Industry and innovation in the Alto Minho region: assessing regional performance

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A B S T R A C T

As a tool, the Sustainable Development Goals (SDG) guide local and regional leaders in developing policy approaches for better social development. SDGs are 17 ambitious objectives towards a greener, healthier, more peaceful and equal planet, promoted by the United Nations to achieve by 2030. Having this performance in mind, countries and regions can measure their level of SDG implementation and rethink how they could promote prosperity, cooperation among regions and progress. This study focuses on SDG-9: Industry, innovation and infrastructure in ten municipalities of the Alto Minho region, Portugal. The main idea is to assess the level of each municipality in the achievement of the indicators related to this SDG. The similarities and differences between the municipalities can underline areas for joint efforts or investments in the development policy. This paper selected a performance analysis as a tool for informing on the amount of effort required to achieve SDG-9 at a local level, i.e., the Alto Minho region in the north of Portugal. If the trend of evolution is maintained, only Viana do Castelo will reach the full range of indicators for SDG-9, and Caminha will have 50 % of the indicators achieved. The remaining municipalities will reach at least half of the indicators, thus achieving a value lower than half of the target value. This approach could be replicated in other SDGs and other regions. This assessment allows the region's stakeholders to indicate areas of required action to achieve the SDG.

Introduction

With the global population increasing at a faster rate, it is predicted that it will reach 8.5 billion by 2030 and 11.2 billion by 2100. For the planet to remain sustainable, innovation and creativity will be increasingly important and decisive to allow more efficient and better use of resources worldwide.

The Sustainable Development Goals (SDG) of the United Nations' 2030 Agenda is intended to be a global task of society to ensure a development that satisfies the needs of the present, at the same time safeguarding or supporting ecosystems of the Earth,

on which the present and future generations depend (United Nations, 2015).

Such development has a necessary dimension of entrepreneurial innovation and private sector intellectual property that seem to be absent in the literature on data sustainability.

In the era of digitalisation, the main factors for sustainable development are the construction and maintenance of adequate economic and social infrastructures, namely, energy, transportation, information technology, telecommunications, and education.

A more robust ecological innovation system is intended to be built, suitable for achieving sustainable development objectives, more specifically, SDG-9. With the existence of these facilities, the innovation systems can incorporate, adapt and produce new technologies suitable for sustainable development. The infrastructures, innovation, or business environment and the qualifications of the workforce are also the focal points of economic policies and planning. Information and Communication Technologies (ICT) are the infrastructures on which all countries should focus.

Likewise, the realisation of SDG-9 to build resilient infrastructures, promote inclusive and sustainable industrialisation and encourage innovation must be incorporated into the strategy to restore economic growth with social inclusion.

Regional development policies were initiated in Portugal a few decades ago due to the notorious asymmetry of the coastal and interior regions of the country. Although this asymmetry continues, the focus has shifted to the regions that display low demographic density and weak economic density. In Alto Minho, a region in the north of Portugal, more than 50 per cent of municipalities are classified as low-density regions. Nevertheless, in a technological and environmental era, as more people decide to live and work outside the crowded cities, there is a lack of the critical thinking needed to study low-density populated areas and identify different drivers to promote sustainable growth.

The municipal level is not always an optimal scale for promoting business investments or even the local supply of public goods and services. Therefore, it is necessary to make an inter-municipal analysis to understand the best features already offered or to be developed for better connections with neighbouring regions. In this context, an analysis of the ten municipalities of Alto Minho is performed, considering the Sustainable Development Goals (SDGs). SDGs are 17 ambitious objectives for a greener, healthier, more peaceful and equal planet, promoted by the United Nations to achieve by 2030. Using the SDGs, it is possible to create a framework for improving the quality of human life while respecting the surrounding environment on the governmental and urban levels or even in private companies or universities.

The data from the National Institute of Statistics from Portugal (INE) was used to select the SDG-9 indicators scrutinised at the municipal level; a statistical analysis was made.

This paper aims to analyse the differences between the ten municipalities of the Alto Minho region, in the north of Portugal, related to four SDG-9 indicators, which intend to build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation (United Nations, 2015). The objective is to verify if there is homogeneity throughout the different municipalities and, if not, identify in which area each municipality needs to invest in getting the established targets for each analysed indicator. The identified research question, RQ, is formulated as follows: "Are there similarities in the performance of several municipalities of the Alto Minho region on achieving the targets established by Agenda 2030 for SDG-9?" Two sub-questions are formulated as follows: SRQ1, "Which municipality of the Alto Minho region is closer to achieving the targets established by Agenda 2030 for SDG-9?" and SRQ2, "How much effort is needed to achieve SDG-9 at a local level in the Alto Minho region?"

The similarities and differences between the municipalities indicate areas for joint efforts with neighbouring municipalities or even investments in the development policy.

This paper is divided as follows. Section 2 presents a literature review of the concepts covered in the paper. Section 3 introduces the methodological approach used in this research. Section 4 demonstrates the main results and discussion related to SDG-9, discretised until the municipality context in the Alto Minho region. Finally, the last section presents the conclusions and suggestions for future lines of research.

2. LITERATURE REVIEW

The Sustainable Development Goals (SDGs) and the 2030 Agenda, adopted by almost all the countries of the world in the context of the United Nations, define the priorities and aspirations of global sustain-

able development for 2030 and seek to activate global efforts around a set of common goals and targets (United Nations, 2015).

There are 17 SDGs in areas that affect the quality of life of all the world's citizens and those yet to come. Five general areas could be identified: people — focusing on the eradication of poverty and hunger, the promotion of dignity and equality; planet — focusing on sustainable consumption and production, the fight against climate change and the management of natural resources; prosperity — referring to personal fulfilment, economic and social progress; peace — cantered on peaceful, just and inclusive societies, free from fear and violence; and partnerships — referring to cross-cutting integration, interconnectedness and joint mobilisation on behalf of the most vulnerable (BSCD, 2022).

Actions in all dimension levels, i.e., national, regional, and local, are needed to achieve a sustainable future for the world (D'Adamo et al., 2021). The global goals aim to be relevant to all community levels, from global to local.

Localisation of global goals and sustainability efforts have played an important role in the advancement of sustainable development around the world because it aims to engage local stakeholders in the processes that affect local, national, and global development (ElMassah & Mohieldin, 2020; Szpilko & Ejdys, 2022).

Therefore, recent works have emerged related to the analysis of SGDs measures and evolution at different levels (Ibrahim, 2022; Berisha et al., 2022; Haas & Ivanovskis, 2022; Smith et al., 2022; D'Adamo et al., 2021; Gustafsson & Ivner, 2018; Allen et al., 2018). For example, D'Adamo et al. (2021) focused on a national perspective (Italy) where multi-criteria decision analysis (MCDA) is used to measure current sustainability performance. Ibrahim (2022) investigates utilised digital governance platforms using a case study of a Norwegian municipality to achieve the UN SDGs towards a smart and sustainable city, whereas Han et al. (2021), Vommaro et al. (2020) and Gustafsson & Ivner (2018) studied the implementation of sustainable policies at the municipal level in terms of strategic planning and management.

The business sector has a critical role to play and a conferred interest in contributing to achieving the SDGs as a driver for economic growth and employment and as a source of technology and innovation.

The SDGs are an opportunity for businesses to improve existing and implement new strategic actions and projects to contribute to regional, national, and

global goals (Smith et al., 2022; United Nations, 2015).

Among the 17 SDGs, Goal 9 explicitly contributes to economic development based on industry, innovation and infrastructures that play an important role at all levels.

This implies that countries should focus on affordable and equitable access for all, such as transborder infrastructure, which will support economic development and human well-being, retrofitting industries to make them sustainable, efficient and innovative.

SDG-9 aims to build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation and is operationalised through five distinct targets, each paired with one or more indicators to monitor progress in its achievement, described below, based on United Nations (2015).

9.1. Develop quality, reliable, sustainable, and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all;

9.2. Promote inclusive and sustainable industrialisation and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries;

9.3. Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets;

9.4. By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities;

9.5. Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending;

9.a. Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological, and technical support to African countries, least developed countries, landlocked developing countries, and small island developing States;

9.b. Support domestic technology development, research, and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities;

9.c. Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020.

The importance of the SDG-9 is traduced by different efforts promoted to measure and monitor their evolution in different countries, promoting the comparison between them. Kynčlová et al. (2020) introduced the SDG-9 index as a measure of countries' progress towards achieving SDG-9 industry-related targets, which intends to assess the extent to which countries have industrialised while promoting social inclusiveness and minimising natural resource use and environmental impacts. One year later, Saieed et al. (2021) applied the Green Economy Progress methodology to assess progress in meeting industry-related SDG-9 targets (SDG-9Pro). This progress index allows cross-country comparisons of progress based on five of the seven industry-related SDG-9 indicators that collectively capture the economic, social, and environmental dimensions of sustainable industrial development, including the CO2 emission intensity as the environmental indicator emphasising their relative importance among the five industry-related indicators in measuring progress towards sustainable industrial development. Recently, both indices were applied to measure the progress and performance of 20 sub-Saharan African countries in meeting four industry-related SDG-9, classifying countries as either active or passive and as either leading or lagging (Luken et al., 2022).

This work intended to analyse the SDG-9 at a regional level applied in a case study in the north of Portugal, to monitor the progress in meeting industry-related SDG-9 targets in the region and differences between municipalities.

3. RESEARCH METHODS

3.1. ALTO MINHO REGION

Alto Minho is a region in the north of Portugal. It is situated between the Minho River and Lima River, and is composed of ten municipalities: Arcos de Valdevez, Caminha, Melgaço, Monção, Paredes de Coura, Ponte da Barca, Ponte de Lima, Valença, Viana

do Castelo and Vila Nova de Cerveira. It is a region of 2219 sq. km, with a total population of around 245 000 (CAOP, 2017). Six of the ten municipalities are considered low-density territories, which are areas with less than 100 inhabitants per sq. km or a GDP per capita of less than 75 % of the national average. Therefore, the challenges for achieving the SDG are higher because it is necessary to join efforts with the neighbouring municipality to use a good investment development policy.

From the municipal context, there are more than one hundred indicators from the seventeen SDGs provided by the Portuguese National Institute of Statistics — INE (2022). In this study, it was decided to centre the analysis on the indicators related to SDG-9.

3.2. SDG-9: INDUSTRY, INNOVATION, AND INFRASTRUCTURE

According to the United Nations Foundation (United Nations, 2015), investment in infrastructure and innovation are crucial drivers of economic growth and development. At the same time, constructing new greener infrastructures or reconfiguring existing ones could contribute to the reduction of environmental impacts and disaster risks. Thus, the development of industry drives the application of science, technology, and innovation.

The ODSLocal platform (ODSLocal, 2022), which made a preliminary study of some regions of Portugal using INE data, was used to select four indicators related to SDG-9, discretised until the municipal context, as described in Table 1. This platform has information available on the local SDG relating to progress indicator monitoring. However, there is a lack of information about most of the municipalities related to the Alto Minho region. Therefore, this study is a pioneer for the north of Portugal.

Table 1 provides a description of SDG-9 indicators and the units used for the analysis. The baseline value corresponds to the year of reference, 2015, where 5 % of municipalities had already been achieved. The target value is the number desirable to be achieved by 2030.

For this study, data from 2015 to 2020 were collected based on the INE (2022) database. Geographically, data was selected for each Alto Minho municipality and for Portugal to make the national comparison.

After gathering the raw data, the normalisation process was used to allow comparability; then, the

Tab. 1. Indicators used for SDG 9

Indicator	Indicator Description	Target	Unit	Baseline Value	Target Value
I9.1	Proportion of community participation in co-financed projects in the total capital revenues of municipal councils	9.1	%	0	81.7
I9.2	Full-time equivalent researchers (FTE) per 1000 inhabitants in institutions and companies with research and development	9.5	No.	0	5.2
I9.3	Expenditure on research and development of institutions and companies with research and development, per inhabitant	9.5	€ (thousands) /inhab.	0	0.37
I9.4	Broadband Internet access at a fixed location per 100 inhabitants	9.c	No.	14	37.3

Source: elaborated by the authors based on ODSLocal (2022).

aggregation of the indicators was made for SDG-9. The statistical analysis was done using Excel, allowing the visualisation and monitoring of the contributions and progress of each municipality concerning SDG-9.

The information for 2020 for each local region was used, as well as the baseline and target values, to produce maps with the trend and distance to the target value, encompassing the several challenges for each local region.

4. RESEARCH RESULTS

4.1. REGIONAL EVOLUTION AND PERFORMANCE

This section presents an analysis of each indicator, considering the evolution of each municipality from 2015 to 2020 through a graphical (a) and a more detailed comparison of the most recent years (b).

Indicator 9.1, represented in Fig. 1, is concerned with the proportion (%) of community participation in co-financed projects in the total capital revenues of municipality councils. Financial management is a crucial element of municipal management insofar as it enables the local government to plan, mobilise, and use financial resources efficiently and effectively, as well as fulfil its obligation to be accountable to its citizens.

Fig. 1(a) shows that most of the municipalities have a good performance, with higher proportions of community participation when compared to Portugal, which works here as a benchmark. Melgaço and Ponte de Lima have zero participation; therefore,

their lines are on the horizontal axis. 2016 denotes a considerable decrease for most regions, but in recent years, the evolution has been more positive. In 2020, only four municipalities were above the national line, namely, Melgaço, Ponte de Lima, Vila Nova de Cerveira, and Paredes de Coura. Fig. 1(b) provides a more in-depth look at the most recent year showing that Arcos de Valdevez, Caminha, Monção, Ponte da Barca, Valença, and Viana do Castelo are the regions with at least around 50 % of community participation in co-financed projects.

The number of researchers in the EU has increased in recent years: 1.89 million researchers (in full-time equivalents (FTE)) were employed in the EU in 2020, which marked an increase of 546 thousand compared with 2010 (Gustafsson & Ivner, 2018). Fig. 2 presents the results related to full-time equivalent researchers per 1000 inhabitants in institutions and companies in research and development (R&D).

The overall picture for this indicator is not encouraging (Fig. 2 (a)): over the analysed years, all municipalities were below the national benchmark by investing in researchers; the only exception was Vila Nova de Cerveira, which remained at the national level until 2019. It should also be noted that Caminha had a promising value in 2020.

Considering that the target value is 5.2, the Alto Minho region still has a long way to go (Fig. 2(b)). Only Caminha fulfilled the indicator, and Viana do Castelo and Vila Nova de Cerveira are halfway there. While researchers and policymakers recognise the importance of using R&D to create beneficial products and new development measures, translation is hampered by limited opportunities for interaction during the policy-making process and concerns over
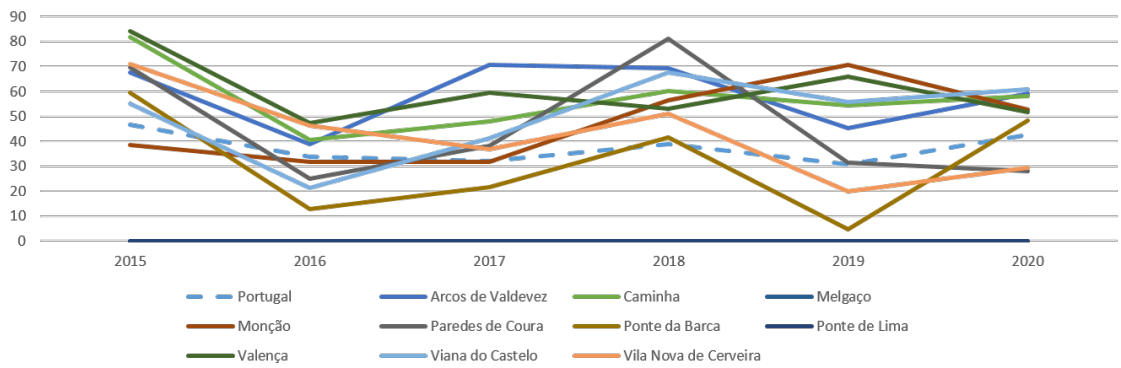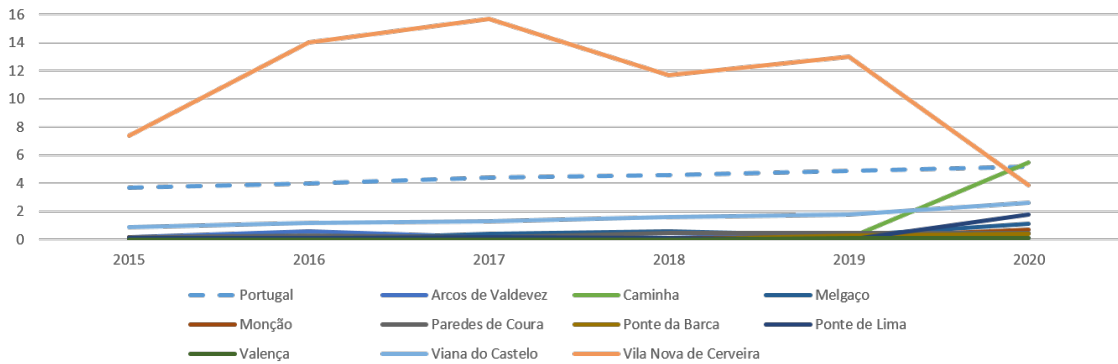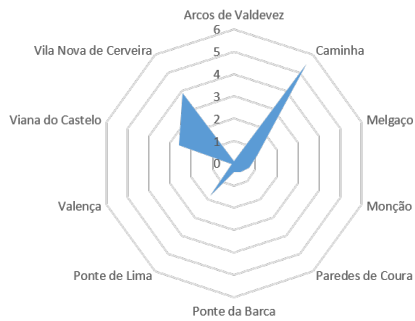
(a)   Evolution from 2015 to 2020
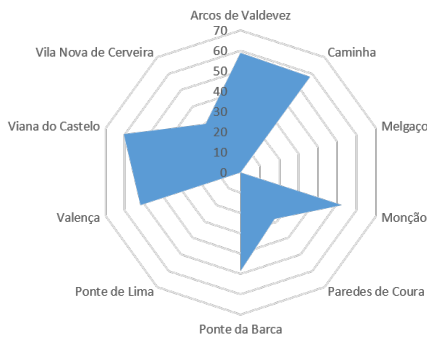
(b)   Municipalities in 2020

Fig. 1. Indicator 9.1: Proportion of community participation in co-financed projects in the total capital revenues of municipal councils

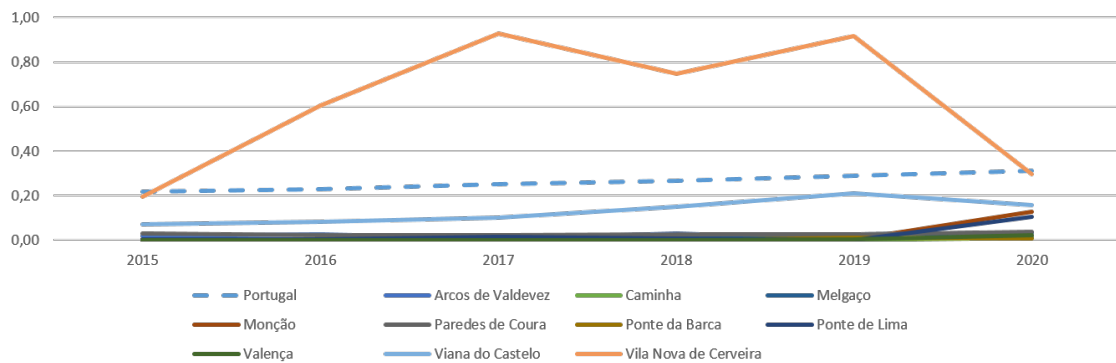Regional evolution and performance of Alto Minho - SDG 9. Evolution from 2015 to 2020

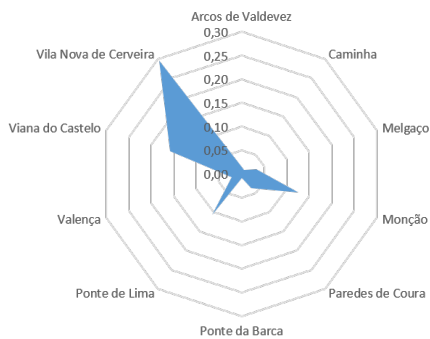(a)   Evolution from 2015 to 2020

(b) Municipalities in 2020

Fig. 2. Indicator 9.2: Full-time equivalent researchers (FTE) per 1000 inhabitants in institutions and companies with R&D

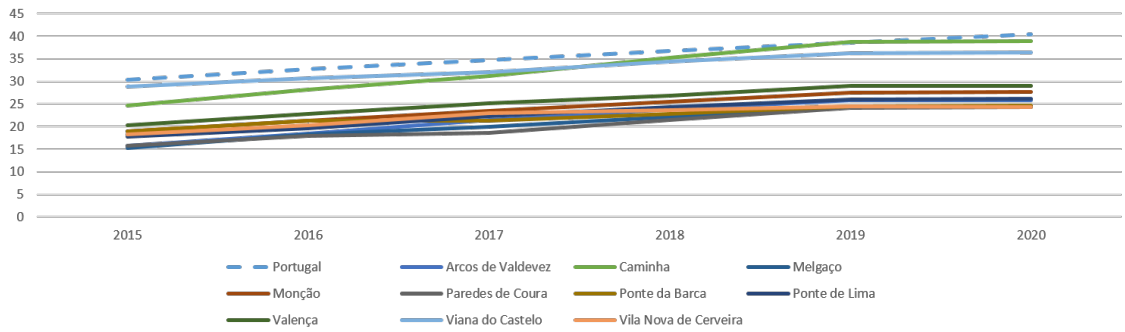(a) Evolution from 2015 to 2020

(b) Municipalities in 2020

Fig. 3. Indicator 9.3: Expenditure on R&D of institutions and companies per inhabitant

the political sensitivity of research findings. Most companies in these municipalities work in technology and renewable energy, which implies more recent research.

Another related indicator is the expenditure on research and development of institutions and companies per inhabitant. The amount of money spent on

research and experimental development (R&D expenditure) is of considerable interest to national and international policymakers because it could work as a leverage on business R&D.

Fig. 3(a) agrees with the analysis of the previous figure, as only Vila Nova de Cerveira stands out. Viana do Castelo has shown an increasing trend,

(a) Evolution from 2015 to 2020
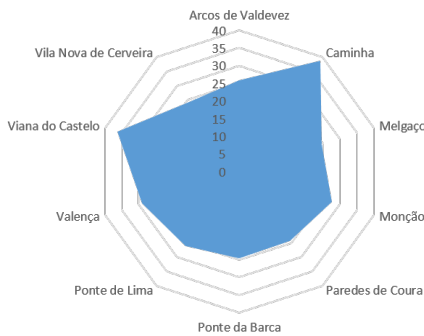
(b) Municipalities in 2020

Fig. 4. Indicator 9.4: Broadband Internet access at a fixed location per 100 inhabitants

except for 2020. The other regions are still in an embryonic state in terms of investment in R&D. When looking at the year 2020 (Fig. 3(b)), it appears that most municipalities have values below 0.05 thousand per inhabitant.

Finally, the last indicator was analysed: broadband Internet access at a fixed location per 100 inhabitants. In the EU, universal service in electronic communications (e-communications), as currently defined, means ensuring that all who so request are provided with those services essential for participation in society and already available to the great majority of citizens. The "access at fixed location" refers to the end user's primary residence (where several members of a household can share the connection) and not to a requirement for operators to use fixed technology.

Fig. 4(a) shows a positive evolution of this indicator. Although all municipalities are below the national proportion of the population that has access to the Internet, the path has always been up, with two localities almost reaching the national value (Caminha and Viana do Castelo). It should be noted

that Alto Minho has several municipalities classified as low-density regions; therefore, these regions are not the most desirable for telecom operators. Even so, there is a national effort to cover all territories with broadband Internet to be more appealing for the implementation of new companies, with the final aim of creating more jobs and more dynamics in the local economy. However, analysing Fig. 4(b), this indicator is the one with the greatest homogeneity in its implementation.

4.2. REGIONAL FORECASTING

Another perspective to assessing regional performance is to understand the status of each municipality on its path to 2030. It built an SDG-9 dashboard of the localities from Alto Minho, using the recent data for 2020: the given value for the municipality, the baseline value, and the target value for 2030, adapted for Portugal. The last two values for each indicator are described in Table 1.
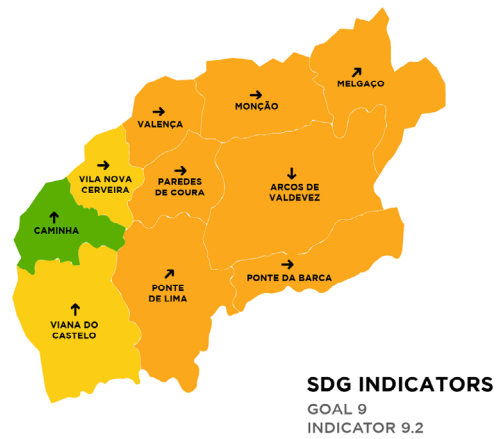
Consequently, the scores gathered by each locality under each indicator were grouped and placed on

(a) Indicator 9.1
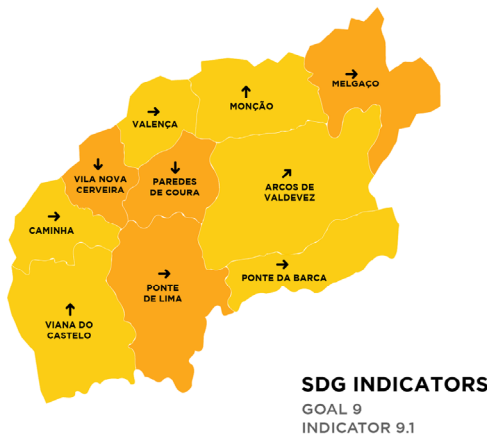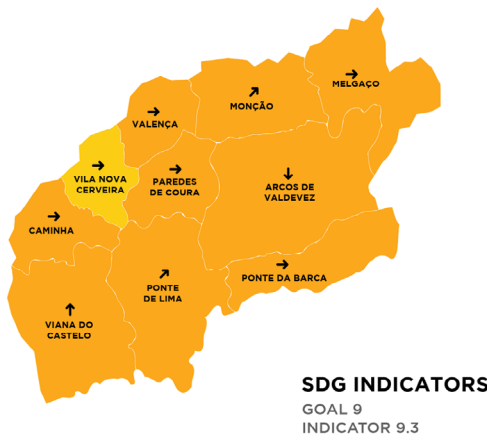

(b) Indicator 9.2

(c) Indicator 9.3
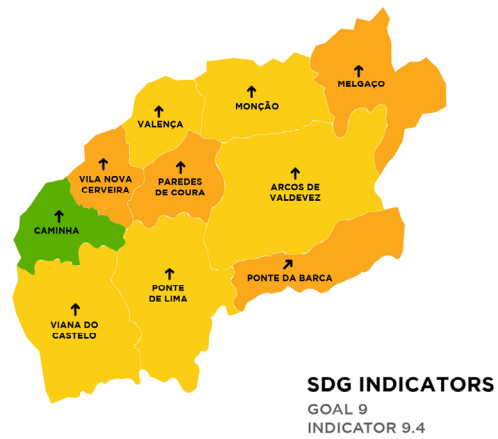

(d) Indicator 9.4

Fig. 5. Spatial analysis from Alto Minho of indicators of SDG-9

a "traffic light" table according to the following classification (ODSLocal, 2022):

- green — achieved, meaning that the most recent observed value of the municipality has already reached the 2030 target value;
- yellow — excellent performance, meaning that the most recent observed value of the municipality has not yet reached the target value but is more than halfway between the base value and the 2030 target value;
- orange — positive performance, meaning that the most recent observed value of the municipality is better than the baseline value but is less than

halfway between the baseline value and the 2030 target value;

- red — negative performance, meaning that the most recent observed value of the municipality falls short of the base value.

This way, the process of visualising each indicator for each locality on a single map, is found in (Fig. 5). The overview of the Alto Minho region is that there is still a long way to go. Only Caminha has already reached half of the indicators. On the opposite side of the classification are Melgaço and Paredes de Coura, with all indicators in orange. None of the municipalities has any indicator in red, which gives hope that

with some effort, all municipalities will be able to reach the indicators in 2030.

Fig. 5(a) shows that 60 % of the municipalities are with excellent performance (yellow colour) to achieve the indicator. Fig. 5(b) highlights Caminha as the only board that has already reached the 9.2 indicator. Viana do Castelo and Vila Nova de Cerveira present an excellent performance. Interestingly, they are the three most north-western locations in Portugal. Indicator 9.3 is the one with the worst performance (Fig. 5(c)). All municipalities, except for Vila Nova de Cerveira, present a considerable distance from the 2030 objective. Finally, the indicator referring to broadband Internet access at a fixed location shows a heterogeneous behaviour (Fig. 5(d)). Caminha has already reached the goal, and 50 % of the municipalities are coloured yellow. The four municipalities that are still in orange colour are the locations with the least population, which may explain the low attractiveness on the part of telecommunications operators in promoting broadband services.

In addition to this analysis, the trend of evolution was analysed. The same value in 2020 in two different locations may indicate different behaviours considering the history (towards or away from the goal). Thus, the projection of the linear regression trend of all values observed since 2015 is analysed, and the result is classified according to four classes:

- Will reach ($\uparrow$), meaning that if the observed trend continues, the municipality will reach the target value by 2030;
- Excellent dynamics ($\nearrow$), meaning that if the observed trend continues, the municipality will not reach the target value but will be more than halfway between the base value and the 2030 target value;
- Positive dynamics ($\rightarrow$), meaning that if the observed trend continues, the municipality will not reach the target value and will be less than halfway between the baseline and the 2030 target value;
- Negative dynamics ($\downarrow$), meaning that if the observed trend continues, the municipality will not reach the target value and will fall short of the baseline value in 2030.

Fig. 5 also provides this information. Indicator 9.4 is the best quoted, with 90 % of the regions achieving this in 2030. For the remaining indicators, only a maximum of 20 % of the municipalities will reach the objective. Keeping the trend of evolution, Viana do Castelo, which is the capital of the district having the largest population, will be the only municipality

to reach all the indicators. Usually, the main city has more opportunities to attract specialised human resources and, at the same time, the opportunity to differentiate services, making the area more attractive to live in. The adjacent municipalities of Viana do Castelo (Caminha and Ponte de Lima) will benefit from their location to increase their level of activity and, therefore, partially achieve the indicators. On the other hand, Arcos de Valdevez, Paredes de Coura and Ponte da Barca are the ones that will have more difficulties in achieving the goal. The other municipalities, especially in the north, have the Minho River and border Spain. This can contribute to increasing and/or expanding business opportunities and creating new opportunities for companies, possibly leading to new research projects.

5. CONCLUSIONS

Industry and infrastructures must be updated to achieve successful communities that can meet future challenges. Using new and suitable technologies and through investments in R&D, it is possible to construct a stable and prosperous society. This paper selected a performance analysis as a tool informing the amount of effort required to achieve SDG-9 at a local level.

Maintaining the current trend of evolution, in the context of the research questions, only Viana do Castelo will reach the full range of indicators for SDG-9, which is not a surprise since it is the capital of the Alto Minho region with a greater density of main services and population. On the other hand, Caminha already has 50 % of the indicators achieved, and the remaining two indicators will not be reached if there is no additional work.

Besides, indicator 9.4 will be the easiest to achieve for most municipalities. Three municipalities have a negative dynamic, i.e., Arcos de Valdevez for two indicators (9.2 and 9.3) and Vila Nova de Cerveira and Paredes de Coura for one indicator (9.1). This means that these municipalities have to increase their efforts related to human and financial resources if they want to be considered for the 2030 Agenda. The remaining municipalities will present at least half of the indicators, not only to be achieved but with a value lower than half of the target value.

It is, therefore, up to each municipality to define its specific targets to achieve the goals. Targets can be reached by joint action with neighbouring municipalities, verifying good local practices, as well as

redirecting efforts toward some of the indicators that are below the intended values.

This work was limited to the database available due to a huge number of indicators available in relation to different regions but a limited number for municipalities. Therefore, there is a need to have more SDG goals to make a complete framework for each municipality.

As a future effort, this methodology is intended to be adapted for other Portuguese regions with this SDG goal and for a complete analysis of all SDG goals for the Alto Minho region.

Acknowledgements

Literature

Acuti, D., Bellucci, M., & Manetti, G. (2020). Company disclosures concerning the resilience of cities from the Sustainable Development Goals (SDGs) perspective. *Cities*, *99*. doi: 10.1016/j.cities.2020.102608

Allen, C., Metternicht, G., & Wiedmann, T. (2018). Initial progress in implementing the Sustainable Development Goals (SDGs): a review of evidence from countries. *Sustainability Science*, *13*(5), 1453-1467. doi: 10.1007/s11625-018-0572-3

Berisha, E., Caprioli, C., & Cotella, G. (2022). Unpacking SDG target 11.a: What is it about and how to measure its progress? *City and Environment Interactions*, *14*. doi: 10.1016/j.cacint.2022.100080

BCSD. (2022). Business Council for Sustainable Development Portugal. Retrieved from https://bcsdportugal.org

CAOP. (2017). Carta Administrativa Oficial de Portugal. Retrieved from https://web.archive.org/web/20181005153441/ http://mapas.dgterritorio.pt/viewer/index.html

D'Adamo, I., Gastaldi, M., Imbriani, C., & Morone, P. (2021). Assessing regional performance for the Sustainable Development Goals in Italy. *Scientific Reports*, *11*(1). doi: 10.1038/s41598-021-03635-8

ElMassah, S., & Mohieldin, M. (2020). Digital transformation and localizing the Sustainable Development Goals (SDGs). *Ecological Economics*, *169*. doi: 10.1016/j.ecolecon.2019.106490

Gustafsson, S., & Ivner, J. (2018). Implementing the Global Sustainable Goals (SDGs) into Municipal Strategies Applying an Integrated Approach. In W. Leal Filho (Ed.). *Handbook of Sustainability Science and Research. World Sustainability Series* (pp. 301–316). Cham: Springer. doi: 10.1007/978-3-319-63007-6_18

Haas, P. M., & Ivanovskis, N. (2022). Prospects for implementing the SDGs. *Current Opinion in Environmental Sustainability*, *56*. doi: 10.1016/j.cosust.2022.101176

Han, Z., Jiao, S., Zhang, X., Xie, F., Ran, J., Jin, R., & Xu, S. (2021). Seeking sustainable development policies at the municipal level based on the triad of city, economy, and environment: evidence from Hunan province, China. *Journal of Environmental Management*, *290*. doi: 10.1016/j.jenvman.2021.112554

Ibrahim, A. M. (2022). A mapping towards a unified municipal platform: An investigative case study from a Norwegian municipality. *Sustainable Futures*, *4*. doi: 10.1016/j.sftr.2022.100063

INE. (2022). Instituto Nacional de Estatística. Retrieved from https://www.ine.pt

Kynčlová, P., Upadhyaya, S., & Nice, T. (2020). Composite index as a measure on achieving Sustainable Development Goal 9 (SDG-9) industry-related targets: The SDG-9 index. *Applied Energy*, *265*. doi: 10.1016/j.apenergy.2020.114755

Luken, R. A., Saieed, A., & Magvasi, M. (2022). Industry-related sustainable development Goal-9 progress and performance indices and policies for Sub-Saharan African countries. *Environmental Development*, *42*. doi: 10.1016/j.envdev.2021.100694

ODSLocal. (2022). ODSLocal – Plataforma Municipal dos Objetivos de Desenvolvimento Sustentável. Retrieved from https://odslocal.pt/

Saieed, A., Luken, R., & Zheng, X. (2021). Tracking progress in meeting sustainable development goal 9 industry-related targets: An index for policy prioritization. *Applied Energy*, *286*. doi: 10.1016/j.apenergy.2021.116490

Smith, H., Discetti, R., Bellucci, M., & Acuti, D. (2022). SMEs engagement with the Sustainable Development Goals: A power perspective. *Journal of Business Research*, *149*, 112-122. doi: 10.1016/j.jbusres.2022.05.021

Szpilko, D., & Ejdys, J. (2022). European Green Deal — research directions. A systematic literature review. *Ekonomia i Środowisko*, *81*, 8-38. doi: 10.34659/eis.2022.81.2.455

Vommaro, F., Menezes, J. A., & Barata, M. M. de L. (2020). Contributions of municipal vulnerability map of the population of the state of Maranhão (Brazil) to the sustainable development goals. *Science of the Total Environment*, *706*. doi: 10.1016/j.scitotenv.2019.134629

United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*