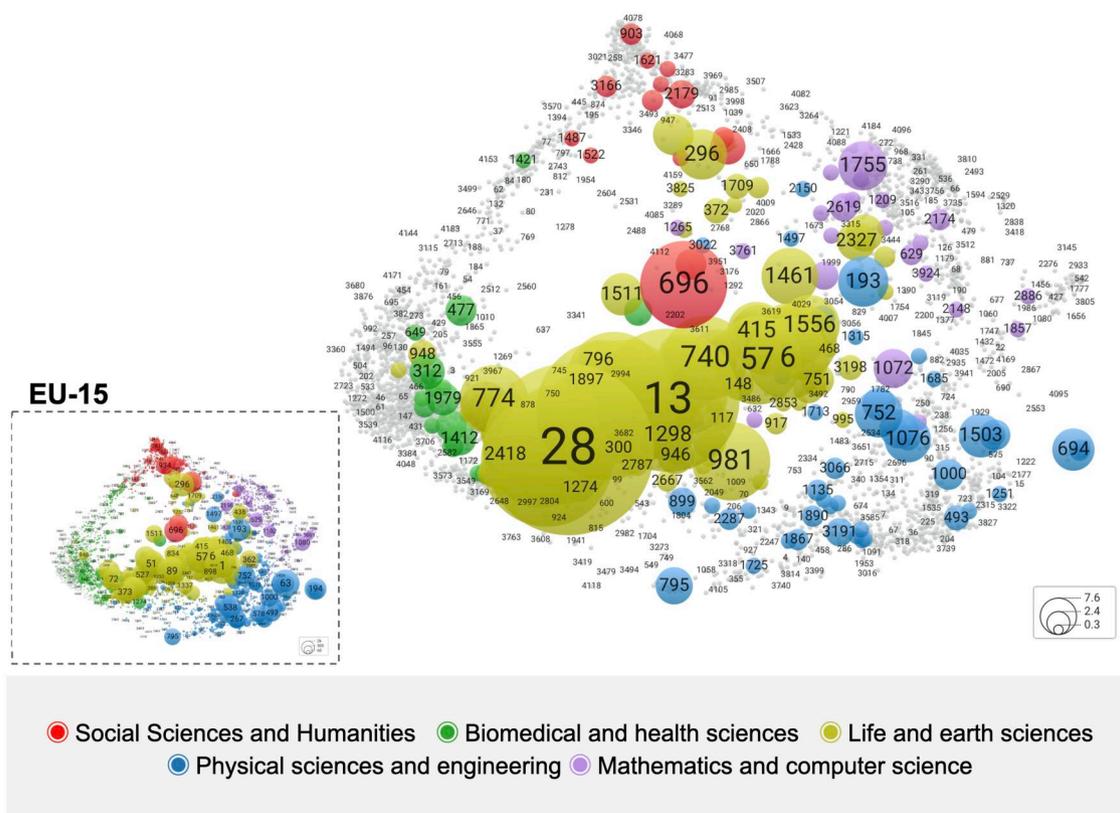


Figure 3. Map of SDG 13 micro-level topics of the Region of Murcia and Europe (EU 15). For an expanded view, see Figure S2 at: <https://zenodo.org/records/14524641>.

Table 1. Region-Murcia Bibliometrics indicators in three different periods.

Time	Documents	CNCI	%Q1	%Int. coll.	%OA
Period 1 2000–4	3,436	1.00	41.66%	23.52%	15.98%
Period 2 2009–13	8,555	1.02	47.19%	34.28%	27.90%
Period 3 2018–22	14,273	1.15	50.98%	47.72%	63.23%
Overall 2000–22	39,012	1.09	48.51%	39.36%	41.89%

both have ~60% of publications. Similarly, the alignment is observable in ‘Gender Equality’ and ‘Clean Water and Sanitation’, both registering close percentages. However, some distinctions are notable. For instance, the ‘Zero Hunger’ SDG shows a stark difference with Murcia attributing 7% of its publications to this goal, as compared to the broader 3% seen in EU-15. Another area of significant divergence is ‘Climate Action’, with Murcia devoting 12% of its publications, contrasting with the 10% in EU-15.

It is crucial to understand that while these percentages might hint at an alignment or lack thereof in the general focus, they do not necessarily imply that the underlying research themes within each SDG are the same. Indeed, the nuances within each SDG can vary, especially given that some variations between Murcia and EU-15, even if minimal, can represent entirely different research orientations or priorities. This perspective and potential of the proposed method become evident when focusing on a specific SDG, such as SDG 13 (Climate Action).

When comparing the micro-level topic maps of Murcia and Europe for SDG 13, the interpretation becomes much more intuitive and apparent than in the general case (Fig. 3). Firstly, it’s much easier to discern which areas are generally engaged, with it being evident from the European perspective that these largely encompass themes within Life and Earth Sciences and Physical Sciences and Engineering. However, for Murcia, the core lies within Life and Earth Sciences, with noticeable absences in other areas. Secondly, it also becomes clear which micro-level topics receive the most focus and the differences between the two. For instance, ‘Plant Response to Salinity’ (ID 28) has a significant presence in Murcia, whereas in Europe it’s not even discernible.

First and foremost, Murcia’s research orientation in this area is distinctively unique (Table 5). This is most evident in the topic ‘Plant response to salinity’, which accounts for a considerable 9.91% of Murcia’s publications, in contrast to just 0.83% in the broader EU-15. Similarly, ‘Soil health assessment’ and ‘Diversity of bryophytes’ are other major focal areas for Murcia, while their representation in EU-15’s research landscape is relatively lower. Notably, some topics, like ‘Viticulture’ and ‘Decoding of viral genomics’, show a significant presence in Murcia’s research output, suggesting a particular regional specialization or interest. On the other hand, when observing EU-15’s dominant topics related to SDG 13, areas such as ‘Petrogenesis and Geochronology’ and ‘Atmospheric Chemistry’ prominently feature, yet their representation in Murcia’s research is minimal. This stark contrast underscores the varied regional priorities and expertise.

These disparities highlight Murcia’s distinctive contribution to research related to SDG 13. While some topics

overlap, like ‘Ecology of field birds’, Murcia’s emphasis on certain areas diverges considerably from the broader European trends, evidencing its particular research interests and strengths in this sustainability domain.

4. Discussion

The methodology presented in this work represents a significant step forward in detecting research topics within a science policy context. While this study employs a specific geographical context (the Region of Murcia), a concrete comparative framework (the European Union), and a targeted classification (the Sustainable Development Goals), the approach itself is versatile and adaptable. The novelty of this methodology lies in the combination of these elements rather than in the individual components, which are well-established. By integrating bibliometric analysis, micro-topic mapping, and content enrichment using tools such as ChatGPT, this methodology offers a nuanced understanding of research contributions that can be extrapolated to other contexts. Specifically, this perspective can be applied to various agents, including institutions, research centres, or national scientific systems, and can be scaled to different geographical frameworks, from individual regions to countries or even global analyses. Moreover, the methodology is not limited to SDGs; it can be adapted to other thematic classifications. This flexibility enhances its potential as a valuable tool for science policy, supporting evidence-based decisions to align scientific efforts with broader societal and policy objectives.

The methodology employed in the present work marks a new phase in this analysis, as it considers the essential element of the SDGs in a scenario lacking proposals and evaluative tools that harness their value and potential. This methodology identifies micro-topics in scientific publications and maps them to the SDGs. This approach creates a micro-scale map of productive research areas in the Region of Murcia, their volume, and the responsible organizations. Simultaneously, it facilitates comparison with the results in the European Union, assessing common elements and peculiarities, and enabling comparison. In essence, this methodology captures the interdisciplinarity and thematic diversity of scientific production at the regional level applied to a case study with a comprehensive analysis of research topics in the Region of Murcia, allowing for a visualization of a thematic structure through its scientific production and highlighting strengths and emerging lines, thus guiding scientific and technological policies to enhance their contribution to the SDGs.

At Fundación Séneca, the entity responsible for promoting researcher training, talent attraction, and scientific excellence in the Region of Murcia, we recognize the need for a robust methodological framework to guide scientific policies. This study significantly supports this objective, enabling strategic decisions aligned with the 2023 Program-Contract, in collaboration with the Regional Ministry of Environment, Universities, Research, and the Mar Menor. The study’s results enhance decision-making in key areas of regional science policy. The analysis identifies fields with scientific output below European standards, facilitating targeted funding calls through ‘Regional Programs for Scientific and Technical Research Excellence, Knowledge Transfer, Valorization, and Scientific Entrepreneurship’. This approach directs resources towards addressing deficiencies, fostering balanced growth in the regional R&D&I ecosystem.

Table 2. Distribution of micro-level topics and publications from Europe (EU-15) and the region of Murcia by area.

	EU-15				Region of Murcia			
	Topics	%	Publ.	%	Topics	%	Publ.	%
SSH	479	11.36%	954,952	9.77%	310	11.19%	3,508	9.29%
BHS	1,343	31.86%	3,978,503	40.71%	1,079	38.95%	15,755	41.75%
PSE	1,131	26.83%	2,510,548	25.69%	556	20.07%	4,757	12.60%
LES	530	12.57%	1,485,599	15.20%	414	14.95%	9,674	25.63%
MCS	732	17.37%	842,050	8.62%	411	14.84%	4,047	10.72%
Total	4,215	100%	9,771,652	100%	2770	100%	37,741	100%

Table 3. Main micro-level topics of the Region of Murcia by area.

Area	Micro-level topic	EU15 %	Murcia %
Social Sciences and Humanities 479 micro-level topics	Sports Psychology	0.70%	7.04%
	Innovative Knowledge Management	1.49%	4.76%
	Corporate Finance and Governance	0.88%	2.71%
	Monetary and Fiscal Policies	1.64%	2.42%
	Childhood Psychological Disorders	0.97%	2.19%
Biomedical and health sciences 1343 micro-level topics	Strength and Endurance Training	0.39%	3.41%
	Fertility	0.21%	2.02%
	Eye Surgery	0.20%	1.47%
	Dental Implants	0.28%	1.34%
	Anticoagulant Therapies	0.24%	1.26%
Physical sciences and engineering 1131 micro-level topics	Electrochemical Processes	0.13%	3.93%
	Ionic Liquid Chemistry	0.34%	2.69%
	Conductive Polymers	0.16%	2.59%
	Palladium-Catalyzed Reactions	0.30%	2.35%
	Particle Physics	0.45%	2.08%
Life and earth sciences 530 micro-level topics	Plant Response to Salinity	0.48%	3.81%
	Food Preservation	0.13%	2.56%
	Soil Health Assessment	0.90%	2.50%
	Fruit Phytochemicals	0.57%	2.49%
	Aquatic Pathogens	0.27%	2.32%
Mathematics and computer science 732 micro-level topics	Functional Analysis	0.30%	4.84%
	Geometric Analysis	0.32%	4.47%
	Cluster Algebra	0.71%	3.19%
	Stochastic Analysis	0.25%	2.82%
	Dynamical Systems	0.58%	2.74%

Table 4. Distribution of publications in the Region of Murcia and Europe (EU-15) by SDGs.

SDG	EU-15	EU-15	Reg. Murcia	Reg. Murcia
1 No Poverty	101,994	1%	184	1%
2 Zero Hunger	260,813	3%	2,340	7%
3 Good Health and Well-Being	4,817,643	59%	19,125	60%
4 Quality Education	193,963	2%	892	3%
5 Gender Equality	372,738	5%	1,621	5%
6 Clean Water and Sanitation	234,428	3%	989	3%
7 Affordable and Clean Energy	374,619	5%	516	2%
8 Decent Work and Economic Growth	104,995	1%	299	1%
9 Industry, Innovation and Infrastructure	223,243	3%	849	3%
10 Reduce Inequalities	131,558	2%	262	1%
11 Sustainable Cities and Communities	592,442	7%	1,798	6%
12 Responsible Consumption and Production	177,809	2%	615	2%
13 Climate Action	841,400	10%	3,722	12%
14 Life Below Water	237,871	3%	1,321	4%
15 Life On Land	490,277	6%	2,918	9%
16 Peace, Justice and Strong Institutions	59,068	1%	58	0%
Total	8,108,539	100%	31,904	100%

Moreover, the study highlights areas of strength within the Region of Murcia, forming a basis for policies aimed at expanding strategic fields. These insights have supported the 'Regional Program for Research Talent and Employability',

which attracts, retains, and develops highly qualified human resources, ensuring sustainability and competitiveness in priority sectors. The findings also inform the design of innovation strategies, such as the RIS4Mur Plan (Research and

Table 5. Main SDG 13 micro-level topics of the Region of Murcia and Europe (EU-15).

Area	Micro-level topic	EU15 %	Murcia %	ID
Region of Murcia	Plant response to salinity	0.83%	9.91%	28
	Soil health assessment	1.42%	6.28%	13
	Diversity of bryophytes	0.28%	5.92%	2,372
	Viticulture	0.51%	5.16%	1,159
	Decoding of viral genomics	0.73%	3.96%	322
	Ecology of seagrass meadows	0.36%	2.35%	1,739
	Ecology of field birds	1.42%	2.32%	51
	Combating plant invasions	0.83%	2.27%	373
	Paleoclimatic studies	2.03%	1.91%	57
	Prehistoric archaeology	0.91%	1.83%	696
EU-15	Petrogenesis and Geochronology	2.60%	0.05%	1
	Paleoclimatic studies	2.03%	1.91%	57
	Atmospheric Chemistry	1.99%	1.56%	6
	Monsoon Patterns	1.55%	1.34%	10
	Paleobiology and Paleoclimate	1.48%	0.14%	148
	Probing Solar Physics	1.44%	0.14%	63
	Marine Biogeochemistry	1.43%	0.22%	89
	Soil health assessment	1.42%	6.28%	13
	Ecology of field birds	1.42%	2.32%	51
	Volcanology	1.23%	0.03%	552

Innovation Strategy for Smart & Sustainable Specialization of the Region of Murcia 2021–7), ensuring alignment with regional capacities and the Sustainable Development Goals (SDGs). Integrating these insights into policy-making fosters evidence-based decisions, advancing the socio-economic development of the Region of Murcia.

The results of applying this methodology prove highly valuable, not only for understanding regional capacities in research and innovation, their projection, and their peculiarities (often explained by the presence of institutions specializing in certain areas such as biomedical or agri-food), their alignment with policies and instruments promoted by the European Union, and their contribution to them, but also crucial for shaping the Regional Strategy for Scientific and Technical Research and Innovation, currently under development, for defining regional R&D+i policies and programmes, and for their alignment with strategies and policies driven by the European Union and its funding programmes.

The methodology introduced in this work, along with its application in the Region of Murcia, offers an innovative approach to understanding and measuring progress towards implementing the SDGs. By identifying the most scientifically productive areas and those with high application potential, the methodology aligns research priorities with regional social and economic needs. It supports the transformation of the research and innovation system and informs the design of science, technology, and innovation policies. These insights help orient activities towards the SDGs by enhancing scientific infrastructures, fostering knowledge generation, attracting and developing research talent, promoting knowledge transfer, and encouraging science-based innovation and entrepreneurship. Furthermore, this approach contributes to building a culture of scientific and technological engagement among citizens, ensuring that research and innovation efforts address regional challenges and support sustainable development.

Organizations and actors in the regional system and regional STI policy makers can benefit from this guidance to make better decisions on actions affecting the above aspects and on the allocation of investments, improving the

implementation of the SDGs and extending their impact and transformative capacity in the multiple spheres of society they reach. The elaboration of the Regional Science and Technology Strategy of the Region of Murcia for the period 2024–7 is linked in the organization of the regional government to a new Department that brings together the competences to elaborate and execute policies in universities, research and environment.

In this context, the methodology and results of this work, and particularly the methodology that allows to accurately map micro-topics in their thematic mapping to the SDGs, constitute an unprecedented opportunity to inform the new orientation of the Regional Strategy, which requires a new thematic agenda oriented towards sustainability, preparing the policies to accompany it, providing a new approach to governance based on reflexivity and building such governance with a focus on foresight, elements that have been considered key to the success of European policies and programmes, in particular in Horizon Europe: the EU framework programme for Research and Innovation (R&I) 2021–7 (European Commission, Directorate-General for Research and Innovation 2023), in its pursuit of the SDGs (Kastrinos and Weber 2020).

The framework provided by this study will make it easier for regional policies to look at European policies and programming instruments until 2027, including thematic guidelines, lessons on governance and future prospects, taking into account that these elements are explicitly and decisively referred to the SDGs of the 2030 Agenda of the United Nations in these policies and programming, which will contribute to strengthening the central role of transitions towards sustainability and social inclusion at regional level, as a basis for their development. At the same time, thanks to the comparative capacity of the methodological tool, it will allow to measure the contribution that the effort in science, technology and innovation from the Region of Murcia can represent for the achievement of these goals at a global level and, from a broader perspective, to show the capacity of public policies and research and innovation activity at the local and regional level as key elements of transformation.

Author contributions

W.A.-M.—Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Software, Visualization, Writing—original draft. A.G. V.—Funding acquisition, Resources, Supervision, Validation, Writing—original draft. M.T.-L.—Funding acquisition, Resources, Supervision, Validation, Writing—original draft. D.T.-S.—Conceptualization, Investigation, Methodology.

Funding

None declared.

Acknowledgements

The authors would like to thank the Centre for Science and Technology Studies (CWTS) for providing the data used in the thematic classification, which was obtained during the research stay of Wenceslao Arroyo-Machado.

Notes

1. <https://fseneca.es/web/publicaciones/informes>
2. <https://thinkinazul.es/>
3. <https://fseneca.es/agroalnext/>
4. <https://fseneca.es/impactoRRSSpublicaciones/>
5. InCites assigns Sustainable Development Goals to publications according to a mapping established with the classification scheme of the Micro Citation Topics. In this way, each topic is associated with an SDG, consequently assigning one or more of the first 16 Sustainable Development Goals to the publications. Source: <https://incites.help.clarivate.com/Content/Research-Areas/sustainable-development-goals.htm>.
6. CWTS annually produces, as part of the Leiden Ranking, a thematic classification based on the citation network of all papers and reviews indexed in Web of Science. The 2023 version encompasses publications from 2000 to 2022. From this map, publications are grouped into clusters, with each of these representing a specific research theme termed a micro-level topic. Source: <https://www.leidenranking.com/informacion/fields>.
7. <https://incites.help.clarivate.com/Content/Research-Areas/citation-topics.htm>

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Research Evaluation, 2025, 34, 1–9
<https://doi.org/10.1093/reseval/rvaf040>

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