Lecture Notes in Networks and Systems 639

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New Metropolitan Perspectives

Transition with Resilience for Evolutionary Development

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Contents

Assessing the Role of the Blue Economy in the Comprehensive Development of Lagging Coastal Areas. A Case Study of Calabria

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Abstract. Global warming has been having profound and wide-reaching consequences on the environment. Marine ecosystems have been at the nexus of these crises. Furthermore, the Covid-19 has exacerbated existing global inequalities across Marine sectors. Over the recent decade, Blue Growth has been considered a call for holistic management of the complex marine social-ecological system. Furthermore, it has shown the potential to coordinate efforts to combat the effects of climate change. Blue Growth industries could help accelerate recovery towards inclusive growth over the post-COVID-19 in the lagging coastal regions. Considering these premises, this study focuses on highlighting the characteristics of Blue Growth industries in Calabria – one of the lagging coastal in Southern Italy – to sustain the region's economic development. It investigates the regional characteristics and intersectoral linkages within the Blue Growth industries. Cluster-based analysis allows us to better understand the interconnections between different sectors within the industries. The paper's results offer new insights into Blue Growth industries' size and specialization in Calabria. The analysis in this paper detects the gaps and potentials in the exciting sectors in Blue Growth and therefore constitutes a practical first step in a series of more comprehensive examinations of Blue Growth patterns in Calabria.

Keywords: Clusters · emerging industries · Blue Growth · Calabria · regional analysis · community-based · network analysis

1 Introduction and Context

The currently observed changes to the earth system are unprecedented in human history. Since World War II, the world's population has soared and a conflict between economic growth and environmental protection has emerged [1]. The population has a tremendous impact on water, energy usage, agricultural lands, and the environment [2]. Cities grapple daily with issues related to the management of water systems and water scarcities [3], electricity shortages (by the impact on hydropower and plant cooling), and water-related diseases (through the use of contaminated water) [4]. As human pressure

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on the Earth system accelerate, unexpected critical global, regional, and local impacts are likely to appear [5, 6]. Hence, Sustainable Development Goals (SDGs) were born in 2015 to protect our planet, end poverty, and ensure that all people enjoy peace and prosperity. Additionally, the adaptation of Paris Agreement is another step to keeping global warming under two degrees Celsius and strengthening countries' ability to cope with the impacts of climate change [7]. The question, however, remains; can economic growth be reconciled with environmental sustainability? Although the Sustainable Development trajectory can be achieved, there is the risk of pursuing one at the expense of the others [8]. In other words, some goals could be easily achieved while disregarding the environment.

A sustainable ocean economy can play a crucial role in keeping 1.5 degrees within reach while providing jobs, reducing inequality, supporting food security, sustaining biodiversity, and boosting resilience [9–11]. Oceans are the Earth's largest natural carbon sink [12]. They absorb roughly 93% of the heat that comes from any greenhouse gas emissions. The oceans have already absorbed 30% of total anthropogenic CO2 emissions since the 1980s [13]. Thus, they are an essential regulator when it comes to global warming. However, this continued warming has led to rising acidification, ocean warming, and damage to its critical ecosystem [14]. It, therefore, places some management emphasis on resilience as an essential design feature in an uncertain world that is not only about bouncing back but is to be prepared [15].

Oceans cover around 71% of our planet, and areas in the coastal waters around the margins of the continents are considered the most productive areas [16]. These areas encompass 66 naturally occurring large marine ecosystems[1], which together produce 75% of global marine fish catches and contribute more than 12 trillion US dollars annually to the global economy [18]. However, these rich coastal seas face increasing threats from impacts like climate change, overfishing, and marine pollution, undermining the services humans require from healthy marine ecosystems [19]. Thus, there has been a very narrow focus on managing most marine activities [20]. The aim is to sustain the production potential for ecosystem goods and services, rather than managing single commodities without regard to the impacts on other parts of the ecosystem [21]. This means that multiple spatial scales need to be considered, and the perspectives need to be long-term rather than more typical short-term views that influence sectoral interests. So, from here, the globe started to shed light on the so-called "Blue Growth" and those interconnections between different sectors. Scholars and activists started looking for achieving win-win efficiency for all sectors. As to measure the efficiency of one sector and achieving its growth, it has to be measured with at least one more sector.

Blue Growth is a relatively new framework for ocean management [22–24]. The roots of its concept can be traced back to the concept of Sustainable Development (SD). SD started in the 1960s as a challenge to start achieving sustainable use of natural resources while at the same time securing social and economic developments. Since then, there have been three milestones in the development of SD. First, at the first United Nations (UN) conference on SD in Stokholm in 1972, the environmental dimension was defined.

[1] The world's oceans have been divided into 66 Large Marine Ecosystems (LMEs). These are defined as near coastal areas where primary productivity is generally higher than in open ocean areas [17].

Then, the economic dimension was the spot in Rio 1992 at the second UN conference on SD. Lastly, in 2002 in Johannesburg, the social dimension was defined at the third UN conference on SD. At Rio+ 20 that held in Rio in 2012, Blue Growth as a new concept was first conceived and took centre stage. This concept was a start to push governments to begin thinking about how to use the natural resources in oceans by combining the aspects of economic growth and environmental sustainability. Blue Growth implies making better use of the oceans via improved natural resource management across different sectors [25]. After the Blue Growth concept was introduced at the Rio+ 20 conference, it has been widely used and become necessary in aquatic development in many countries, regionally and internationally [23].

Smith-Godfrey identified Blue Growth as "the sustainable industrialisation of the oceans to the benefit of all" [26]. It connects the different ocean industries [22], for instance, fishing, shipping, tourism, and marine ecosystem services such as coastal protection and carbon storage [22]. Understanding such interactions (e.g., shipping impacts on the fishing industry) helps manage all components together, which tends to produce optimal outcomes at the system level [27]. However, this imposes challenges rooted mainly in complexity and scale [28]. Although these challenges are surmountable, they demand a pragmatic approach [29]. Such an approach explicitly recognises the existence of underexplored potentials.

Before the COVID-19 pandemic hit, Blue Growth industries such as fishing, energy, shipping, and tourism had been estimated to contribute 2.5% of world gross value-added; that value was predicted to double by 2030 [30]. However, the pandemic has hit hard the ocean sectors and global supply chains [31]. For example, the maritime tourism sector was one of the first sectors affected by the outbreak, with global reporting of COVID-19 cases among crew members and passengers on cruise ships [32]. Moreover, the linkages between blue sectors and land-based industries mean that the pandemic has broader impacts beyond these individual sectors but across the entire economy [31]. Therefore, a sustainable and holistic recovery strategy is critical for the well-being and resilience of communities and economies at large.

For this reason, the European Union has made great efforts to successfully implement the principle of cohesion by investing in infrastructure and aiding regions [33]. In 2014, the European Maritime and Fisheries Fund (EMFF) was adopted for the 2014–2020 period to support the objectives of the Europe 2020 strategy for smart, sustainable, and inclusive growth. More recently, European Commission proposed to renew the EMFF in order to continue supporting the implementation of the Common Fisheries Policy (CFP), the EU Integrated Maritime Policy, and increase territorial cohesion in the field of ocean governance [34]. As a result, the fund was renamed European Maritime Fisheries and Aquaculture Fund (EMFAF) 2021–2027. It aims to unleash the growth potential of a sustainable Blue Economy toward a more prosperous future for coastal communities [35]. The fund supports the European Green Deal's goals and helps achieve goal 14 of SDGs [36]. It aims at stimulating the growth of Blue Economy through; 1) assisting fishers transitioning to a sustainable fishery capture; 2) encouraging coastal regions in diversifying their economies; 3) increasing job opportunities through financing European coasts projects; 4) enhancing sustainable aquaculture developments[2].

[2] https://aac-europe.org/images/EC_EMFF.pdf.

In this research, Calabria is used to assessing regional economic growth through Blue Growth industries. Our primary research question is: can Blue Growth be the potential for a sustainable and inclusive transition in Calabria? We tackled this question by analysing the Blue Growth industries' performance by measuring their size and specialisation. The following section focuses on defining the case study and its blue economy. Section 3 provides the methodology, defining the extent of Blue Growth in Calabria and the tools used. Section 4 presents the gaps and specialisations in the exciting sectors in Blue Growth. Finally, Sects. 5 and 6 raise some issues that emerge when framing the Blue Economy within regional development and therefore constitute a useful first step in a series of more comprehensive examinations of Blue Growth patterns in Calabria.

2 Methodology

2.1 Area of Study

Our area of study is Calabria region in Southern Italy. The region has long been one of the poorest in Italy. The disparity in Italy is huge; Lombardy region, for example, has the highest regional GDP - roughly 400 billion euros – which accounts for more than one-fifth of the Italian GDP, while all eight Southern regions as whole produce less than Lombardy[3]. Italy is considered the only country in Europe with the most substantial and persistent territorial inequalities with an extraordinary degree of geographical concentration; among 173 European regions, the five poorest are in Southern Italy [37]. In OECD report for 2018 on Italy's regions and cities, it stated that "Italy has the largest regional disparities among OECD countries in unemployment rates, and the second largest in terms of safety" [38]. In 2020, the six regions with the lowest unemployment rate were in Southern Italy, with around 19% of Calabria's population unemployed [39]. "In 2019, almost one in four women in Calabria were without a job, whereas the share of unemployed males was of 20.2%"[4]. Therefore, in this study, we try to focus on this lagging region and assess its economic growth and the potential that could help it develop.

Regarding Blue Economy, on the one hand, Italy is one of the most significant contributors to the EU Blue Economy employment. It is specialised in labour-intensive sectors such as Coastal tourism or Extraction of living resources [40]. The Italian Blue Economy is dominated by the coastal tourism sector and Maritime transport. The Mediterranean Sea has been crucial to the economy of coastal cities [41]. Its traditional sectors (aquaculture, fisheries, coastal and marine tourism, shipping, shipbuilding/repair, and ports) and new maritime economy sectors (such as blue biotechnology, ship recycling, and ocean energy) have enormous potential for prosperity and inclusion growth[5]. There are several projects in the Mediterranean Sea in which Italy has participated to promote its Blue Economy transition [42]. On the other hand, Calabria is a coastal region that occupies the southernmost tip of Italy with an area of 15,081 km^2 with a total of 1,877,728 inhabitants in 2021 and presents a population density of 124.5/km^2 (Eurostat, 2020). Calabria is a statistics NUT III Region and integrates 5 provinces (NUTS III): Catanzaro, Cosenza,

[3] https://www.statista.com/statistics/793266/gdp-in-italy-by-region/.

[4] https://www.statista.com/statistics/778264/unemployment-rate-in-italy-by-region/.

[5] https://www.unep.org/unepmap/resources/factsheets/blue-economy.

Fig. 1. Map of the 45 Local labour Market Areas (LMA) in Calabria

Crotone, Reggio di Calabria, and Vibo Valentia that contain 44 Local labour Market Areas (LMA) (See Fig. 1). It is bordered by Basilicata to the north, the Gulf of Taranto to the east, the Ionian Sea to the south, the Strait of Messina to the southwest, which separates it from Sicily, and the Tyrrhenian Sea to the west. The Blue economy's potential has emerged in recent years in the Calabria, even though a coordinated effort has yet to emerge. The Mediterranean Sea is a development space that, if used sustainably, may lead to economic prosperity and contribute to the region's stability by creating jobs and innovative business opportunities in the maritime sectors [42]. Nevertheless, information about how the marine system works in Calabria is scarred. In the following section, we will give an in-depth examination of the Blue Growth industries in Calabria in terms of its size and specialisation.

2.2 Methods

In order to understand a system and evaluate the economic growth of a given region, the inter-sectoral relationships should be examined [43]. By dividing the economic system into interrelated sectors, clusters show exactly which sectors are closely related [44, 45]. Porter introduced the concept of industry clusters as groups of interconnected firms, suppliers, related industries, and specialised institutions in particular fields that are located in particular locations [46]. Industry cluster analysis facilitates revealing the spatial configuration of innovation and understanding of the performance factors and innovation flows, which will emphasize the potential elements of a regional innovation eco-system [47]. Porter focused on how the mutual transparency and knowledge exchanges in spatial proximity can enhance the competitiveness of a region by encouraging local innovation processes [48]. In times of crisis, clusters prove capabilities to ensure quick information flow and technological capacities. Therefore, they are crucial in playing a pivotal role in Europe's recovery from the crisis. In the beginning, clusters were defined in the US by proposing 51 traded clusters [49]. From the 51 traded clusters, ten Emerging Industries were defined based on employment growth and overall size [50]. The selection of the sectors in the emerging industries reflects the strong competitiveness potential of these sectors [51]. European Panorama of Clusters and Industrial Change analysis showed that emerging industries stood their ground better during the economic crisis, unlike traded clusters [52]. Blue Growth industries is considered one of the emerging industries. Emerging industries were shaped and affected by a number of megatrends [53] which are defined as "sustained forces on a global and macroeconomic level that influence the developments of business, environment, economy, society, cultures, and citizens' lives on a local and global scale" [54]. As for Blue Growth industries, it was affected by the changing mobility paradigm, driven by automation, green and circular economy, and smart mobility trends [55]. These industries cover traditional and new, and high-growth sectors [52]. It consists of 33 sectors (Table 1) that evolved from 15 clusters (Fig. 2).

Our study focuses on selected characteristics depicting the Blue Growth industries' current and past dynamics. We follow the European Observatory for Clusters and Industrial Change (EOCIC) methodology for measuring the Blue Growth industries' performance existing in Calabria region. The EOCIC shows the extent to which clusters have achieved this specialised critical mass by employing measures such as (size, specialisation, and productivity). This study examined the industries' size and specialisation by measuring the employment, establishments, and Location Quotient (LQ). The size is measured by the number of employees within the industry. On the other hand, LQ provides insights into the employment specialisation of the region. We then added a few additional calculations based on EOCIC 2020 report. The new LQ additional formulas consist of the number and size of plants, represented by the Plant and Size Quotient respectively. We retrieved our data from the Italian National Institute of Statistics (ISTAT). After data collection, the next step was to check the internal consistency of the indicators as appropriate for our study. Our focus is on LMA, it is "*a geographical area surrounding a central city (or cities a few miles apart) in which there is a concentration of labour demand, and in which workers can change their jobs without changing their residences*" [56]. Labour markets are crucial for the performance of the cluster and one

Table 1. It shows the sectors in Blue Growth industries as was classified in the Statistical Classification of Economic Activities in the European Community (NACE), which are cutting across different clusters

Blue Growth industries	NACE Code	Sectors' names	Cluster
	35.12	Transmission of electricity	Electric power generation and transmission
	35.11	Production of electricity	
	79.11	Travel agency activities	Hospitality and tourism
	77.32	Renting and leasing of construction and civil engineering machinery and equipment	Distribution and electronic commerce
	52.10	Warehousing and storage	
	46.14	Agents involved in the sale of machinery, industrial equipment, ships and aircraft	
	77.34	Renting and leasing of water transport equipment	
	42.91	Construction of water projects	Construction products and services
	73.11	Advertising agencies	Marketing, design, and publishing
	72.19	Other research and experimental development on natural sciences and engineering	Education and knowledge creation
	52.22	Service activities incidental to water transportation	Water Transportation
	33.15	Repair and maintenance of ships and boats	
	50.10	Sea and coastal passenger water transport	
	50.30	Inland passenger water transport	
	50.40	Inland freight water transport	
	30.11	Building of ships and floating structures	
	30.12	Building of pleasure and sporting boats	
	50.20	Sea and coastal freight water transport	
	25.99	Manufacture of other fabricated metal products n.e.c	Downstream metal products

(*continued*)

Table 1. (*continued*)

	22.19	Manufacture of other rubber products	Vulcanized and fired materials
	28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	Production technology and heavy machinery
	28.22	Manufacture of lifting and handling equipment	
	36.00	Water collection, treatment and supply	Environmental services
	03.11	Marine fishing	Fishing and fishing products
	03.12	Freshwater fishing	
	10.20	Processing and preserving of fish, crustaceans and molluscs	
	52.24	Cargo handling	Transportation and logistics
	52.23	Service activities incidental to air transportation	
	52.29	Other transportation support activities	
	49.41	Freight transport by road	
	71.12	Engineering activities and related technical consultancy	Business services
	71.20	Technical testing and analysis	
	09.10	Support activities for petroleum and natural gas extraction	Oil and gas production and transportation

of its distinct constituent elements. It represents the local labour pool in which the transfer of knowledge and technology is easy between firms [57]. Therefore, the data were transformed from more than 400 local administrative units to 45 Local labour Market Levels and from NACE 3-digit level to NACE 4-digit level (Table 2).

Table 2. Data Frame Structure

	Year (2012–2019)	
Data type	**Number of establishments**	**Average number of employees**
NACE code	**Sector's code (4 digits)**	**Sector's code (4 digits)**
Italy		
South		
Calabria		
LMAs		

The retrieved data was for eight years, 2012 to 2019; however, the analysis shown in this article is only for 2019 to try to get the most recent picture of the system. We adopted size and specialisation measures. These measures are described as follows:

2.3 Size

Employment

We calculated the size by measuring the LMAs' share of the total Italian employment in Blue Growth industries. It is calculated using the following formula:

$$Size_{r,b} = \frac{e_{b,r}}{E_{b,i}} \tag{1}$$

where

$e_{b,r}$ is the employment in Blue Growth industries b in LMA r

and $E_{b,i}$ is the employment in Blue Growth industries b in Italy i

Establishments

As for the number of establishments, we used only the network visualisation to analyse the region's data. Nevertheless, the number of establishments was used later in the calculations of LQ.

Specialisation

Location Quotient (LQ)

The Location Quotients method is adapted to identify the extent to which clusters have achieved their specialisation. LQ compares the proportion of employment in Blue Growth industries in Local Labor Market Areas over the total employment in Italy to the proportion of total Italian employment in that Blue Growth industries over total Italian employment. The equation is as follows:

$$LQ_{b,r} = \frac{e_{b,r}/E_r}{e_{b,i}/E_i} \tag{2}$$

where

$e_{b,r}$ is the employment in Blue Growth industries b in LMA r

$e_{b,i}$ is the employment in Blue Growth industries b in Italy i

E_r is the total employment in LMA r

and E_i is the total employment in Italy i

Moreover, we added to the standard calculation of LQ, the EOCIC new measures of LQ. The additional measures of LQ help reveal large firms, SMEs, or both have a high contribution to the employment share in Blue Growth industries. It is calculated by Plant and Siza Quotient. It is as follows:

$$LQ_{b,r} = \frac{e_{b,r}/E_r}{e_{b,i}/E_i} = \tag{3}$$

$$Plant\ (Concentration\ SMEs) = \frac{f_{b,r}/E_r}{f_{b,i}/E_i}$$

$$multiplied\ by \tag{4}$$

$$Size\ (Concentration\ large\ firms) = \frac{e_{b,r}/F_r}{e_{b,i}/F_i}$$

where

$f_{b,r}$ is the number of firms in Blue Growth industries b in LMA r

E_r is the total employment in LMA r

$f_{b,i}$ is the number of firms in Blue Growth industries b in Calabria/Italy i

E_i is the total employment in Calabria/Italy i

$e_{b,r}$ is the employment in Blue Growth industries b in LMA r

$F_{b,r}$ is the total number of firms in Blue Growth industries in LMA r

$e_{b,i}$ is the employment in Blue Growth industries b in Calabria/Italy i

and E_i is the total number of firms in Calabria/Italy i

Other elements that were introduced by EOCIC are Beta Size and Beta Plant. They measure the influence of large firms and the influence of SMEs, respectively.

$$Plant\ Beta(influence\ SMEs) = \frac{covariance\ (plant\ formula; LQ\ formula)}{\text{Variance(LQ formula)}} \tag{5}$$

$$Size\ Beta(influence\ large\ firms) = \frac{Covariance\ (size\ formula; LQ\ formula)}{\text{Variance(LQ formula)}} \tag{6}$$

The point of this second measure is that the employment in Blue Growth industries might be made up for the most part by large companies in a region. However, the industries within the same region might experience high levels of influence by SMEs. If the number is higher than 0.55 that indicates strong influence or dominance by either large companies, SMEs or both. In particular, "A strong influence by number and/or size is seen if the value of beta is above 0.55. In other words, SMEs are said to exert influence on emerging industries in a region if Plant Beta is above 0.55 and Size Beta below 0.55. Large firms are seen as key influencers if the Plant Beta is below and Size Beta above the stated threshold. Both Betas can be above 0.55 as well, meaning both SMEs and large firms strongly influence emerging industries in a region" [52]. In this step, we measured the influence of large firms vs SMEs at both scales – within the region and on the national scale. To do so, the first step was to calculate Plant and Size of each LMA with respect to Calabria. Then calculate the covariance and variance to get the Plant Beta and Siza Beta. After that, the same steps were taken but with respect to Italy. The only difference between the two steps is whether we take the number of firms and employees in Italy overall or only in Calabria region.

In addition to that, Social Network Analysis (SNA) was applied to analyze Calabria industries' networks. SNA is one of the promising tools for analysing and helping in a deep understanding of the system's complexity in terms of its inter-sectoral linkages and sectors' influence [58]. It maps the network structure of the regional Blue Growth industries and describes the intersectoral linkages and their relative size in each LMA. We use network analysis to build a relationship graph in which nodes are bipartite and represent LMAs and sectors in the Blue Growth industries, and edges are links between them. In the network, 'ties' resulted from the existence of the industrial sectors within LMAs. Networks allow us to describe the relations between the location and the sectors and evaluate the strength of connections [59]. Besides ECO methodology, two metrics

were extracted from the network graph, eigenvector centrality and betweenness centrality [58]. Eigenvector centrality shows the degree of strength of a node by measuring its direct connections to other connected nodes. Betweenness centrality is a measure of centrality based on the shortest paths. We chose these two metrics because they complement each other, with eigenvector centrality measuring the value of a node in the overall network and betweenness centrality within the network [60].

3 Results

First, we started by grasping an image of the structure of Blue Growth industries in Calabria. Figure 3 depicts the Blue Growth sectors and the clusters that link them. Fifteen clusters (shown in a circle layout) are the connection between the industries. Some of these connections are relatively narrow, based on only one sector. Others are broader, with 100% of the cluster being part of Blue Growth industry (e.g. "Fishing and fishing products" cluster).

Blue Growth sectors are formed in the vertical line on the left, and the colour of the nodes reflects the parent cluster. The horizontal line at the bottom of the figure shows the 45 LMAs in Calabria. It gives us an initial image of the most robust nodes for LMAs, clusters, and Blue Growth sectors. For LMAs, it shows that Cosenza, Catanzaro, and Reggio Calabria are the most powerful zones in Calabria. Furthermore, the pie charts in the LMAs' nodes show that the highest number of establishments in these LMAs are from "Distribution and electronic commerce" and "Business services" clusters. Moreover, "Fishing and fishing products" and "Electric power generation and transmission" clusters are 100% part of Blue Growth industries. Additionally, "Water transportation", "Distribution and electronic commerce", and "Transportation and logistics" clusters have the highest share of sectors in Blue Growth industries, 7, 4, 4 sectors, respectively. However, "Engineering activities and related technical consultancy" sector from "Business services" cluster contributes to the highest number of establishments for Blue Growth industries in Calabria for 2019. Although the European Commission already made this classification for Blue Growth industries, network visualisation helps us understand the linkages with the sectors and the associated clusters.

3.1 Employment

According to our results, Blue Growth industries in Calabria appears to have a minimal size compared to the rest of the country (Table 3). However, that does not mean there is no hope for these industries to grow. Possibilities and sustainable development for coastal communities will be attained but with challenging normative concepts and representations of economics [61]. The growth can be achieved by establishing a coherent and direct understanding of the industry and relationships in economic sectors. Therefore, it is essential to establish the proper and coherent network for Blue Growth industries by understanding that the place and its economies are unique.

Table 3 shows the LMAs with a high size percentage. These LMAs are Cosenza, Lamezia Terma, Reggio Di Calabria, Gioia Tauro, Catanzaro, and Vibo Valentia with the size of Cosenza (19.19%) more than the double size of the other LMAs. However,

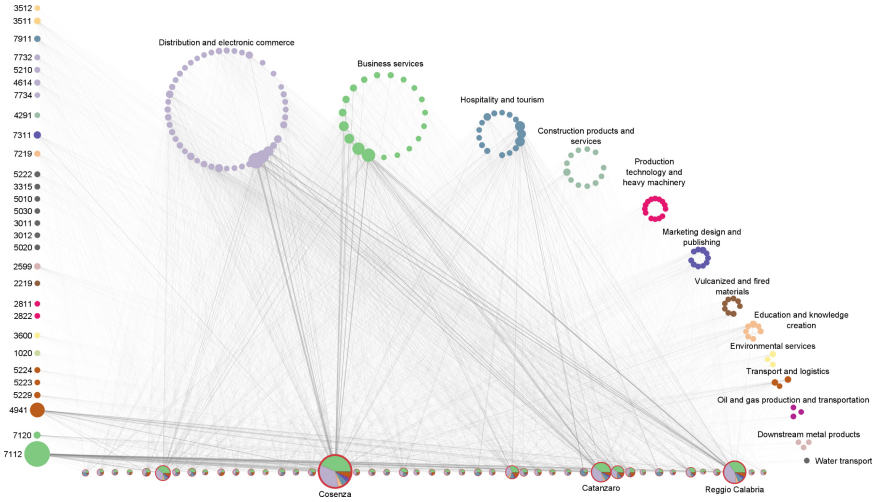

Fig. 2. Linkages between Blue Growth industries sectors and the parent clusters for the number of establishments in Calabria for 2019. **Legend:** Circles: clusters. Horizontal line: Local labour Market Areas. Vertical line: Blue Growth sectors

contradictorily, the size of Calabria's LMAs is almost nothing compared to Italy, with Calabria making up only 1.44% of the Blue Growth industries.

Betweenness centrality captures the nodes' role in allowing information to pass from one part of the network to the other. It indicates sectors and LMAs that act as bridges to others—in other words, having the most considerable effect on connecting the network as a whole. Our analysis shows that the highest sectors are "Engineering activities and related technical consultancy", "Freight transport by road", and "Travel agency activities", respectively. While the most dominant LMAs are, Crotone, Reggio Di Calabria, and Lamezia Terme. Interestingly enough, Cosenza comes in sixth place. Betweenness centrality also shows that "Sea and coastal freight water transport" sector has no control over the network. On the other hand, Eigenvector centrality dedicates the node's influence on the whole network. The numbers from the network showed the exact same tops as in Betweenness centrality. Engineering activities and related technical consultancy", "Freight transport by road", and "Travel agency activities" for sectors, and Crotone, Reggio Di Calabria, and Lamezia Terme for LMAs.

A deeper look at the internal distribution of the strengths and weaknesses of Blue Growth clusters is pivotal for fully understanding how the region is positioned for expanding its Blue Economy. Economic network visualisation played an essential role in our analysis. It helped in understanding regional economics and economic geography. As Fig. 4 shows, Freight transport by road sector acts as a "hub". It has the highest number of employees among all LMAs in Calabria, 6646.6 average number of employees. The highest proportion of that sector is in Cosenza, Lamezia Terme, and Cortona, with 903.3, 647.1, and 641.6 average number of employees, respectively. The second-highest number of employees is in Engineering activities and related technical consultancy sector, 4013.8 average number of employees, a quarter of that is in Cosenza with 965.9 average

Table 3. Employment size in Calabria's LMAs for 2019

LMA	Average employment in Blue Growth industries (2019)	Size of LMAs compared to Calabria	Size for Italy
Italy	1305084.25		
Calabria	18755.54		1.44%
Acri	195.53	1.04%	0.01%
Amantea	210.95	1.12%	0.02%
Belvedere **Marittimo**	138.21	0.74%	0.01%
Cariati	70.2	0.37%	0.01%
Cassano All'ionio	231.36	1.23%	0.02%
Castrovillari	571.2	3.05%	0.04%
Cetraro	62.7	0.33%	0.00%
Cosenza	3599.4	19.19%	0.28%
Mormanno	71.9	0.38%	0.01%
Paola	138.1	0.74%	0.01%
Praia A Mare	168.18	0.90%	0.01%
San Giovanni In Fiore	85.9	0.46%	0.01%
San Marco **Argentano**	342.7	1.83%	0.03%
Scalea	189.7	1.01%	0.01%
Catanzaro	1475.08	7.86%	0.11%
Chiaravalle Centrale	60.7	0.32%	0.00%
Sellia Marina	268.2	1.43%	0.02%
Soverato	359.07	1.91%	0.03%
Lamezia Terme	1679.82	8.96%	0.13%
Bianco	85	0.45%	0.01%
Bovalino	124.65	0.66%	0.01%
Delianuova	17.5	0.09%	0.00%
Gioia Tauro	1590.38	8.48%	0.12%
Locri	224.91	1.20%	0.02%
Marina Di **Gioiosa Ionica**	127.21	0.68%	0.01%
Melito Di Porto Salvo	146.46	0.78%	0.01%
Oppido Mamertina	32.62	0.17%	0.00%

(*continued*)

Table 3. (*continued*)

LMA	Average employment in Blue Growth industries (2019)	Size of LMAs compared to Calabria	Size for Italy
Polistena	535.5	2.86%	0.04%
Reggio Di Calabria	1606.01	8.56%	0.12%
Roccella **Ionica**	81.2	0.43%	0.01%
Rosarno	551.44	2.94%	0.04%
Sant'eufemia D'aspromonte	43.28	0.23%	0.00%
Stilo	86.8	0.46%	0.01%
Taurianova	146.45	0.78%	0.01%
Cirò Marina	165.41	0.88%	0.01%
Crotone	1225.32	6.53%	0.09%
Mesoraca	26.2	0.14%	0.00%
Petilia Policastro	185.2	0.99%	0.01%
Serra San Bruno	42.86	0.23%	0.00%
Soriano Calabro	61.66	0.33%	0.00%
Tropea	162.57	0.87%	0.01%
Vibo Valentia	1403.25	7.48%	0.11%
Corigliano-Rossano	152.47	0.81%	0.01%
Nova Siri	26.53	0.14%	0.00%

number of employees. The highest number of employees are in Cosenza, Lamezia Terme, Reggio Di Calabria, Gioia Tauro, and Catanzaro, with 3599.4, 1679.8, 1606.0, 1590.4, 1475.1 average number of employees, respectively. However, the lowest is in Delianuova, Mesoraca, Oppido Mamertina, Serra San Bruno, and Sant'eufemia D'aspromonte, 17.5, 26.2, 32.6, 42.9, and 43.3, respectively, because they are landlocked LMA. Although Cosenza is dominant in Blue Growth industries employment, it has almost no employment in "Renting and leasing of water transport equipment" and "Building of pleasure and sporting boats" sectors. As for Lamezia Terma, the highest number of employees are in "Freight transport by road", "Engineering activities and related technical consultancy", and "Service activities incidental to air transportation" sectors, 647.1, 299.9, 287.5 average number of employees, respectively. Reggio Calabria is supposed to be a major economic centre for regional services and transport on the southern shores of the Mediterranean. The highest number of employees is in "Sea and coastal passenger water transport" sectors, 195.7. Gioia Tauro has an important port; Port of Gioia Tauro is one of the largest seaports in southern Italy. It is situated on one of the busiest maritime corridors in the world, Suez to Gibraltar. Gioia Tauro has the highest employment in

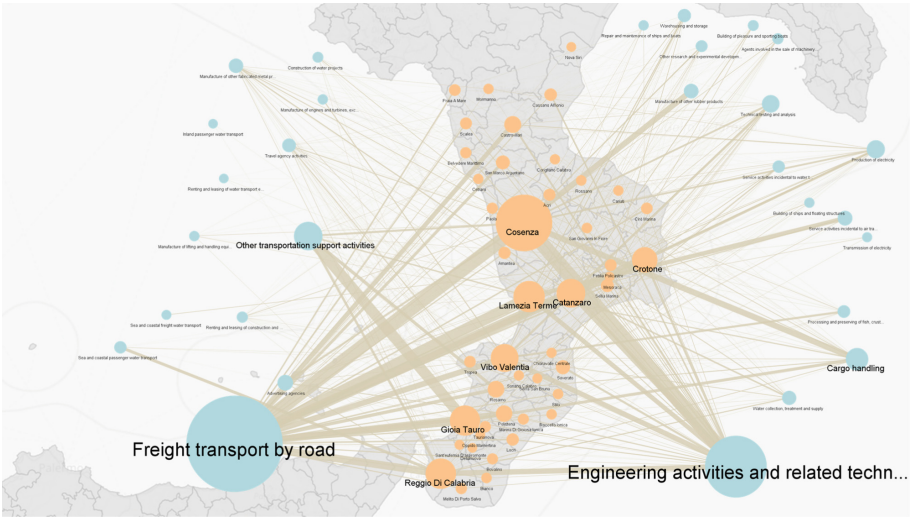

Fig. 3. Network of the employment in Blue Growth industries in Calabria for 2019**. Legend:** Orange nodes: Local labour markets. The size of the orange node: average no. of employees in all sectors found in that LMA. Blue nodes: Blue Growth sectors. The size of the blue node: average no. of employees in that sector. Edge width: average no. of employees in each sector in the connected LMA.

"Other transportation support activities" sector, which consists, for example, of forwarding of freight services and customs activities. Catanzaro is the second-highest LMA in "Production of electricity" sector with 107.6 average number of employees. On the other hand, 4 out of 33 sectors did not exist in Calabria in 2019, "Freshwater fishing", "Marine fishing", "Inland passenger water transport", and "Support activities for petroleum and natural gas extraction" sectors.

3.2 Number of Establishments

For the number of establishments, "Engineering activities and related technical consultancy", "Freight transport by road", "Technical testing and analysis" sectors show the highest Betweenness centrality. While Crotone, Reggio Di Calabria, and Vibo Valentia are the highest LMAs. Regarding eigenvector centrality, it shows the exact same order.

Graph 4 shows "Engineering activities and related technical consultancy" sector has the highest number of establishments in Calabria (3419 units), while "Freight transport by road" sector has 1592 units only. The highest number of "Engineering activities and related technical consultancy" establishments is in Cosenza, Catanzaro, and Reggio Di Calabria, 806, 339, and 310, respectively. The graph shows that the biggest LMAs in terms of the number of establishments are Cosenza, Reggio Di Calabria, Catanzaro, Lamezia Terme, and Vibo Valentia, 1373, 588, 582, 435, 420. Although Gioia Tauro is dominant for employment in "Other transportation support activities" sector, it has only eight establishments for that sector. Meanwhile, Cosenza and Reggio Calabria have a higher number of establishments, 23, and 21, respectively. "Advertising agencies" sector

and "Technical testing and analysis" sector are in the third and fourth places in terms of the number of establishments after "Freight transport by road" and "Engineering activities and related technical consultancy". The weakest sectors in Blue Growth industries are "Inland passenger water transport" and "Sea and coastal freight water transport", with two establishments each. Vibo Valentia has an important industrial area, "Vibo Marina". It is an important commercial and tourist harbour for petrol distribution and fish selling (especially tuna). It has 193 establishments for Engineering activities and related technical consultancy sector and 99 establishments in Freight transport by road sector. The weakest LMAs are Delianuova, Sant'eufemia D'aspromonte, and Nova Siri, with 12, 16, and 17 establishments, respectively. In a nutshell, Freight transport by road and Engineering activities and related technical consultancy sectors are the "dominants" of Blue Growth industries in Calabria for 2019.

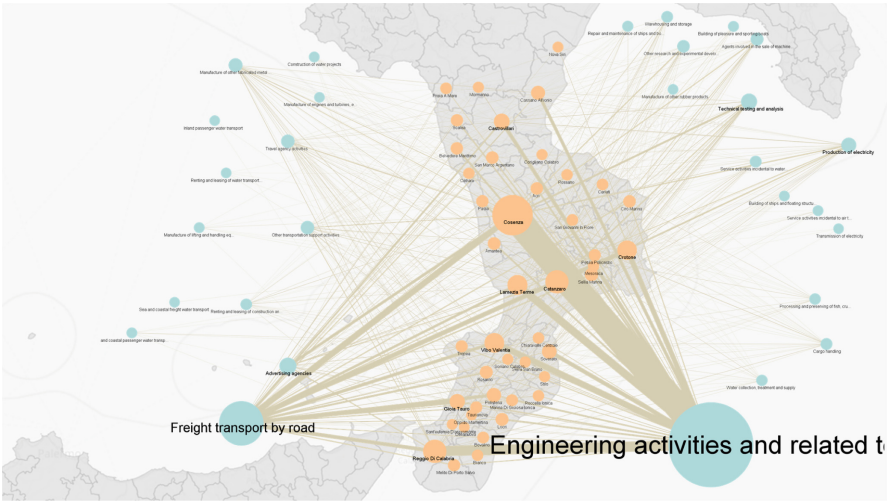

Fig. 4. Network of the number of establishments in Blue Growth industries in Calabria for 2019. **Legend:** Orange nodes: Local labour markets. The size of the orange node: no. of establishments in all sectors found in that LMA. Blue nodes: Blue Growth sectors. The size of the blue node: no. of establishments in that sector. Edge width: no. of establishments in each sector in the connected LMA.

3.3 Location Quotient (LQ)

In order to identify to what extent clusters have achieved their specialisation, Location Quotients method is adapted. LQ compares the per cent of local employment in a specific industry to the per cent of national employment in the same industry.

In Italy, there are almost 200 thousand activities in this Blue Growth that employ almost 900 thousand people (equal to almost 3.5% of the country's employment rate). The Blue Economy generates an added value of 134.5 billion euros: 8.5% of the total economy. However, in terms of specialisation, 4 out of 5 provinces in Calabria, compared

to the rest of Italy, are not yet specialised in these industries. Although seas surround Calabria from most of its frontier and it is famous for its beautiful beaches, it still lacks utilising one of its critical assets. Table 4 shows the degree of specialisation for each LMA. The LMAs that specialise in Italy are Gioia Tauro and Rosarno. Gioia Tauro was no surprise as it has one of the largest seaports in southern Italy, Port of Gioia Tauro. Gioia Tauro was ranked the second port operating in the Mediterranean Sea [62]. Rosarno shows specialisation in "Freight transport by road" and "Other transportation support activities" sectors that include, for example, forwarding of freight and arranging or organising of transport operations by rail, road, sea or air.

Table 4. Location Quotient for LMAs in Calabria Region for 2019.

LMA	Average employment in all industries (2019)	Average employment in Blue Growth industries (2019)	LQ for Calabria	LQ for Italy
Italy	23214.949	1305084		
Calabria	484269	1293184		0.600
Acri	7311	19553	0.792	0.476
Amantea	7697	21095	0.812	0.488
Belvedere **Marittimo**	5691	13821	0.719	0.432
Cariati	537	702	0.387	0.233
Cassano All'ionio	14403	23136	0.476	0.286
Castrovillari	16649	5712	1.016	0.610
Cetraro	3422	627	0.543	0.326
Cosenza	77555	35994	1.375	0.826
Mormanno	4762	719	0.447	0.269
Paola	8321	1381	0.492	0.295
Praia A Mare	3499	16818	1.424	0.855
San Giovanni In Fiore	6265	859	0.406	0.244
San Marco **Argentano**	8768	3427	1.158	0.695
Scalea	6469	1897	0.869	0.522
Catanzaro	44425	147508	0.984	0.591
Chiaravalle Centrale	3979	607	0.452	0.271
Sellia Marina	7606	2682	1.045	0.627
Soverato	11548	35907	0.921	0.553
Lamezia Terme	3996	167982	1.245	0.748

(*continued*)

Table 4. (*continued*)

LMA	Average employment in all industries (2019)	Average employment in Blue Growth industries (2019)	LQ for Calabria	LQ for Italy
Bianco	4075	85	0.618	0.371
Bovalino	8251	12465	0.448	0.269
Delianuova	1761	175	0.294	0.177
Gioia Tauro	1668	159038	2.824	1.696
Locri	983	22491	0.678	0.407
Marina Di **Gioiosa Ionica**	5245	12721	0.718	0.431
Melito Di Porto Salvo	9665	14646	0.449	0.270
Oppido Mamertina	2248	3262	0.430	0.258
Polistena	12096	5355	1.311	0.787
Reggio Di Calabria	61639	160601	0.772	0.463
Roccella **Ionica**	494	812	0.487	0.292
Rosarno	6874	55144	2.376	1.427
Sant'eufemia D'aspromonte	2078	4328	0.617	0.370
Stilo	246	868	1.045	0.628
Taurianova	5671	14645	0.765	0.459
Cirò Marina	7691	16541	0.637	0.383
Crotone	28834	122532	1.259	0.756
Mesoraca	1783	262	0.435	0.261
Petilia Policastro	4669	1852	1.175	0.706
Serra San Bruno	4211	4286	0.302	0.181
Soriano Calabro	3802	6166	0.480	0.288
Tropea	5984	16257	0.805	0.483
Vibo Valentia	29184	140325	1.424	0.855
Corigliano-Rossano	27685	15247	0.163	0.098
Nova Siri	4529	2653	0.174	0.104

Furthermore, the Beta measurement with respect to Calabria shows the internal structure in Calabria for Blue Growth industries. The results show that Plant Beta is 0.34 and Size Beta is 0.62 which reflects the stronger influence of large firms within the region. The first conclusion to be drawn is that the specialization of some LMAs in Calabria is driven by the firms' sizes not the number of firms. The Beta on the national

scale shows the same feature which is size driven. When we took the number of firms and employees on the national scale and measure it with the same variables but on the LMAs scale, we got that Plant Beta is 0.53 and Size Beta is 0.74. This might reveal that the concentration of firms is low. However, the number of firms is still important when considering the absolute size [63].

Overall, from 2012 to 2019, the trend in LMAs in Calabria appears to be relatively stable. There is no significant increase or decrease in those areas. However, as considered one of the main LMAs in Calabria, Reggio Calabria had been experiencing a decline throughout these eight years. Additionally, "Support activities for petroleum and natural gas extraction" sector has 0 employees and establishments in all years and the same for "Inland freight water transport" sector. "Manufacture of engines and turbines, except aircraft, vehicle and cycle engines", "Transmission of electricity", "Sea and coastal freight water transport", and "Inland passenger water transport" sectors display low levels of economic activity within the region (only 0.16% of the total establishments for all the region in 2019) and low labour specialisations. Finally, higher productivity levels in "Engineering activities and related technical consultancy" and "Freight transport by road" sectors, 50%, and 23% of all sectors in Calabria for 2019, respectively).

All LMAs in Calabria are involved in Blue Growth industries. However, they differ based on the number of connections each one has to all the sectors. For instance, Reggio Calabria, Crotone, Lamezia Terme, and Vibo Valentia have connections with 24, 24, 23, and 23 sectors, respectively. On the other hand, although Cosenza is the largest LMA in terms of the number of employment and establishments, it has only 22 sectors from Blue Growth industries. Mesoraca, Nova Siri, Delianuova, and Sant'eufemia D'aspromonte have the least sectors with 3, 4, 5, 5 sectors, respectively.

4 Discussion

The primary aim of this paper was to provide a better understanding of the Blue Growth industries' performance in Calabria and focus on the heterogeneity of the industries in the region. Their economic performance is a combination of very different levels. The specialisation of the industries is not the only driver of regional development; the size of economic activity, however, is another variable recommended in the literature [64–66]. The evidence from quantitative research across several countries and regions demonstrates a positive relationship between employment in strong clusters and economic performance [66–68]. Blue Growth industries are one of the largest among emerging industries in the total employment in Europe. It is ranked 3rd out of 10 in total employment in Europe, consisting of 13.3 million employees [52]. The total employment in Blue Growth industries in 2012 is 11825652 [51], while the average number of employees in Calabria for the same year is 51782.96. Calabria has a very high labour shortage, consisting of roughly 1% of Europe's total employment for Blue Growth industries. The labour shortage could be for a lack of market-oriented management skills, lack of financial and controlling knowledge, increase in costs, few incentives, or restructuring of some activities. One of the reasons that Calabria might have is low employment because of low wages as Blue Growth industries is ranked 9th for the average wage in 2019 [52].

Furthermore, the COVID-19 pandemic has created new circumstances and unemployment might increase. The results have revealed general lessons for understanding Blue Economy in Calabria.

"Freight transport by road" and "Engineering activities and related technical consultancy" sectors are the main sectors in Blue Growth industries. However, there is miss information about the role of marine and freshwater fishing in Calabria. The dataset we used does not provide information regarding these sectors, which raises questions about whether the capture fisheries in Calabria are just small-scale fisheries or artisanal fisheries. Hence, there is a need for qualitative data to measure the performance of the small scall and the importance of regional stakeholders to support these small industries.

It was claimed that "…. Similarities between systems often allow data from one system to carry information that has value in others" [22]. However, the system is complex and has complicated interconnections within many sectors. For example, one cannot know if the depletion of some fish species is from overfishing or pollution or other reasons [22]. Hence, in this paper, we use illustrated economic networks as a tool to absorb this complexity. In this project, we show a structural analysis of the inter-sectoral linkages and main sectors of the Blue Growth industries in Calabria. Such analysis employs suitable network metrics to measure the centrality and influence of each sector on the other ones and the possibilities for clustering of related activities [69]. The Blue Growth industries shows an appreciable dynamic in cross-sectoral linkages. It "… include all sectors and industries related to a maritime environment as well as sectors producing, making use of, and treating fresh-water sources" [52]. The networks introduced in this paper demonstrate that the marine system has very complex social-ecological systems exposed to several cross-scale interactions affecting critical ecological and socioeconomic processes and their interaction. This means that when the future Blue Growth potential is discussed, one should be aware of which processes and at which scales, or levels, are likely to drive change in fisheries. The ocean potential is primarily estimated based on the interactions between the different sectors, which, if well addressed, can result in too high expectations for growth. The study of Blue Growth in a specific city has to be oriented to that city's system, as the system is comprised of several different, but connected, sub-systems, which are exposed to different combinations of drivers and have different governance systems.

5 Conclusion

This study has sought to identify the characteristics of Blue Growth in Calabria. The results show the cross-sectoral linkages within the region and give us a holistic view of the current structures, which is essential for initiating an inclusive transition. Nevertheless, the situation of Calabria within the country is also crucial to evaluate the extent of the region (physical and economic). In doing so, we, on the one hand, have evaluated the system through 2 measures: size and specialization and also the influence of either large firms or SMEs on the Blur Growth emerging industries in Calabria. On the other hand, we extracted two metrics from the network graph, eigenvector centrality and betweenness centrality. We found that there are powerful zones within Calabria that act as the dominants for Blue Growth industries. For sectors, "Engineering activities and

related technical consultancy", "Freight transport by road", "Travel agency activities", and "Technical testing and analysis" are the dominant ones. Crotone, Reggio Di Calabria, Cosenza, Vibo Valentia, and Lamezia Terme are the strongest LMAs in Calabria. However, Calabria is very weak compared to the rest of the country. The industries there are small, and it is not specialised in these sorts of sectors although it is a coastal region and washed with water from 3 sides. Therefore, our study is meant to be a start point to reveal the characterises of the industries in the region and hence aim to overcome the inertia of an undesired business as usual development. We try to establish a clear image of the sectors and their relationships, thus, establishing an oriented paradigm for a sustainable and inclusive transition through Blue Growth industries. Especially after the recent evolution of the COVID-19 global pandemic that has further increased uncertainty around future trajectories. People are looking at Blue Growth as a way to save countries from poverty and declining GDPs and to segregate warring parties. Using the Blue Growth concept in the right way that aims to respond to the natural resource use challenge in oceans by combining the aspects of economic growth and environmental sustainability could help lagging regions ramp up [70]. Identifying significant cross-scale interactions that influence natural resource production is vital to understanding how and at what spatial or temporal scale and organisational level should be managed. For future studies,

One of the limitations of this study is the difficulty in measuring the impacts of the sectors' economic activity and therefore quantifying the environmental impacts. Therefore, it would be interesting to conduct studies that can provide solid arguments to support it. For the future of this research, the empirical analysis presented here will be extended by the addition of qualitative, not only quantitative, indicators on innovative behaviour in the estimation of the impact of absorptive capacity in the case of regional clusters. Local ecological knowledge can provide a valuable means of accessing new data. Moreover, we need to investigate if the absolute size plays a more important role than the level of specialization in Calabria or the other way around. There is still a lot more to be investigated regarding other indicators for the performance of Blue Growth in Calabria. Thus, the questions arising around 'scale' extend further to the level of regional management required to govern the Blue Economy in Calabria. Blue Growth can create millions of new jobs, but it must be exploited and managed sustainably.

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Data Availability. Publicly available datasets were analyzed in this study. This data can be found here: [http://dati.istat.it/Index.aspx?QueryId=21147].

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Lecture Notes in Networks and Systems 639

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New Metropolitan Perspectives

Transition with Resilience for Evolutionary Development

This open access book conveys attention to the theme of transition towards resilience and sustainability and its evolutionary perspective that emphasizes the complexity and uncertainty that governments and society are called to address in response to the ongoing challenges. "New Metropolitan Perspective Post COVID Dynamics: Green and Digital Transition, between Metropolitan and Return to Villages' Perspectives", 25–27 May 2022, Reggio Calabria, Italy. The papers included in the book are grouped around the following main topics: the envisaged transition towards resilience and sustainability; the relevance of the planning dimension for defining sustainable development pathways and managing complexity; and the green and digital transition by glimpsing at approaches, experiences, and cases that outline innovative solutions in cities and inner areas. The book primarily targets the academic and policymaker communities involved in managing the complexity of the transition for regions and cities.

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