2nd International Conference on
MANAGEMENT, ECONOMICS & FINANCE
15-17 November 2019

Fostering 'Bioeconomy Strategy' through synergies: managerial implications from Interreg Europe

Yannis Mouzakitis[1,*] and Giannis T. Tsoulfas[2]

[1]University of Patras, Department of Mechanical Engineering & Aeronautics, 26504, Rio, Greece

Hellenic Open University, School of Social Sciences, Aristotelous 18, 26335, Patra, Greece

[2]Agricultural University of Athens, General Department, 75 Iera Odos, 11855, Athens, Greece

Abstract.

Back on 2012, the European Commission launched and adopted the Bioeconomy Strategy in order to reduce dependency on fossil fuels and meet its energy and climate change policy targets. In this vein, the concept of bioeconomy, namely the production of renewable biological resources and the conversion of these resources and waste streams into value added products, is multi-faceted in terms of ambitions, initiators, and barriers, involving several types of stakeholders, in different (local, regional and national) settings. This paper sheds light on the regional level of bioeconomic development, focusing on initiatives which are financially supported by EU. More specifically, we conduct secondary research on 20 regional schemes funded by the Interreg Europe Initiative, and we analyse /compare the above case-studies with respect to 26 variables. Based on this evidence, we discuss the effectiveness, the greenness and the innovativeness of the selected projects, and we evaluate the contribution and the potential of (funded) cross-regional synergies as a policy tool in the transition towards a bio-based model of sustainable development.

Keywords: EU policy; bioeconomy transition; circular economy; regional development; sustainable development

1. Introduction

Sustainable development is a major concern in EU legislation and policy, which seek to balance between economic, social and environmental development. This objective is reflected not only in legislation and action plans, bud also in an increasing number of EU funding schemes, where sustainable development objectives are prominent in the corresponding calls (Dudek and Wrzochalska, 2017; Potluka et al., 2017). One of the most prominent directions which of may contribute towards a sustainability transition, is the concept of Bioeconomy, which is the focal point of a growing number of strategies and policies all over the world (OECD, 2009; Staffas et al. 2013; de Besi and McKormick, 2015). In this vein, EU has adopted

the "Bioeconomy Strategy' which addresses the related production of renewable biological resources and their conversion into vital products and bioenergy (European Commission, 2012; 2019, A).

In another level of consideration, one may notice the significant role of EU funded interregional cooperation projects. Aligned with serving the EU strategies and policies, these

funding Programmes (such as Interreg) are fundamental in order to promote the cooperation between regions and countries, the development of relevant skills and competences. They constitute an effective solution towards the development and the transfer of good practices as well as the utilisation of common methods and tools (Cosmi et al., 2017). Therefore, the regional dimension of the EU policy schemes towards Bioeconomy is a matter of great priority (Spatial Foresight et al., 2017), but yet under-studied (Golembiewski et al., 2015).

This paper seeks to shed light on the emerging topic of the regional dimension of bioeconomic development. Towards this end, we conduct secondary research on 20 regional 'bio-economic' schemes funded by the Interreg Europe Initiative, and based on this evidence, we discuss the effectiveness, the greenness and the innovativeness of the selected projects. In addition, we evaluate the contribution and the potential of (funded) inter-regional synergies as a policy tool in the transition towards a bio-based model of sustainable development

The remaining paper is organised as follows: section 2 includes a short overview of the central concepts of the paper: the 'Bioeconomy Strategy', which constitutes a significant pillar of circular economy, and the 'Interreg Initiative', which is discussed in the context of regional development. The afore-mentioned theoretical implications are followed by section 3, which provides a description of the research methodology, and the presentation of the results. The paper continues with a discussion (section 4) and comes to an end with the conclusions and the directions of future work (section 5).

2. On the Bioeconomy Strategy and the Interreg Initiative

Bioeconomy is defined by European Commission as "the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy. Its sectors and industries have strong innovation potential due to their use of a wide range of sciences, enabling and industrial technologies, along with local and tacit knowledge" (European Commission, 2012). Towards this end, the European Commission has adopted the "Bioeconomy Strategy", and developed a corresponding plan which focuses on three actions: (1) developing of new technologies/processes for the bioeconomy, (2) establishing markets and competitiveness in bioeconomy sectors, and (3) encouraging policymakers and stakeholders to work more closely together (European Commission, 2012).

Pfau et al. (2014) argue that the concept of bioeconomy appears with several interpretations and visions. In this vein, one may find a wide spectrum of corresponding strategic national plans (McCormick and Kautto, 2013), and an increasing number of

local/regional interventions (Staffas et al., 2013; Mouzakitis et al., 2017). In one of the most recent related publications of the field, the Global Bioeconomy Summit (2018) concludes that bioeconomy development will be driven by the following forces:

- societal aspirations for improved health and wellbeing,
- valorisation and protection of biological resources, including residues, in the traditional bioeconomy core-sectors (agriculture, forestry, fishery, water management food and bioenergy), and
- innovative breakthroughs in biological, digital and other technology fields.

In the afore-mentioned context, we seek to study whether the regional dimension of funding support, in the form of Interreg Initiative, may act as a positive catalyst to the direction of the emerging paradigm of bioeconomy.

The Interreg Initiative was introduced in 1990, as an effort to facilitate the single European market, the EU persisted on eliminating the barriers posed by national borders. Since then four Interreg periods have been implemented: Interreg I (1990–1993), Interreg II (1994–1999), Interreg III (2000–2006) and Interreg IV (2007–2013). Interreg V started in 2014 and will end in 2020. Reitel et al. (2018) gave an overview of the Interreg Initiative from its beginning. They state that, although it covered a limited geographical area, the first Interreg Initiative period allowed for a deepening and generalisation of cross-border cooperation in Europe. The second period coincided with the inclusion of Austria, Finland and Sweden but also external countries had the chance to participate. Moreover, the development of networks at European level was promoted and the Initiative introduced some priority areas, namely transport, tourism and environment. During the third period the 2004 EU enlargement took place and the 2007 EU enlargement was elaborated. Therefore, the Initiative accommodated this enlargement and additional topics were introduced. In the fourth period the objectives of the EU Cohesion Policy were modified, and the new ones were convergence, regional competitiveness and employment and European territorial cooperation. The Interreg Initiative was actually implemented in the context of the last objective.

Currently, the fifth generation of the Initiative aims at building on the previous one. In the updated EU Cohesion Policy there are two goals: investment for growth and job and European territorial cooperation. The Interreg Initiative supports the latter and is funded by the European Regional Development Fund (ERDF) (Interreg, 2019, A). There are three types of programmes: (1) Cross border, i.e. adjacent areas across borders (60 programmes); (2) Transnational, i.e. regions from several countries of the EU forming bigger areas (15 programmes); and (3) Interregional, which are implemented at pan-European level and do not only involve the 28 EU member states but also neighbouring countries (4 programmes).

The EU has already presented the new framework for cohesion policy post 2020. The main novelty introduced in the forthcoming programming period is the addition of two types of programmes to the existing three ones (European Commission, 2019, B): (1) a specific type for outermost regions (between them and with their non-EU neighbours) to reflect their very specific cooperation needs, and (2) a new type on interregional innovation to support the commercialisation and scaling up of innovation initiatives.

3. Research Methodology & Results

In the following subsections, we describe the methodology followed in this paper and then we present the main findings of our analysis.

3.1 Research Methodology

In order to ensure a transparent and reproducible research methodology', we adopted the following 3-steps procedure:

1. formulation of research question
2. collection of data
3. analysis of the results

In the first step, the leading question of this work is "whether the funded Interreg projects contribute to the diffusion/advancement of the 'Bioeconomy Strategy' (and secondary of circular economy) in Europe". Towards this end, in the second step we conduct a secondary research browsing[1] the related database developed by Interreg (2019, B), which includes 258 (ongoing) projects. As for the wider topic, Interreg projects fall into one of the following four categories (Interreg C, 2019): (1) research and innovation (65 projects), (2) SME competitiveness (66 projects), (3) low-carbon economy (60 projects), and (4) environment and resource efficiency (67 projects). The selection was based on the keyword "bio-economy"[2] and resulted in 20 cases (see Appendix). We studied the material published in the database and created a dataset of 26 variables (see Tables A2 & A4 in the Appendix), which shed light on both hard (technical and financial) and soft (organisational) aspects of each project. Finally, in the third step, we discuss from a managerial perspective the (preliminary) results of the previous step in combination with findings from the corresponding literature, and we evaluate the contribution of the studied projects, in the context of "Bioeconomy Strategy" and "Interreg Initiative".

In the vein of research methodology, we should also notice that this study is subject (but also revealed), the following limitations:

- all the selected projects are still in progress (6 of them started on 2019), and therefore, it is difficult to assess their contribution in the advancement of bioeconomy. However, one may argue that their declared ambitions provide a description of their starting point, while the published documents provide evidence of the trend which is to be followed.
- the database of Interreg Initiative presents deficiencies at both usability and reliability of the information provided.

3.2 Results

Starting with the basics (see Table 1), the 20 selected projects have an overall budget of 30.4 million Euro, and an overall duration of 1,049 months. The average budget is 1.5 million Euro

[1] The data were collected from 1/9/2019 till 15/10/2019.

[2] We should remark that the term "bioeconomy" provided no results

and the average duration is 52.5 months. All the selected projects are ongoing, starting in 2016-2019, and ending in 2020-2023. Overall, there are 162 partners from 23 countries, while the project leaders come from 9 countries, and the consortiums range from 6 to 10 partners.

Table 1: a synopsis of the studied projects

Number of Projects: 20				
Overall Budget (m. €): 30.4 (avg. *per project: 1.5*) **Overall Duration** (months): 1049 (*per project: 52.5*)			**Countries**: 23 (*lead. countries: 9*) **Partners**: 162 (*per project: ~8*)	
Start in 2016: 6 2017: 6 2018: 2 2019: 6	**End in** 2020: 6 2021: 6 2022: 0 2023: 8	**Interreg Topic** Research and innovation: 1 SME competitiveness: 5 Low-carbon economy: 2 Environment and resource efficiency: 12	**Leading Country** Italy: 4 Greece: 3 Finland: 3 Spain: 3 France: 2 Netherlands: 2 Other: 3	**Consortium** 6 partners: 3 7 partners: 2 8 partners: 6 9 partners: 8 10 partners: 1

Moving into the analysis of the partners (see Table 2), we have developed the following typology:

1. *Public Authorities*, which are mainly administration agencies (there is a small number of cases, where these organisations also fulfil specific societal needs such as transportation or water provision) of local, municipal and regional jurisdiction. Apparently, in the frame of Interreg Initiative, it is not surprising the fact that this is by far the dominant type of partner.
2. *Universities*, which constitute the second most popular (14 in 20 cases) type of participants.
3. *Innovation Centres*, which may correspond to a relatively low percentage of the total number of partners (10%), but on the other hand, they are present (with a vital role) in half of the selected cases.
4. *Environmental consultancies*[3], which have a rather low presence (in 5 out of 20 projects, 6% in total number of partners), taking into account the 'green' character of the selected topic (bioeconomy).
5. *Research Centres*, which were deliberately categorised in a distinct group (and not 'merged' with the universities), in order to have a better picture of the 'innovation' background of each project.
6. *Other*, which in most cases are (commercial) chambers, or technical experts.

In the afore-described categories, it is important to provide the necessary clarifications between the two (close, at a first glance) types, *innovation centres* and *research centres*, which fulfil a completely different role. More specifically, the former ones provide knowledge,

[3] Environmental public (auditing or regulatory agencies) do fall in the first category.

guidance and support in order to 'operationalise' innovations, while the latter develop new artefacts, processes, products, etc.

Table 2: a partner analysis of the studied projects

Number of Projects: 20		**Number of Partners**: 162
Leader Type Public Authority: 11 University: 5 Innovation Centre: 2 Research Centre: 1 Other: 1 **Advisory Partner** YES: 9 NO: 11	**Public Authority** YES: 20 NO: 0 **University** YES: 14 NO: 6 **Innovation Centre** YES: 10 NO: 10 **Environmental Consult.** YES: 5 NO: 15 **Research Centre** YES: 4 NO: 16	**Partner Type (…/162)** Public Authority: 97 (60%) University: 23 (14%) Innovation Centre: 16 (10%) Environmental Consult: 9 (6%) Research Centre: 4 (2%) Other: 13 (8%) **Traditional 'bioeconomic' partners** YES: 8 NO:12

We argue that an important aspect to be considered in the assessment of the selected cases, is whether each project seeks to publish its outputs, disseminate its practices, and/or share its experiences. In this vein, we draw data from the standard structure of the Interreg website which offers the possibility of hosting the following features:

1. *Good Practices*, which correspond to methods and/or techniques which can be prescribed as correct or effective.
2. *Library*, which acts as a repository of published material.
3. *Newsletter*, namely a bulletin issued periodically, and
4. *Action Plan*, which are detailed plans with specific steps, interventions and measurements in order to accomplish the corresponding objectives.

The results with respect to the afore-described typology of publicity are presented in Table 3, which also includes evidence concerning the green, the innovative and the sectoral orientation of the selected projects. More specifically, we assess the 20 projects in terms of Bioeconomy, based on the typology (see Section 2) proposed by Global Bioeconomy Summit (2018). In addition, while also categorise the selected projects with respect to the following types of circularity interventions: closing supply chains, residual waste management, product lifetime extension, and resource efficiency (Aguilar-Hernandez et al., 2018).

Table 3 communication, greenness and innovation analysis of the studied projects

Number of Projects: 20			
focus on Communication **1. Good Practices** YES: 14 NO: 6 **2. Library** YES: 17 NO: 3 **3. Newsletter** YES: 1 NO: 19 **4. Action Plan** YES: 4 NO: 16	**Overall (1+2+3+4)** (0/4): 3 (1/4): 3 (2/4): 10 (3/4): 3 (4/4): 1	**focus on Bioeconomy** no specific: 13 health & wellbeing: 1 biological resources: 7 innovative breakthroughs: 0 **focus on Circular Economy** no specific: 15 closing supply chains: 4 residual waste management: 0 product lifetime extension: 0 resource efficiency: 1	**focus on Innovation** no specific: 13 product: 0 process: 0 business model: 7 **focus on specific sectors** high: 7 low:13

The Appendix includes the results of analysis of the selected 20 projects, with respect to the afore-presented 26 variables.

4. Discussion

The discussion of our findings is structured in two levels: in a more generic, we comment on the barriers (and the different 'types') of Interreg Programme, and in the second one, we focus on the 20 selected projects.

A major consideration of the related literature has to do with contributing to the adaptation of policies to the new scenery, as it is shaped by findings and progress in matters dealt with in projects. That is to say partners are concerned about how to exploit the outcomes of their work after the end of the project and enhance its impact (Harguindéguy and Bray, 2009; Medeiros, 2011; Decoville, 2013).

Recognising and managing the barriers encountered in project design and implementation is an important lesson learnt from previous projects. Besides, the Interreg initiative itself has been striving to remove all obstacles associated with cross-border regions by introducing cooperative structures and instruments. Several typologies of barriers have been suggested in the literature.

A meso-macro approach was proposed by Reitel et al. (2018), who discussed three types of obstacles with respect to cross-border cooperation. Political and societal obstacles refer to the organisation of societies and the difficulty to establish cross-border territory governance. Functional obstacles mainly relate to coordination in legal, administrative and technical issues. Economic obstacles have essentially to do with funding limitations. Moreover, the above types of obstacles are mutually feeding each other. To deal with them it is necessary to establish mechanisms that may be reused and evolve. The development and exchange of best practices is commonplace in Interreg projects and are associated with innovation diffusion. Knippschild and Vock (2017) recognise this fact but they add that it is necessary to examine regional and national contexts as well as the establishment of common cooperation structures. Fitjar et al. (2013) analysed the extent at which partners of Interreg projects were able to foster advances in policies. They suggest that there are several reasons that shape this ability. First and foremost, it has to do with the levels of authority over the policy area. Then, it depends on whether the project builds on established networks and whether it involves top-ranking officials.

Furthermore, it is affected by the relative position of the partner in the consortium, which will indicate its potential to influence the course of the project.

A micro-meso approach was proposed by Cholewa et al. (2019), who state that the qualitative analysis of projects implementation can reveal the main barriers in reaching their objectives. By analysing two Interreg projects they concluded that these barriers are: (1) semantic, which refers the varying levels of partners; (2) language, which is about having to collaborate in a language there than your mother tongue; (3) organisational, which refers to the complicated bureaucratic processes and the lack of coordination among partners; (4) resource, which is mainly focused on the access to necessary data; and (5) project-specific that has to do with some certain issues dealt in projects that cannot be generalised. Cholewa et al. (2019) proceeded with some suggestions to face some of these problems, A first recommendation is about the preparation of the application for funding. It has to do with the composition of the consortium and the skills needed to implement the project. In addition, the feasibility of the proposed tasks has to be assessed. Next, the authors suggest the development of a common repository of knowledge in order to assist partners to reach a certain level and be able to cooperate efficiently. With respect to language barriers, partners are encouraged to exercise their skills during project events together with project stakeholders. In addition, when necessary, the assistance of translators could further facilitate communication and comprehension during the project activities. From an organisational point of view the authors recommend (1) the formation of an effective project team, (2) the establishment of efficient communication, (3) the stimulation of the interest of partners in order to boost motivation and (4) the continuous integration of partners in project progress.

With respect to the ongoing Interreg projects, a significant oxymoron must be noted: the most popular topic, i.e. environment and resource efficiency, is not one of the main priorities of the ERDF. Moreover, there is no project falling into the priority “Enhancing access to, and use and quality of, information and communication technologies”, which is declared to be one of the main priorities of the ERDF.

Focusing on the 20 selected projects that were the main subject of analysis in this paper, the selected *Interreg Topic* (variable#5) of each project, provides initial evidence of the intention/vision of each Interreg project. Considering that these projects were selected on the basis of “bio-economy”, one should anticipate the strong percentage (12/20) of the ‘Environment and resource efficiency’, but in the same vein, one may also remark that a higher percentage for the topic of ‘low-carbon economy’ should be expected. In a similar perspective, it is an (unpleasant) surprise that 13 of the 20 projects have no specific orientation (variable#24) towards Bioeconomy, a trend which is confirmed by the similar results in the orientation towards circular economy (variable#25).

Overall, one may summarise the above findings into the following areas of interests:

1. *effectiveness*, where we assess the ability of each project to be successful and provide specific results. At this preliminary stage of development, we assess effectiveness in terms of (current) degree of *communication*, and sectoral orientation (as it is expressed in the project description).

2. *innovativeness*, where each project is assessed with respect to its trend of adopt/develop a technological (product or process) or an organisational innovation.

3. *greenness*, where we explore the ability of being 'bioeconomic' and 'circular'.

In other words, each area of interest may be assessed according to specific criteria, which are connected to specific variables of the dataset. The results are presented in Table 4, where one may conclude that in total (and in all individual categories), the overall picture is not positive.

Table 4: An assessment of Interreg projects

Area of Interest (# of variables)	Criterion	{number of projects}	
		Low	High
Effectiveness (22, 23)	1. sectoral orientation	9	11
	2 degree of communication	16	4
Greenness (23, 24)	3. bioeconomy orientation	7	13
	4. circular economy orientation	15	5
Innovativeness (26)	5. technological (product/process)	20	0
	6.organisational (business model)	14	6
	Total (…/120)	*91*	*39*

5. Conclusion

This paper sought to discuss the regional dimension of circular economy, and more specifically, it provided evidence on the contribution of the 'Interreg Initiative' in the direction of EU 'Bioeconomy Strategy'.

One may summarise the afore-mentioned results and discussion may in the following conclusions:

- the (strong majority of) selected projects do not present a specific focus/orientation on Bioeconomy (or even on the wider Circular Economy) vision
- the projects focus on the (quite vague described) dimension of organisational innovativeness, while they do not have a significant contribution towards (adoption or development of) technological innovation
- the selected cases present also a rather low performance, with respect to both sectoral orientation and degree of communication.

We stressed on the fact that is a work in progress, based on preliminary results of ongoing projects. In this vein, there is much work to be done, and towards this end, we may suggest the following directions for future research:

- conduct a content analysis of the publications (good practices, action plans, etc.) which have been developed by the selected projects
- focus on specific projects with a strong orientation towards bioeconomy (see variables #22-23), and collect data through empirical/primary research

- combine the above directions, and the corresponding findings into a holistic theoretical framework[4], which may guide the analysis and comparative study of existing funding initiatives towards bioeconomy.

The transition towards a bio-economic paradigm is still in its infancy, and opens new roads for industry practitioners, policy makers, and scholars from academia.

References

[1] Aguilar-Hernandez, G. A., Sigüenza-Sanchez, C. P., Donati, F., Rodrigues, J. F. and Tukker, A. (2018). Assessing circularity interventions: a review of EEIOA-based studies. *Journal of Economic Structures*, 7(1), 14.

[2] Cholewa, M., Helman, J., Molasy, M. and Rosienkiewicz, M. (2019). Identification of challenges to be overcome in the process of enhancing innovativeness based on implementation of central European projects funded from Interreg programme. In Burduk, A., Chlebus, E. Nowakowski, T. and Tubis A., (eds.), *Advances in Intelligent Systems and Computing*, Springer, pp. 185-194.

[3] Cosmi, C., Salvia, M., Leo, S. Di, Pietrapertosa, F. and Loperte, S. (2017). Interregional cooperation as a key tool for the achievement of strategic-energy and climate targets: The experience of the INTERREG IVC RENERGY and SEE RE-SEEties projects. In Bisello, A., Vettorato, D., Stephens, R. and Elisei, P., (eds.), *Smart and Sustainable Planning for Cities and Regions*, Springer, pp. 335-352.

[4] De Besi, M. and McCormick, K. (2015). Towards a bioeconomy in Europe: National, regional and industrial strategies. *Sustainability*, *7*(8), 10461-10478.

[5] Decoville, A., Durand, F., Sohn, C. and Walther, O. (2013). Comparing Cross-border Metropolitan Integration in Europe: Towards a Functional Typology, *Journal of Borderlands Studies*, 28(2), pp. 221-237.

[6] Dudek, M. and Wrzochalska, A. (2017). Making Development More Sustainable? The EU Cohesion Policy and Socio-Economic Growth of Rural Regions in Poland, *European Journal of Sustainable Development*, 6(3), pp. 189-200.

[7] European Commission (2012). *Innovating for sustainable growth: A bioeconomy for Europe*. Publications Office of the European Union.

[8] European Commission (2019, A). Updated Bioeconomy Strategy 2018 [Online]. Available: https://ec.europa.eu/knowledge4policy/publication/updated-bioeconomy-strategy-2018_en

[9] European Commission (2019, B). Interreg post 2020 - Regional and Urban Policy - European Commission [Online]. Available: https://ec.europa.eu/newsroom/regio/item-detail.cfm?item_id=630400.

[4] See our similar work on eco-industrial parks (Mouzakitis, 2017), and sustainable grassroots innovations (Mouzakitis and Adamides, 2019).

[10] Fitjar, R. D., Leknes, E., and Thygesen, J. (2013). Europeanisation of regional policy making: A Boolean analysis of Norwegian counties' participation in the EU's Interreg programme. *Environment and Planning C: Government and Policy*, 31(3), pp. 381-400.

[11] Golembiewski, B., Sick, N. and Bröring, S. (2015). The emerging research landscape on bioeconomy: what has been done so far and what is essential from a technology and innovation management perspective? *Innovative Food Science & Emerging Technologies*, *29*, 308-317.

[12] Global Bioeconomy Summit (2018). The official conference report of the GBS 2018: Innovation in the global bioeconomy for sustainable and inclusive transformation and wellbeing. Berlin, Germany: German Bioeconomy Council.

[13] Harguindéguy, J-B and Bray, Z. (2009). Does cross-border cooperation empower European regions? The case of INTERREG III-A France–Spain", *Environment and Planning C: Government and Policy*, 27, pp. 747–760.

[14] Interreg (2019, A). About Interreg | What is Interreg and how it works [Online]. Available: https://interreg.eu/about-interreg/.

[15] Interreg (2019, B). Explore Interreg: filters to modify/refine results. [Online]. Available: https://www.interregeurope.eu/search/

[16] Interreg (2019, C). Approved Projects | Interreg Europe [Online]. Available: https://www.interregeurope.eu/discover-projects/.

[17] Knippschild, R. and Vock, A. (2017). The conformance and performance principles in territorial cooperation: a critical reflection on the evaluation of INTERREG projects. *Regional Studies*, 51(11), pp. 1735-1745.

[18] McCormick, K. and Kautto, N. (2013). The bioeconomy in Europe: An overview, *Sustainability*, *5*(6), 2589-2608.

[19] Medeiros, E.J.R. (2011). (Re)defining the Euroregion concept, *European Planning Studies*, 19(1), pp. 141-158.

[20] Mouzakitis, Y. (2017). Governing the sustainability transition towards a circular economy of eco-industrial parks: a conceptual model for the role of management agencies of industrial estates. *International Journal of Decision Sciences, Risk and Management*, *7*(3), 219-231.

[21] Mouzakitis, Y., and Adamides, E.D. (2019). 'The bottom-up side of eco-innovation: mapping the dynamics of sustainable grassroots innovations' in Ball, P. et al. (ed.) Sustainable Design and Manufacturing 2019 (Smart Innovation, Systems and Technologies Series 70), Singapore: Springer, pp. 61-71.

[22] Mouzakitis, Y., Aminalragia-Giamini, R. and Adamides, E.D. (2017). 'From the treatment of olive mills wastewater to its valorization: towards a bio-economic industrial symbiosis' in Campana, G. et al. (eds.) Sustainable Design and Manufacturing 2017 (Smart Innovation, Systems and Technologies 155), Cham: Springer, pp. 267-276.

[23] OECD. Publishing. (2009). *The bioeconomy to 2030: designing a policy agenda*. Organisation for Economic Co-operation and Development.

[24] Pfau, S. F., Hagens, J. E., Dankbaar, B. and Smits, A. J. (2014). Visions of sustainability in bioeconomy research. *Sustainability*, *6*(3), 1222-1249.

[25] Potluka, O., Spacek, M. and von Schnurbein, G. (2017). Impact of the EU Structural Funds on Financial Capacities of Non-profit Organizations, *VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations*, 28(5), pp. 2200-2223.

[26] Reitel, B., Wassenberg, B. and Peyrony, J. (2018). The INTERREG experience in bridging European territories. A 30-year summary. In Medeiros, E., (ed.), *Urban Book Series*, Springer, pp. 7-23.

[27] Spatial Foresight, S. W. E. C. O. (2014). ÖIR, t33, Nordregio, Berman Group, Infyde (2017). Bioeconomy development in EU regions. Mapping of EU Member States'/regions' Research and Innovation plans & Strategies for Smart Specialisation (RIS3) on Bioeconomy for 2014-2020.

[28] Staffas, L., Gustavsson, M. and McCormick, K. (2013). Strategies and policies for the bioeconomy and bio-based economy: An analysis of official national approaches. *Sustainability*, *5*(6), 2751-2769.

Appendix

Table A1: a dataset of the selected projects_1

#	Name	Variable														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Bioregio	2017	2021	60	1.5	4	FI	2	6	8	3	3	1	0	0	1
2	Ceci	2019	2023	48	1.5	4	FI	2	6	8	4	1	0	2	0	1
3	Cesme	2017	2021	60	1.3	4	GR	1	6	9	6	0	0	2	1	0
4	Circe	2017	2021	48	1.9	4	IT	1	8	8	6	0	0	1	0	1
5	ColorCircle	2019	2023	48	1.2	4	FR	2	5	6	3	2	0	1	0	0
6	Ecowaste4F	2017	2020	48	1.5	4	FR	3	7	8	7	0	1	0	0	0
7	Enhance	2017	2020	48	1.1	4	ES	1	5	6	2	1	0	0	3	0
8	ExtraSMEs	2018	2023	65	1.8	2	GR	1	8	9	5	2	1	0	0	1
9	Locarbo	2016	2020	54	1.6	3	IT	1	6	7	5	1	0	1	0	0
10	RCIA	2017	2021	60	1.9	2	AT	4	9	9	4	0	0	4	0	1
11	Reduces	2019	2023	42	1.4	4	FI	2	7	10	3	5	0	0	0	2
12	Replace	2019	2023	42	1.7	4	IT	1	9	9	7	1	0	0	1	0
13	Resolve	2016	2021	60	2.0	3	NL	1	8	9	8	1	0	0	0	0
14	Retrace	2016	2020	48	1.4	4	IT	2	5	8	4	2	0	1	1	0
15	RuralGrowth	2016	2020	54	1.5	2	HU	1	7	7	4	1	0	0	0	2
16	SilverSMEs	2018	2023	60	1.9	2	ES	1	7	9	6	1	0	1	0	1
17	Since-AFC	2019	2023	48	1.5	2	GR	1	7	9	8	1	0	0	0	0
18	SmartPilots	2016	2020	48	0.9	1	BE	5	4	6	2	0	1	1	0	2
19	Symbi	2016	2021	60	1.6	4	ES	4	7	9	5	1	0	2	0	1
20	WLE	2019	2023	48	1.2	4	NL	1	5	8	5	0	0	0	3	0

Table A2: a synopsis of the variables_1

#	Name	Values
1	Starting Date	(year)
2	Closing Date	(year)
3	Duration	(months)
4	Budget	(mil. Euros)
5	Interreg Topic	1: Research and innovation; 2: SME competitiveness; 3: Low-carbon economy; 4: Environment and resource efficiency
6	Leader Country	AT: Austria; BE: Belgium; ES: Spain; FI: Finland; FR: France; GR: Greece; HU: Hungary; IT: Italy; NL: The Netherlands;
7	Leader Type	1: Public Authority; 2: University; 3: Research Centre; 4: Innovation Centre; 5: Other
8	Participants_Countries	(number of countries)
9	Participants_Partners	(number of partners)
10	Partners_Authorities	(number of public authorities)
11	Partners_Universities	(number of universities)
12	Partners_Research	(number of research centres)
13	Partners_Innovation	(number of innovation centres)
14	Partners_Environment	(number of environmental consultancies)
15	Partners_Miscellaneous	(number of miscellaneous organisations)

Table A3: a dataset of the selected projects_2

#	Name	Variable										
		16	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
1	Bioregio	n	y	y	y	y	y	4	h	2	1	3
2	Ceci	y	n	n	y	n	n	1	l	0	0	3
3	Cesme	n	n	y	y	n	n	2	l	0	0	3
4	Circe	n	n	y	y	n	n	2	l	0	0	3
5	ColorCircle	n	n	n	n	n	n	0	l	0	0	3
6	Ecowaste4F	y	y	y	y	n	y	3	h	2	1	3
7	Enhance	n	n	y	y	n	y	3	l	0	0	0
8	ExtraSMEs	y	y	y	y	n	n	2	h	2	0	0
9	Locarbo	n	n	y	y	n	n	2	h	0	0	3
10	RCIA	y	n	y	y	n	n	2	h	0	0	0
11	Reduces	n	n	n	n	n	n	0	l	0	0	0
12	Replace	y	n	n	y	n	n	1	l	0	1	0
13	Resolve	y	n	y	y	n	n	2	h	0	4	3
14	Retrace	n	n	y	y	n	n	2	l	0	0	0
15	RuralGrowth	y	n	y	y	n	n	2	h	0	0	0
16	SilverSMEs	y	y	y	y	n	n	2	h	1	0	0
17	Since-AFC	n	y	n	n	n	n	0	h	2	1	0
18	SmartPilots	n	y	y	y	n	y	3	l	2	0	0
19	Symbi	n	y	y	y	n	n	2	l	2	0	0
20	WLE	y	y	n	y	n	n	1	l	2	0	0

Table A4: a synopsis of the variables_2

#	Name	Values
16	Partners Advisory	y: Yes; n: No
17	Partners Bioeconomy sectors	y: Yes; n: No
18	Good Practices	y: Yes; n: No
19	Library	y: Yes; n: No
20	Newsletter	y: Yes; n: No
21	Action Plan	y: Yes; n: No
22	degree of communicativeness	(total number of 'yes' in 16-20) (.../4)
23	Orientation Sectoral	l: Low; h: High
24	Orientation Bioeconomy	0: no specific, 1: health & wellbeing, 2: biological resources, 3: innovative breakthroughs
25	Orientation_ Circular Economy	0: no specific; 1: closing supply chains 2: residual waste management; 3: product lifetime extension; 4: resource efficiency
26	type of Innovation	0: no specific; 1: product; 2: process; 3: business model