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PROFESSIONAL PRACTICE IN LOCAL DEVELOPMENT: AN EXPLORATORY APPROACH IN THE REGION OF VALENCIA (SPAIN)

ANTONIO MARTÍNEZ-PUCHE*, MARIA HERNÁNDEZ^{1**}

Key-words: Employment, local development, professionals, holistic approach, ADLYPSE, territorial resources.

Abstract. This paper addresses the exercising of local development in Spain, particularly in the Region of Valencia. At the end of 1980, a professional position was created to form part of the public administrations, who would be responsible for attracting economic resources, diversifying economic activities, taking advantage of the capacities and possibilities of the territories, and encouraging the creation of employment opportunities. These activities have been conducted from a holistic and integrated perspective, in which professional geographers participate from both an applied and training point of view. The objectives of this publication, based on a survey carried out in 2019 involving 114 professionals belonging to the Federation of Technical Personnel in Local Development Management of the Region of Valencia (ADLYPSE) and in-depth interviews, are to explore: a) the academic profiles; b) the type of actions carried out in the territory; and c) the importance of these actions, highlighting the close relationship between Geography and the management of territorial resources. Among the results, it is worth highlighting that, despite the importance of these experts in the promotion and management of the territory's resources, they have no professional recognition in many of the region's municipalities since they have been limited to managing subsidies and financial aid, and have an excess of bureaucratic tasks. Therefore, the professional profiles of technical staff in local development should be adapted to the real needs of the territories in which they work, since an industrial or tourist municipality will have different priorities to a rural municipality with a small population. The importance of training, in general, and geography training, in particular, is also underlined. Of the five university master's degrees that are currently active in Spain, having a clear link to local development, three are led by geographers.

1. INTRODUCTION

Local development is a territorial strategy of a global nature in which multiple factors and approaches, situations, cultural and socio-economic contexts, the attitudes and aptitudes of technical professionals, politicians and citizens all play a part. The concept has been studied from a range of different approaches (Sanchís, 2006; Garofoli, 1999), among which the following are worth highlighting: the territorial approach (Allende, 1987; Di Meo, 1987; Mabileau, 1993; Vázquez, 1993; 2005; Zapata, 2001; 2009, Martínez-Puche *et al.*, 2000; Pérez and Carrillo, 2000; Martínez-Puche, 2001; Vachon, 2001); the socio-economic approach (Perrin, 1991; Valcárcel 1996; Villasante, 1998; Ybarra, 1998; Albuquerque, 2002; Ponce & Martínez-Puche, 2003; Sanchís, 2006; Noguera, 2016; García, 2007; Martínez-Puche *et al.*, 2008); the cultural and institutional approach (Vázquez, 1984; Sánchez, 2005; Precedo 2007); the administrative approach (Arrandis, 1996; Esparcia, 2009; Canales and Pérez, 2002) and the economic/entrepreneurial approach linked to the social economy and cooperativism (Costa, 1995; Caravaca, 1999, Chavez & Monzón, 2001; Sanchís & Cantarero, 2003; Becattini, 2004). This professional position considers the social, economic and technological evolution that forces professionals who work in the territories to adapt to these changes as well as the administrations in

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which they work (Di Meo, 1987; Scott & Storper, 2007; Saubens, 2008; Vázquez, 2010; Vazquez, 2011; Berger-Masson, 2013; Mazzucato, 2018; Galasoet al., 2018).

It is essential to approach local development policies from an evolutionary perspective, and the territory as a system that interacts with all the factors and resources. It is also important to value the work undertaken by local development professionals in attracting economic resources (subsidies), which have a notable impact on the promotion of planned strategic initiatives; to promote community participation, networking and cooperation with other territories for developing socioeconomic synergies, taking into account that their work is carried out in a specific municipality. Moreover, notable nuances in the application of actions and basic concepts are required (Alburquerque, 2007):

- local development is not only municipal development. The local productive system, which includes, among others, the series of relations and productive and commercial connections that explain the productive efficiency and competitiveness of the economic base of a given territory, does not necessarily coincide with the administrative boundaries of a municipality or province.
- local development is not only endogenous development. Many local development initiatives are also based on taking advantage of opportunities for exogenous dynamism. What is important is to know how to “endogenise” these external opportunities within a locally determined development strategy.
- local development is a territorial and bottom-up approach, but it must also seek interventions from the other decision-making levels of the state (province, region and central government) so as to facilitate the fulfilment of the objectives of the local development strategy. An efficient coordination of the different territorial levels of public administrations and a coherent integrated context of the different development policies between these levels are therefore required. Top-down decisions are also important for the local development approach.
- local development is not limited to local economic development alone. It is an integrated approach in which social, environmental, cultural, institutional and human development aspects must be considered. Despite this, in the context of local development policy practices, the term “development” is still confused with “growth”. Thus, while “growth characterises only the increase of economic dimensions (production rates), development refers to processes that relate both to the diffusion of the effects of growth in society as a whole and to the acquisition of autonomous growth. Hence, it implies qualitative transformations and the alteration of social and economic structures” (Sagredo, 1984, p. 48).

To continue with the analysis of this concept and the elements it comprises, Dalla Rosa (1999, p. 37) argues that development is not a theory, but a practice in which “mistakes can be made, but it has the obligation to achieve results. Development is a political choice, a reinvention of the future. It is distinct from growth, although development without growth is not possible. These notions should not be confused: facilities and infrastructures are necessary, but they are only means, not ends”. With respect to this view, Carpio (2007, p. 12) raises various related questions, among which worth mentioning is that: “development is not reduced to the realisation of individual projects, it does not depend on an expert’s report. Public aid often goes to research offices, whereas local development, above all, needs to encourage and mobilise the actors”. Both authors emphasise the need to shape a new sensibility, different to the one that the world powers are creating as the dominators of mass media. It is also necessary to consider the meaning of the model of development we want. “It is a question of fostering a new sensibility. It is a question of a scheme of values and the key words are participation and commitment” (Dalla Rosa, 1999, p. 38).

In Spain, the first local development initiatives were marked by a bias towards economic and employment generation. In the mid-1990s, local development was related to a job-creation strategy, since this was “undoubtedly the problem of the Spanish economy at the end of the 1980s” (Vázquez 1993, p. 133). The change in development strategy in Spain coincided with the arrival of the first democratic governments and the decentralisation of the state (the creation of the Autonomous Regions), so that local development was implemented by the Autonomous Regions and the democratic City

Councils as an appropriate strategy to create employment and restructure local and regional economies. On the other hand, local development arose as a response to the crisis situations of the 1970s and 1980s, which brought about drastic changes (the globalisation of the economy, socio-cultural and technological transformations). The effects of the policy of productive restructuring promoted by the National Government and the adaptation prior to the country's accession to the European Community (high unemployment rate, control of inflation, public deficit and balance of payments) should also be added.

According to Vázquez (1993), a large part of the conceptualisation of local development policies applied from 1989 onwards is due to the will and commitment of small working groups operating in international organisations who understood the significance and scope of local initiatives to boost productive adjustment, halt the growing unemployment in many municipalities and, in short, better regulate the economy. According to the same author, territorial theories of development defend the strategic superiority of small businesses in development processes. These theories of authors such as Friedman and Weaver (1979), Sach (1980), Stöhr and Tödting (1979; 1981) are based on the idea that each territory is the result of a history in which the institutional, economic and organisational environment has been shaped, giving it its own identity and enabling it to provide strategic responses to the challenges of globalisation. This approach has been enriched in the current century with a participatory and proactive model. It has led to the incorporation in local development policies of elements such as social capital, territorial cohesion, the qualification of the workforce and the transferability of knowledge and good practices, among other tangible and intangible aspects related to governance and participatory strategies (Bellandi and Sforzi, 2003; Martínez-Puche & Sanchiz, 2016; Martin *et al.*, 2019; Di Meo, 1991; European Commission, 2005; Mazzucato, 2018, Galaso *et al.*, 2018). These issues have strengthened not only the financing of local employment initiatives, but also qualitative and evaluation parameters, which conceive local development not only as a project (having a beginning and an end), but also as a polynuclear and continuous, lasting process, in which synergies are established with the values of the territory (Table 1).

Table 1

Evolution of local development policies in Spain

	Traditional Model (Before 1980)	Flexible Model (Between 1980–2000)	Participatory and Proactive Model (Since 2001)
Dominant strategy	Polarised development Functional Vision	Diffuse development Territorial Vision	Polynuclear Development. Proactive Territory Governance and Territorial Cohesion
Aims	Quantitative growth Major projects	Innovation, quality, flexibility, entrepreneurship,	Quality, commitment, knowledge capital. Opposite to the mere acquisition, optimisation of resources (tangible and intangible).
Mechanisms	Redistribution. Mobility of capital and labour	Mobilisation of endogenous potential. Use of local and external resources	Social capital and Human Resources qualification. Transferability of knowledge Transferability of knowledge and experience (bank of good practices).
Organisation	Centralised management. Financing for companies. Public administration of resources	Local development management. Service provision. Intermediate organisations.	Process versus Project. Concertation, cooperation and concreteness. Public participation and sustainable planning.

Source: Adapted from Vázquez (1993), Alonso and Méndez (2000). Own Elaboration.

Thus, Stöhr and Taylor (1981) advocate for bottom-up development strategies that offer opportunities for improvement to individuals, social groups and local communities and allow them to mobilise their capacities and resources. In this way, they propose initiatives to affix the population in

the territory, promote local agriculture and generate employment opportunities. In short, alternative actions to those of the traditional model of industrial and macroeconomic development of large companies located in metropolises (Gutiérrez, 2003). Over the years and due to the greater complexity that has developed in societies, especially in rural areas, issues such as addressing depopulation, establishing the young population and women and economic diversification, in many cases, based on the interrelationships with the primary sector (Albadalejo *et al.*, 2007), have been acquiring greater weight (European Commission, 2005; Saubens, 2008).

In this sense, the work of geographers and their holistic perception of the resources of the territory, particularly in the rural environment, is important, as stated by Paul Claval (1998, p. 238). Thus, the trait that best defines “the specificity of the geographer is his infinitely renewed ability to devote to the world a lucid and astonished gaze: they must know how to recognise what is expressed by the play of physical, living or mental forces already known, and to grasp what is new and what raises questions. Geography is first and foremost a discipline that looks at the world and the society that inhabits it. To train a geographer is to question the origins of this complex capacity to transfer raw data to what is already known, and at the same time to discover in it the unusual, the unseen. To learn to be a geographer is, therefore, to become unaccustomed, to place oneself in an unusual perspective and to question the evidence of the senses” (Fig. 1).

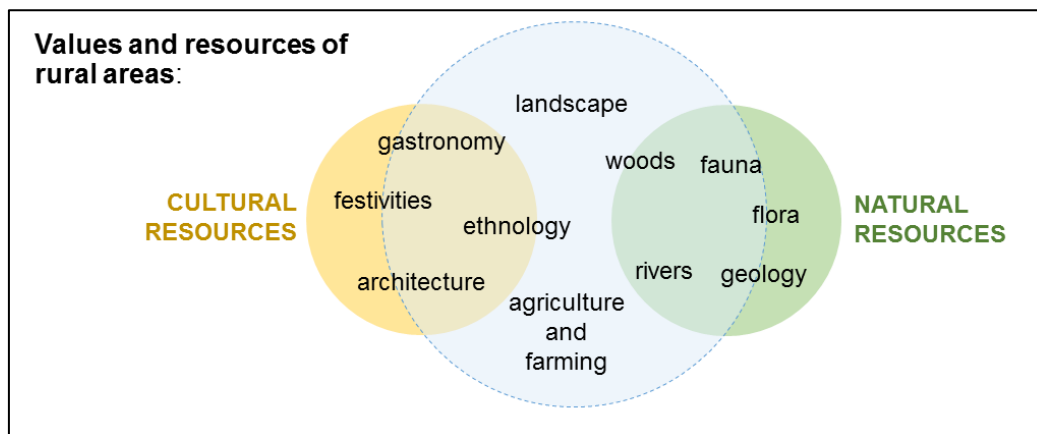


Fig. 1 – Integrated and territorial approach. Own elaboration.

Local Development Agents (LDAs), also known in the regulatory framework as Employment and Local Development Agents (ELDAs), play a fundamental role since they are responsible for implementing local development initiatives. However, there is little research that focuses on them (Lansu *et al.*, 2013) compared to the abundant bibliography on the conceptualisation of the idea of local development or development policies, especially rural development policies. Therefore, it is important to determine which are the elements associated with this figure, since it can condition how these policies are executed. Therefore, the research questions raised in this study are:

- Q1. Are local development professionals a key element for the management of the territory's resources?
- Q2. Are differentiated profiles needed, beyond training requisites, in which the integrated and geographical vision of the territories helps these professionals make strategic and effective decisions in their workspaces?
- Q3. Territories respond to differentiated needs in relation to their problems, resources and locations (rural, tourist, industrial). Therefore, should local development professionals act from a more strategic perspective and tailor their actions to the real needs of their territories? Is this possible in the current regulatory and public policy framework?

Within this context, the main objectives are:

- to analyse in depth academic profiles, the nature of the actions carried out in the territory and the importance of these actions, highlighting the close relationship between Geography and the management of territorial resources, although the local development professional is transversal.
- to establish the importance of a holistic and strategic vision of the actions derived from local development professionals
- to analyse the importance of training and education that professionals undertake from an integrated perspective
- to assess the strategic role of these professionals in the territory, with the need to establish networks within the city councils (with other professionals) and outside them (with other territories), to share and learn from experience.
- To empower these professionals, who are subject to intense bureaucratic work that limits the creativity and diversification of their actions beyond the management of subsidies.

2. METHODOLOGY

To achieve the proposed objectives, various methodologies have been used. First, a review has been made of the bibliography and regulatory framework on aspects related to local development agents in recent decades, and more specifically in the Region of Valencia (Fig. 2). The aim is to establish the “state of the art” with regard to the evolution of local development agents, their functions and their professional profiles.

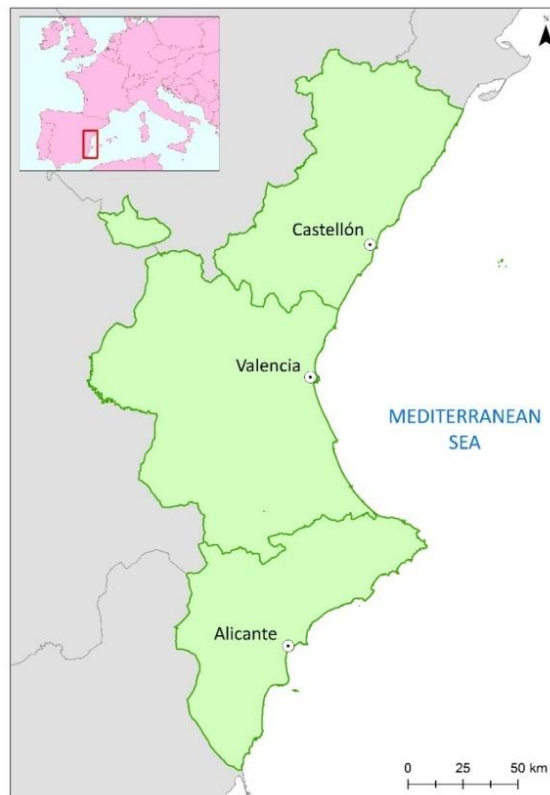


Fig. 2 – Location of area of study.

Second, data have been collected with the help of a survey. This action seeks to enrich the fieldwork and update the data available in the bibliography and in other recent works. The survey (a semi-structured questionnaire) was distributed among all the associates of the Federation of Technical Personnel in Local Development Management of the Region of Valencia (ADLYPSE-Comunidad Valenciana) between November and December 2019. It should be noted that the whole procedure was carried out preserving the anonymity of the participants. The questionnaire has a total of 44 items and is structured into four sections:

- Section 1: Area of work, who undertakes it, the degree of satisfaction with their professional performance and recognition as a professional.
- Section 2: Responsibilities and coordination of projects and measures, objectives of the entity, scales of work.
- Section 3: How we “see ourselves” and are seen as local development professionals, the degree of usefulness of local development professionals and the degree of resources managed.
- Section 4: Roles, profiles, training, age, gender, type of contract, education, qualifications.

The semi-structured questionnaire includes both open and closed-answer questions. The latter, unlike dichotomous yes/no questions, allow us to measure attitudes and determine the level of agreement of the respondent with the statements proposed. For many of the responses we used the Likert scale. This is a measurement tool that it is particularly useful in situations where we want the person to qualify their opinion. In this sense, the response categories have helped us capture a greater diversity in the respondents’ answers and the intensity of their opinion towards the statement.

We received responses from a total of 114 professionals, both associated (67.9%) and not associated (32.1%) with ADLYPSE-Comunidad Valenciana (Fig. 3). Of the responses received, 56.3% (n= 63) were from the province of Alicante, 27.7% from Valencia (n= 31) and 17.9% (n=20) from Castellón (Fig. 4). From a total sample of 600 working professionals, according to ADLYPSE-Comunidad Valenciana, we obtained 114 responses. This means that there is a confidence level of 90%, with a margin of error of 7%. Of these, 264 received subsidies from Public Employment and Training Service of the Region of Valencia (LABORA), 150 were consolidated professionals and the rest (190) were employed in other occupations related to associations, local action groups (LAGs), and those associated with the promotion of entrepreneurship and collaborative work (private entities).

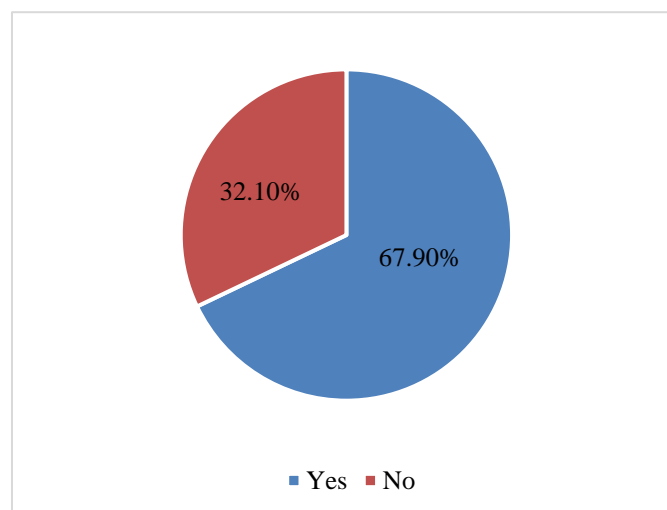


Fig. 3 – Are you a professional associated to ADLYPSE-Comunidad Valenciana?
 Source: Professional profiles survey (2019); Martínez-Puche, 2021. Own elaboration.

However, the survey focused on the members of ADLYPSE-Comunidad Valenciana. It is worth highlighting the difficulty in obtaining directories of DLAs or ELDAAs, apart from professional groups, as there is no joint census given the existence of different profiles, the diversity of functions and the fact that this figure was introduced into many town councils, entities and organisations as European Business and Innovation Centre (CEEIs) and former LEADER offices and Local Action Groups (LAGs), Territorial Employment Pacts, Consortia and Associations of Municipalities) only very recently.

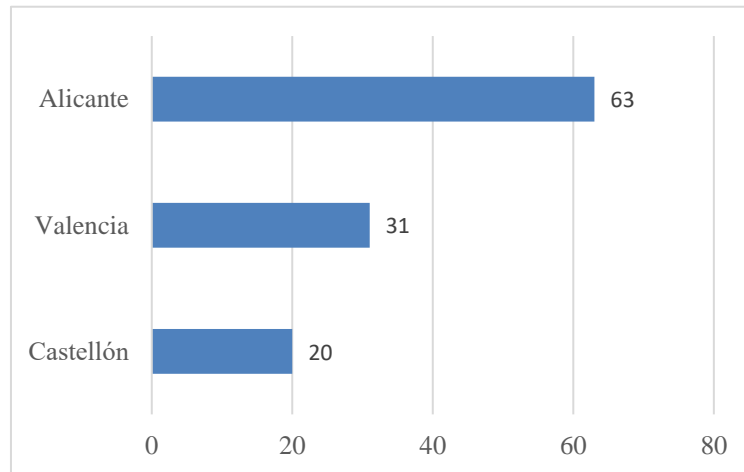


Fig. 4 – Participation of local development agents in the Region of Valencia by province.
Source: Professional profiles survey (2019); Martínez-Puche, 2021. Own elaboration.

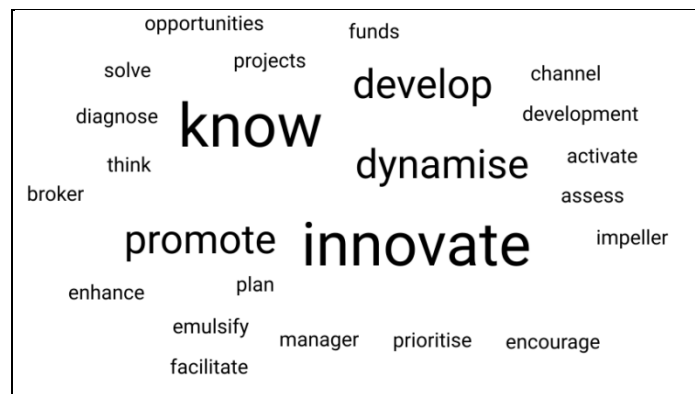


Fig. 5 – Highlights of the main attributes of local development professional practice.
Source: Focus group. Own elaboration.

Thirdly, in June 2022, during the training course held at the University Business Foundation (FUNDEUN) with local development professionals, we took the opportunity to carry out a group dynamic on 65 participants from the town councils of the province of Alicante. They were asked three questions, which they had to answer very briefly in order to establish a final word cloud with the most repeated terms. The first part consisted in matching their main attribute with a verb. The second question asked them to identify the main function in their professional practice. And, among the numerous actions and programmes they manage, they were asked to highlight the main action. The results can be seen in Figures 5 and 6.

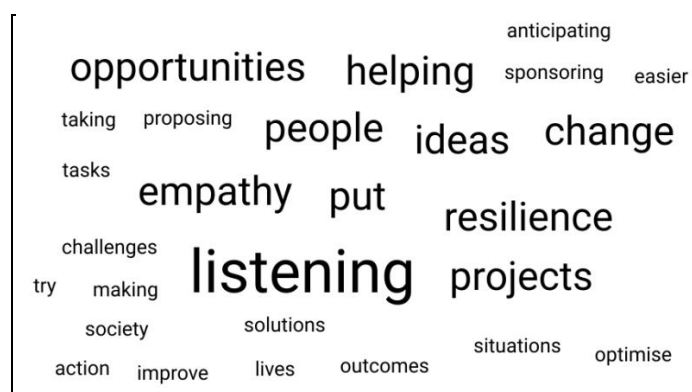


Fig. 6 – Highlights of the main actions of the local development professional practice.
Source: Focus Group. Own elaboration.

3. RESULTS

For more than three decades, local development managers have been attempting to generate and attract to the municipality as many economic resources as possible, as well as to manage social and environmental resources. The partial subsidisation for the hiring of technical personnel in local development management have never limited the actions on a social, environmental or cultural level or any other type, as long as they are focused on local development.

Before analysing the responses obtained in the four sections into which the survey was structured, it is necessary to analyse the regulatory framework of the figures of LDAs and ELDAs. The Orders of July 15, 1999 (National government) and the Order of November 29, 2000 (Regional government) establish the bases for the granting of public subsidies for the promotion of local development and the promotion of projects and companies classified as I+E. Article 8 specifies the functions that ELDAs carry out. The profile and functions are summarised in Table 2.

Table 2

Profile and functions, according to regulations of ELDAs

PROFILE	<ul style="list-style-type: none"> • Technician with knowledge of the socio-economic reality of the municipality. • Analytical and relational skills.
FUNCTIONS	<ul style="list-style-type: none"> • Dialogue between the business community in the area and the public administration at all levels of representation. Public administration at any level of representation. • Identifying idle or underused resources, of business projects for local economic promotion and innovative initiatives for the generation of employment in the local area, identifying new activities and entrepreneurial possibilities. • Dissemination and encouragement of potential opportunities for creating activity among unemployed people, promoters, entrepreneurs and collaborating institutions. • Technical support in the initiation of business projects for their consolidation into companies that generate new jobs, advising and informing on the technical, economic and financial viability, and, in general, on business launch plans. • Support for business promoters, once the companies have been set up, providing technical support during the first stages of operation, through the application of business management consultancy techniques and assistance in the appropriate training processes to contribute to the smooth running of the companies created.

Source: Order of July 15, 1999; Order of December 29, 2000. Own elaboration.

An analysis of these regulations clearly reveals that their functions are: to establish strategic plans, carry out diagnoses and comprehensive proposals to seek new opportunities from a socioeconomic point of view. Their role also includes finding ways to qualify and place entrepreneurs and the unemployed. Without a doubt, these activities and functions give local development a greater dimension than that perceived by supralocal administrations and citizens. And they are not entirely incompatible with the complementary actions of tourism, youth, career guidance or environmental agents.

For this reason, there are authors who point out that some town councils have not established defined functions for this role, apart from the public calls for applications made by LABORA. This limits the real capacity for intervention in the labour market, and a real process of social change is not generated, as their actions are limited to the management of programmes and public calls for employment (Calvo and Lerma, 2008a). In addition, an excessive dependence on subsidies has hindered the work to be carried out by local development agencies. In this sense, some things have not changed much in the last three decades as reflected by the responses of the participants in the focus group. Thus, the employment programmes applied only have a temporary nature, which prevents adequate planning or a foresighted management of the needs of the activity. This means a high turnover of technicians (understood in the broadest sense of the term) who have a short-term vision for their activity and who are maintained with extended subsidies. This aspect prevents the full implementation of actions in the field of motivation, which is left to the presumed professionalism of the human resources hired (Calvo, 2008). According to the respondents of the survey, there is still a high percentage of single-person agencies (66.2%), with a significant increase in the number of agencies with at least two professionals (16.9%) (Fig. 7).

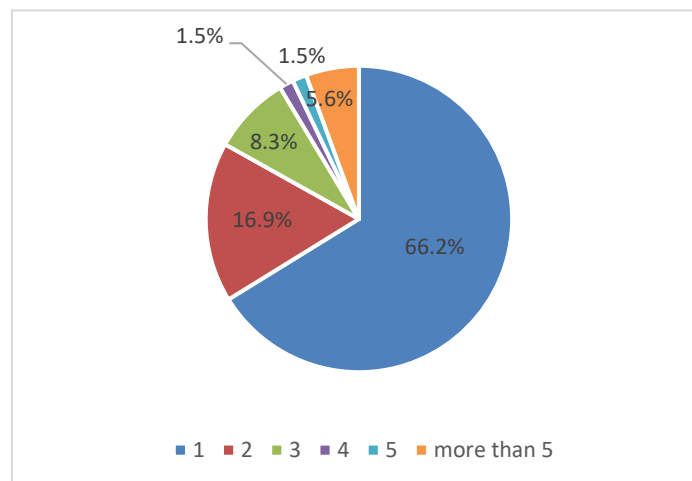


Fig. 7 – How many members are there in your Local Development Agency (2019)?
 Source: Professional profiles survey (2019); Martínez-Puche, 2021. Own elaboration.

Local Development Agencies expanded and matured during the 2001–2010 period, and consequently the number of LDAs increased both in Spain as a whole, but also in the Region of Valencia (Table 3). The year 1999 marked a turning point in the regulation of the ELDAs: the order of July 15 brought about the definitive consolidation of this professional figure. In turn, between 1999 and 2003, there was a progressive transfer of the management and control of active employment policies to the different autonomous regions (Calvo and Martínez-Puche, 2012), with all of them assuming these competences and creating their respective autonomous employment services, which, in the case of the Region of Valencia, was the Valencian Employment and Training Service (SERVEF), created in 2001 and currently called LABORA.

Table 3

Establishment date of Local Development Agency (2019)

Establishment date	Local Development Agency (%)
Before 1990	9.9
Between 1991 and 2000	26.8
Between 2001 and 2010	57.7
After 2010	5.6

Source: Professional profiles survey (2019). Own elaboration.

In relation to the administrative entity on which they depend, 68.2% of the agencies belong to a municipal department (council), with consortiums and associations of service providers also being prominent. It is also striking that a high percentage of the LDAs surveyed (59.2%) did not come to be in the municipality in which they practiced, or even in municipalities of the Region of Valencia (Figure 8). This would raise another working hypothesis to be explored in other studies regarding the relationship between professional performance, the link between these professionals and the territory in which they work and their greater or lesser degree of commitment and efficiency. Is it better to be a native of the municipality in which this work is carried out due to the greater knowledge of the place and its people? Or, on the contrary, is it preferable, in jobs of this nature, to not be a local person in order to be able to carry out the functions with a greater degree of independence and objectivity?

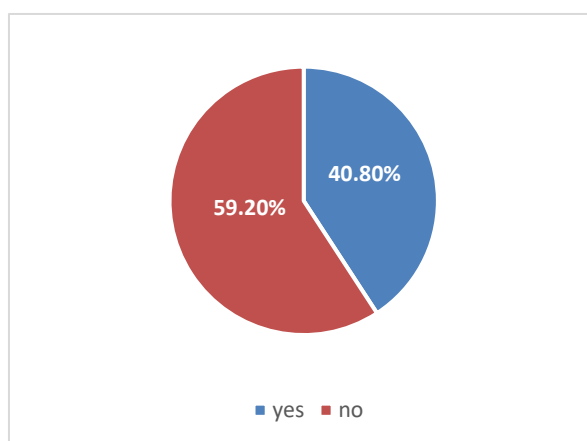


Fig. 8 – Do you work as an ELDA in your home municipality?

Source: Professional profiles survey (2019); Martínez-Puche, 2021. Own elaboration.

In relation to the scope of action, there is a more or less an equal distribution of territories in which local development agencies are found, regardless of their degree of productive specialisation. However, the greater weight of industrial and service-related municipalities is notable, which also employ a greater number of professionals in their local development agencies (Table 4).

Table 4

What is the productive specialisation of your area of influence?

Productive specialisation	Local Development Agency (%)
Mainly industrial	31.0
Mainly touristic	12.7
Mainly agricultural	19.7
Mainly services	36.6

Source: Professional profiles survey (2019); Martínez-Puche, 2021. Own elaboration.

Another issue that stands out is the type of contract available for local development professionals: civil servants (16.7%) and permanent employment contracts (24.5%) are the most representative profiles. Over the last decade, LDAs were conceived as qualified professionals who carried out multidisciplinary functions in structures that were usually (almost 70%) of a single-person nature, who in most cases have not consolidated their jobs (68%). Their professional qualification, however, is not an obstacle to identifying certain training deficiencies and a lack of specialisation caused fundamentally by the complexity and diversity of the tasks they carry out, the single-person nature of the services and the scarce supply of training (González, 2008). In relation to this issue, Martínez-Puche (2021) analyses the Report on the employment situation of technical personnel in the management of local development in the Region of Valencia, commissioned by the ADLYPSE-Federation-Valencian and elaborated by Mellado & Fabregat in 2019.

On December 29, 2000, the Regional Government published the Order establishing the regulatory bases and the general procedure for the granting of subsidies under the public employment programme of social interest and promotion of local development. With this Order, the Regional Government sought to unify and homogenise the variety of public employment postings that had been managed until then. This same regulation states that “employment and local development agents are configured as employees of local corporations or dependent entities whose main mission is to collaborate in the promotion and implementation of active employment policies related to the creation of business activity, this collaboration being carried out within the framework of joint action agreed between the contracting entity and the Regional Ministry of Economy, Finance and Employment” (Pérez, 2001, p. 24). Likewise, it established the maximum amounts of the subsidy and the percentage to be paid by LABORA (up to 80%, up to a maximum of 27,045 euros per year, renewable for annual periods with a maximum of four years).

It was assumed that in the fifth year, the promoting entity should be able to bear the costs derived from the personnel and the consolidation of that job. But often, due to a lack of economic resources or knowledge, political changes or a lack of commitment, this technical position is not consolidated. This means that local development actions have no continuity, especially if we consider that they are medium and long-term projects that in many cases exceed the legislative period of four years. This has produced a paradox, because although it has allowed the creation of a corps of active local development technicians working in the territory, on the other hand, it has prevented the permanence of professionals in the specific territories, who, after four years of performing this role, had acquired a significant knowledge of the problems of the area. Therefore, this accumulated background and the “know-how” appropriate to the territories in which they have intervened is lost. Furthermore, it has led the local entities to “relax” in terms of the decision to create positions in the Municipal Local Development Services, thus ignoring the latent need to create stable, efficient and quality services (Sanchís and Campos, 2005). This is why the four-year extension, articulated by the modification of the Ministerial Order of 1999, published on February 15, 2008, was welcomed.

Although LABORA co-finances the hiring and deployment of technical staff in local development management in the Region of Valencia, it is significant that it makes up only around 25% of the total wages paid to all professionals in said area. The remaining 75% is paid by the local authorities. Therefore, contrary to what is sometimes claimed by certain quarters, the dependence of professionals on this subsidy is limited and it is the local councils who are responsible to a greater extent for financing the hiring of technical staff in local development management.

The Order of the Regional Government of December 4, 2001 includes two novelties to be highlighted in this regard: the creation of a labour exchange and training courses for local development technicians. In fact, from this point on, the selection of ELDA's would be carried out by people who formed part of the labour exchanges articulated according to the rules of constitution and operation dictated by the Regional Government. The personnel aspiring to form part of the job pool had to have a

university diploma or degree, professional experience, while extra-academic knowledge acquired in local development would also be valued. These criteria are still applied at present.

In this sense, it is necessary to understand the difficulty in defining the profile of a Local Development Technician, and this is due to various factors. First, as the reality of each territory in itself is a differential factor and, at the same time, fundamental to promoting endogenous development, the human and professional characteristics of the agent must be in consonance with, and intimately related to, this different and differentiating historical and cultural reality. Second, because attitudes such as intuitive capacity, perception, common sense, the ability to observe, integrated vision, sensitivity, seductive capacity, creativity and commitment do not pertain to any academic field or qualifications, but form part of a nebulous field that is difficult to define. Third, because LDAs or ELDAs need broad training that allows them to work competently in regional and human geographical analysis, economics, sociology, psychology, history, applied ecology, agronomy, tourism, public programme management or business management, to name but a few of the fields of knowledge that directly affect local development (Izquierdo, 2005). Another aspect that has been identified through the surveys is that LDAs become mere hunters of subsidies, which in some way endorses or justifies their job and usually does not take into account the real needs (economic or social) of their territory. Similar statements were made in the study conducted by Calvo (2010).

The analysis of the answer related to their training reveals the diversity of their degrees, but also the diverse weight of this university training. Among the most consolidated, worth mentioning are graduates in Economics, Sociology, Geography or Law, among others (Table 5). In this last category it is worth mentioning graduates in Tourism who have been entering the labour market in recent years and who have been considered as suitably qualified by LABORA in the 2018 call for ELDA vacancies. Not surprisingly, in some Valencian public universities, local development courses are being offered. The following optional subjects stand out: “Local Sustainable Development” (33813) part of the degree in Geography and Environment at the University of Valencia; “Local Development and Sustainability” (33054) part of the degree in Geography and Territorial Planning at the University of Alicante; “Tourism and Territorial Practices in Local Development” (23752) part of the Degree in Tourism at the University of Alicante; and “Government and Management for Local Development” (34975) part of the Degree in Political Science and Public Administration, University of Valencia.

Table 5

Qualifications of practising Local Development professionals. Region of Valencia, 2019

Degree	%
Economics (ADE)	17.6
Sociology	16.7
Geography	12.7
Law	12.7
Labour Relations/Social Studies	8.8
Business Studies	7.8
Higher Technical Engineers	6.9
Social Work	6.9
Labour Sciences	5.9
Tourism	2.9
Agricultural Engineers	1.0
Psychologists	1.0

Source: Professional profiles survey (2019); Martínez-Puche, 2021. Own elaboration.

Another result is that just over 50% of Local Development professionals see themselves as under-utilised and, above all, as undervalued (86.6%). This undervaluation is due to the lack of social

recognition compared to other professions. Thus, on the Likert scale, values 3 and 4 obtained 23 votes respectively and value 5 obtained 26 answers. Moreover, this is exacerbated by wage discrimination, the most voted values being 4 (20 answers) and 5 (36 answers). A further important problem is the consolidation of the position, the most voted value being 5 (50 answers). Another of the factors highlighted by the interviewees is the lack of decision-making capacity and influence, although this is not relevant for the professionals surveyed. They consider the grievances established with other public administration technicians to be more important and above all, the lack of material and human resources for performing their professional tasks.

4. DISCUSSION

“An Employment and Development Agent (DLA or LEDA) is the person selected by the Administration to promote the local development of a specific target area, an undertaking that has to be achieved by involving all the social, political and economic agents converging in this area and acting as an intermediary agent between all of them” (Nofuentes, 1997, pp. 50–51). The definitions relating to these figures, as shown by the bibliographical review carried out, insist that these are the agents who, “after having carried out the relevant studies, will place before the eyes of society the weaknesses, threats, strengths and opportunities that affect this area; thus, all the social agents involved will agree on the need to act in a certain direction in order to remedy the initial situation (Calvo and Lerma, 2008b; González, 2008; Saubens, 2008). Some authors even emphasise that they undertake a role of mediation, promotion and coordination of the development (Sanchís and Cantarero 2003) process since they must listen to and support all opinions, “they must learn to be sensitive to the different existing problems, they must have a great capacity for negotiation and use all their intelligence to channel the development process in an adequate way” (Nofuentes, 1997, pp. 50–51). However, it should be noted that three decades later this has not been the case, as shown by the results obtained in this research and highlighted by Martínez-Puche (2021) when analysing the profile of the LDAs.

Another issue under analysis has been the relationship of the Local Development Agencies of the Region of Valencia with other agents of the territory, particularly the CEEIs, the Valencian public universities, the Provincial Councils, the Chambers of Commerce, the business associations of the territory and structures of social economy. According to the results of the surveys, the groups with which local development professionals work the most are the unemployed and the long-term unemployed, which highlights the fact that most technicians manage grants and subsidies derived from active employment policies, which “limit and stress” our target group. These themes coincide with those examined in the study by Calvo and Lerma (2008b), Vázquez (2010) and Galiana (2012). Other groups would also be included within the context of employment policies and programmes, such as young people, vulnerable groups, the over 45s and women (European Commission, 2005; Vázquez, 2011). In relation to the entities and their assessment, the first entities are the local administrations and entities of the Generalitat Valenciana (LABORA), followed by business associations and groups, and, on a second level, the Valencian universities. In this last case, mention must be made of the implementation of the AVALEM TERRITORI project, dependent on LABORA, on which the Universities Jaume I of Castellón, the University of Valencia and the University of Alicante (Spain), have been working since 2017 (Hermosilla *et al.*, 2017; Martínez-Puche & Lopéz, 2018).

On the other hand, there is also a need to look more closely at the reality of local administrations and other supra-local development structures, as these have undergone significant legislative changes, such as the law on budgetary stability or the so-called “law on contracts”, which have restricted their capacity to act and react. It is very difficult to establish a single profile of technical personnel in the management of Local Development in the Region of Valencia (FUNDEUN, 2006). The public

administration must also perceive the local development professional as a key player and catalyst of municipal and supra-local processes in many areas. But all of this must also be demonstrated through the measurement and quantification of the resources that their actions generate and the synergies that they trigger in the territory (González, 2016; Mazzucato, 2018; Galaso *et al.*, 2018).

Currently, with some exceptions where there are multidisciplinary teams, the technical staff of Local Development managers performs tasks that are highly focused on employment, training and subsidy management (Esparcia, 2009). On the other hand, they require training in public administration, knowledge of economics, web management and other subjects related to the territory (knowledge of local, tourist and cultural resources), which they encounter in the daily practice of their profession. FOREM (2000) addresses the training needs of local development agents, as proof of the wide variety of university profiles (degrees) that access these jobs according to this research. However, what is really desirable, and what the idea of economic promotion and local development is based on, is for professionals to be able to carry out multiple tasks beyond the management of employment programmes and subsidies (which, according to the responses, seems to be the main focus of their work, about which some have complaints). Therefore, after establishing what is desirable, as well as what the reality is, we must move towards what is possible and necessary, which, in our opinion, would focus on four pillars:

- the provision of multidisciplinary teams made up of at least two people (in the case of very small municipalities);
- the training of all members in transversal matters of local development (short-cycle and ad hoc training);
- the specialisation of workplaces according to area (employment, training, subsidies, economic promotion, etc.), taking into account the professional profile of each member of the team (employment, training, subsidies, economic promotion, etc.);
- the necessary provision of coordination bodies with other departments of the city council, such as Urban Planning, Equality, Tourism, Youth, etc. But also, with other supra-local bodies and resource management structures, which we have seen LABORA subsidise.

The results of this research also show that it would be necessary to study the possibility of proposing new legal figures for local development agencies, such as foundations, trusts, public companies or autonomous bodies, with the aim of streamlining the work of the agency and providing a better service to citizens and also to address the staffing restrictions from which the local administration currently suffers (González and Pérez, 2012; Clark *et al.*, 2018). The attitude of the technical staff in the management of local development should be highlighted and they should be committed to working with the community and for the community from both private entities (generating services and providing work where the administration cannot reach due to limited resources) and public bodies (city councils, associations of municipalities, territorial pacts and other local development structures).

Local Employment and Development Agents have frequently been absorbed by the “employment” competence that prevails in the professional practice of these technicians. As stated by Esparcia (2009), the DLAs are sometimes viewed by local corporations from a reductionist perspective, limited to applying policies emanating from higher authorities, and even to attracting subsidies. Their training and skills are often ignored and their potential under-utilised with a lack of definition of professional profiles and competencies linked only to economics and law. This is still the case according to the results of the surveys. In this sense, perhaps this situation prevailing in the practice of local development is the same as that which has existed in economic geography for a long time, which became soaked in economicism and lost sight of its mission: the explanation of what makes places different in terms of the characteristics and development conditions of the settled population, and how places with development problems could and should evolve towards progress actions, valuing their potentialities either directly or with external help (Sforzi, 1999). Therefore, we would not be mistaken saying that technical personnel in the management of local development are all professionals who work with a local-territorial perspective and approach in a specific institutional framework in which public administrations and local development

agencies play a key role in the socio-economic promotion of their respective territories, combining finalist policies (employment, social welfare, identity, entrepreneurial culture), sectorial policies (rural development, commerce, industry, tourism) and instrumental policies (continuous training and qualification of human resources, citizen participation and compliance with regulations). All of this is conducted with a notable sense of strategy, territorial planning and medium and long-term actions (process) (Rodríguez, 2009). We can observe that local development, not only from a conceptual but also from an applied point of view, incorporates highly heterogeneous criteria, formats, professionals, profiles and administrative and territorial contexts. The existence of professional associations at the regional level that share the same needs and demands, contrasts with the absence of agreed criteria, homogeneous regulations and administrative recognition in the field of local development professional practice.

5. CONCLUSIONS

We have analysed the reality of the professional practice of local development technicians in the Region of Valencia. This research is an exploratory study with a quantitative perspective, bound by the census of ADLYPSE-Comunidad Valenciana, linked to professionals from local development agencies and open to all technical personnel in local development management in the Region of Valencia.

The general conclusion is that, in spite of the territorial constraints and the attitude and aptitude of the Local Development Agent (LDAs), there are notable problems which are the same for all, and which arise independently of the scale of action. On the other hand, not everyone is qualified to be a local development agent, because apart from other considerations, it is a vocational job that demands a lot from oneself. Some general conclusions are: there is still no professional recognition of this technical figure; there is no job stability to reinforce their position in the municipal hierarchy; their actions are still limited to the field of subsidies and administrative management; there is still a tendency to be a professional for everything in the municipal hierarchy; there is a tendency to be a “jack-of-all-trades”, which is reinforced by the perception that many politicians and colleagues in the public administration have of LEDAs; there is a lack of training, above all in matters related to the promotion of social skills; the regulations governing local development functions, from the outset, characterise a technician who has many fields of action, but little capacity for action. Undoubtedly, the need for associative corporativism is important in order to be able to fight for the rights and profiles of these professionals in an organised way. The dispersion of academic and professional profiles, together with the lack of definition of professionals working in local development in public or private organisations and entities, does not help to establish a clear definition and specification of what an AEDL really is. There has undoubtedly been an evolution of tasks that have moved towards the specialisation and bureaucratization of local development professionals. And the capacity and creativity in the development of programs and initiatives has been lost, especially in large cities.

We have encountered some limitations due to the degree of response from the professionals surveyed, the lack of definition of tasks and functions, as well as the different contexts (rural-urban, large cities and smaller population centres). In this sense, the article is biased in relation to those who have participated, but it is useful for making a first characterisation of the current functions, actions and perceptions of what a local development professional does in the Region of Valencia and, particularly, in the province of Alicante. Undoubtedly, the professional practice of Local Development is transversal and multidisciplinary, although there are disciplines that are better adapted to the competences to be carried out in the management of Local Development, which are sometimes not taken into account in public calls for applications, as is the case with geography. In this sense, the Professional Association of Geographers continues working to reverse this situation.

In addition, from this article we can also extract the need, after collecting information, to carry out qualitative research, which would explore in greater depth the realities and needs of technical staff in the management of local development. This would require a singularity through casuistry, differentiated

contexts and sizes of entities enabling the establishment of a classification of categories, which could then be useful to the local administration. There are public employment offers and aid for local development projects, but do they really meet the needs of the “subsidised” territories? Advancing the knowledge of these issues would be one of the lines of research to be developed in the future.

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TOWARDS AN ANALYTICAL FRAMEWORK FOR ASSESSING THE IMPACT OF CULTURE-DRIVEN INTERVENTIONS ON INTEGRATED LOCAL DEVELOPMENT PLANNING: INSIGHTS FROM THE CASE STUDY OF PIRAEUS AVENUE IN ATHENS, GREECE

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Key-words: cultural assets, culture-driven interventions, impact assessment, local innovation, territorial capacity building, integrated local development planning, Piraeus Avenue.

Abstract. In recent years, culture has been addressed as a key component of integrated approaches to local development planning. In this context, it has been systematically combined with institutional and social aspects of local planning strategies and in support of local innovation/creativity systems. However, the articulation of these integrated approaches inhibits a wide typology of context-specific actions in European cities adopting different patterns of promoting culture as an innovative dimension of spatial planning. At the same time, recent discussion in the field suggests the adoption of more holistic frameworks that equally address the role of culture with differentiated aspects such as physical renewal, social relations and governance networks, hence recognising the integrated character of culture-driven interventions and explaining hindering development factors. The present paper aims to elaborate on the importance of such a holistic framework by testing its aspects in the context of the Piraeus Avenue area in Athens (Greece) and the (short-term and fragmented) emanating of developmental policies in support of the creativity and innovation that exist in this locality. The research focuses on the impact of cultural interventions in the Piraeus Avenue area in terms of the building of territorial efficiency, territorial quality, territorial identity and territorial capacity. In parallel, the research addresses the role of demographic and socio-economic parameters in this regard. To address these research aim issues, desktop research together with ten (10) semi-structured interviews with local stakeholders were conducted. Results indicate several positive impacts in the area mostly regarding spatial quality. However, in relation to territorial capacity building, a key finding is the need for activation towards building complementary uses and activities with other types of local stakeholders with accentuated decision-making powers. The research findings can serve to inform policy-making by identifying best practices and key challenges in the formulation of a holistic impact assessment framework towards culture-based spatial development planning in the European space.

1. INTRODUCTION

Since the beginning of the 1990s, the increasing discontinuity and fragmentation of urban development and related planning policies in Europe has triggered theoretical discussions and empirical research on the importance of both rediscovering alternative approaches and an emanating focus on integrated local development strategies (Delladetsima, 2003; Nussbaumer & Moulaert, 2004). All these entailed a shift from physical planning considerations and multi-sector urban revitalization practices towards a strategic rethinking of urban development processes involving the mobilization of local communities (Ferilli *et al.*, 2016). In this respect, several approaches (Crisp *et al.*, 2023; EC, 2022; Ferilli *et al.*, 2017; Hamdouch *et al.*, 2017) have identified the differentiated factors that should be taken into consideration in the making of an alternative developmental rationale; among these, culture was given top place as an expedient input in local development strategies.

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Culture-related local development and planning: a multidimensional imperative

Numerous social and spatial studies have revealed how a multiplicity of cultural formations proved to be impact-relevant in urban dynamics. More specifically, culture has been integrated into spatial planning and local development in differentiated ways and mainly as source of economic capital (see Evans, 2001 and Mommas, 2004 for an analytical review) closely related to the concepts of creativity, creative city and creative industries (Porter, 1998; Landry, 2000; Evans, 2001; Florida, 2002, 2008, 2012, 2017; Scott, 2006). This has highlighted specific characteristics of the cultural economy (Scott, 2000; Power & Scott, 2011) as a marketing strategy (see Bianchini, 1993; Bassett, 1993; Mootch, 1996); as a new consumption pattern in urban space (Montgomery, 2003; Pratt, 2005; Moore, 2014); as a social practice (Mommas, 2004; Santagata, 2010) indicating also the importance of social creativity and learning in everyday life practice (Roberts, 2006; André *et al.* 2013; Hillier, 2013; Moulaert, 2018; Haraldseid, 2019); and as a local and social innovation booster (Moulaert *et al.*, 2004, 2005, 2017, 2018, 2022; Maccallum *et al.*, 2009; André *et al.*, 2013; Moulaert & van Dyck, 2013) connecting the actual role of local skills, capabilities, and assets towards a culture-led development planning (Sacco *et al.*, 2013, 2014) through its emphasis on the development of socially creative milieus (André *et al.*, 2009).

The articulation of these dimensions denotes a distinct understanding of the term culture and its practical implications, with significant socio-historical contextual meanings. The recognition that culture should be understood as “a starting point for interpretation” (Shurmer-Smith, 2001:1) for the production, shaping, use and representation of spatial phenomena has marked the development of the so-called cultural-spatial turn (Baldwin *et al.*, 1999 in Hubbard & Kitchin, 2011). The shift represented an inherent quest for an alternative to the 1970s and 1980s economic and property-based strategies (Evans, 2001). Furthermore, the global challenges that emerged during the 1990s (Knieling & Othengrafen, 2009), fuelled respectively the valorisation of non-material aspects in spatial development such as: meaning, identity, and the politics of difference (Eade & Mele, 2002). At the same time, culture’s non-material aspects transcended the interpretive field to entail specific spatial manifestations (Kunzmann, 2004: 384). Within this approach, the term ‘culture’ was expanded to encompass additional aspects of social life beyond merely aesthetic considerations, for example employment, welfare provision, social organization and political participation. Based on this conceptualization, culture acquired a far more specific role in determining a shared analysis of social phenomena, but also in sharing a pragmatic urban development vision in urban space.

Creative strategies were implemented in many places, thereafter putting an emphasis on the interrelation of economy and space, further supported by the enactment of global classifications such as the UNCTAD stat². The attraction of ‘creative professionals’ and their contribution into the ‘creative city’, ‘creative clusters’, ‘creative hubs’, ‘creative industries’ and ‘creative capital’ formations, was argued to boost entrepreneurship and innovation, both largely important for local development (Delladetsima & Loukakis, 2017). Nevertheless, the implementation of a ‘creative city’ approach (see among others Porter, 1995; Landry, 2000; Scott, 2000; Florida, 2003; Mommas, 2004; Evans, 2009; Markusen & Gadwa, 2010; Santagata, 2010) has led to a direct equation of identifying creativity indicators in cities to their economic competitiveness and development (Healy, 2004). Consequently, it has been argued that it became the source of “carbon-copy” policies and strategies (André *et al.*, 2013) largely promoting market objectives while sidelining the promotion of spatial, sustainable spillovers (Sacco *et al.*, 2014). As a response, literature emphasized the importance of stipulating new types of local capacity building (André & Abreu, 2009; Sacco *et al.*, 2013; Moulaert *et al.*, 2017, 2022). Still, there is a certain lack of empirically situated schemes that would explain the spatial and sectoral aspects nexus of culture’s integration (Tremblay & Battaglia, 2012; Sacco *et al.*, 2014; Ferilli *et al.*, 2016; Sogovia & Hervé, 2022).

² See UNCTAD, Retrieved August 30, 2023, from <https://hbs.unctad.org/classifications/>.

Culture as a key dimension of integrated spatial development

The idea of a more integrated development approach comprising culture as a key component at the European level has evolved to be a counter-dynamic to neoliberal doctrines and non-interventionist policies. In this context, relevant literature (Ferilli *et al.*, 2017) addresses points of criticism towards creative policies aiming at the attraction of foreign investments, the implementation of physical renewal strategies (large redevelopment projects and flagship cultural districts) and the promotion of institutional transformations (deregulation of markets and state practices, privatization of public domain and actions, public-private partnerships). Instead, the focus has been turned to the endogenous local development approach with cultural practices enhancing socially oriented, area-based collective action and programmes (promotion of local skills, capacities, and local assets) (Moulaert, 2010). An important point here is also the consideration of assessing development policies' impact relevance through these practices (Sacco *et al.*, 2013).

The aforementioned shift, as expressed also through the concept of social creativity (André *et al.*, 2013), was argued to be extremely relevant to counterbalancing the deep social legitimacy crisis in European cities during past decades (Hillier, 2013). In this view, the consideration of culture in local development strategies has been addressed as a key factor for enhancing capacities such as diversity, tolerance, collective learning and critical thinking between different stakeholders and local actors. Under these terms, the social creativity approach gives prominence to the networking role of culture by taking the form of socially innovative practices (Moulaert *et al.*, 2017, 2022), hence opening a new theoretical nexus of creativity's collective character potential, to building new relations, reconstructing identities and empowering vulnerable groups by challenging institutionalized practices (André & Abreu, 2009). The actual spatial manifestation of this potential not only exposes the 'creative city' limitations but also reveals future possibilities for planning systems (Knieling & Othengrafen, 2009) and development strategies (Sogovia & Hervé, 2022). In these terms, planning is argued to be rooted, understood and practiced in a particular cultural system which can also be seen as an asset for socio-spatial change. Subsequently, culture and creativity, in spatial planning, lead to the development of creative planning, thus, to a field of experimentation for planning cultures' possibilities, that embodies social innovation and collective learning strategies (Moulaert & MacCallum, 2019; Hamdouch, *et al.*, 2017).

Despite the dynamic potential of the social creativity approach for spatial planning, this has been inserted at the policy level rather in an abstract sense recognizing the *a priori* beneficial character of culture in citizens' everyday life (Hubert, 2010; Moulaert *et al.*, 2017; Pasikowska-Schnass, 2019; European Commission, 2020). While there is a certain degree of uncertainty regarding the European common identity (Alzons, 2019), and there is high vulnerability of global societies to repetitive economic and other crises, such as the COVID-19 crisis, the inadequacy of soft actions due to economic, legislative, and other parameters prevails over the possible positive spillovers of culture-related experimentation in local development planning. The realization of culture as a resource for local development and the analysis of hindering and enabling opportunities (Kazepov, 2005) as well as shaping, re-shaping and un-shaping processes in current sociopolitical systems with the active role of local societies (Moulaert, 2018) needs a more focused analysis on the culture-based initiatives impact assessment. Simultaneously, while recent contributions emphasize the significance of cultural assets for sustainable development across various local contexts (Gravagnuolo *et al.*, 2021; Olney & Kafiris, 2022; Stihl, 2023) and offer new insights into sustainable tourism (Duxbury, 2021; Rudan, 2023), they appear to overlook the aspect of impact assessment holistic understanding. An exception to this trend is the emphasis placed on heritage management (Arcos-Pumarola *et al.*, 2023; Ashrafi *et al.*, 2021; Gravagnuolo *et al.*, 2022) and the subsequent embeddedness of intangible cultural assets to tangible heritage (Capello *et al.*, 2019).

The importance of assessing the impact of cultural input through a holistic approach

Culture as an integrative component in local development planning is not a one-dimensional component. Rather than that, it entails three main elements: a) a given definition of culture; b) its

subsequent relevance to the development process; and c) a local policy and planning perspective (See Figure 1 for a schematic representation of culture's analytical role).

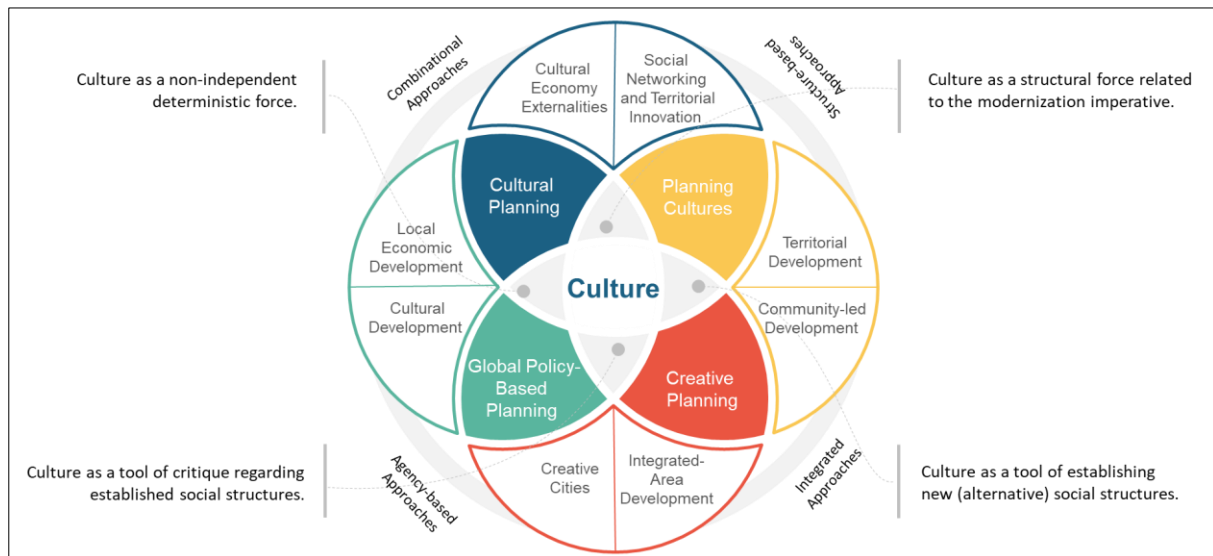


Fig. 1 – Portrayal of Culture's Multidimensional Approach in the Field of Spatial Development Planning based on the literature review presented in this article. This Visualization has been produced based on Venn Diagram³ to highlight that the Applications of Culture are distinct, but also highly interconnected.

Additionally, debates on culture's potentialities in spatial development and planning are based on the exploration of the multiple interrelations between urban development and planning challenges in relation to the typical/ non-typical culture-related responses introduced in support of an alternative development imperative. This implies the structuring of a context-specific alliance for the identification and analysis of a development problem in a cohesive and coherent way (Sum & Jessop, 2013). Such an approach can contribute to the impact assessment of cultural interventions focusing exactly on culture's ability to enhance soft strategies in spatial development planning considering that contemporary cities are often "places of vulnerability" (Eckardt & Sanchez, 2015: 127) where local responses to crises do not meet the wider priorities of development politics.

It also needs to be stressed that despite the wide interest derived from the relative literature and policy practices, the integration of culture in development practice has merely been based on "fuzzy theories" (Markusen & Gadwa, 2010: 379). As a result, there is an overall analytical void regarding the causal links between culture and the institutional spatial development environment (Nyseth *et al.*, 2017) still evident to this day. This also reflects the unfettered character of culture's integration into those fields. As a result, further research is needed based on theoretical and practical developments that analyse the strategic relevance of culture through more holistic impact assessment methodologies (Sacco *et al.*, 2014; Sacco *et al.*, 2013) in a way that context-specificness builds upon transdisciplinarity; this means that research processes should take into consideration the grasp of a problem's complexity, the links between abstract and case-specific knowledge, and the need for promoting the common good through knowledge production (Novy *et al.*, 2013).

In order to assess the potentialities of culture as a strategic component of an alternative local development initiative, focus should be shifted to the big spatial planning picture. In this respect, Moulaert & Mehmood (2013) have suggested that social reality, as a process of assessing elements, should be placed in the context of a whole development trajectory that is ontologically set. In an era

³ See <https://www.lucidchart.com/pages/tutorial/venn-diagram>, Retrieved February 23, 2022.

when the future of urban development and planning is still significantly dependent on struggles over resources (Delladetsima, 2003), coming both from the institutionalized and the non-institutionalized world, culture, as a strategic component, should tackle this exact discontinuity as evidenced both in the scale and purpose of planning investments and governance arrangements between different policy levels (ibid.). In this context, culture also incorporates a role of legitimizing the inadequacy of conventional land-use planning or later strategic interventions and the subsequent generation of creative planning (Hamdouch *et al.*, 2017).

Evidently, the nature of urban development and spatial planning fields is highly complex; hence, they constitute a mixture of elaborate policymaking and practice systems along with the interaction of multiple actors, flows, places, relations, values, collectivities, synergies etc. and often bring in unreliable responses to endogenous and exogenous forces (Healy, 2007). It is now well accepted that pressure for immediate action towards the implications of the economic crisis and the COVID-19 pandemic (Comfort *et al.*, 2020) put weighty barriers to the creation of strategic planning comprising long-term culture-based components. In this context, culture's importance for attracting large-scale economic interests incorporating renewed physical design strategies, cultural heritage, technology, and a touristic image of the cities, followed by numerous speculative practices, large-scale redevelopment remains quite popular in policy practice (Hamdouch *et al.*, 2017). At the same time, distinctively from the social creativity approach, the use of cultural and creative assets for social purposes takes the form of either individual or communitarian economic empowerment, or leasing out state welfare provisions (Moulaert *et al.*, 2017; Moulaert, 2022). In this respect, further research is needed in order to align theoretical models to value-creation practices (Segovia & Hervé, 2022).

Directions for culture's impact assessment strategies

The analysis of cultural impact assessment has been a less popular dimension of the impact assessment field. According to Partal & Dunphy (2016), the fewer references to the cultural dimension are related, first and foremost, to the contested definition of culture. In this view, the cultural impact assessment has been occupied mostly by the impact of tangible cultural resources, such as built heritage and other physical artefacts. In this context, the impact of intangible cultural resources has been considered a subtopic of social impact assessment or a form of cultural influence to societal and environmental issues (Boyle, 1998). As a result, there is quite a generic framework of how to address the impact of newly proposed cultural arrangements. Cultural impact assessment has been developed mostly in the context of local project evaluation frameworks leading to significant variations in the field (Sagnia, 2004) while there is limited relevant literature on the formulation of a comparative literature review up to date (see Partal & Dunphy, 2016).

Sagnia (2004: 6) has suggested that cultural impact assessment is "a process of identifying, predicting, evaluating and communicating the probable effects of a current or proposed development policy or action on the cultural life, institutions and resources of communities, then integrating the findings and conclusions into the planning and decision-making process, with a view to mitigating adverse impacts and enhancing positive outcomes". Cultural impact assessment is highly related to the ways that culture is integrated into wider development aspirations (Belfiore, 2020). In this direction, a more systematic effort to address a coherent model of cultural impact assessment has been developed in the context of the urban development field. Gibson (2011) has proposed methodological tools for assessing the multiplicity of the cultural content and its relation to local societies. In his view, the appropriation of culture, that is, cultural activities and interventions, should have a clear goal towards social sustainability. The value of culture is not a *per se* value but is integrated into systemic relations within a local community. As a result, the research on cultural impact should be based on a multidimensional research method that includes both quantitative and qualitative methods, techniques, and tools. Moreover, cultural impact assessment can be specified in terms of analysing

the potential impact of new cultural uses and organizations situating exactly the subject of interventions, policy goals, contextual characteristics and relevance to other local stakes.

Furthermore, literature related to the holistic local development approach (Moulaert *et al.*, 2005; Nussbaumer & Moulaert, 2004; Gonzales & Healy, 2005; Cassinary, 2011; Moulaert and Mehmood, 2013) and holistic sustainable development (Mrak *et al.*, 2022) has identified patterns for specifying the position of theory and practice into the analysis enhancing aspects such as coverage of peoples' needs, the improvements of relevant interventions in the area and the improvement of qualitative aspects such as accountability, liability, and responsibility. In this direction, cultural impact assessment is also close to the territorial impact assessment framework and methodologies. Territorial impact assessment in general aims to provide an integrated view of a project's impact in a particular area and therefore an integrated view of relevant policy arrangements (Medeiros, 2020; 2023). Although Territorial Impact Assessment is also highly relevant to local project-making processes (ESPON, 2019), its relevance lies in the valorisation of local characteristics based on statistical and geostatistical data in relation to the view and judgment of local, cultural and policy actors. In this context, territorial impact assessment indicates a process of constant counterchecks between a project's objectives, inputs, as well as outputs and wider socio-economic problems, and impacts explained as territorial capacity building.

In the following sections, we test a holistic scheme for assessing the differentiated impacts of cultural assets in the Piraeus Avenue area and the extent to which they can effectively contribute to local sustainable development planning strategies. The research focuses on the impact of cultural interventions in this area; hence addressing what the identified and potential outcomes of culture-related interventions in the area are in terms of territorial efficiency, territorial quality, territorial identity and territorial capacity building. Concurrently, the research addresses the role of demographic and socio-economic parameters in this regard.

2. CASE STUDY AREA

The paper addresses the outcomes and dynamics of cultural initiatives for spatial development planning based on a holistic cultural impact assessment and cultural impact relevance approach, attempting also a response to the aforementioned theoretical principles and challenges. It focuses on the case study of Piraeus Avenue in the Athens Metropolitan Area. Piraeus Avenue (Fig. 2) is a main artery that connects the centre of Athens to the port of Piraeus. It covers an area that belongs to four municipalities (Athens, Moschato-Tavros, Nikaia-Agios Ioannis Rentis and Piraeus Municipalities) and it is 10 kilometres long. Piraeus Avenue's historical importance and modern trajectory as a former industrial site has been thoroughly analysed in different studies (Kampouroglou, 1883; Tsokopoulos, 1984; Ntorizas, 1997; Kotea, 1997; Kardamitsi-Adami, 1999; Malikouti, 2004); architectural reports, research and policy papers (Ministry of Environment Spatial Planning and Public Works, 1995a; 1995b; Belavilas, 2002; Vatavali & Belavilas, 2007; Skayannis & Makri, 2012; Moschouti, 2012; Kotios *et al.*, 2018; Vincent & Bournova, 2023), press and online articles. It has also become the locus of ethnographic fiction (Ferousis, 2002; Psychopaidis, 2004), cultural production initiatives, educational activities and academic and historical studies (Argyrakaki & Lagopoulos, 2009; Oikonomopoulou, 2011; Tsagkarakis, 2010; Giannouloupoulou & Koutsanellou, 2013; Gkanouri & Skagianni, 2017; Chatzi, 2018; Kokkinis & Chamatzoglou, 2018) and has attracted several photographic and film interests. The avenue itself has also been, in part, the site of numerous architectural bids.

To gain a deeper understanding of the empirical study results, this section presents the key characteristics of the Piraeus Avenue area. These characteristics are derived from the findings of a desktop research study.

The historical development of the avenue as a brownfield site

The development of the avenue is tightly associated with Greece's industrialization trajectory. Since its development in the middle of the 19th century, the avenue – extending towards the South of the agglomeration from the Athens centre (Omonia Sq. to the port of Piraeus) – began to attract peri-urban uses/activities such as factories, crafts, warehouses, and wholesale depots. During the early stages of the Greek industrialization process between 1865–1875 (Agriantoni, 1991), tile factories were in the northern area of Piraeus Municipality, while tanneries also developed in adjacent areas (the Rentis area). Next, during the 1873–1883 period, the Piraeus Municipality area accumulated flour mills. Towards the end of the 19th century, intense development along Piraeus Avenue took place especially in proximity to the Athens and Piraeus built-up factory. Given these dynamics that lasted until World War I, a radical transformation of the spatial structure occurred with the installation of larger factories along the road, and the construction of the Athens-Piraeus railway. In the interwar period, Piraeus Avenue further extended its industrial role with the establishment of chemical and other large-scale plants. Up until 1939, the industrial landscape of Piraeus was determined mainly along the road segment from the north of Piraeus to Tavros. Within the interwar period, the areas of Rentis and Tavros included also 1922 refugee movement settlements that made up the only residential uses located on Piraeus Avenue (Makri & Skagiannis, 2012). The aforementioned processes began to change in the 1970s when Greece experienced a de-industrialization process (Agriantoni, 1991). After the 1970s, Piraeus Road lost its previous industrial importance and started degrading. Gradually, a land use differentiation trend took place with the attraction of new uses, while old factory facilities were largely abandoned, as they became obsolete.

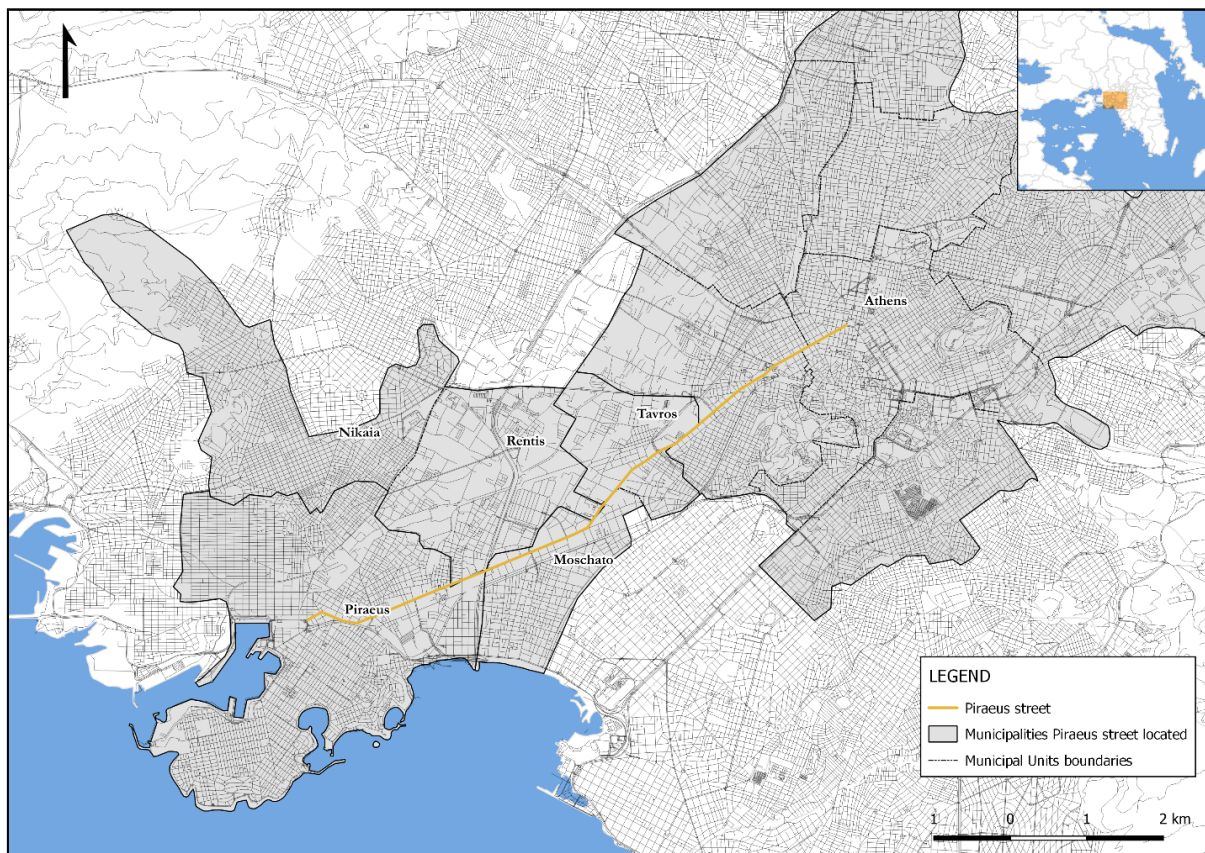


Fig. 2 – Piraeus Avenue and the Municipalities it crosses. Author's processing is based on open geospatial data.

Hence, starting the 1970s, Piraeus Avenue entered a long period of transformation, posing the need for a strategic renewal of the existing building stock. Nevertheless, an important tendency of the development of cultural uses was manifested after the 1990s, combined with several redevelopment proposals and plans, or even ideas for the land use structure of the axis. In this context, since the 1980s, a parallel legislative framework has been developed to enhance a new role of the axis.

The development of culture-related planning policies for the development of the road

The search for a new vision for Piraeus Avenue's redevelopment became a challenging priority for municipal and regional authorities. The Regulatory Plan of Athens of 1983 (Government Bulletin 18A /18.2.1985) was the first plan enforcing land use considerations, but its 1992 strategic plan amendment (Government Bulletin 94A /5.6.1992A) did not, in fact, foresee any regulations for the development potential of Piraeus Axis as a whole. However, it foresaw actions for redefining the Athens and Piraeus central areas, measures for the limitation of central functions and the elimination of wholesale and industrial uses. Moreover, it identified Athens and Piraeus' historical character and their role as metropolitan centres of international scope. In this context, emphasis was put also on the western side of the centre of Athens with the transfer of cultural and administrative uses to the areas of Gazi, Kerameikos and Iera Odos. The Athens City Local Plan (1988) (Government Bulletin 80Δ /4.1.1988) identified the need to determine incentives for new uses as well as the metropolitan role of the centre of Athens. The Moschato Municipality Local Plan (1988) (Government Bulletin 386Δ /2.6.1988) referred mainly to public road works with special reference to Kifisos and Piraeus roads intersection. The Tavros Local Plan (1987) (Government Bulletin 834Δ /31.08.1987) determined the need for incentives for the development of multi-centre and general housing uses on the street. The Aghios Ioannis Rentis City Local Plan (1987) (Government Bulletin 1038Δ /16.10.1987) referred to the upgrading of Piraeus Street with the gradual replacement of the industrial uses with less disturbing and aesthetically upgraded uses as well as the presence of wholesalers in the Central Market of Rentis. The Piraeus City Local Plan (1988) (Government Bulletin 79Δ / 4.2.1988) included Piraeus Road areas as in need of preservation and protection of historic buildings and of attracting new functions.

In 1996 a new legislation was reinforced in relation to the protection of the traditional character of specific parts of or buildings around the road (Government Bulletin 510Δ /1996; and its amendment (267 Δ /1997) and as part of an effort to upgrade the road. This legislation altered the aforementioned local plans in terms of designating as traditional the area of Piraeus Avenue outside the historical centres of Athens and Piraeus cities and within the municipal boundaries of Athens, Tavros, Moschato, Kallithea, Ag. Ioannis Rentis and Piraeus municipalities. In this context, eighty-eight (88) buildings and ten (10) facades located within the zoning plan of the Athens, Ag. Ioannis Rentis, Moschato, Tavros and Piraeus Municipalities were characterized as historically protected/preserved. As provided by law, it was forbidden to interfere in any way with the architectural character of these buildings, control was foreseen for repairs and additions to the buildings and public gatherings, leisure activities in general, cultural functions, while administration offices and social welfare uses were allowed.

In March 1995, the reconstruction program of Piraeus Avenue was announced, with the aim to reveal its history and its important buildings, enforce traffic regulations and nine (9) intervention points, as well as an integral plan for the avenue not compartmentalized in the distinct sections belonging to the related municipalities. Its relevant study issued by the Ministry for the Environment, focused on the following renewal initiatives: the recognition of Piraeus Road as a heritage site, the approval of a land-use regulation, the evaluation of building conditions, the designation of listed buildings, the enforcement of traffic regulations, and the development of multi-purpose targeted actions in specific areas.

Regional legislation [the Athens/Attica Master Plan (Government Bulletin 18A /1985; 156A /2014), legislation on the traditional character of particular parts or buildings of the road (Government Bulletin 510Δ /1996; and its amendment 267Δ /1997), and the legislation on Piraeus axis character (Government Bulletin 1063 Δ /2004, 103 ΑΑΠ /2007)] valorised the role of particular measures regarding land uses, regeneration interventions, building plot ratio etc., modifying the existing Urban Plans as based on relevant consultations and the subsequent policy studies/papers (Ministry of Environment Spatial Planning and Public Works, 1995b). However, in practice, these have mostly remained incomplete.

In 2004 (Government Bulletin 1063Δ/16.11.2004), Athens, Tavros, Moschato, Ag. Ioannis Rentis and Piraeus municipalities' local plans were modified in order to regulate new uses in the area while an amendment (103ΑΑΠ/22.2.2007) allowed the relocation of food hypermarkets and partly specified land use categories referred to the 2004 legislation. The 2004 legislation also defined distinct construction permits for the area.

In 2014, the new Athens-Attica Regulatory Plan was enforced (Government Bulletin 156A /1.8.2014). As stated in the new plan, it aimed at setting the goals, directions, policy, priorities, measures and programs necessary for spatial and urban planning, and housing organization of Attica, as well as the protection of the environment according to the principles of sustainable development. The plan was set to be developed also based on population and financial projections until 2021 while it was also stated that the Plan's strategic goals, the promotion of policies, as well as the pace and extent of implementation of the prescribed regulations would be consistently monitored through the defined criteria. The Plan's three strategic goals were: balanced economic development, sustainable spatial development, and the improvement of the inhabitants' quality of life. According to the plan, Piraeus Avenue should be developed with an emphasis on cultural and leisure uses. Overall, the Plan was sought to highlight the axis key elements of image and identity of the city as an international cultural and tourist destination metropolis.

In addition, in the context of securing the European Structural and Investment Funds implementation and the Enterprise Agreement for the Development Framework (NSRF) 2014–2020, the Municipalities drafted local operational programmes that included, to a certain extent, provisions for Piraeus Avenue. The Athens operational programmes 2012–2014 and 2015–2019 included a limited number of action areas in the Piraeus Avenue zone as indicative initiatives. The Moschato – Tavros municipal operational programme 2015–2019 made a thorough analysis of the history of Piraeus Road, of the symbolic character as well as the population dynamics at the south-east part of the axis. Nikaia – Aghios Ioannis Rentis municipal operational programme 2015–2019 referred to Piraeus Avenue as a main road with the development of large-scale activities of educational and cultural importance. Furthermore, Piraeus municipal operational programme 2015–2019 referred to spotted interventions in the area. At the same time, the Athens Sustainable Urban Development Plan funded by the Region of Attica and the Ministry of Employment Operational programmes (Ergo Athina 2012–2015; Ergo Athina 2020), as well as the Athens spatial and sectoral development strategy aimed at the recognition of cultural interventions' importance for the city (City of Athens, 2020).

Overall, policy interest in Piraeus Avenue was gradually expressed and a series of actions began, significantly affecting the current trajectories of the road. Policymakers responded to this situation with the formulation of a planning policy agenda and the enactment of subsequent legislation which aimed at the valorisation of the old industrial building stock and the attraction of cultural, entertainment, educational, recreational and targeted productive activities, while also aiming to transform the road into a supra-local development pole. Indeed, the relocation of cultural uses, such as theatrical spaces near Omonoia Square, the School of Fine Arts, the Ellinikos Kosmos Cultural Centre, the Technopolis in Gkazi area, the Benaki Museum, the M. Cacoyannis Foundation and the Greek Festival, during the

1990s and the 2000s constituted supra-local interventions that enriched the cultural capital of the area. These cultural assets have been combined with the development of supra-local commerce and mass entertainment activities on specific sites that in combination have altered the dynamics and image in different parts of the Piraeus Avenue area.

Despite the existence of a strategic interest in the road's redevelopment at a metropolitan level during the 1990s and 2000s, it can be argued that this has gradually decreased because interventions and the utilization of European financial instruments have been reoriented to areas with more intense poverty and social exclusion during the past decade. As regards the Piraeus Avenue case, concern at the local level planning remains more accentuated in the Moschato – Tavros Municipality. At the same time though, there is a lack of current operational support for new culture-based redevelopment actions in the area together with the proliferation of recent large-scale interventions through public-private partnership schemes that incorporate culture as a general supporting vision for other services and current recreational uses. The planning trajectory of Piraeus Avenue remains mostly related to the logic of not disturbing the status quo of land uses and interests as they stand (see Giannakourou, 2019), since it is the outcome of a combination between market forces dynamics and the limited local communities' engagement in the planning process (Belavilas, 2022). At the same time, the long-term inactivity of the political and legal imperative for the area has not been the object of a systematic exploration. As a result, there is a need for updated research and data before proposing an updated planning vision for the road. While Piraeus Avenue holds a significant industrial past, defining and evaluating redevelopment projects into former industrial areas is truly complicated and requires the investigation of complex conflicts and trade-offs that, if left unexplored, will add more to the vulnerability of the case area planning trajectory. In this context, it should be taken into consideration that the Piraeus Avenue planning paradigm is over thirty years old, and it has been further entangled after the emergence of the economic crisis.

Current Land Uses and Building Stock in the area

Despite the initiatives for the development of Piraeus Avenue, the road is facing a multitude of problems with the existence of road quality technical problems, traffic congestion issues and many vacant or abandoned industrial buildings. At the same time, the revival of the decaying industrial brown-field and the transformation of a large part of the road to now receive visitors – tourists, young people, schoolchildren, students – in museums, festivals, university halls, recreational areas, offices, industries, and commerce remains at stake for a large part of the road. The large acreage and poor quality of the unutilized land and building stock for a long time could not be reversed only through the relocation of public-driven cultural capital in the road.

Piraeus Avenue constitutes a terrain of highly differentiated and contrasted land uses⁴. The closure of the majority of industries in the area did not lead to the subsequent redevelopment of the industrial buildings. At the same time, appendant craft and warehouse uses remained or continued relocating in the area. Now, Piraeus Avenue has a certain degree of highly differentiated uses in terms of physical space quality, land-use and socio-economic activities that reveal a significant spatial fragmentation affected mainly by the distinct social, economic and spatial challenges faced by the individual areas connected to the road. Near the centre of Athens, Piraeus Avenue concentrates mostly commercial, administrative and cultural uses with the existence of several residential and common spaces. In the south area of Athens Municipality, Piraeus Road has residential uses mostly in the road's inner blocks combined with low-cost entertainment uses, cultural interventions, one industry and other services. On the contrary, the part that belongs to Tavros has mainly light industry, warehouses etc. together with cultural interventions and housing located mostly in the inner blocks. The part that belongs to Moschato,

⁴ This analysis is based on a site visit and on land use mapping conducted by the author during 2020–2021.

Rentis and Piraeus areas has mostly industries, light industries, warehouses, entrepreneurial activities, and services.

Retail uses have also emerged significantly in some parts of the road. At the same time, commercial enterprises show investment interest in the creation of department stores as they are offered for large areas with a direct connection to the centre. Due to the restrictions and the designation of many buildings as preserved, the buildings' alteration and demolition has been mostly avoided. Along with a few cases of department stores, retail trade exists but is fragmented and weakened, meeting local needs in specific areas. Uses related to driving throughout the length of the avenue, such as dealerships, warehouses, garages, and liquid fuel stations, are found mainly in the Moschato area, while office uses along with tourism and entertainment uses are present mainly in the south of Athens municipality (Kerameikos area). Residential concentrations exist significantly in the Athens area, with central Athens including buildings of historical importance. Actual land uses also show a large degree of diversification in terms of buildings' use related to non-built areas use and ground floor use (Figs. 3, 4).

The differentiation in activities is also related to differentiations in the quality and characteristics of the building stock. Moving away from the centre of Athens there is a prevalence of unstructured blocks, abandoned buildings and industrial shells, buildings of lower heights, a few cases of newer buildings and a lower quality of public space. A slight increase in the buildings' heights is observed closer to the city of Piraeus. The physical characteristics of the axis indicate also the severe lack of sidewalks or them being damaged or narrow, green spaces, and transitory areas for temporary parking or warehouses.

The sizes of the plots and the percentage of coverage in each one have affected the type of uses hosted today across the axis. In particular, the industrial zone located mainly in the middle of the road is characterized by large plots of land with low building heights and high floor space indices. Conversely, small and densely arranged blocks, close to the Athens and Piraeus areas, appear to be related to an urban character, where residential and commercial properties prevail. In its largest part, the building heights do not show large variations (from 2–4 floors) with the exception of the part of Athens (7–8 floors). A low-rise zone is generally maintained in the largest part of the road. In addition, in terms of traffic, a series of arrangements has altered the traffic capacity of the road over the years. However, the creation of uneven junctions (mainly in local administrative boundary areas) abruptly cuts off the continuity of the urban fabric.

Demographic and socioeconomic challenges in the area

In correspondence with the differentiation of land uses along the area due to the size of the axis, as well as its inclusion in different administrative boundaries and historical conditions, the socio-economic characteristics⁵ of the axis are also differentiated. Population concentration is larger at the two ends of the road. Regarding the demographic data, and specifically the age structure, we find that mainly middle-aged people live around the Piraeus Avenue residential area with the southeastern part of Tavros being an exception, since there is a stronger concentration of more dynamic age groups (15–34 y.o.). Regarding gender, a slightly higher concentration of men mainly in the central areas of the Municipalities is observed, except for the Municipality of Piraeus. As regards nationality, we note a larger concentration of migrants or third-country nationals especially in the north-west of the Athens centre and partly in the area of Aghios Ioannis Rentis. The concentration of residents coming from EU27 regions is also evident in central Athens; however, their presence in the Piraeus Avenue-connected neighbourhoods is lower.

⁵ The analysis in this section is based on available data derived from the Greek National Statistical Authority Censuses 2011/2021, Retrieved May 23, 2023 from <https://www.statistics.gr/>.

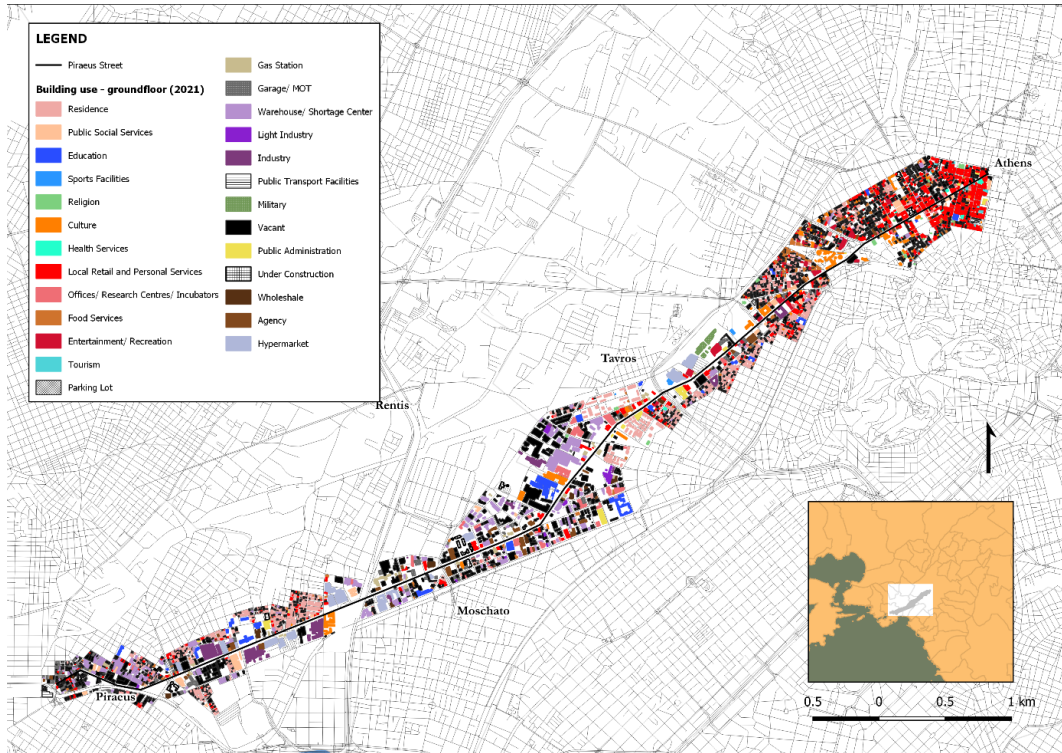


Fig. 3 – Building use in the area (ground floor), 2021.



Fig. 4 – Use of non-built areas, 2021.

In terms of employment, there is an increased concentration of the population employed in the arts, entertainment, and recreation activities mainly in the Athens area, but also in Moschato – Tavros Municipality. On the other hand, we observe the presence of more technical professions at both ends of the road, as well as in the Moschato area. Indicative of this presence is also the provision of services and wage labour in these areas. Next, in the centre of Athens, we observe higher rates of self-employment and retail trade. In addition, we note a greater concentration of workers in the municipal units of Tavros and Rentis. In terms of the percentage of students and in relation to Piraeus Avenue, a greater concentration appears in the Tavros area. Correspondingly, in the Tavros and Rentis areas we also observe comparatively increased rates of unemployment. It is quite important also that areas connected to Piraeus Avenue that already had high deprivation levels, in particular the Centre of Athens and the entrance to Piraeus Municipality, have mostly held the same status throughout the years (Karadimitriou *et al.*, 2021).

3. METHODOLOGY

Towards a New Analytical Framework for Culture's Impact in Piraeus Avenue

In this section, we present the results of the empirical study conducted to test the prospects and dynamics of cultural initiatives for spatial development planning on Piraeus Avenue based on a holistic cultural impact assessment and cultural impact relevance approach.

As already mentioned, this exploration is based on the following elements: a. the ways that cultural interventions and assets are created, valorised, used, reproduced, and institutionalized in a particular area as part of a local development issue; b. the spatial manifestation of this development; and c. a wider recognition of culture's role in development. For this purpose, culture's impact in the area is approached under four (4) dimensions: a. territorial efficiency; b. territorial quality; c. territorial identity; and d. territorial capacity building. Territorial efficiency represents the physical aspects of local development and planning, hence the extent to which there has been a change either to the physical or built environment, or to the economic performance of local economic actors. Territorial quality integrates the social dimensions reflecting on culture's impact on living standards and access to services. Territorial identity elaborates on the presence of social capital in the area. Finally, territorial capacity building investigates the enhancement of governance relations and new institutionalized practices. It is noted that territorial development inadequacies lie in the lack of one or more types of impact. In this regard, while a project might not aim or be able to cover all impact dimensions whose relevance it should, in principle, clarify to other existing interventions in the area while it should also be aligned to a wider institutional strategy.

Analysis Methods and Techniques

The technique of semi-structured interviews was used to assess the territorial dynamics in the area of Piraeus Avenue and thereafter the interrelations between distinct cultural, public, and private actors. Interviews were conducted with key informants from the local, regional, and public administration and private actors integrated into development initiatives, as well as cultural institutions in the area. In particular, the aim of the interviews was to explore the key elements of spatial development stimulation in the area identified since the enforcement of land use regulations during the 2000s, as well as the impact of cultural assets activity. Additionally, the interviews sought to elucidate crucial topics raised in this regard. The empirical research design aimed for a qualitative assessment of culture's holistic impact approach, wishing to comprehend the underlying mechanisms, contextual factors, and lived experiences of individuals engaged in culture-related interventions in the area. The limited availability of up-to-date data regarding strategic aspirations for the area underscored the necessity of further analysing the validity of the existing secondary data, drawing on the specific knowledge and experience of key informants. This challenge was compounded by the volatile socio-economic environment amidst the economic crisis. In addition, the research's focus on

impact assessment oriented towards territorial capacity and governance processes underscored the importance of conducting an in-depth analysis of the existing social, economic, and spatial processes.

Ten (10) semi-structured qualitative interviews were eventually conducted, followed by a thematic analysis in order to come up with the identification of exact processes for enhancing relevant tangible and intangible assets and their characteristics following suggestions evident in literature (Ataman & Tuncer, 2022). The thematic analysis was conducted to uncover significant patterns in the interviewees' responses. Thematic analysis was selected as the most appropriate method to analyse the responses based on the interviewees' experiences, with the aim of paving the way for further research in the field. Thematic analysis identifies and organizes themes for describing the phenomenon under study (Daly *et al.*, 1997). Interviewees were selected using a snowball technique⁶, while criteria for selecting the informants were related to their institutional power regarding decision-making processes in the area, their integration into culture-related development programs, and their active interest in the development of Piraeus Avenue as a cultural axis.

The use of semi-structured interviews involves employing predetermined themes and/or questions while allowing relative freedom for both the interviewer and the interviewee during the interview process. In the context of the present research, semi-structured interviews were chosen to extract the participants' understanding of various issues such as development, impact, culture, creativity, and crisis, as well as to identify specific processes for enhancing relevant assets and their characteristics. Therefore, the selection of semi-structured interviews reflected the need for a pragmatic approach in socio-spatial research, recognizing the importance of an integrated analysis based on a multiplicity of data (Moulaert *et al.*, 2012). Semi-structured interviews enabled them to be conducted while covering specific themes, providing relevant freedom for both the interviewer and the interviewee. Overall, semi-structured interviews included predetermined themes and/or questions in combination with relative freedom both for the interviewer and the interviewee in the conduction of the interview. The interviews took place from May 2021 to June 2021. Due to COVID-19 restriction measures, participants were given the choice to participate either physically or virtually, respecting virtual communication principles in research (Sah *et al.*, 2020).

4. RESULTS AND DISCUSSION

Assessing Culture's Territorial Impact in the Area

The present section showcases the findings of the thematic analysis, focusing on the meaning and significance of the identified themes in relation to the research design and the territorial impact dimension. Specifically, the analysis examines the themes of territorial efficiency, territorial quality, territorial identity, and territorial capacity building, supported by evidence from the collected data.

Table 1

Interviewees characteristics

Key Informant Code	Type of Institution	Position
I1	Local Administration	Administrative Officer
I2	Regional Administration	Administrative Officer
I3	Private Cultural Institution	External Associate in Cultural Programmes
I4	Public Cultural Institution	Managing Director
I5	Private Consulting Company	Chief Innovation Officer
I6	Private Consulting Company	Managing Director
I7	Local Administration	Mayor
I8	Private Cultural Institution	General Director / Vice-President of the General Assembly
I9	Local Administration	Head of Department
I10	Local Administration	Head of Department

⁶ Twelve (12) unofficial discussions initially took place in order to find key informants for the interviews' conduction. See also Figure 5.

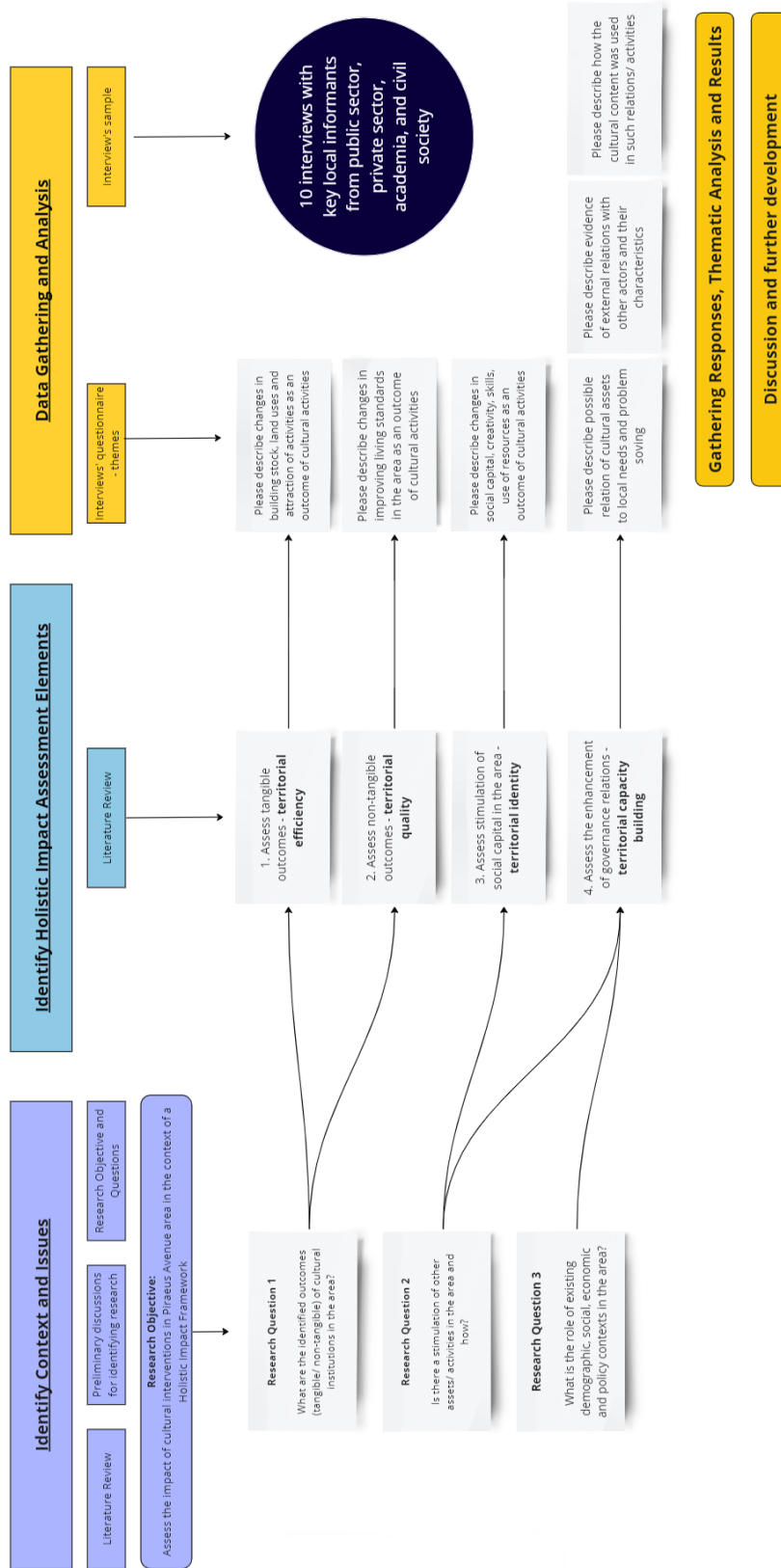


Fig. 5 – Research Methodological Steps.

a. Territorial Efficiency

Study results indicated that changes in terms of territorial efficiency are mainly localized and fragmented in the first zoning of major cultural spaces in the 2000s, while a number of cultural institutions located in Piraeus Avenue at that time managed to renovate both the buildings they were relocated to as well as public space outside their buildings in some cases. At the same time though, according to I9, these building upgrades coming from spot interventions in the area did not attract new renovation investments significant over time for the whole Piraeus Avenue. According to I4, an exception here is the case of Athens Technopolis, an industrial museum/major cultural venue of the City of Athens and former gasworks located in Gkazi/Kerameikos neighbourhood in the south part of Athens Municipality. This public-driven initiative managed to contribute to the former gasworks renovation as well as become a landmark for further public space investments in the area.

Regarding the issue of land uses, different development trajectories were indicated. According to I2 and I10, the existence of cultural institutions managed to create a new positioning of small-scale retail mainly spontaneously connected to food and personal care services. According to I1, I7, I9, the development of these services was also partly connected to the relocation of public sector education and consulting services (e.g., the School of the National Centre for Public Administration and Local Administration, and Technopolis' Innovation hub). On the other hand, according to I1, I8, I3 and I10, no relevant attraction of businesses was noted near the School of Fine Arts located in the Aghios Ioannis Rentis area despite the flow of students that emerged as a result of its relocation. Overall, regarding real land uses in the area, results indicated that the zoning of cultural institutions has not managed to systematically contribute to the large-scale reuse of buildings in this direction. For this reason, the area retains a high degree of diversification and environmental hazards.

As regards the issue of land values, and according to I2, the area followed a broader trend of value increase which, however, was not directly linked to the location of cultural institutions but to wider area redevelopment strategies (such as in the case of the Gkazi neighbourhood). On the other hand, I10 indicated how real estate values decreased significantly during the 2010's economic crisis. All in all, according to the same interviewer, there is no systematic connection between the level of land values and cultural institutions' relocation in the case of Piraeus Avenue; however, a case-by-case analysis is required regarding the impact of an institution on the increase in land values.

At the same time, inflows of income from the cultural institutions cannot be channelled towards other actions for the surrounding area. According to I3 and I7, the strengthening of jobs as well as the attraction of visitors based on cultural institutions' activities maintains a hyper-local character, and no situated link with strengthening the job market at the local level can be supported. At the same time, a significant number of services such as garages, warehouses, and craft activities have remained in the area without, however, creating conditions for the competitiveness of a local production system.

b. Territorial Quality

According to survey results, residents and stakeholders in the area have not built social ties under the adopted development rationale for Piraeus Avenue (based on culture or not). Even though the road and the wider areas it crosses have historically hosted refugee populations with a strong element of social solidarity, in the modern development course of the road no question of social integration was ever raised and therefore a strong desire does not exist from below to reorganize the uses of the road. Accordingly, as per I10, issues of reducing poverty, tackling inequalities and strengthening employability at the road level were never raised, according to I1, I2 and I10. This fact also highlights a set of other aspects of the area's development path. The physical dimensions of space quality highlighted by the interviewees, such as the quality of the sidewalks, the accessibility of the road and the different naming/numbering of the road highlight, in fact, a care for the interest and safety of both the residents and the visitors. However, according to I1 and I10, the absence of a coherent plan for

attracting cultural and other investments over time shows that the initial planning did not seem to take efficiency considerations into account.

The linear development of the road as it has been shaped over time has not succeeded in creating communication fields between the inhabitants of the various areas. I5, I6 and I7 referred to the absence of technological infrastructures as well as communication infrastructures which could attract a greater number of residents as users of the public space as a key point for the sustainable development of the road. Overall, according to all interviewees, the design of Piraeus Avenue as a cultural axis has significantly improved the access of residents and visitors to cultural and entertainment services. At the same time, this has not led to the determination of common strategies between culture-related organizations, public institutions and citizens for the spatial improvement of Piraeus Avenue. On the contrary, each cultural institution operates autonomously, targeting mainly hyperlocal visitors as I9 and I10 argued. The debate about the limits of the role of a cultural organisation was expressed as an important element for the respondents in the sense that cultural institutions cannot or should not play the role of an institutional body by organizing regulatory interventions or defining their cultural program based on the development priorities of the region as indicated by I3 and I4. According to I4, cultural organizations justifiably aim for their financial survival while undertaking additional networking initiatives eliminating the risk of its activities – a trend more intensively evident after the economic crisis. From there on, as I9 argued, it is important for public and funding institutions to take into consideration cultural institutions' advisory role in the field of expressing social needs, but also to support their cooperation with public bodies - those responsible for decision-making and policy formulation.

On the other hand, according to I10, cases of physical space renovations did not result from a participatory process with the contribution of residents and/or entrepreneurs in the area. In many cases according to the interviewees, the determination of land uses with the protection and attraction of cultural capital has not been accompanied by a targeted management plan for the protection and promotion of the cultural stock. In this view, individual interventions and action plans should communicate with each other to complement development goals in the region, a dimension that has not been achieved. At the same time, the considerable time that has passed since the initial determination of land uses makes the interconnection between different interventions even more difficult.

c. Territorial Identity

The existence of human networks contributes decisively to the achievement of goals in a society, including development goals. In this way, the existence of social capital concerns the existence of interpersonal relationships as well as social networks which are accompanied by value systems (Field, 2003:13). In this context, and as pointed out by I1, I3, I10, the various creative actions in the area, while they have strengthened the creativity and skills of many individuals (for example through student and artistic workshops) they have not somehow turned this creation of knowledge into capital for the region. At the same time, this new knowledge is fragmentary and there is no file recording which, even later, could contribute to the utilization of an idea or proposal to be implemented. For all interviewees the cultural issues have a great degree of subjectivity of the added value that they may provide at a practical level, or a different reading by different social groups. Such a repository with the use of modern technological tools could contribute to documenting the cultural importance of Piraeus Road.

In the case of Piraeus Avenue, the utilization of culture as a development tool did not contribute to the development of common values and resources to achieve development outcomes in the area. At the same time, according to I1, I7 and I10, a communication flow of information about the road and the various actions was not created in a systematic way and by many institutions. Although participants involved in local development initiatives for Piraeus Avenue specific areas have expressed that they would happily re-engage in consultation processes (I6, I7), they did not appear to have motives to take

any active initiative to revive the idea. An additional obstacle in this situation is the reduced operational capacity of municipalities and public services.

The fact that Piraeus Avenue is a mosaic of uses means, on the other hand, that the people who are active, living and working in such a large area will have different motivations and goals for the development of the area. The same seems to apply to the municipalities of the region and to the various cultural institutions. According to all interviewees, this condition did not allow for the creation of strong social trust between the various institutions, a necessary element, according to I10, for their cooperation. However, for I3 and I10, difficulty in strengthening social capital is just as important for the case of Piraeus as the non-existence of capital flow. The refuted development potential of the area seems to have been affected not only by internal factors but also by the lack of communication of the project in question and the lack of engaging people in it. Often, there have been cases where other areas have been development priorities due to past experiences, as well as municipalities' inability to manage the risks in the area related to local participation as I1, I2, I8, I9 and I10 stated. This is connected to Li *et al.*'s consideration (2022: 11) "when measuring formation factors such as trust, social norms, and social structure, their measurement factors should be considered before the old neighbourhood renewal project. In other words, the formation factor is the collective level of social capital in the historical context of the neighbourhood rather than social capital triggered by the renewal project". According to I8, I9 and I10, such a study is missing for the case of Piraeus Road while there have been many years since the initial plan enforcement. In the meantime, social capital dynamics in the area have changed.

d. Territorial Capacity Building

According to I1, I2, I7 and I10, the discussion around the development dynamics of Piraeus Street and its related discontinuities has been structured primarily not by the causes of these discontinuities but mainly by the visible results concerning the development of the natural space. A large discussion concerning the causes revolves around the weakness or often non-existence of networks of communication and cooperation between competent bodies. The objectives of the spatial strategy of each region include elements such as the improvement of the economic situation and employment, the improvement in social terms of the daily life of citizens and the preservation of the natural and built environment based on a sustainable development process. According to I7, municipalities often shoulder mainly the burden of the development process, as well as the communication with the citizens. At the same time however, they have significant shortcomings both in their operational capacity and in the support of specialized knowledge regarding the selection and/or claim of appropriate political and investment tools. These deficiencies are more evident in the section of Piraeus Avenue where former industrial uses are mostly concentrated, namely in the Moschato-Tavros Municipality. On the other hand, according to I2 and I4, the case of Athens is a more complex one as prioritization is often observed in neighbourhoods exposed to a larger percentage of criminal activities or in sectors with a greater inflow of capital, such as tourism.

According to I1, I2, I4 and I9, the development strategy for Piraeus Avenue has not been linked to a holistic street plan that would convince and concern a large number of citizens beyond the cultural sector. At the same time, according to I10, it has not been linked to individual local development plans of the Municipalities. According to I3, I5 and I6, the partnership efforts for Piraeus Avenue are more spontaneous initiatives that arise from the interest of executives of the various institutions. However, they have not succeeded in designing a sustainable proposal for the axis. The success of a new planning process should include elements such as the re-examination of the dynamics and socio-economic relationships in the region, the organized partnerships between stakeholders as well as the citizens, and a targeting of the local administration institutions' empowerment to support planning and implementing sustainable urban policies. These deficiencies are also indicative of the inability of the interviewees to propose more specific solutions. This has the aim of developing new capabilities based on the already

existing local potential. According to all interviewees, the passage of such a long period of time since the previous planning requires an initial formulation of analytical and strategic conditions for the road.

The characteristics of Piraeus Avenue require a revised metropolitan planning. Through the interviews, not only the weakness of the local bodies but also the frequent overlapping and ignorance in the public opinion regarding the responsibilities of each level of official bodies was highlighted again. According to I1, I2, I8, I9 and I10, apart from the financing issues, a clear organization of forces for the purpose of developing the road is missing. As developed by I10, a possible solution would be the establishment of a management body with authority at the government level or district level and under the logic of an emblematic project with, however, the participation of wider bodies and forces.

According to I2, I5, I6, I7 and I8, the various projects have not progressed as the central administration has neglected strategic planning based on which a local planning of resource mobilization might have been successfully implemented. However, I5, I6 and I7 declared to be optimistic that this is a matter of time for this strategic planning to mature. Interviewees also expressed the need for a new discussion regarding strategic planning – which, unfortunately, in the Greek context, is not often done effectively. The financing part is also important for most of the participants (I1, I2, I4, I5, I6, I9, I10); however, according to study results, the main discontinuities revolve around the lack of a strategic planning intervention for the road connected to operational priorities. As a result, the debate on the strategic planning of Piraeus should be reopened based on a targeted analysis of the current situation as a basis for planning its development dynamics.

Table 2

Main themes and subthemes in interviewees' responses

Dimension	Question	Themes	Subthemes	Interviewees
Territorial Efficiency	Please describe changes in building stock, land uses and the attraction of activities as an outcome of cultural activities	Land-uses	Localized change in land uses	All
		Attraction of activities	Spontaneous attraction of small-scale services	I2, I10
			Attraction of large-scale services	I1, I7, I9
			Attraction of mass entertainment	I4, I9, I10
		Buildings reuse	No large-scale reuse of buildings	I9
		Land values	Increased land values	I2
			Further research needed	I2, I10
		Income	Sub-local character of jobs creation	I3, I7
			Continuation of craft activities	All
		Territorial Quality	Please describe changes in improving living standards in the area as an outcome of cultural activities	Social Ties
Tackling Inequalities has never been raised	I1, I2, I10			
Strengthening employability at the local level has never been raised	I1, I2, I10			
Strategic relationships	Absence of a coherent plan			I7
	Pilot character of interventions			I1, I10
	The land plans are considerably outdated			All
Communication between citizens	Absence of technological and communication infrastructures			I5, I6, I7
	Attracting hyper local visitors			I9, I10
	Limited capacity of cultural institutions			I3, I4
	Financial sustainability of cultural institutions			I4

Table 2 (continued)

			Advisory role of cultural institutions	I9
		Citizens Participation	Lack of a participatory approach	I10
Territorial Identity	Please describe changes in social capital, creativity, skills, use of resources as an outcome of cultural activities	Value creation	Fragmented Skills creation	I1, I3, I10
			Value does not return to the area	I1, I3, I10
			Subjectivity of culture's added value	All
			No development of common values	All
		Knowledge creation	Fragmented knowledge creation	I1, I3, I10
			Lack of communication flow for the area's characteristics	I1, I7, I10
			Limited motives for cooperation efforts	I6, I7
		Social trust	Lack of social trust	I3, I10
			Lack of knowledge on social capital in the area before the situation of cultural institutions	I8, I9, I10
			Other development priorities	I1, I2, I8, I9 and I10
Territorial Capacity Building	Please describe possible relation of cultural assets to local needs and problem solving	Planning	Outdated land-use plan	All
			Please describe evidence of external relations with other actors and their characteristics	Operational Capacity
	Policy priorities	Tourism		I2, I4
		Criminality		I2, I4
	Planning	Lack of an updated holistic plan	I1, I2, I4, I9	
		Lack of integration among municipalities	I10	
		Spontaneous partnership efforts	I3, I5, I6	
		Need for a specific operational body	I10	
		Financing constraints	I1, I2, I8, I8, I10	
	Please describe how the cultural content was used in such relations/ activities	Value	Overall lack of updated strategic planning	I1, I2, I4, I5, I6, I7, I8
Value does not return to the area			I1, I3, I10	

5. CONCLUSIONS

The aim of the present paper was to investigate aspects of cultural impact relevance in the case of the Piraeus Avenue Area in Athens, Greece, taking into consideration a holistic impact assessment approach. Therefore, it elaborated on the significance of cultural interventions of different character and scope and on the extent to which they have a potential to contribute to sustainable development planning strategies. The research analysed the impact of cultural interventions in the area in terms of territorial efficiency, territorial quality, territorial identity and territorial capacity building. To address the research aim, ten (10) semi-structured qualitative interviews with local stakeholders were conducted to assess the outcomes of the cultural and creativity assets-related action combined with insights for statistical, sociodemographic, economic and spatial data for the area. Given the diverse nature of the Piraeus Avenue area, notwithstanding the cohesive development framework, a qualitative thematic analysis was undertaken. This approach sought to comprehensively capture the existing and preliminary trends in

culture-related spatial development, while also investigating the potential for new governance arrangements.

Results indicated several positive impacts in the area and particularly concerning its spatial quality. However, as regards territorial capacity building, a key finding was the need for activation towards building complementary uses and activities with other types of local stakeholders that have more power in decision-making. More specifically, the deterministic incorporation of culture in its spatial development rationale in the case of Piraeus Avenue is related to structural deficiencies faced by organizations for sustaining and/or creating new developmental initiatives. These deficiencies include the social acceptance of initiatives, the creation and sustainability of networking links between actors, the difficulty to find funding opportunities, and the difficulty to adjust to changes coming from the socioeconomic environment. The study results can provide empirical data to contribute to ongoing discussions about the necessity to re-envision the creative city approach, particularly considering the context of transition at the empirical level (Segovia & Hervé, 2022).

The Piraeus Avenue redevelopment strategy has failed to address citizens' lives improvement in an everyday life realm. The planning strategy for the road failed to create productive links between the cultural content produced within the organisations and the intertemporal socioeconomic challenges for the area. Quite the contrary, qualitative research results suggested that the formulation of the planning rationale for the road has reflected, and continues to do so, a strategy for hyper-local development poles which will most likely attract visitors. This finding further stresses the need to situate analytically the practical links of a culture-related planning development strategy to combining activities and local communities' needs. Research results indicated the inability of culture-related strategies to support the development of soft skills for the local population or for the population that would develop long-term links with the area. Taking also into consideration the fact that the culture-related local development paradigm of Piraeus Avenue has started in the 1990s, the need for soft skills and cultural change needs to address the 'why' (Varnum & Grossmann, 2017) or the 'why not' of a shift in cultural practices for the area. These results can be valuable in the context of recent discussions on citizen participation aimed at supporting and sustaining cultural practices and institutions, as highlighted by Modzelewska (2021).

Moreover, the Piraeus Avenue culture-related redevelopment strategy has not been able to create sustainable links to regional and national policy imperatives. Research results indicated the absence of targeted strategies that would support the organizations in extending their activities, although this extension is not widely accepted. In addition, research results indicated the lack of political prioritization towards the further development of a culture-related spatial planning strategy for the road after the first relocation of cultural institutions in the area. It is quite reasonable that research results indicated a lack of interest in institutions or citizens' engagement in local activation initiatives based on culture-related activities. The identification of these factors is pertinent to understanding power relations that may impede urban equality, governance, and sustainability through culture-based initiatives. It also addresses the limitations of the cultural sector in this regard (Čamprag, 2023). Furthermore, they prompt further discussion on the broader issue of the lack of integration of culture into Greek strategic and operational planning policy tools (Tsilimigkas & Derdemezi, 2020).

As a counter point, research results indicated that there is a dynamic towards the connecting the Piraeus Avenue culture-related planning development paradigm with the utilization of new technological tools. The latter can assist in the context of both the recording of knowledge on cultural stock and for the communication of the cultural product in the area including emergency situations such as the restrictive measures against the COVID-19 pandemic. It is noted that the cultural sector was one of the sectors most affected during the pandemic in Greece and abroad, as it led to the interruption of all activities significantly reducing new productions in the field. It also strengthened the communication of the cultural institutions' actions abroad. Utilizing research results in the context of digital transition in Greece can be immensely valuable for informing and guiding further research efforts regarding the

relevance of culture-based actions and promoting the use of new technologies in the Greek creative sectors (Hellenic Republic, 2019).

Research results highlighted that the implementation of an institutional framework of incentives cannot be limited only to the registration of categories of permitted land uses, especially considering that a long period of time has passed since the enforcement of the last spatial plan for the region. In this direction, local institutions should work towards harmonizing their activity according to European Union (EU) policy opportunities in the cultural and creative sector for supporting context-relevant experimentation and expression of ideas. It is noted for example that EU policies support residency hosts under the Culture Moves Europe mobility scheme as a way for artists from other countries to visit third countries and implement local cultural activities.

These issues are further exaggerated as the road is a significantly differentiated spatial level both in terms of physical and socio-economic development. The multiplicity of existing land uses with different socioeconomic characteristics and opportunities for redevelopment makes the usage of an axis-based development paradigm useless. Opportunities for the Piraeus Road redevelopment require its connection to specific urban centre areas with updated data, participation of more institutions and support in financing mechanisms. As indicated through the empirical research, there is an existing will for public-private partnerships in the field, but not wider incentives. There is also a renewal of a strategic plan for the road based on wider consultation, which is highly important. The creation of a single supra-local management body might assist in the management support of this plan. Research results can provide valuable insights for assessing the socio-spatial sustainability of recent large-scale initiatives aimed at investing in expansive office and leisure spaces in the Piraeus Avenue area. These spaces are intended to host multidimensional economic activities and serve as landmarks for the area.

On the other hand, the mapping of issues related to the study of development perspectives for Piraeus Road, and especially the impact of culture, had not been the subject of a systematic study. Although the study of Piraeus Avenue has been the subject of several studies and articles, its connection to the theoretical framework with newer approaches to spatial development planning remains an open field of research. As a significant number of cultural and other assets have remained largely latent, it can be argued that research interest in the area also became latent after some time. The study can contribute to new directions for studies that have already tackled the development challenges of the area (see section 1) in light of the industrial heritage utilization incorporating the sustainable management of investments in the area. In addition, it can contribute to the formation of conditions for the strategic planning of Piraeus Avenue, especially since the investment activity and interest have been activated again. The development of theoretical approaches that support the culture-based interventions' impact on literature is not satisfactorily linked to the study of cases that highlight the perspectives and challenges of connecting with case studies. The implementation of a holistic impact assessment approach can contribute to the direction of indicating practical opportunities and limitations in this regard connecting theoretical contributions developed until 2017 in the field to more recent research priorities such as heritage management and sustainable tourism (Kim *et al.*, 2021).

Overall, the study provided a framework for the comparative analysis of the specific impact of culture-related institutions in the area and their comparative research through the analysis of a holistic methodology for impact assessment. Future research may involve conducting a more comprehensive analysis of each dimension within the framework for Piraeus Avenue and beyond, employing quantitative techniques to relate the road's characteristics to specific areas within the municipalities. Such an analysis is expected to significantly contribute to the creation of an updated development planning vision for Piraeus Avenue grounded in situated knowledge, as well as to enhance comparative research analysis in the field. This approach provides added value to the cultural impact assessment by considering the social aspect and the interrelation between different aspects, especially in cases of long-term inactive planning arrangements. It aligns with recent discussions concerning the need for a deep

understanding of geographical contexts when setting strategies for prioritizing impacts (Wang & Kao, 2023), and allows for extending discussions to other regions at the international level.

On the other hand, some limitations of the research exist that stem from its qualitative nature. The sample size of interviews was relatively small, and while it included key informants, there may have been others unavailable at the time of the research. Participation may also have been impacted by restrictions due to the COVID-19 pandemic ongoing at that time. Further research is necessary to derive quantifiable results. Regular updated research is also needed to obtain the most recent data on Piraeus Avenue, as there is no organized registry.

Despite these limitations, this study is the first to systematically approach this holistic framework in this case area and beyond. It can be further leveraged for research in the field, aiming to trigger a conversation on the development of situated knowledge.

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PERCEPTION OF LOCAL DEVELOPMENT AND TOURISM IN THE VISION OF STAKEHOLDERS IN THE WESTERN SIERRA MORENA (ANDALUSIA, SPAIN)

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Abstract. Rural spaces take into account the multifunctionality of uses and economic diversification as adaptive strategies for development, while becoming areas for new socio-economic activities. Tourism is regarded as a tool for generating local development processes in this context. The goal of this study is to investigate the local development processes triggered by tourist activity in the three westernmost Nature Parks of Sierra Morena: Sierra de Aracena and Picos de Aroche (Huelva), Sierra Norte de Sevilla (Seville) and Sierra de Hornachuelos (Cordoba). A mixed methodology was applied: (1) conducting interviews with stakeholders so as to ascertain the perception of those who participate in the development processes or influence them; (2) using secondary data to evaluate the impact of tourism on local development. The results of the work indicate that: (1) turning the areas into Nature Parks has repercussions on the tourist supply and demand; (2) the economic dimension of tourism in local development is prevalent in the dominant discourse, while expectations are not found; (3) socio-cultural impacts on the community are barely perceived by stakeholders, with few positive impacts of tourism on the local community; (4) the environmental dimension is regarded as a personal, rather than a collective matter, underestimating environmental impacts; (5) tourism development in the different municipalities and Nature Parks is irregular. In conclusion, the effect of tourism on local development processes in the study area is limited, although there are differences between municipalities and Nature Parks.

1. INTRODUCTION

In rural areas where traditional activities have declined and employment opportunities are scarce (Marini & Mooney, 2006; Saxena *et al.*, 2007; Ramsey & Malcolm, 2017; Pezzi *et al.*, 2019), the multifunctionality of resource uses and the economic diversification around those resources are adaptive strategies for development (Saxena *et al.*, 2007; Wilson, 2010; Woods, 2011). Thus, rural spaces are no longer just spaces for agricultural production (Mormont, 1994), but also places that stimulate new socio-economic activities, such as leisure, tourism, catering, production and consumption of specialised foods, as well as the maintenance of biodiversity, among others (Saxena *et al.*, 2007; Pinto-Correia & Breman, 2008; Anton-Clavé *et al.*, 2008; Woodhouse *et al.*, 2018; Belliggiano *et al.*, 2020). In these spaces, capitalising on natural and cultural heritage as resources and their reinterpretation becomes an opportunity for regional and local development (Ray, 1999). Thus, tourism is seen as a desirable

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diversifying agent (Brouder, 2012) and a challenge (Sharpley, 2002) capable of leading to the endogenous development and consolidation of local development processes (Sharpley, 2002; Cànoves *et al.*, 2003; Cànoves *et al.*, 2006) and to the regeneration of peripheral spaces during a crisis, making it possible to overcome the obstacles of peripherality, including accessibility, competition, and depopulation (Priedaux, 2002; Bohlin *et al.*, 2016; Ramsey & Malcolm, 2017).

In the European Union, the Common Agrarian Policy (CAP) established a favourable context for the implementation of rural tourism (Cànoves & Villarino, 2000), which frequently insists on tourist activities (Wanhill, 1997; Márquez-Fernández *et al.*, 2006; Nieto-Masot & Cárdenas-Alonso, 2017; Engelmo-Moriche *et al.*, 2021; Tirado-Ballesteros & Hernández-Hernández, 2016; Gómez-Moreno & Rubio-Barquero, 2020) and establishes the competitiveness of the tourism services (Wanhill, 1999) as a development strategy (OECD, 1994), sometimes being the only strategy proposed (Carson, 2018). Rural and protected nature areas (PNA) will be attractive for tourism, establishing themselves as backgrounds for tourist activities. Although the environmental strategy is the classic motivation in PNA, it is a segmented rural tourism that incorporates nature products (Flather & Cordell, 1995; Anton-Clavé *et al.*, 2008).

Sustainable development appears as an ideology or as a “culturally assumed pre-understanding of the environment” (Serrano-Barquín, 2008: 330) which generates sustainable tourism. While local development is a holistic and long-term concept in a specific space (local/regional) (Serrano-Barquín, 2008), rural development is a context (Gómez-Moreno, 2011). Thus, sustainable development as a framework for tourism activities is essential for tourism to be a development instrument (Berno & Bricker, 2001). Sustainability is often attributed to rural tourism (Belligiano *et al.*, 2020), based on the premise that there is a certain harmony between the needs of the visitor interested in the host community, the place based on the landscape and environmental attractions of the spaces, and the receiving community, since there are a limited number of visitors, who do not need a wide range of services, infrastructures and equipment (SIEs) (Cànoves *et al.*, 2006). However, this is not always the case (Cànoves *et al.*, 2006), and many sustainability measures have not effectively contributed to achieving this objective (Belligiano *et al.*, 2020). For this reason, tourism in rural areas and PNAs must raise the sustainability question related to endogenous local development processes (Felicidades-García & García-Delgado, 2004), such as rooting, empowerment, and improving the quality of life in the long term (Saxena *et al.*, 2007; Saxena & Ilbery, 2008). From this perspective, Integrated Rural Tourism in lagging regions (Saxena *et al.*, 2007; Saxena & Ilbery, 2008; Saxena & Ilbery, 2010) is seen as local and small-scale tourism, with a more significant correlation between sustainable development and sustainable tourism in a broad sense by generating connections between the economic, social, cultural, natural and human structures of the areas where it takes place (Sharpley, 2000; Saxena *et al.*, 2007; Saxena & Ilbery, 2008; Saxena & Ilbery, 2010).

At the same time, the perspective of rural development focused on tourism runs the risk of neglecting other important factors and processes at the peripheries (Carson, 2018). It is necessary to reconcile it with the PNAs objectives, with socially viable strategies for nature conservation, public use, socio-economic development and quality of life (Troitiño-Vinuesa, 1995; Adamowicz, 2010; Gómez-Moreno & Rubio-Barquero, 2020). For this reason, the analysis of the interdependent dimensions of sustainability (Renfors, 2020) and local development processes (Saxena *et al.*, 2007; Lopez & Ivona, 2018; García-Delgado *et al.*, 2020) is of interest. Although local development processes are linked to the global context (Cànoves & Villarino, 2000), the article considers four dimensions from the immediate local scale of observation and comparison:

- a) Environmental. The optimal use of natural resources compatible with ecological processes, the conservation and protection of the environment and of biodiversity (Bramwell, 1994; Troitiño-Vinuesa, 1995; Cànoves *et al.*, 2005; Cànoves *et al.*, 2006; Anton-Clavé *et al.*, 2008; Cànoves *et al.*, 2014), where tourism appears as an instrument for its enhancement (Bramwell, 1994).

- b) Economic. The economic growth of the community (Bramwell, 1994), the maintenance of economic activities (Cànoves *et al.*, 2014), and tourism as an instrument of economic-business development (Pulido-Fernández, 2007; Roberts & Tribe, 2008).
- c) Socio-cultural. The achievement of equity and social cohesion, the appreciation of social capital and local culture and the respect for local identity and authenticity (Bramwell, 1994; Cànoves *et al.*, 2005), tourism being an instrument for improving the quality of life, thus responding to the interests of local communities (Bramwell, 1994; Cànoves *et al.*, 2005; Cànoves *et al.*, 2006) and their decision-making, especially important in PNAs (Zawilińska, 2020; Gómez-Moreno & Rubio-Barquero, 2020).
- d) Political-institutional. Understanding governance as a political system, legal framework and distribution of transversal power, including the participation of stakeholders and the relations between them, in either a favourable or undeveloped context (Panyik, 2015). Within this political-institutional dimension, territorialization (integration) appears as a result of the contribution of tourism to the reduction of regional disparities and territorial cohesion (Cànoves *et al.*, 2005; Bohlin *et al.*, 2016).

Multifunctionality has prompted marginal and marginalised spaces to search for these new functions, highlighting the fact that tourism is perceived as a panacea (Greffé, 1994; Cànoves *et al.*, 2003; Yubero-Bernabé & García-Hernández, 2019; García-Delgado *et al.*, 2020) that generates expectations in academic, political and popular discourses (Hjalager, 1996; Araque-Jiménez & Crespo-Guerrero, 2010; Bohlin *et al.*, 2016; Dinis *et al.*, 2019), when the reality is that for many rural communities the capacity for tourism development is limited (Koster & Baccar, 2016). In addition, tourism generates environmental, economic, social, cultural and territorial effects and impacts (García-Delgado, 2014), often adverse, on the territories in which it is established (Lane, 1994; Cànoves *et al.*, 2006; Hernández-Hernández, 2009; García-Delgado, 2014; Ramsey & Malcolm, 2017).

Tourism is a development binomial that has been insisted on (Opperman, 1993; Telfer & Sharpley, 2015). Yet, it is necessary to verify whether this correlation is myth or reality (Sharpley, 2002; Bohlin *et al.*, 2016) and analyse the contribution of tourism to development at the local level. There are many proposals for analysis at the micro-scale (Spangenberg, 2002) with the establishment of environmental indicators (Šadeikaitė, 2017) applied to the sustainability of rural tourism and PNA (Blackstock *et al.*, 2008; Torres-Delgado & López-Palomeque, 2014) or to the company (Roberts & Tribe, 2008). However, what is more interesting to analyse is the perception of these elements and processes in the community periphery so as to understand the contribution of tourism to local development in three Nature Parks (NtPs) of Andalusia, Spain, through the issues that stakeholders consider essential with regards to the tourism-development binomial at the local scale, and by contrasting them with secondary data.

2. CASE STUDY

The study area is the Mediterranean mid-mountain of Sierra Morena (Andalusia, Spain). Its ecological and landscape richness has led to the creation of 6 NtPs in 1989, the three westernmost being the focus of this research (Fig. 1): Sierra de Aracena and Picos de Aroche NtP (SAPA), Sierra Norte de Sevilla NtP (SNS) and Sierra de Hornachuelos NtP (SH).

Subsequently, other nature protection figures overlapped in the territory: Special Conservation Zones and Special Protection Zones for Birds, Dehesas de Sierra Morena Biosphere Reserve by UNESCO (2002) and, in the case of the SNS, the UNESCO Global Geopark establishment (2015). In addition, there are four Natural Monuments (CAGPyDS, 2021a) and an essential protection of Cultural Heritage, with 187 real estates protected, among which 17 Historic Sites (GDPHA, 2022).

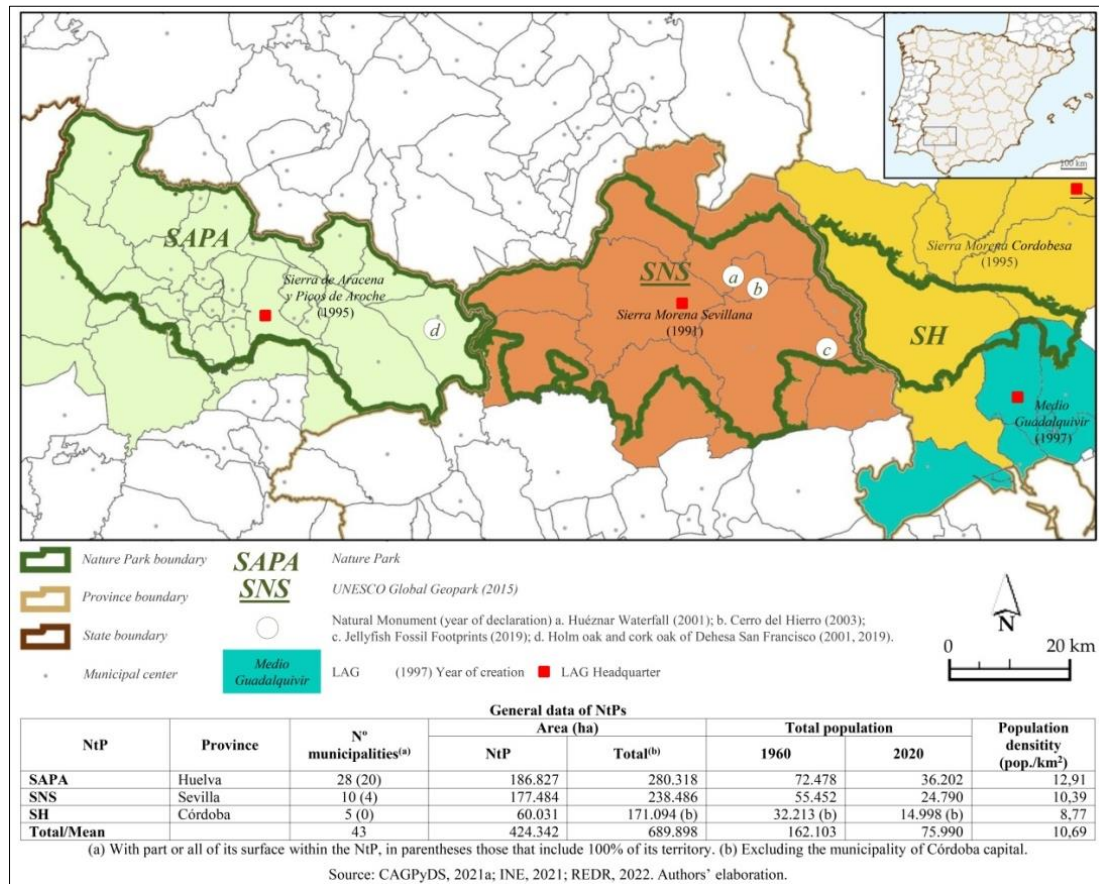


Fig. 1 – Study area.

Overall, there is a significant landscape diversity that increases from SH to SNS-SAPA (Silva-Pérez & Ojeda-Rivera, 2001; Garzón-García & Ramírez-López, 2018) (Figures 2, 3 and 4). Despite this, the dominant landscape is *dehesa*, a cleared Mediterranean forest (Márquez-Domínguez *et al.*, 2001) which has generated an exceptional landscape (Silva-Pérez & Fernández-Salinas, 2015) and subsequent economic activities (Pizarro-Gomez *et al.*, 2020).



Fig. 2 – Cork oak (foreground) and chestnut grove (background) in SAPA



Authors' elaboration (September 2021).

Fig. 3 – Forest-gallery on SNS



Fig. 4 – La dehesa landscape in SH

Most of the area of the three NtPs is private (Mulero-Mendigorry, 2003; Garzón-García & Ramírez-López, 2018). SAPA and SNS are NtPs of great expanse, with numerous municipalities and a network of settlements in their interior, predominantly for livestock and forestry uses (Márquez-Domínguez *et al.*, 2001). While SH has an average-size area, with most of it in a single municipality, it lacks an internal network of settlements where extensive property and a hunting-forestry orientation predominates (Mulero-Mendigorry, 2001; Garzón-García & Ramírez-López, 2018) (Fig. 1). Administratively, the set of three NtPs consists of 43 municipalities¹.

This space has been suffering a demographic crisis since the 1960s as a result of various factors merging together (García-Delgado, 2009), losing 52.55% of its population between 1960 and 2020 (Fig. 1). Today they have an ageing population and a low demographic density of 10.69 inh./km², with 18 municipalities <10 inh./km² (INE, 2021). Of the group, only four municipalities have more than 5,000 inhabitants (2020), and 18 municipalities have fewer than 1,000 inhabitants (INE, 2021).

SAPA and SNS have a regional entity with Local Action Groups (LAGs) that practically identify with their territory, while SH is divided between the two LAGs (Fig. 1). Public and private services are concentrated in the most populated nuclei, which perform urban functions as county seats (García-Delgado, 2009; Mulero-Mendigorry & Silva-Pérez, 2013).

Leisure functions (summer holidays) were already present in these areas in the last quarter of the 19th century (Fernández-Tabales *et al.*, 1993), but itinerant activities (by road) have predominated. In their provincial groups, the three NtPs highlight the importance of urban cultural (Seville and Córdoba) and coastal (Huelva) tourism (García-Delgado, 2008). At the time of the establishment of the NtPs, there was virtually no tourist offer, apart from the Gruta de las Maravillas (Aracena) (Garzón-García & Ramírez-López, 2018). The creation of the Natural Parks has meant an increase in the tourist offer, especially in SAPA, focused on accommodation in rural houses and restaurants, concentrated in the central-eastern municipalities (Fernández-Tabales *et al.*, 1993). The SNS offer is more recent and is also focused in the southern municipalities (Silva-Pérez & Ojeda-Rivera, 2001). In the case of SH, the offer is very scarce and recent, with most of the initiatives located outside the NtP. There has been no joint tourism planning, and each municipality has proposed its own strategies, with relative success in some cases (for example, Aracena, Cazalla de la Sierra, Hornachuelos). Progressively, there has been a shift from passive rural tourism to active rural/nature tourism.

It is a marked peripherality of bordering provinces, autonomous communities and States (Fig. 1), with little accessibility by road to the provincial capitals and very precarious within the regions where only express roads cross the territory.

3. METHODOLOGY

This work is part of a broader investigation (Bahamonde-Rodríguez *et al.*, 2022; Bahamonde-Rodríguez *et al.*, 2023) that addresses tourism in NtPs related to three issues: sustainability, governance and local development, the latter being the topic addressed in this article. This research applies a mixed methodology (Sá *et al.*, 2019; García-Delgado *et al.*, 2020). On the one hand, a qualitative method was used, widely applied to tourism studies in rural areas and PNAs (Saxena & Ilbery, 2008; Adamowicz, 2010; Saxena & Ilbery, 2010; Brouder, 2012; Renfors, 2020; Zawilińska, 2020). Forty semi-structured (Int) interviews were conducted between April and July 2021 (Fig. 1). It was a non-probabilistic sampling of the stakeholders based on their importance in cultural, geographic and demographic terms (Saxena *et al.*, 2007; Saxena & Ilbery, 2010), conducting direct interviews with directors of NtPs, managers of LAGs, actors, municipalities and private foundations, while tourism companies and business associations were selected according to the type of services they provide and their local (Dinis

¹ In this study we excluded the municipality of Córdoba capital, with a small protected area (<2%) in SH, which distorts the data.

et al., 2019) or external (Cáceres-Feria & Ruiz-Ballesteros, 2017) character, following the snowball technique (Secor, 2010).

These interviews comprised ten questions (q) (Figs. 5, 6) aimed at finding out the perception, awareness, understanding and commitment, attitudes and practice (Hardy, 2005; Cànoves *et al.*, 2014; Sá *et al.* 2019; Renfors, 2020; Zawilińska, 2020) of those who participate in or influence development processes as well as their evaluation and perception (García-Delgado *et al.*, 2020). This work focuses on q9, “Does tourism contribute to local development?” and the problems derived from tourism (q7, q8) (Hardy, 2005). The interviewees were allowed to refer to the themes they deemed necessary (Brouder, 2012) to obtain information through an inductive analysis (Patton, 2002) and to identify the key themes (Longhurst, 2010), which are coded according to recurring patterns (Renfors, 2020). For this, the interviews were transcribed and coded following the initial structure.

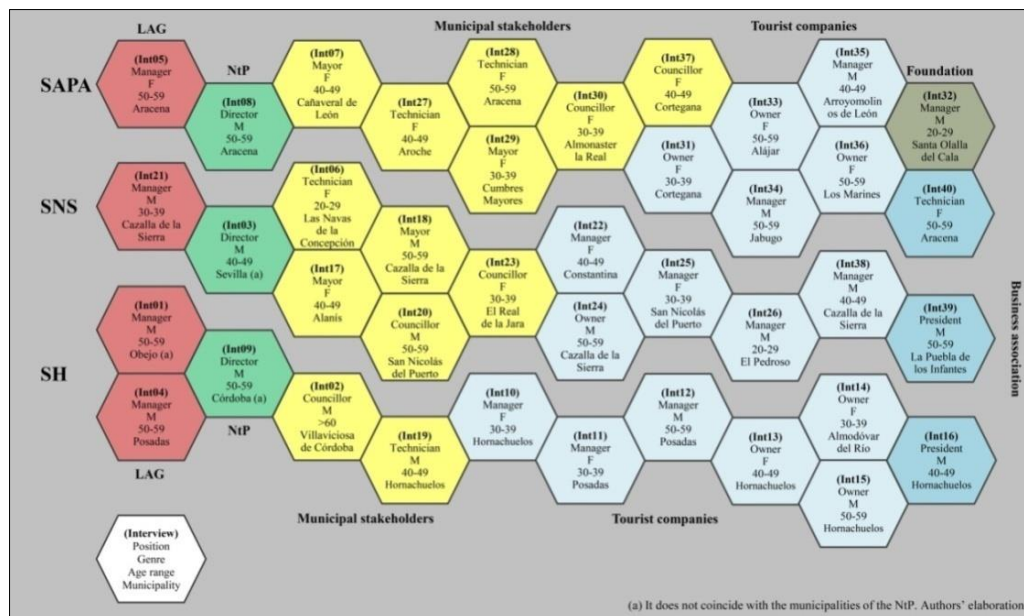


Fig. 5 – Interviews.

Due to the restrictions imposed by the sanitary measures triggered by COVID-19, the interviews were primarily conducted via videoconference, using the Google Meet[®] tool and seeking their territorial balance in relevance within each NtP, as well as centrality or periphery. The impossibility of conducting systematic interviews or questionnaires with the local population led to non-systematised informal interviews. At the same time, territorial recognition was carried out based on the identification and analysis of tourist resources, on the verification of accessibility and connectivity, and on the determination of territorial diversity. On the other hand, the information obtained from the interviews was crossed with municipal quantitative data obtained from statistics and official databases. Finally, a triangulation of the data was carried out (Longhurst, 2010) to maximise the understanding of the phenomenon and the convergence (or lack thereof) of the results (Cope, 2010).

(q1) What function do the Nature Park and Biosphere Reserve have in your destination (and others)?	(q2) What is the value of the landscape in tourism?	(q3) ^(a) How do you perceive sustainable tourism development in your destination?	(q4) ^(b) Does sustainability have a strong effect on the tourism development of your destination? Why?	(q5) ^(a) What kind of conflicts related to sustainability are created between stakeholders?
(q6) ^(a) Could you give a practical example of sustainable tourism development in your destination? What would you improve?	(q7) What happens with your destination in the context of global change?	(q8) Are there difficulties in managing the tourist space?	(q9) ^(b) Does tourism contribute to local development?	(q10) What consequences has COVID-19 had on the destination?

^(a) Questions based on Renfors (2020). ^(b) Questions adapted from Renfors (2020). Authors' elaboration.

Fig. 6 – Interview questions.

4. RESULTS

From the interviews, five main themes were derived around the pairing of tourism and local development, which the informants repeatedly expressed, although with different levels of agreement.

(a) The establishment of NtPs has repercussions on tourism supply and demand

The interviewees agree that the tourist activity develops thanks to the establishment of the NtPs in 1989, seeing the difference between the territories within the PNA and those not included (Int08). The regional administration generates public services, infrastructures and equipment (SIEs) linked to the recreational use of NtPs (Fig. 7).

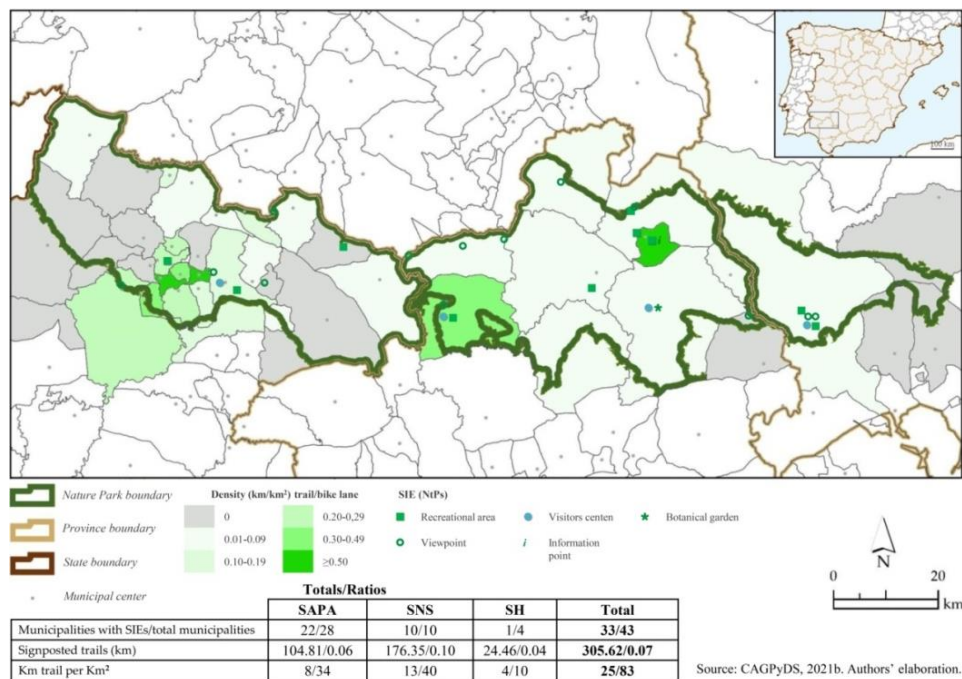


Fig. 7 – Services, infrastructure and public equipment in the NtPs.

Secondary data on the offer of accommodation places (Figs. 8, 9) indicates that before the establishment of the NtPs this was scarce in SAPA, very scarce in SNS and non-existent in SH. The growth of the total offer is greater in SAPA than in SNS and SH, although not in relative numbers (SNS = 9.703%; SAPA = 3.611%; SH: 1.044%). Hiking continues to dominate in many municipalities lacking accommodation. The initial prevalence of camping spaces has disappeared from rural houses and regulated establishments, while tourist apartments (non-business activities) are currently present.

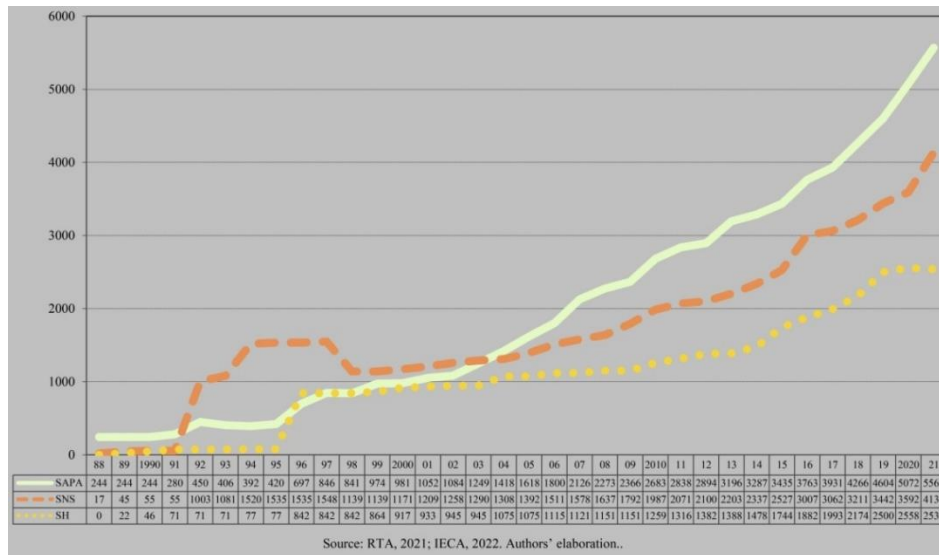


Fig. 8 – The evolution of the number of accommodation places in the study area.

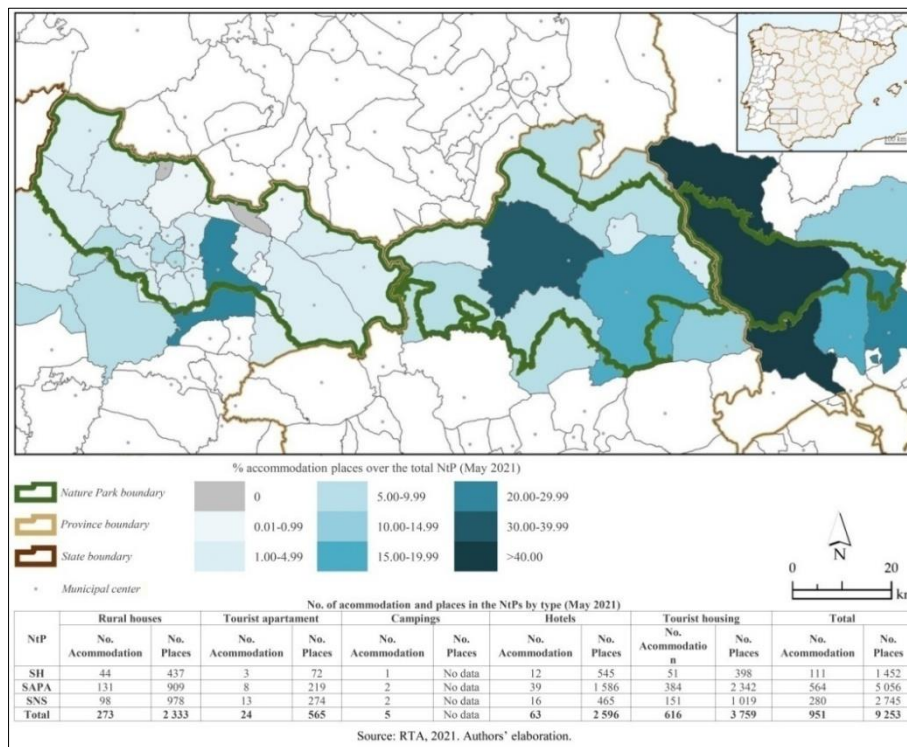


Fig. 9 – Tourist accommodation and places by NtPs (May 2021).

It has progressively gone from leisure tourism to a different, active type of tourism, which has increased the linked supply (Fig. 10). Thus, tourism activity companies have recently cropped up, being generated earlier in SNS.

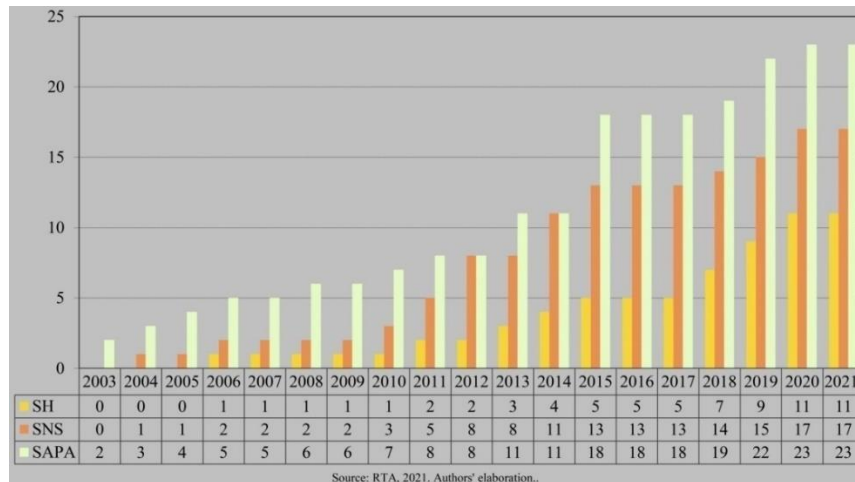


Fig. 10 – The evolution of receptive companies and activities.

(b) The contribution of tourism to the local economy

Most of the municipal stakeholders, business associations and tourism companies highlight that tourism contributes to economic growth, ceasing to be a secondary activity and becoming the main source of income (Int28, Int40) or one of the most important ones (Int19, Int40). Some municipal stakeholders regard the fact that tourism is a secondary activity as negative, while others see tourism as an opportunity (Int30, Int40). It is the tourist companies that believe tourism to have a multiplying effect on the economy, bringing about modern, as opposed to traditional activities (Int13, Int26).

For the directors of the NtPs, the managers of the LAGs, the Foundation, some tourism companies and a business association, tourism is just one more activity (Int01, Int05, Int21, Int39), despite the fact that it produces economic growth and helps to generate an economic movement (Int32), sometimes affecting the maintenance and recovery of farms taking advantage of synergies (Int05, Int08, Int21, Int31, Int32, Int33). However, they highlight that excessive expectations are frequently generated (Int05, Int09), especially among municipal stakeholders who see tourism as “a panacea, disregarding everything that is not tourism” (Int05).

The net income declared by the municipality with respect to the average area between 1989 and 2019 decreased in 26 municipalities, while only 16 increased, and only 2 exceeded the average (Fig. 11).

Taking 2009 (the beginning of the international economic crisis) and 2019 (before the pandemic) as reference points, the main business sector (except agriculture) (Fig. 12) tends to gather companies in retail trade, while a change towards tourist activities with a tendency to a high specialisation is present in only 4 municipalities (SAPA).

Among the municipal stakeholders, there is no perception of a tourism development problem if there is complementarity with other activities (Int02, Int07, Int17, Int18, Int23, Int28). The managers of LAGs and the Foundation do not perceive a risk of specialisation and dependency, considering that the tourist activity is a complementary one (Int05, Int32).

LAGs managers highlight that there are families whose main economic resources come from tourism (Int05), and that this generates employment among young people who work in companies, but also undertake employment or are self-employed (Int04). For some municipal stakeholders, tourism employment is very important, although sometimes it is self-employment (Int30), since tourism companies limit the generation of employment because they are micro-enterprises and create part-time

and temporary jobs (Int15). For their part, some companies point out the precariousness of employment. The directors of the NtPs refer to the need for training in the sector, which is regarded by the managers of LAGs as a challenge (Int21).

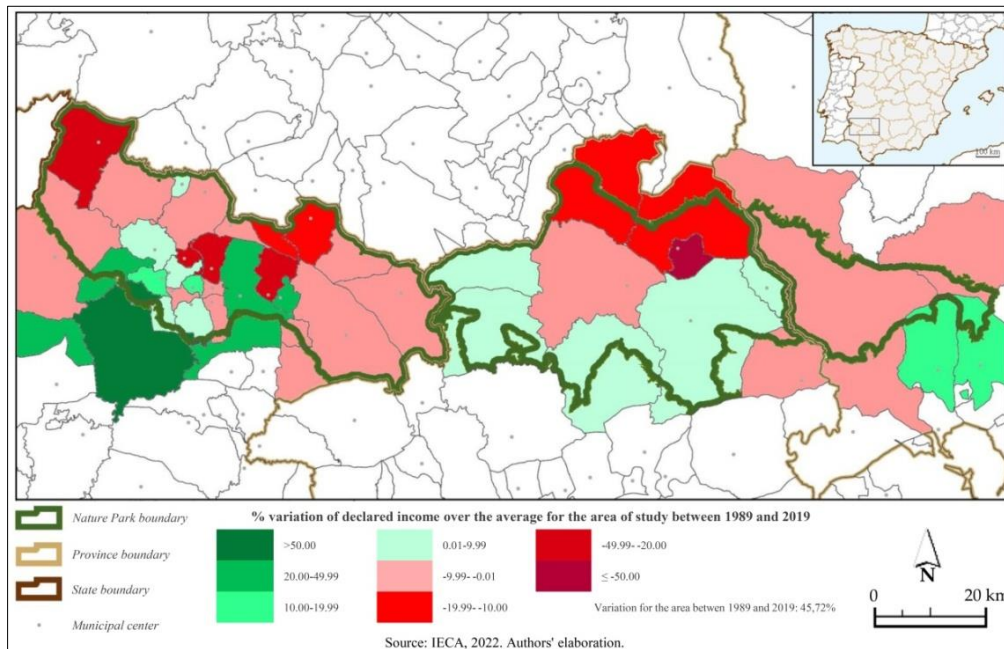


Fig. 11 – The variation of declared net income over the total study area between 1989 and 2019.

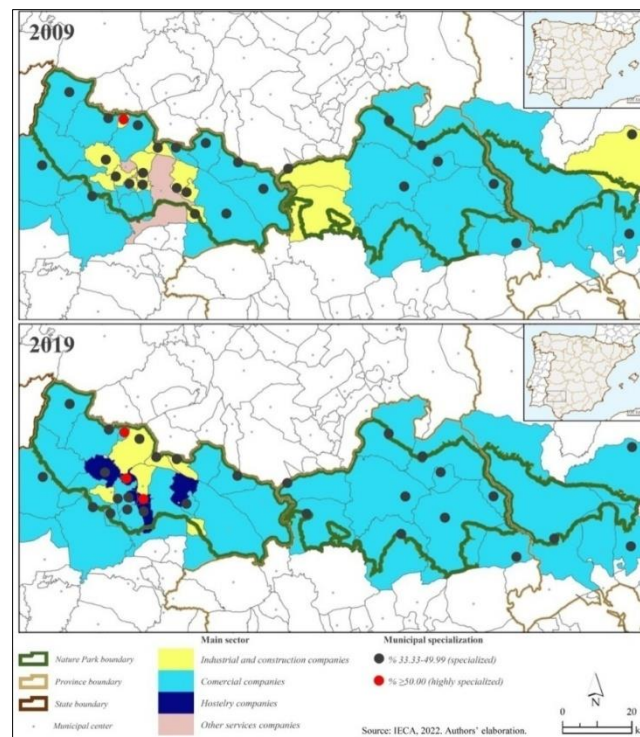


Fig. 12 – Companies by main sector of activity in 2009 and 2019.

The tourism employment data by municipality appear within the services sector. Analysing the main sector of activity by percentage of employment in 2009 and 2019 (Fig. 13) one may note that employment is focused in the primary sector in 13 municipalities in 2009 and in 15 municipalities in 2019 (it increases in SAPA), is more prevalent in SNS and SH, and sees a high specialization in more than half of the municipalities. In another 12 municipalities (SAPA and SNS) it is the (generic) services that employ the majority of the population in both years. Industry is only the main source of employment in 2 municipalities in both annuities (SAPA), while construction declines in 7 municipalities in favour of services.

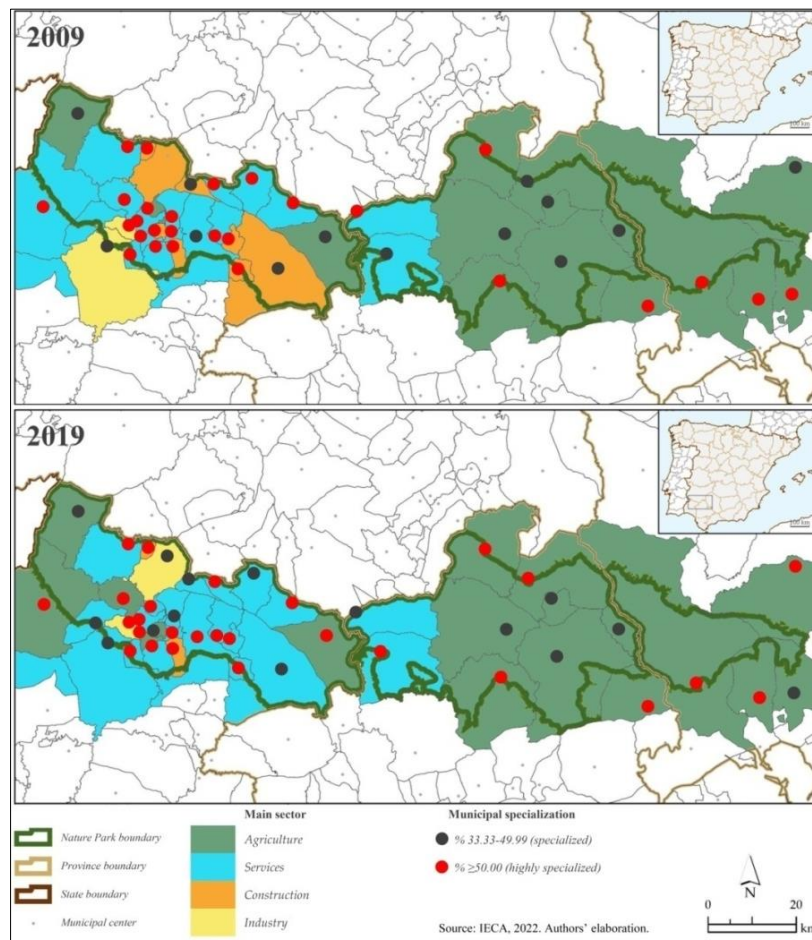


Fig. 13 – Employment by main sector of activity in 2009 and 2019.

On the other hand, unemployment continues to be endemic, and in 2019 only 8 municipalities registered values under the regional average (Fig. 14).

LAGs managers and some tourism companies highlight that significant investments in the tourism sector flow from outside the territory and generate certain dependency relationships, which do not contribute to development (Int05, Int13, Int21, Int22, Int35).

The greatest limitations of tourism in terms of generating economic growth are, according to the various stakeholders: seasonality (Int01, Int08, Int16, Int18, Int34, Int35), short stays (Int01, Int18), the territorial concentration of initiatives (Int08, Int35) and the scarce diversity of the offer (variety, quality and temporality) (Int01, Int08, Int18, Int34), highlighting some where the continuous tourist flow is

necessary, but not greater (Int01, Int24), and customer loyalty (Int18) for the viability of companies, through the creation of innovative products (Int35). The NtPs directors, LAGs managers and tourism entrepreneurs insist on differentiating between tourists who stay, demand services and spend, stimulating other activities/sectors and generating added value (Int24), a multiplier effect (Int22) and promoting the territory (Int25); and visitors, who frequently do not leave any benefit in the territory (Int03, Int09, Int15, Int26), which is extended (from tourist accommodation) to those who go to rural houses on weekends and bring everything from their place of residence (Int35). However, this opinion is in the minority among municipal stakeholders.

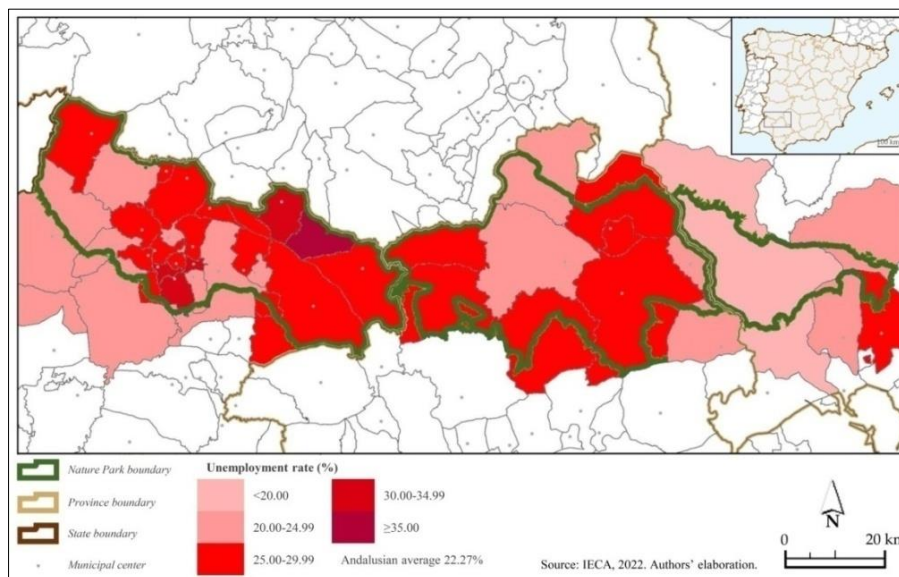


Fig. 14 – Municipal unemployment rate (2019).

(c) The limited social impacts of tourism on the local community

Most informants do not directly address the sociocultural influences, with the demographic variable being mentioned most often.

The NtPs directors do not refer to the contribution of tourism in the fight against depopulation, although they recognize demographic ageing as a problem (Int08).

For the managers of the LAGs, tourism has not contributed to limiting the depopulation process. Although tourism business activities are more in line with young people and generate opportunities (Int04), there is a lack of specific aid to avoid emigration (Int05, Int21) and attract troops (Int01), in a society where the idea of leaving the town is rooted (Int04), reinforced by the deficiency of public and private services and communication infrastructures (Int01, Int21), the arrival of the population being a neo-rural exception (Int21).

Among the municipal stakeholders there is no agreement. For some, tourism contributes to stabilizing the population, slows down depopulation and increases opportunities for young people (Int19). For others, in order to improve the population, it is necessary to have services and technological resources, as seen with the increase in population due to the pandemic (Int18, Int29). There is no shortage of those who claim that tourism does not stop depopulation (Int02) and that emigration is its cause (Int06).

Tourism companies admit that tourism does not mean the end of depopulation (Int33). Still, it is an opportunity (Int39), since it allows the stabilization of the rural population (Int35), highlighting that despite the emigration of young people, many return to set up tourism-related businesses (Int26). On the

other hand, some tourism companies speak of a neo-rural population, which develops projects with different points of view (Int31), which is perceived negatively by a part of the local companies, which indicates that it does not affect the resident population. (Int10). Only one business association suggests that the anti-depopulation effects of tourism are limited (Int39).

According to data from the Continuous Census conducted between 1991 and 2019, a demographic decrease is noted (Fig. 15), affecting 35 municipalities, being $\leq 20.00\%$ in 12 municipalities, while of the seven municipalities that registered an evolution, only one had a growth of $\leq 20.00\%$.

Two tourism companies, LAGs managers and a municipal stakeholder point out the forgetfulness of the local population, and observe the danger of “not denying anything to tourists” (Int10). There is a maladjustment of visitors to the local population (Int21), which affects the relationships between it and the tourist population, limiting the ways of life of the residents (Int01). It is necessary to educate the tourist regarding native customs (Int03, Int10) so that there is a beneficial change in the life of the local population (Int31, int37). Only for one of the tourism companies and for municipal stakeholders does tourism value tangible heritage and traditional, immaterial work (Int22, Int23, Int27, Int29).

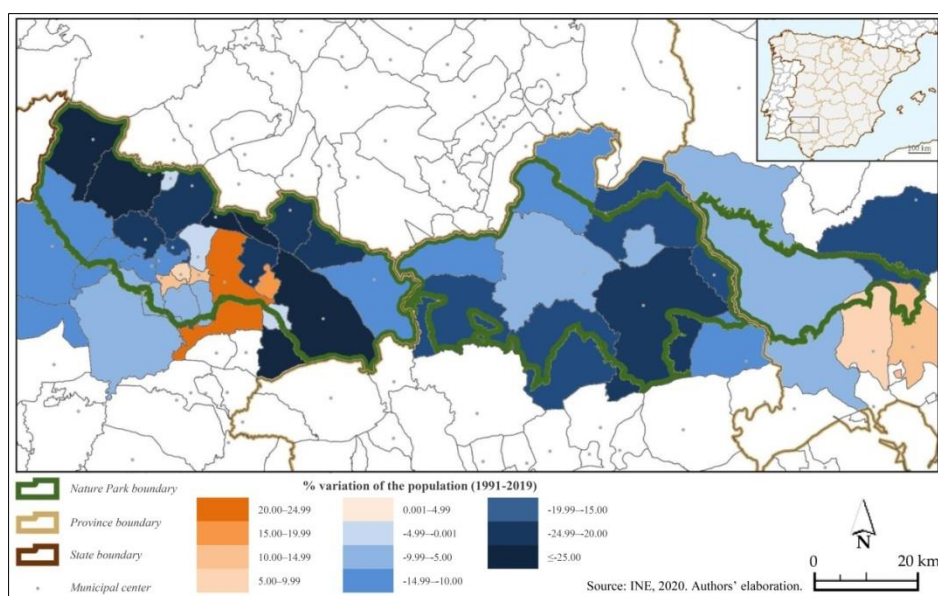


Fig. 15 – Variation of the population between 1991 and 2019.

(d) The limited environmental impacts of tourism activities

From an environmental perspective, the directors of NtPs see a need for tourism based on the environment (how it is respected and used), which is valued and consumed, corresponding to an increase in quality (Int03). For LAGs managers, the sustainability of the environment, particularly regarding land uses and traditional activities, is an attraction for tourism. However, visitors and the resident population must perceive it as such (Int03, Int04). For the Foundation, environmental sustainability is necessary for tourism to contribute to local development (Int32), and sometimes it perceives over-frequency, making it essential to control flows in order to monitor negative impacts.

There is no agreement among municipal stakeholders on the environmental dimension of tourism activities. Some perceive it as a problem, considering it necessary to implement actions for the sustainability of tourist activity in high-traffic municipalities, controlling the flows (Int28, Int37). In contrast, in the more peripheral municipalities, there are intentions to avoid the effects of over-frequency (Int20, Int23), betting on quality (Int20) and employing specific financing measures (Int23). Others

believe that sustainability is quite a foreign concept for the municipalities, rendering it necessary to increase tourist flows so as to then increase the economic benefit (Int07).

Tourism companies highlight that sometimes there is an overexploitation of resources in places (SAPA, SH) where all the tourist activity is focused (Int35), pointing out that tourism must be controlled to “not die of its own success” (Int10) and respect sustainability (Int34, Int35). Some companies attribute unsustainable behaviours to companies that come or are from the outside (Int38), while others see sustainability as an opportunity for segmentation (Int33, Int36, int40).

On the other hand, what stands out is the difficulty in managing waste due to the condition of NtPs (Int21, Int40) and the lack of ad hoc financing (Int39).

Only one of the NtPs directors emphasised *Excessive water consumption* (Int08). At the same time, municipal stakeholders (Int37) and tourism companies (Int10, Int31) highlight that tourists look for rural houses with swimming pools during the summer as a consequence of the pandemic.

(e) Unequal tourism development between municipalities and NtPs

From a territorial perspective of integration and structuring, the unequal distribution of accommodation and the number of beds in the territory is a fact (Fig. 9), with a concentration of accommodation supply in the most central and best-linked areas.

In the provision of SIEs, there are essential differences between the NtPs, with SNS being the best equipped and SH the worst (Fig. 7). There is also an imbalance within NtPs, with a tendency to gather SIEs, which are well distributed only in SNS.

For the directors of the NtPs, there is a centre-periphery relationship in tourist activities (Inst03, Int08, Int09), but they do not indicate the exact cause.

For their part, the managers of the LAGs affirm that tourism is a more or less critical activity depending on the place (Int04), and only one of them does not note geographic concentration (Int01). Those who see the concentration point out that tourism is gradually opening up to peripheral municipalities (Int04, Int21). They highlight that various initiatives were launched to avoid the focusing of activity, including creating routes through the most peripheral areas and developing projects in municipalities with little or no tourism (Int05). They cite the Sierra Morena GR-48 Trail that runs through the three NtPs (and beyond) and the Jabugo Route (SAPA).

There is no agreement among the municipal stakeholders. For some, there is no tourist concentration (Int02, Int28), since each municipality has its dynamics (Int06). For others, there is a concentration of tourism due to the focusing of natural or cultural heritage (Int07), a more significant financial capacity (Int07), or receiving more aid and being favoured (Int30). Some point out that the problem lies in contextual limitations, such as ageing, population size, income and investment (Int20).

Between tourism companies and business associations, there are very different visions. For some, there is a concentration of tourist activities due to the support of the Town Halls (Int39) and a favourable political and institutional context for tourism (Int13, Int26, Int38), which encourages visits to central over peripheral municipalities (Int10, Int35). For others, there is an agglutination of activities in municipalities, but it is unexpected, without planification (Int40), partly explained by the non-existence of demand thresholds (Int10). Some tourism companies and business associations deny the presence of tourism focusing, highlighting that projects are being addressed in other places so that the effect expands in municipalities with little or no initiative (Int36), since this usually results in a diversification of endogenous products and resources that allow residents to go on living there (Int36), trying to create a destination so that people who already go to the most touristic municipalities move throughout the NtP (SAPA).

By NtPs, the concentration is especially appreciated in SAPA, around seven municipalities, while in SNS, it occurs in 5, and in SH in 1 (Table 1).

Table 1

Concentration of activities in the NtPs by municipality, according to the informants

NtP	Municipalities with concentration	Cause
SAPA	Aracena	Proximity to the issuing markets (Int05, Int08, Int27) Accessibility (Int05, Int08) Geographic Centrality (Int35) Historical heritage (Int05, Int07, Int35) Gruta de las Maravillas (Int05, Int07, Int34, Int34, Int35) It has more financial resources (Int07, Int34) Receives more aid and support from LAGs and Business Associations (Int30) Service Concentration (Int35, Int40)
	Alájar, Almonaster la Real, Castaño del Robledo, Fuenteheridos, Galaroza, Linares de la Sierra	Historical heritage (Int05, Int07) Geographic Centrality (Int27, Int35) Proximity to Aracena (Int05, Int07, Int27)
SNS	Almadén de la Plata	Accessibility (Int21) Historical heritage (Int21)
	Cazalla de la Sierra	Proximity to the issuing markets (Int09, Int21) Accessibility (Int21) Historical heritage (Int21) Municipal power/institutional context (Int38, Int39)
	Constantina	Proximity to the issuing markets (Int09, Int21) Accessibility (Int21) Historical heritage (Int21)
	Real de la Jara	Accessibility (Int21) Historical heritage (Int21)
	San Nicolás del Puerto	Natural heritage (Int20)
SH	Hornachuelos	Proximity to the issuing markets (Int03) Closeness to the core of the NtP (Int03, Int11) Direct access to NtP (Int14) Municipal power/institutional context (Int10, Int13)
	Pantano de la Breña (Norte dentro SH)	Natural heritage (Int04) Accessibility (Int04)

Source: Interviews. Authors' elaboration.

5. DISCUSSION

Leisure functions (summer) were already present in these areas in the last quarter of the 19th century, especially in SAPA (Fernández-Tabales *et al.*, 1993). Still, the offer was very scarce (Garzón-García & Ramírez-López, 2018), and itinerant activities predominated (Hardy, 2007). The establishment of NtPs supposes the creation of accommodation, service companies and restaurants, as observed in other NtPs (Araque-Jiménez *et al.*, 2002; Anton-Clavé *et al.*, 2008; Cànoves *et al.*, 2014). At the time, the regional administration (through the NtPs) developed public SIEs, often without feasibility studies (Araque-Jiménez *et al.*, 2002; Anton-Clavé *et al.*, 2008).

However, although the informants do not influence it, the turning point of the accommodation offer will be generated with the favourable institutional framework of the Common Agricultural Policy (CAP) with the implementation of the LAGs starting in 1991 (SNS) and 1995-1997 (SAPA, SH), by contributing the community initiative LEADER (I, II and +) and national PRODER (I and II) and EAFRD programmes to the revitalisation of tourism (Araque-Jiménez & Crespo- Guerrero, 2010; Belliggiano *et al.*, 2020). In general, there has been an irregular success of the initiatives, depending on the investment, location, presence of protected resources and accessibility for tourist survival (Engelmo-

Moriche *et al.*, 2021), by prioritising opening tourist establishments with less attention to the planning (Pitarch-Garrido & Arnandis-i-Agramunt, 2014; Nieto-Masot & Cárdenas-Alonso, 2017; Garzón-García & Ramírez-López, 2018; Belliggiano *et al.*, 2020), forgetting that not all spaces have tourist potential (García-Delgado *et al.*, 2020) and without taking into account the speculation and illegal component (Garzón-García & Ramírez-López, 2018). On the other hand, the supply of tourism activity companies is very recent and linked to urban demand and experiences, which indicates a change from the demand perspective (Flather & Cordell, 1995; Anton-Clavé *et al.*, 2008).

The economic dimension of tourism in local development prevails in the discourse of the informants (Renfors, 2020). Two visions of the contribution of tourism to the local economy are counterposed: 1) tourism ceases to be a secondary activity and becomes the main one as well as an opportunity to replace traditional activities; 2) tourism produces economic growth despite the fact that it is complementary to traditional activities. This shows that rural communities are affected in different ways by the competition paradigm (Saxena *et al.*, 2007) in a context of structural crisis, where any opportunity for economic diversification is welcome, and tourism is seen as a chance to face economic decline by contributing to diversification (Smith & Krannich, 1998). Thus, poverty in PNAs is a redundant issue in academia and politics (Pulido-Fernández, 2008; Woodhouse *et al.*, 2018) that has been incorporated into the rural development paradigm as part of the LEADER approach (McAreevey & McDonagh, 2011). However, it generates excessive expectations (Araque-Jiménez & Crespo-Guerrero, 2010) and its effects are more limited than perceived and expected in NtPs. Additionally, it is not a solution to all ills (Greffe, 1994; Cànoves *et al.*, 2003; Yubero-Bernabé & García-Hernández, 2019), since resources by themselves do not generate tourist flows (Prats, 2011). On the other hand, tourism does not immediately affect income (Ribeiro & Marques, 2002), which increases in municipalities with a more diversified economy and specialisation in primary activities, regardless of the tourist offer.

The informants do not directly address tourism entrepreneurship as a source of vitality (Dinis *et al.*, 2019; Pato, 2020; Renfors, 2020) and local development (Dinis *et al.*, 2019), nor the scarcity of entrepreneurial culture (only seen by LAGs managers) as a driver of innovation and change (Lordkipanidze *et al.*, 2005), which contrasts with the perception of stakeholders in other areas that attribute an essential role to it (Renfors, 2020; Pato, 2020). Tourism requires a high degree of participation of companies, products and services (Lordkipanidze *et al.*, 2005), and model entrepreneurs tend to innovate (Lordkipanidze *et al.*, 2005; Pato, 2020). There is also no mention of the prominent presence among neo-rural and foreign entrepreneurs, of “immigrant” businessmen who have an initial vision of the territory and then decide to move elsewhere (Giles *et al.*, 2013), with strategies that are more vital than economic (Romagosa *et al.*, 2020). It coincides with local development programs and the process of opening up, mobility and neo-rurality (Kayser, 1990; Rivera & Mormont, 2007; Cáceres-Feria & Ruiz-Ballesteros, 2017), detected by the informants in the three NtPs with a tendency towards concentration (especially SAPA and SNS), which display an integrating perspective of development (proactive), are more innovative and generate more employment than some local companies, observing a growing role of foreigners in rural development and tourism, but also in connection with external markets (Cáceres-Feria & Ruiz-Ballesteros, 2017). On the other hand, tourism companies and LAGs managers place some emphasis on accommodation, speculation and illegality (Garzón-García & Ramírez-López, 2018), on which regional legislation has enshrined recognising housing for tourism purposes and rural housing for tourism purposes, as well as on which of them have increased the most in recent years.

Employment is frequently observed as one of the most significant benefits of tourism in rural areas, but it is not a prominent aspect for the informants. Tourism lacks an immediate effect on job creation (Ribeiro & Marques, 2002), which is scarce, although job opportunities are generated (Pato, 2020). It is due to the low business dimension that little employment is generated (self-employment,

part-time, income supplement, family businesses), seasonal, poorly paid and precarious (Deller, 2010; Renfors, 2020), aggravated (after the international economic crisis) due to the increase in non-business activities (which do not generate employment). While fostering employment faces the problem of lack of training in the sector, which is a challenge, there is also the problem of the demand for low-skilled and short-term employment (Lane, 1994). On the other hand, a perverse effect is generated. The arrival of large external companies also involves hiring qualified personnel outside the field, justified by this lack of training. It invalidates the affirmation of the stakeholders who affirm that tourism is the main economic activity of their municipalities since there is no correlation between the number of tourist companies, accommodation places, or employment in services, justified by public and private services which predominate in municipalities where a micropolitan effect is ongoing (Bjarnason *et al.*, 2021). The increase in employment is linked to the socio-spatial context through entrepreneurship and rural and endogenous innovation (Balfour *et al.*, 2018). It goes through the diversification of the offer, its segmentation, and the associated offer, but seasonality conditions it and hinders the professionalisation of tourism (Cànoves *et al.*, 2014) since the reality continues to be that NtPs suffer from chronic unemployment (Araque-Jiménez & Crespo-Guerrero, 2010).

The informants highlight the multiplier effect of tourism as a positive economic impact (Cànoves *et al.*, 2003). While they recognise the increased demand for services, spending, revitalisation, added value, and promotion of the territory, in reality, they do not appreciate tourism development or do it in a limited way. Tourism enables catering and commercial offers concerning the development of accommodation due to the continuous flow of tourists and visitors, allowing commercial services to be developed in most touristic municipalities. Still, commercial companies (distribution retailers) come from the outside.

The influx of foreign investment is highlighted by some informants who speak of the receipt of subsidies and dependency relationships generated with decision-making outside, the use of economies of scale and the search for short-term profit (Lane, 1994; Bramwell, 1994). It threatens economic stability due to the effect of external forces (Bramwell, 1994) and alliances with external capital (Bianchi, 2004) caused by the presence of investors (and speculators), operators, chains and intermediaries (SAPA and SNS) to which the community and local businesses lose (Bramwell, 1994).

Informants see the biggest obstacles to economic development in supply and demand. On the one hand, there are the difficulties of commercialisation and the lack of coordination as difficulties of the sector (Cànoves & Villarino, 2000; Cànoves *et al.*, 2006; Cànoves *et al.*, 2014), the scarce diversity of the offer (Greffe, 1994) and the inexistence of sufficient packages to attract and retain tourists offering spending conditions (Gannon, 1994). The most prominent issue is the seasonality and limitation of the season of tourist activity (Cànoves & Villarino, 2000; Renfors, 2020), focused around the shoulder seasons of autumn and spring and in summer since COVID-19, which influences the entrepreneurial spirit and the viability of companies (Renfors, 2020). To this would be added the short stay, which means that the activity is focused on weekends and short holidays, with a discontinuous flow that prevents investment in the product, as it is not profitable. It results in tourists' low loyalty to the company's viability, which is necessary to create innovative products (Cànoves & Villarino, 2000). On the other hand, one of the deficiencies is the excursions that do not generate expense or added value at the destination, generalised to those who stay in rural houses, who make the expense at the place of origin. However, it is a fact that the tourist dynamics allows the most central municipalities with public services to reach thresholds of private services, as is the case of commercial ones.

The analysis of the perception of the positive and negative economic impacts of tourism reflects the presence of a preconceived scheme, since the topics addressed in the study of tourism and the forums are repeated. Still, the perception is frequently not linked to the evidence. Still, rather than training, e.g. in Tourism and Economy, it is a discourse repeated among many municipal stakeholders. The critical vision is situated among those who have humanistic, technical and environmental training, namely, the

ones who establish the need for development in NtPs to be socio-economic, related to the owners, local population or social agents (Europarc, 2009).

The informants do not attribute the loss of traditional activities, the changes in uses and the degradation of the landscape to tourism, but rather to the dynamics of the agricultural space itself, i.e. ageing, depopulation, low profitability, among others, forgetting that, in the PNA, the scenery is not mandatory and agricultural activities are what maintain the resources (Cànoves *et al.*, 2005; Anton-Clavé *et al.*, 2008). These visions demonstrate the complex implications linked to the transition from a weak multifunctionality to a strong one (Wilson, 2010), which generates competition between antagonistic activities and is a source of conflict.

It is necessary to study the social, cultural and demographic effects on the local population in sparsely populated, primary and distant areas of urban agglomerations (Grefe, 1994). However, the sociocultural and demographic dimension is addressed in a limited way by the informants, being perceived as weak and contradictory (Renfors, 2020), which contrasts with a PNA where residents highlight sociocultural and institutional dimensions above economic and environmental ones (Trišić *et al.*, 2021).

The scientific literature frequently states that rural tourism stabilizes the population, slows depopulation, and counteracts emigration by offering opportunities for the youngest to remain (Cànoves *et al.*, 2014). A large part of the interviewees expresses themselves in this sense. However, the actual effects are more limited than perceived, since only eight municipalities have gained in population numbers between 1991 and 2020, in two due to the impact of deurbanization in SH, and all the others in SAPA around the county seat. Although the most touristic and best linked municipalities (SAPA) indeed gain population, it is necessary to consider that the micropolitan effects generated by the increment of supra-municipal services in the county capitals are more critical (Bjarnason *et al.*, 2021) than those generated by tourism, as well as the emigration of young people to neighbouring municipalities due to the effects of gentrification and urban speculation. Tourism development sometimes coincides with a slowdown in population decline or stabilization, but we cannot describe a generalised process (Cànoves *et al.*, 2006). At the same time, most peripheral areas suffer more depopulation (Ramsey & Malcolm, 2017) regardless of the tourist offer and the main activity.

Although the informants did not highlight it, throughout the interviews and fieldwork, the importance of women in entrepreneurship and job performance has been verified (Hjalager, 1996). Likewise, the arrival of neo-rural entrepreneurs (Cànoves *et al.*, 2005) and foreigners observed in other rural spaces in tourist activities (Romagosa *et al.*, 2020) occupies a prominent place. Yet, this importance is more qualitative than quantitative, and is due to their philosophy of life (Romagosa *et al.*, 2012) and business model in line with local-based tourism (Cáceres-Feria & Ruiz-Ballesteros, 2017). They would differ from those who come from the outside, appropriate the territory and exclude the local population from traditional activities (Blázquez-i-Salom, 2002) by participating in traditional customs and activities. However, the vision of the other is still present. They look at it with reluctance, i.e., local companies developing poorly understood projects and brandishing slogans such as “they come from the outside” about “the weirdos” who have renounced urban life as a classic dichotomy. The informants perceive adverse effects on local society, pointing to the maladjustment of visitors to it, producing a disempowerment that feels that it has neither participated nor agreed in the implementation of tourism when the priority should be given to their needs and interests and not only to the objectives of tourist activities (Cànoves *et al.*, 2006). The empowerment of the community in political, social, psychological and economic terms is not achieved (Khanom *et al.*, 2019). It even leads to losing local power with the arrival of “mayors from outside”.

Heritage recovery is evidence of and an opportunity to redistribute the benefits of tourism (Cànoves *et al.*, 2005), while heritage protections and rehabilitations are in tune with heritage conservation, with a local government discourse based on heritage (Adamowicz, 2010). However, it is a positive impact barely perceived by the informants. On the other hand, the recovery of heritage

sometimes implies the usurping of its use or loss of functionality (Blázquez-i-Salom, 2002), which prevents the development of a new paradigm based on patrimonialization (García-Delgado *et al.*, 2020).

In the PNAs, the environmental sustainability of tourism activities is not an option but an obligation (Renfors, 2020). However, protecting natural values with tourism and recreational activities continues to be challenging (Anton-Clavé *et al.*, 2008). For the informants, sustainability is indeed present in the development processes (Renfors, 2020). Nonetheless, they ignore the importance of the environmental dimension and the impacts produced by tourism are considered unimportant or specific. For some, sustainability is a business opportunity that involves a confusion between responsibility and sustainability (Saarinen, 2021), facing the need for low-intensity tourism, proximity, ornitourism, astrotourism and the segmentation of activities and product creation based on experience (Flather & Cordell, 1995; Anton-Clavé *et al.*, 2008).

The different actors identify specific problems of over-frequency and overload in places (central municipalities, urban areas, main attractions) and specific moments (due to the seasonality of the activity), as has been seen during the pandemic due to the lack of a limit and a control instrument (Cànoves *et al.*, 2006) as well as to unawareness (on the part of the local population, visitors and companies). This over-frequency generates other problems related to fragility (Bramwell, 1994), such as generating waste that has high treatment costs in the NtPs, which the community must deal with (economic impact). On the other hand, there are unsustainable practices related to outdoor activities, such as entering places with restricted access without permission, unauthorised activities, and water waste, demonstrating the lack of adaptation to the Mediterranean climate and the changing climate of tourist activities.

From the different political scales, they continue to “promote the idea that tourism can effectively reduce regional disparities” (Bohlin *et al.*, 2016: 1802), as tourism is seen as a panacea (Grefe, 1994; Cànoves *et al.*, 2003; Shmallagger & Carson, 2010; Yubero-Bernabé & García-Hernández, 2019; García-Delgado *et al.*, 2020). With regards to this aspect, the favourable framework for the development of tourist activities has been, in theory, the same for all municipalities (Yubero-Bernabé & García-Hernández, 2019) and has allowed a more balanced development of marginal areas (Cànoves & Villarino, 2000), appearing the LAGs as promoters. However, there are marked territorial imbalances in tourism development that are evident in the focusing of initiatives in the three NtPs in the most central places (Andraz *et al.*, 2015; Nieto-Masot & Ríos-Rodríguez, 2021), and which make clear the trend of focusing hosts in a limited number of sites (Bohlin *et al.*, 2016). The informants point to different causes.

Firstly, there is talk of proximity to the issuing markets and accessibility, together with geographical centrality. As can be seen, leisure functions are carried out in the best-linked areas (Mulero-Mendigorry, 2001; Engelman-Moriche *et al.*, 2021), both in private initiatives and in public SIEs (Araque-Jiménez *et al.*, 2002). Good accessibility to the city of Seville in the eastern part of SAPA (Mercado-Alonso *et al.*, 2012) and the southern part of SNS (Silva-Pérez & Ojeda-Rivera, 2001) generates destinations near densely populated areas (Bohlin *et al.*, 2016) and access to car travellers (Hardy, 2007). Therefore, as isolation increases, the scale of attraction, uniqueness and resource conservation must rise to attract and generate other forms of tourism (Priedaux, 2002; Mastronardi *et al.*, 2017). The improvement in accessibility reduces peripherality and territorial differences and provides market opportunities (Cànoves & Villarino-Pérez, 2000).

Secondly, there is the focusing of heritage, resources, natural and cultural products and the potential of the place (Cànoves *et al.*, 2005; Ramsey & Malcolm, 2017; Garzón-García & Ramírez-López, 2018; García-Delgado *et al.*, 2020; Engelman-Moriche *et al.*, 2021). The diversity of landscapes (SAPA, SNS) and the protected area (SH) (Garzón-García & Ramírez-López, 2018) entail the concentration of activities since there are dull or average places which are not exotic or attractive enough for tourism (Roberts & Hall, 2001; Ramsey & Malcolm, 2017). For this reason, it is necessary to create tourist environmental units with a minimum of complementary resources (Pearce, 1988) and the conformation of the destination (García-Delgado & Felicidades-García, 2014).

Thirdly, the limited financial and investment capacity is emphasised. Context constraints, such as primary specialisation, ageing, population size and income (Koster & Baccar, 2016), hinder investment (Engelmo-Moriche *et al.*, 2021). It is the municipalities with the largest population and economic diversification that receive the most significant investment, as can be seen in the regional capitals (Márquez-Fernández *et al.*, 2006) and the appearance of municipalities as facilitators of tourist activity that provide direct financial support in the support infrastructures (Renfors, 2020), while also launching tourism initiatives (information points/tourism offices, accommodation).

Fourthly, there is the reception by certain municipalities of more aid and the fact that they enjoy a favourable political/institutional context. Some municipalities receive, for instance, more final assistance and institutional support from LAGs, provincial, regional, or the state (Cànoves *et al.*, 2005) as demonstrated by the concentration of activities within the LAGs in SAPA and SNS (Márquez-Fernández *et al.*, 2006) as well as the concentration of services (which increase attractiveness). Among the causes is the generation of municipal lobbies in the LAGs (Esparcia-Pérez *et al.*, 2000).

Overall, centre-periphery relations continue to prevail, and most peripheral areas do not have better results even if they receive more funds (Bohlin *et al.*, 2016), with policies incapable of counteracting this concentration (Andraz *et al.*, 2015). These centre-periphery relationships are very marked in SAPA (Garzón-García, 2016), partly related to the development of infrastructures (Cànoves *et al.*, 2005). On the other hand, the products created in the most peripheral areas have had limited effects and, in some cases, have benefited more central areas such as the Ruta del Jabugo (Pérez-Mora *et al.*, 2019; Pizarro-Gómez *et al.*, 2020; Bahamonde-Rodríguez *et al.*, 2022b) and GR-48, which in its design responds only in part to peripheral areas (this is not the case in SNS), indicating gravitation (Saxena *et al.*, 2007). Thus, more has been contributed to the most central rural areas (Figueiredo, 2008), deepening the abyss between affluent and marginal rural areas (Bock, 2016).

6. CONCLUSIONS

The tourism effects on local development processes in the study area are limited, although there are differences between NtPs and municipalities. The PNA establishment and the implementation of European policies have been vital in developing tourism in the NtPs.

The constructed reality of the actors conditions their responses and depends on their characteristics, such as performance, age, and gender, but also on external factors, such as their place of residence, relationships with others, and the level of tourism development, with the view of tourism being more favourable among those who are more closely linked to the activity. There is agreement among the informants that there is a correlation between tourism and development. Yet, there are levels of agreement and disagreement on the dimensions of local development, which appear dissociated in the discourses.

The economic dimension of local development is emphasised, but it does not meet the expectations generated and has negative impacts. In addition, tourism activities have been opted for as a development strategy, sometimes the only one, generating an unrealistic idea of the tourist space from supply and demand, which suffers from specialisation and abandonment of traditional activities. Although specific environmental impacts are perceived, sustainability is compromised due to specialisation and abandonment. Identity spaces converge to musealization and cease to be so, and the NtPs achieve neither patrimonialisation nor conservation, while the debate between conservation and commodification appears. Within the social dimension, the demographic challenge is perceived as the biggest problem, but tourism shows little positive impact on demographic dynamics, while social and cultural impacts are ignored. It is a fact that NtPs are created to protect, but they are inhabited spaces, and the inhabitants do not take part in development processes. In the end, territoriality and the effects of the political-

institutional framework make rural spaces evolve according to qualitative and quantitative parameters, i.e. economic, social, political and cultural guidelines, manifested in terms of reinforcing inequality and reinforced centrality, which limits development in the most remote municipalities claiming to be the periphery of the periphery. Thus, the most central and networked actor can influence its structure or growth potential or remain static.

The qualitative analysis has limitations when considering how far to trust the opinions of the interviewees and their hidden discourses, or the fact that impacts are not perceived does not mean that they do not exist since they can also be latent or have delayed effects. In addition, it is necessary to study the attitudes of the local population towards NtPs and the determinants of leisure and recreation activities. On the other hand, the lack of quantitative data at a local scale reduces the contrast of qualitative-quantitative information.

Concerning the above, future lines of research will address (1) the perception of the local population through a quantitative analysis to establish the degree of compliance with the aspirations of the local community, (2) the governance structure, incorporating other actors into the analysis, and the social relationships and leadership issues that structure cooperative or competitive relationships, and (3) the entrepreneurial propensity of different groups, e.g. women, the young, neo-rurals, and foreigners.

Our study shows that the problems of rural tourism in ENPs are common because although they differ contextually, the results are similar. Achievements, failures, outcomes and impacts can be extrapolated to other rural spaces to establish if the objectives of local development based on tourism are met through the application of mixed methodologies.

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ASSESSMENT OF URBAN DYNAMICS – A CASE STUDY ON BERHAMPORE MUNICIPALITY AND ITS SURROUNDINGS, WEST BENGAL, INDIA

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Key-word: Berhampore, Built-up Index, Normalized Difference Vegetation Index, Modified Normalized Difference Water Index, Normalized Difference Built-up Index, urban dynamics.

Abstract. Berhampore was a former Armenian-to-British colony and historic commercial centre, had steady expansion during the colonial era, a still-ongoing trend. The natural landscape is transforming from the centre to the periphery in an extremely unpredictable way due to rapid urbanization. The current study examines the urban growth of Berhampore town in West Bengal, India, using geospatial techniques. To understand the spatiotemporal dynamics of the urban landscape from remotely sensed data, four indices are used: the Normalized Difference Built-up Index (NDBI), the Normalized Difference Vegetation Index (NDVI), the Built-up Index (BUI), and the Modified Normalized Difference Water Index (MNDWI). The result of these indices shows the unsustainable urbanization in this region. Over the course of thirty years, the built-up area increased by nearly 7.80 percent, depleting the prime vegetative cover, water bodies and, in some cases, the barren land. According to the study, it is helpful to determine current urban growth and development so that local planning authorities may control growth and development in accordance with the ecological or environmental carrying capacity of the region.

1. INTRODUCTION

The land use changes are almost global phenomena due to the rapid population growth and urbanization currently occurring. The natural landscape has been significantly impacted by the dynamics of land use/cover (LULC) pattern throughout time, which have been the outcome of the human civilization's existence and activities on the outermost layer of the planet (Lyon *et al.*, 1998; Cheruto *et al.*, 2016; Zha *et al.*, 2003; Xu *et al.*, 2019). The term "land cover" refers to an inherent feature of land, while land use is the process by which land is changed from one primary use to another. The rate of uncontrolled rapid urbanization is quite alarming, particularly in developing countries (Bose & Roychowdhury, 2020; Chen *et al.*, 2003; Cheruto *et al.*, 2016; Tah *et al.*, 2023; Roy & Mondal, 2023). Land use change and urban sprawl were two of the most important and significant issues in urban studies as cities expanded upward and outward. In most cases, city cores are extended from the centre to the urban fringe due to population increase and urbanization, which results in a fragmented urban morphology that negatively impacts the surrounding area and the local ecosystem (Ramachandra *et al.*, 2014; Naikoo *et al.*, 2020; Das *et al.*, 2021). Climate change, air pollution, water pollution and the degradation of the quality of life for both rural and urban areas are some of the most significant ecological issues associated with rapid urban expansion.

According to the United Nation report (2018 & 2019), the overall population of the world will increase to 8.5 billion in 2030, and nearly 55% of the total world population will live in urban areas (Tah *et al.*, 2023). By the end of April 2023, the United Nations Department of Economic and Social Affairs (UN DESA) predicted that India's population will exceed 1,425,775,850 based on the most recent UN predictions and estimations of the world's population. From 62 million in 1951 to 377.1 million in 2011,

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the number of people living in urban areas had dramatically increased in India and it is anticipated to reach 600 million by 2031 (Mukherjee and Das, 2018; Das *et al.*, 2021; Roy & Mondal, 2023).

Remotely sensed images provide accurate, precise, spatio-temporal data covering large areas. In comparison to the conventional methodologies, Remote Sensing (RS) and Geographic Information Systems (GIS) provide a new tool for identifying, evaluating, mapping, and simulating the nature and extent of urban growth and its related changes. Using a variety of indices, matrices, and models, several studies have shown the value of remotely sensed data in monitoring land use and land cover change in urban environments (Yang and Lo, 2002; Xu *et al.*, 2019). Various local, regional & global level works have been undertaken on the basis of interrelationship among NDBI, NDVI, MNDWI and BUI by using modern GIS techniques (Das *et al.*, 2021; Roy & Kasemi, 2021; Roy & Mondal, 2023).

In India, urban expansion-related extensive research work has been done on various cities, like *Kolkata* (Bhatta, 2009; Das *et al.*, 2022), *Mumbai* (Kandpal and Saizen, 2019), *Delhi* (Naikoo *et al.*, 2020), *Chennai* (Vaani and Anand, 2018), *Bhubaneswar* (Das *et al.*, 2021), Durgapur Sub Division (Patra and Gavsker, 2021), *English Bazar* (Shaw and Das, 2018), Raiganj (Roy and Kasemi, 2021), Siliguri (Bose and Roy Chowdhury, 2020), Asansol Durgapur (Choudhury *et al.*, 2019) etc. Small and medium-sized cities and towns contribute significantly to urban growth, yet they are sometimes overlooked. In order to better understand the urban dynamic in small towns and cities in developing countries, Berhampore, a small city in West Bengal, has been selected as the study area, even though the nature of urban dynamics and the intensity of city growth depend on various factors and vary from area to area.

The current work aims to analyse and observe the spatiotemporal variation of the Berhampore urban agglomeration at a distance of about 6 km from its core to the outside boundary using NDVI, NDBI, BUI, and MNDWI indicators in the RS and GIS context.

2. STUDY AREA

In 1876, Berhampore municipality was set up. One of the oldest municipalities in West Bengal, it is located in the Berhampore block of the Murshidabad district. According to the “Bengal Municipal Act of 1876”, the administration and management of Berhampore Municipality was eventually transferred to 14 elected and 5 government-nominated members in the year 1884. At that time, Berhampore Municipality was split into 6 wards, including Gorabazar, Cantonment, Berhampore, Khagra, Cossimbazar and Saidabad.

The latitudinal extension of the area is 24°04'39"N to 24°07'48"N and the longitudinal extension is from 88°14'57" E to 88°15'50" E (Fig. 1).

The Bhagirathi River passes the middle portion of the town. National Highway 12 (Previous National Highway 34) divides the study area into two parts and the Eastern Railway runs through the Eastern side. Berhampore is the administrative, nodal, and district headquarters of the Murshidabad district. According to the 2011 census of India, the total population of Berhampore town was 195, 223, allowing it to be categorized as a class-1 municipality town in West Bengal. Berhampore is located as the middle part of the State, which is why it acts as an active nodal centre between North Bengal and South Bengal. According to the 2011 Census, Berhampore Municipality was surrounded by nine census towns such as – Banjetia, a part of Kasim Bazar, Sibdanga Badarpur, Chaltia, a part of Gora Bazar Ajodhyanagar, Haridasmati, Goaljan and Gopjan etc. The whole study area is roughly 113.02 sq. km. This study area consists of one municipality, nine census towns, and numerous villages. A buffer of 6 km was created from the District magistrate office of Berhampore to select our study area to show the urban – peri-urban landscape transformation. The Berhampore Urban Agglomeration (UA) has grown rapidly in the past two decades. The process of concentrating a population in a certain region over a relatively short period of time is known as urbanization. The existing literature study (Roy & Biswas,

2021; Roy & Mondal, 2023) points out that the surroundings of Berhampore are changing quite rapidly. The western side of the area of study does not have a quicker pace of urbanization due to the river. Moreover, the pattern of urban growth and the shape of urban sprawl have never been investigated. This is why through this research we add to the existing literature on the area, and expand the knowledge on land use change in urban areas in India.

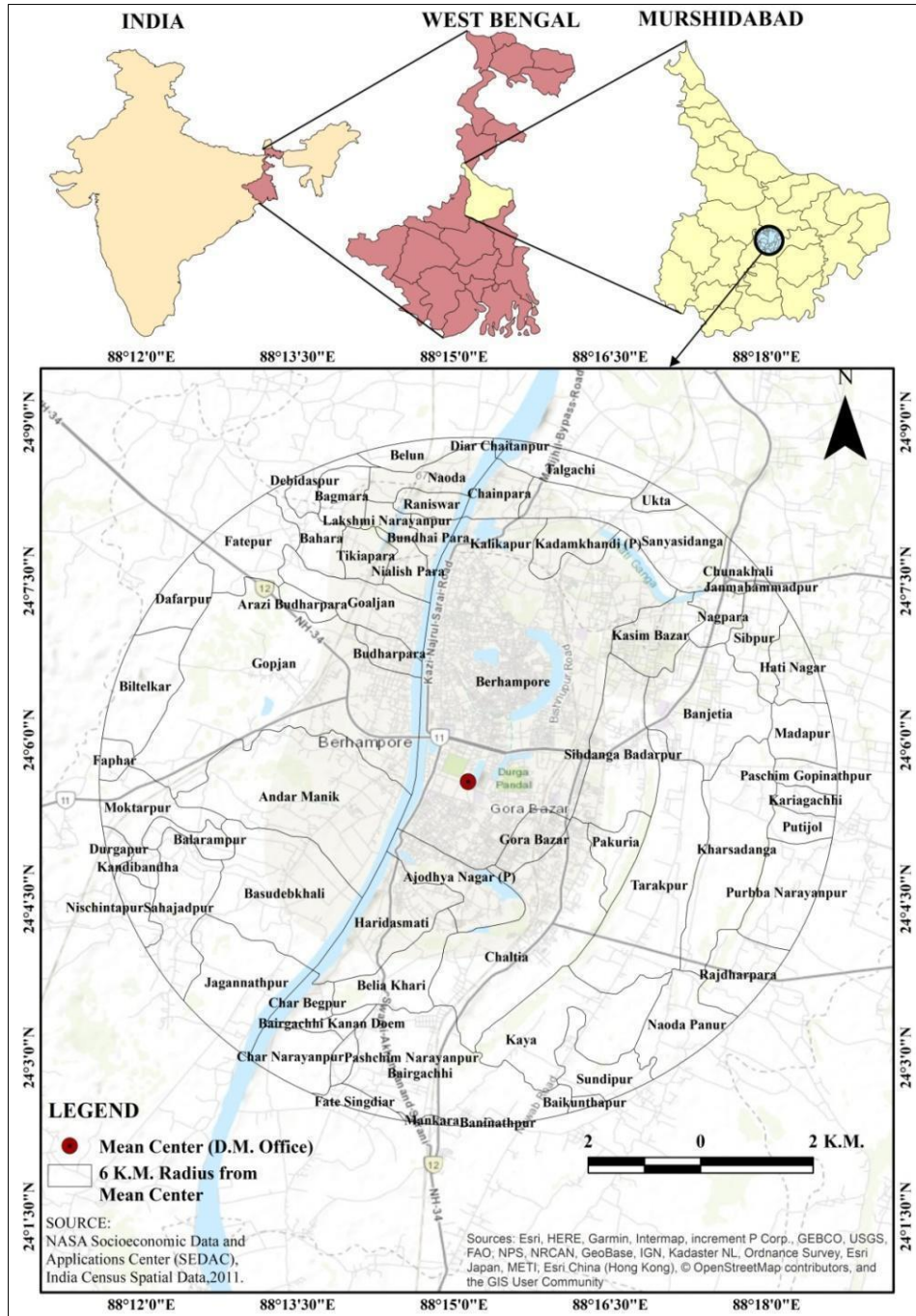


Fig. 1 – Location of the study area.

3. DATABASE AND METHODOLOGY

The present study has been undertaken with the help of geospatial data, due to a lack of official data at micro-level. The images from Landsat 5 TM, 8 OLI and TIRS are used in the index-based classification method to find changes for the years 1991, 2001, 2011, and 2021. The images were downloaded from the United States Geological Survey (USGS) of different dates (Table 1). The ArcGIS 10.2 and QGIS 2.18 software have been used to create a location map, a NDVI map, a NDBI map, a BUI map and a MNDWI map. MS-Excel (07) is used for the statistical calculation and for the representation of the calculated data.

Table 1

Details of used secondary data

Data Type	Date	Sensor	Path Row	Data Source	Datum & Projection
Spatial data	1991-01-24	Landsat 5/ TM	139/43	USGS earth explorer	WGS 84 UTM
	2001-01-19	Landsat 5/ TM	139/43		
	2011-01-31	Landsat 5/ TM	139/43		
	2021-02-11	Landsat 8/ OLI-TIRS	139/43		
Non-spatial data	Murshidabad District Census HandBook, 2001 & 2011				
	District Statistical Hand Book, Murshidabad 2010,2011,2013 & 2014				

3.1. Normalized Difference Vegetation Index (NDVI)

NDVI is frequently used to determine the health of the greenery that has been changed over a period of time in a large area (Lyon *et al.*, 1998). The Normalized Difference Vegetation Index is mainly used to identify the vegetation cover by using satellite images. Near-infrared (NIR) and RED bands are used to calculate the NDVI.

$$\text{NDVI} = \frac{\text{NIR} - \text{RED}}{\text{NIR} + \text{RED}}$$

The NDVI value ranges from -1 to +1. A positive value indicates healthy vegetation and a negative value indicates water bodies, artificial structures or a lower vegetation cover. NDVI values are classified into three categories, such as <0 (low), 0–0.2 (medium) and >0.2 (high), according to this study area. These values are selected based on the previous study which was suitable for that location (Roy & Mondal, 2023).

3.2. Normalized Difference Built up Index (NDBI)

The NDBI helps to detect the changes in built-up areas over a period of time in a vast area. Shortwave Infrared (SWIR) and Near Infrared (NIR) are used to calculate the NDBI (Zha *et al.*, 2003).

$$\text{NDBI} = \frac{\text{SWIR} - \text{NIR}}{\text{SWIR} + \text{NIR}}$$

The NDBI value ranges from -1 to +1. A positive value indicates the high density of a built-up area, and a negative value indicates the low density of a built-up area. NDBI values are classified into three categories, such as <0 (low), 0–0.2 (medium) and >0.2 (high), according to this study area from literature review (Roy & Mondal, 2023).

3.3. Built Up Index (BUI)

The built-up Index is calculated using the revised method developed by Chen *et al.* (2003) to distinguish urban areas and barren land to some extent based on their value of reflectance in the GIS environment. It is mainly used to identify new artificial structures of urban landscape.

$$\text{BUI} = \text{NDBI} - \text{NDVI}$$

The BUI value varies from -1 to +1, and the higher the BUI is, the greater the possibility that the pixel is a built-up area.

3.4. Modified Normalized Difference Water Index (MNDWI)

MNDWI is more appropriate than the Normalized Difference Water Index (NDWI), established by McFeeters (1996) for acquiring water information from urban environments by reducing, or even deleting, vegetation, land, and soil noise. Green and Shortwave Infrared (SWIR) are used to calculate the MNDWI (Xu, 2006).

$$\text{MNDWI} = \frac{\text{GREEN} - \text{SWIR}}{\text{GREEN} + \text{SWIR}}$$

The value ranges from -1 to +1. A higher degree of water enhancement in the MNDWI-image means that open water features may be extracted more precisely, since built-up areas, soil, and vegetation all have negative values and are thus more easily identified and removed from the analysis. MNDWI values are classified into three categories, such as < 0 (low), 0–0.2 (medium) and >0.2 (high), according to this study area from literature review (Roy & Mondal, 2023).

4. RESULTS AND DISCUSSION

4.1. NDBI

The nature of the artificial structure of the urban and peri-urban sector has been explained by the NDBI from 1991 to 2021 with a 10-year gap. The NDBI maps have been classified into three categories (Table 2), such as <0 (low), 0–0.2 (medium) and >0.2, which applies to areas with high values of the index. The class of high values of NDBI was not represented in the 1991 and 2001 images of the study area. However, in the years of 2011 and 2021 the value increased from 4.81 to 7.80 % of the area. It clearly indicates that the values of the NDBI have gradually increased over time. Therefore, it is clear that, from 1991 to 2021, the highest NDBI value increased over nearly 8% of the total area.

Table 2

Area under different NDBI values within the study area (1991 to 2021)

NDBI	1991		2001		2011		2021		Area Change(%)			
	Area Sq. km.	%	Area Sq. km.	%	Area Sq. km.	%	Area Sq. km.	%	1991–2001	2001–2011	2011–2021	1991–2021
<0	93.58	82.80	90.31	79.91	85.49	75.64	79.02	69.92	-2.89	-4.27	-5.72	-12.88
0-0.2	19.44	17.20	22.71	20.09	22.09	19.55	25.19	22.29	2.89	-0.54	3.35	5.7
>0.2	0	0.00	0	0.00	5.44	4.81	8.81	7.80	0	4.81	2.99	7.80
Total	113.02	100	113.02	100	113.02	100	113.02	100				

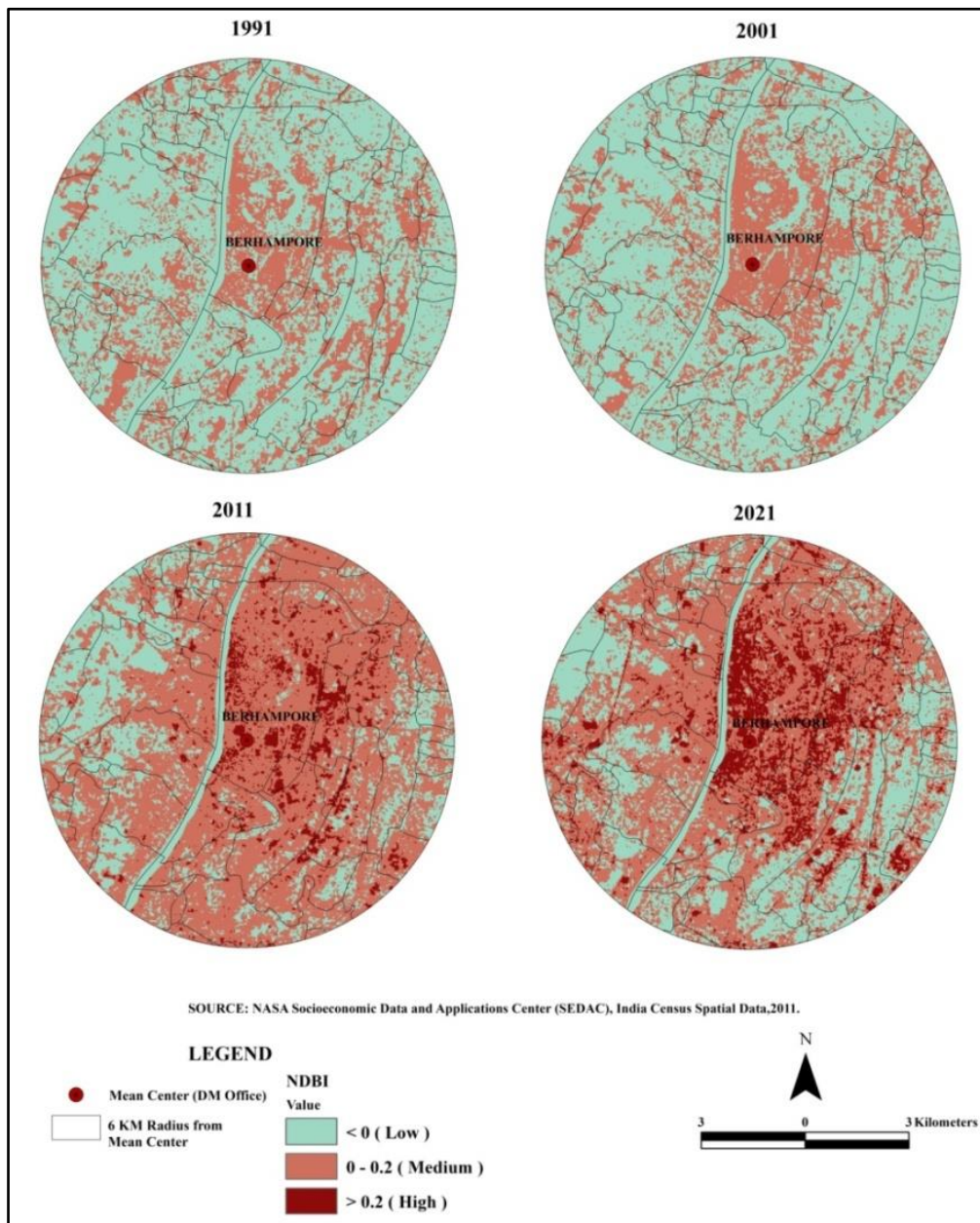


Fig. 2 – The Normalized Difference Built up Index of the study area from 1991 to 2021.

The NDBI values in the study area in 1991, 2001, 2011 and 2021 varied between +0.12 to -0.27, 0.15 to -0.28, 0.31 to -0.24 and 0.39 to -0.23, respectively. The highest value of NDBI is found mainly in the central part of town. These parts consist primarily of Khagra, Saidabad, Gorabazar, Indropostha, Dayanagar, Cossimbazar and Kadai etc. The rate of urbanization of Berhampore town and its surroundings is very dynamic from 2001 to 2011. In India, a census town is one which is not statutorily notified and administered as a town, but whose population has nevertheless attained urban characteristics. They are characterized by the following population exceeding 5000. At least 75% of the main male working population is employed outside the agriculture sector and population density is greater than 400 persons per square kilometre.

According to the Census Handbook (2011) it was clearly observed that:

- Phase 1: Kossimbazar was one census town from 1971 in the North-Eastern part of the city;
- Phase 2 (the middle phase): Two new census towns were added in the North-Western portion of the city Gorabazar and the Western part of the city Goaljan from 1991 to 2001;
- Phase 3: Six additional census towns were added to the area around the Berhampore municipality during this phase, which lasted from 2001 to 2011. These census towns are Gopjan (Western part), Sibdanga Badarpur (Eastern part), Banjetia (North-Eastern part), Chaltia (North-Western), Ajodhayanagar, and Haridasmati (Southern part).

All directions are calculated using the quadrant method of the District Magistrate office as the mean location inside the Berhampore municipality. The low value of NDBI is mainly found in the fringe region and in the Western and Eastern parts of the study area. According to Roy & Biswas (2021). It is clearly observed that National Highway 34 and State Highway 11 play a vital role in the urbanization process. Additionally, it has been noted that the census towns, a part of Gorabazar, Ajodhyanagar, Chaltia, Sidbanga and Badarpur, and a part of Kasimbazar fall under the inner region of urban expansion, with the mean centre of three of these towns (Gorabazar, Sidbanga Badarpur, and Chaltia) shifting from the core to a transitional zone. According to a hotspot study, Chaltia Census Town is 95% significant to enhancing the increasing functionality of the functioning area and it has been demonstrated that the functional centre shifted from the core to Chaltia because of its location, which offers reduced traffic and easy access to all urban amenities (Roy & Biswas, 2021).

4.2. NDVI

The changes to the tropical deciduous forest cover (the natural vegetation in the area) between 1991 and 2021 have been investigated using the NDVI index. The NDVI maps have been classified into three categories (Table 3), such as <0 (low), $0-0.2$ (medium), and >0.2 , which represents areas with high values of the index. The threshold value 0.2 basically indicates the shrub type of vegetation cover. The class of high values represents NDVI values for 1991, 2001, 2011 and 2021, which are, respectively, 20.91, 19.48, 15.95 and 14.87 percent in the total area. So, it can be clearly noted that the values of NDVI gradually decrease over time because of unplanned rapid urbanization. Therefore, it is apparent that the highest NDVI value from 1991 to 2021 has dropped by over 6 percent of the entire area due to the process of illegal unplanned urbanization, or some vegetated area being converted into agricultural fields or any kind of construction activity.

Table 3

Area under different NDVI in the study area from 1991 to 2021

NDVI	1991		2001		2011		2021		Area Change (%)			
	Area Sq. km.	%	Area Sq. km.	%	Area Sq. km.	%	Area Sq. km.	%	1991–2001	2001–2011	2011–2021	1991–2021
<0	3.59	3.18	3.5	3.15	3.12	2.76	3	2.65	-0.03	-0.39	-0.11	-0.53
$0-0.2$	85.8	75.92	87.89	77.36	91.87	81.29	93.21	82.47	1.44	3.93	1.18	6.55
>0.2	23.63	20.91	21.63	19.48	18.03	15.95	16.81	14.87	-1.43	-3.53	-1.08	-6.04
Total	113.02	100	113.02	100	113.02	100	113.02	100				

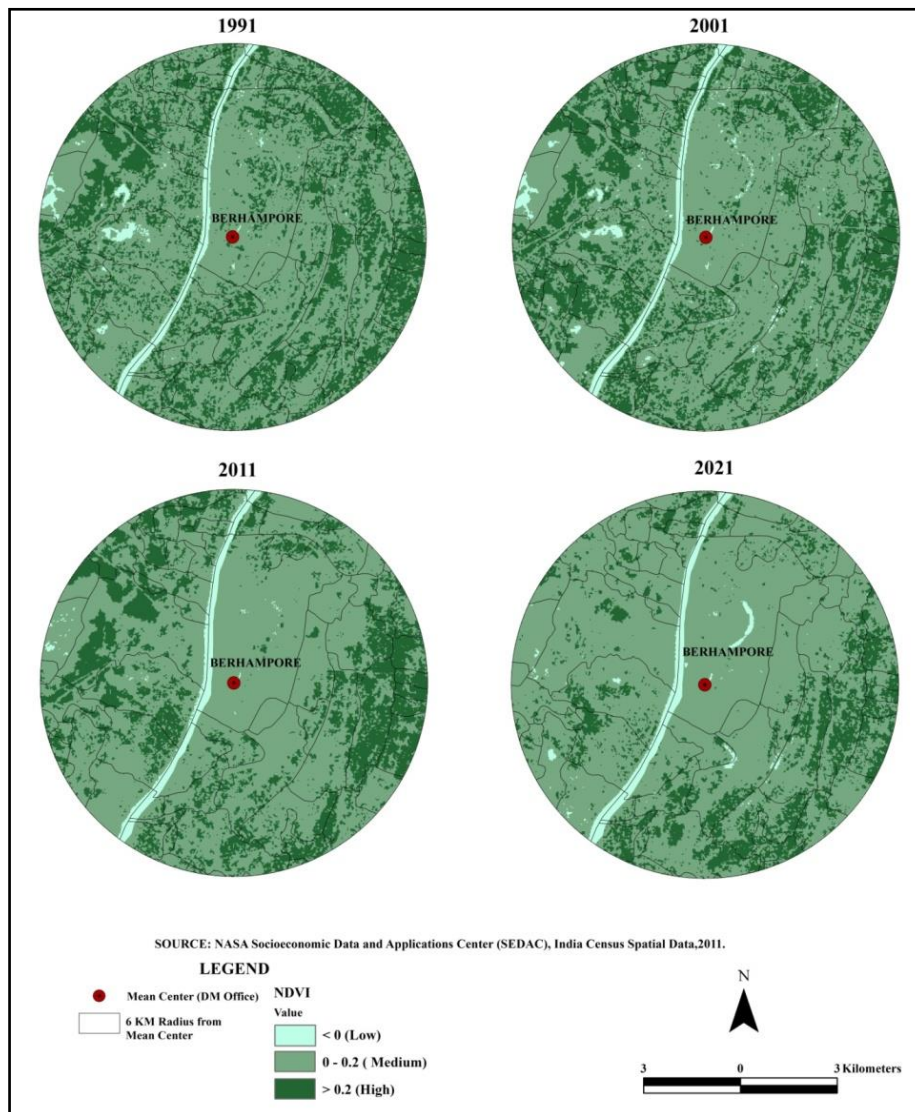


Fig. 3 – The Normalized Difference Vegetation Index of the study area from 1991 to 2021.

The NDVI values in the study area in 1991, 2001, 2011 and 2021 varied from +0.37 to -0.07, from 0.40 to -0.09, from 0.42 to -0.01 and from 0.28 to -0.02, respectively. The highest value of NDVI is mainly found at the outer part of the town, and the lowest value is recorded at the town's core and its surroundings. The core area of the city acts mainly as the central business district or main urbanized sector, but the surrounding sector of the city is not very well developed in comparison to the core. The city's Western and Eastern areas had the highest vegetation cover; however, owing to unplanned urbanization, peri-urban areas quickly became urban sectors, and, as a result, all of the study area would see major vegetation loss in 2021.

4.3. MNDWI

MNDWI is another extremely important indicator that shows the water component of the city and its periphery from 1991 to 2021 within a 10-year temporal gap. The MNDWI maps have been classified into three categories (Table 4) such as <0 (low), 0–0.2 (medium), and >0.2 which represents areas with

high values of the index. The threshold value 0.2 basically indicates the healthy body of water. The areas with high values of MNDWI in 1991 and 2001 registered 3.03 and 1.77 percent, respectively, for the entire study area. Most of the healthy water bodies are missing from the study area due to unplanned rapid urbanization. The main urban centre relocated to the Southeast, and it is evident from the maps of 2011 and 2021 that darker blue regions are absent during this time period (Roy & Biswas, 2021; Roy & Mondal, 2023). Therefore, it is clear that the maximum MNDWI value for the whole area from 1991 to 2021 has decreased by more than 3%.

Table 4

Area under different MNDWI in the study area from 1991 to 2021

MNDWI	1991		2001		2011		2021		Area Change (%)			
	Area Sq.km.	%	Area Sq.km.	%	Area Sq.km.	%	Area Sq.km.	%	1991–2001	2001–2011	2011–2021	1991–2021
<0	88.27	78.10	89.01	78.76	91.2	80.69	95.01	84.06	0.66	1.93	3.37	5.96
0–0.2	21.33	18.87	22.01	19.47	21.82	19.31	18.01	15.94	0.6	-0.16	-3.37	-2.93
>0.2	3.42	3.03	2	1.77	0	0.00	0	0.00	-1.26	-1.77	0.00	-3.03
Total	113.02	100	113.02	100	113.02	100	113.02	100				

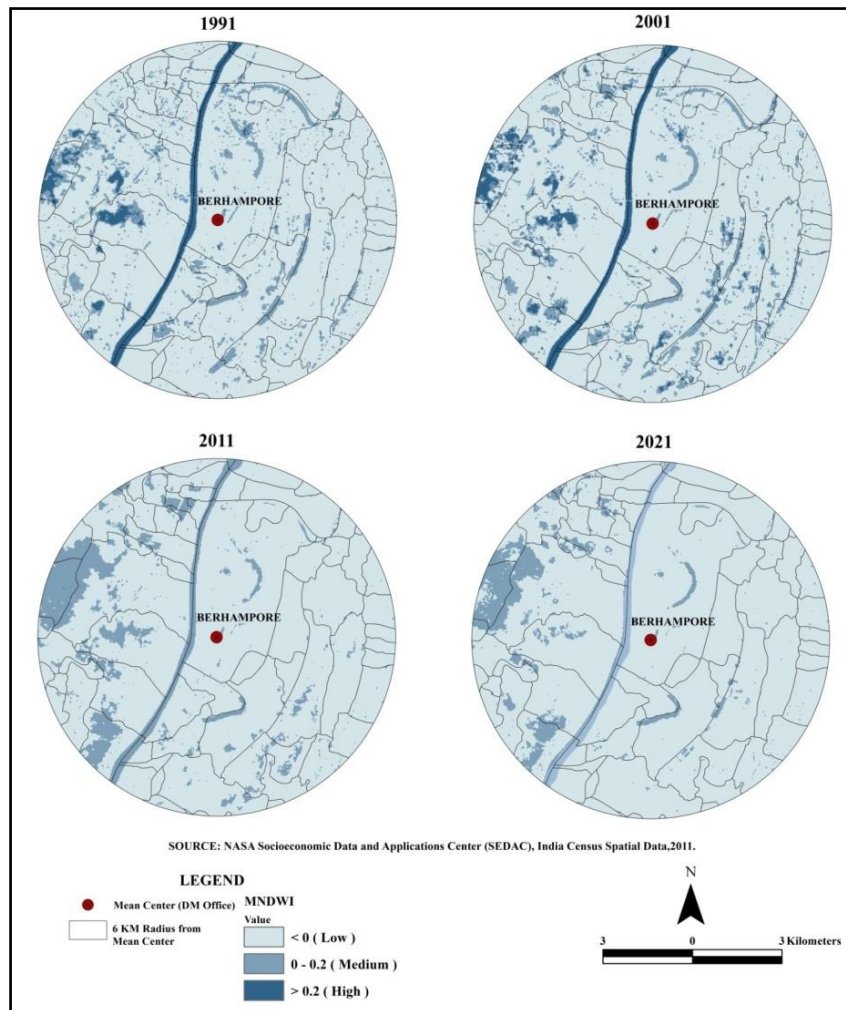


Fig. 4 – The Modified Normalized Difference Water Index of the study area from 1991 to 2021.

The MNDWI values in the study area in 1991, 2001, 2011 and 2021 varied from 0.21 to -0.26, from 0.21 to -0.29, from 0.16 to -0.29, and from 0.12 to -0.27, respectively. The highest value of MNDWI is mainly found at the Western boundary of Berhampore municipality, due to the river Bhagirathi and the city core, as well as important lakes such as Chaltia, Bishnupur, Chatrar, Dhobighat, Minbhaban, and Shilpo taluk etc. The remaining lakes, including Biltakar (in the extreme West), Nischintapur Lake (South-West), Sahajadpur (South), Kalaberia Lake (South-East), Pakuria Lake (East) and Katiganga (North) are scattered within the study area. According to Roy and Mondal (2023), it is clear that the process of urbanization has destroyed roughly 3.02 sq. km of water bodies within the boundaries of the Berhampore Municipality, while from 1991 to 2021 the number of ponds decreased and the turbidity of water bodies increased steadily.

4.4. BUI

Another significant graphical indicator is the built-up index (BUI), which is widely used for identifying among built-up land and urban regions. As a result, the geographical distribution of the built-up index for the area of study is shown in (Fig. 5). In the city's urban and densely populated sections in early 1991, built-up index (BUI) values were high at the city core. As a result, the highly populated and constructed zones in the centre of a city act as its core, having a very high built-up index, while the outermost regions of the city with high vegetation cover were where the low value of built-up index was most frequently observed. Even higher BUI values were calculated at the core of the city in 2021 (the maximum values calculated for that year reached 0.53, compared with the maximum of 0.05 in 1991).

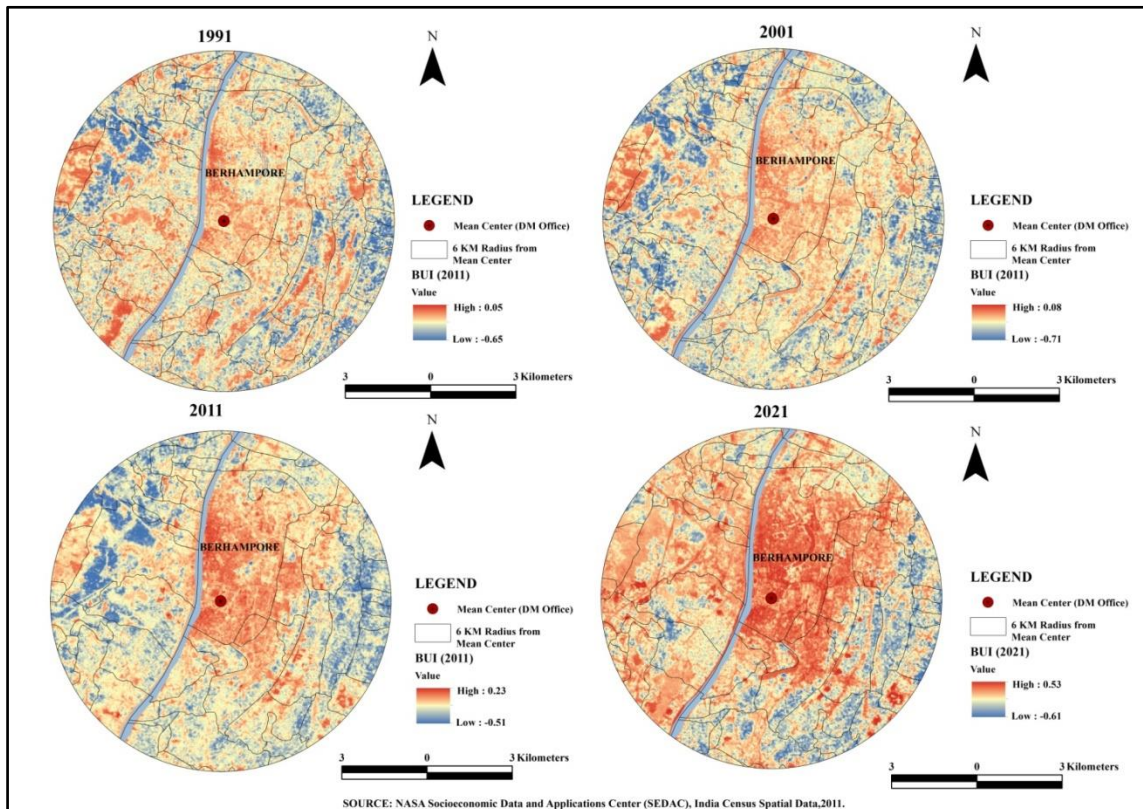


Fig. 5 – The Built up Index of the study area from 1991 to 2021.

However, after 30 years, a significant transition happened with a rising tendency of BUI values towards the city's North, North-Eastern, Eastern, South-Eastern and Southern outskirts. As a result, the spatial patterns of built-up areas show an increasing built-up index (BUI) trend towards the North, North-Eastern, Eastern, South-Eastern, and Southern outskirts, as they are covered with less vegetation. However, the Western portion of the Berhampore municipality has not been expanded due to the natural barrier of the river Bhagirathi. This trend is indicative of the rapid growth of the city towards the periphery as a result of extreme population pressure and the rising cost of land at the city core.

The correlation between indicators of urban dynamics and the change rate of urban landscape is presented in Fig. 6. Urban dynamics has rapidly increased within the study time. It is obvious that NDBI and NDVI, as well as NDBI and MNDWI have low to significant negative relationships due to a rapidly increasing trend of the built-up area within the study frame.

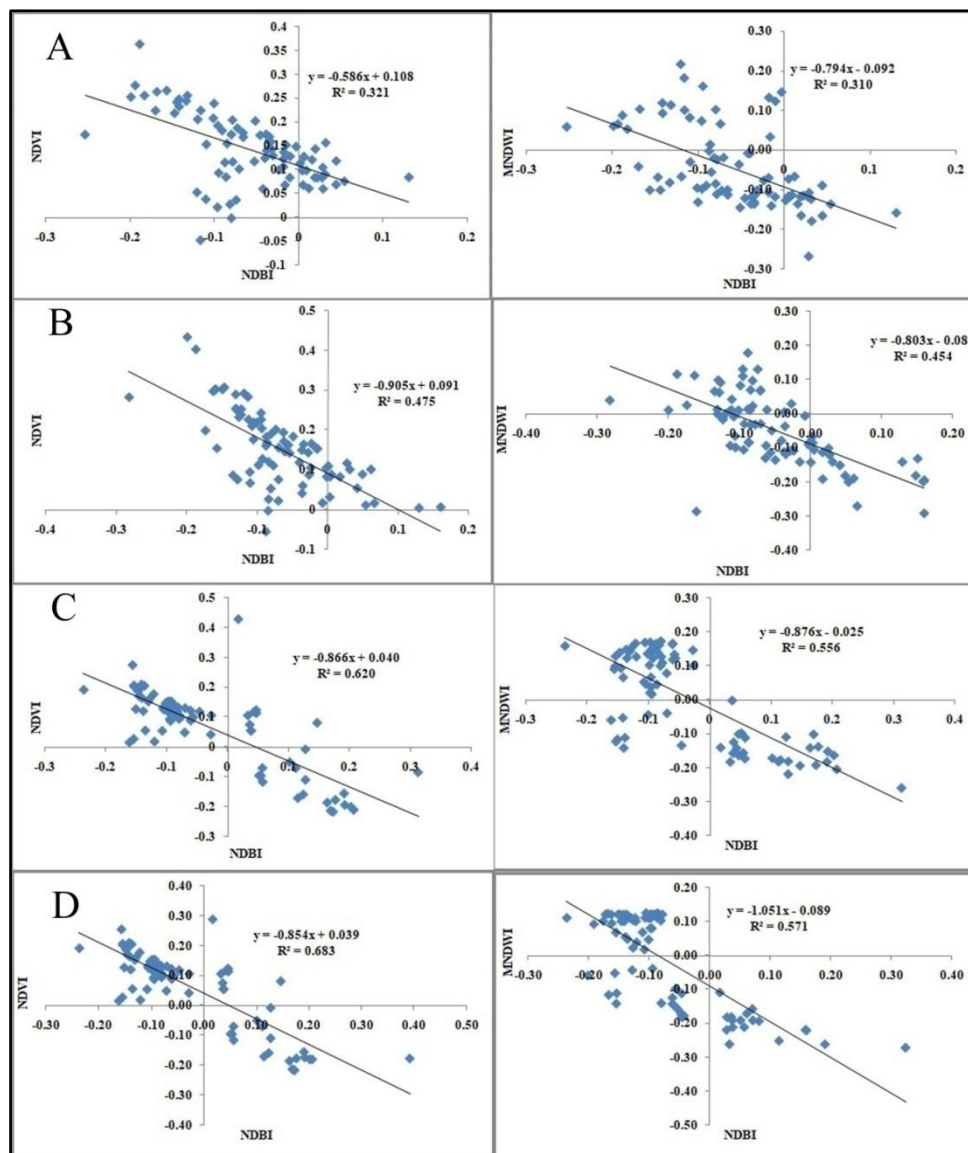


Fig. 6 – A. The correlation between NDBI-NDVI & NDBI-MNDWI in 1991; B. The correlation between NDBI-NDVI & NDBI-MNDWI in 2001; C. The correlation between NDBI-NDVI & NDBI-MNDWI in year 2011; D. The correlation between NDBI-NDVI & NDBI-MNDWI in year 2021.

5. CONCLUSIONS

Urbanization is associated with the modification of land use, economic activity and cultural characteristics in addition to the gradual increase in the urban population. Since the beginning of the Armenian colonial setup, the town of Berhampore has gradually experienced morphological transformations as a result of urbanization. Early in the 18th century, commercial enrichment and British colonialism accelerated the progress of urbanization, and the city began expanding in the North and North-Eastern directions. Although there were just 24,397 urban residents in Berhampore municipality in 1901, there are now 195,223 according to the 2011 census. At present, it is a Class I municipality town, which means a city is an urban centre with a population of more than 100,000 inhabitants. The growth of urban buildings is accelerated by the increase in population, but the amount of green and blue space is simultaneously reduced. During the investigated period (1991–2021), the natural landscape in the study area has been heavily impacted by urbanization and urban sprawl. The most rapid changes took place between 2001 and 2011. The amount of shrub green cover has recorded the maximum value 20.91 percent in 1991, as the second phase (2001–2011) displays the highest changes. Due to significant development in residential projects and artificial structures, the healthy water bodies suffered significant changes in 1991 and 2001, and did not recover in the following decades. On the other hand, the highest built-up area happened between 2011 and 2021. The study found that the expansion of the town over time was unplanned and sluggish, and that its structure had significantly shifted from the centre to the periphery. The health of the town may not be supported by the current green and blue areas. The living conditions, social and bio-psychosocial wellness and way of life of the city inhabitants may be affected due to the removal of the vegetative cover and water bodies. The scientific and sustainable urban land use by local administrators, as well as people's awareness are urgently needed in order to support environmental sustainability and prevent the future deterioration of the city environment. Urban planners and the town leaders may benefit from the current research in adopting long-term planning in the near future.

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COMPETITIVENESS AND SUSTAINABILITY OF THE TOURISM SECTOR OF BOSNIA AND HERZEGOVINA ACCORDING TO OECD

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Key-words: OECD, tourism, competitiveness, sustainability, Bosnia and Herzegovina.

Abstract. This paper investigates the potential applicability of OECD competitiveness and sustainability indicators of tourism in Bosnia and Herzegovina. The analysis assesses the current state of the country's tourism industry and identifies areas that require significant improvement to enhance competitiveness compared to other Western Balkan countries. This comprehensive study covers all relevant data necessary to measure the OECD indicators. Based on the research conducted, it was found that Bosnia and Herzegovina does not adequately monitor the competitiveness of its tourism industry. The main objective of this research is to demonstrate that the political-territorial structure of the country presents the main challenge in achieving a competitive and sustainable tourism industry.

1. INTRODUCTION

The term “sustainable tourism” was first explained by the UNWTO (United Nations World Tourism Organization) in 1996 as an activity in which economic, social, and environmental needs will be fully in line with cultural needs, ecological processes, and biodiversity, while simultaneously supporting local development (Fennel, 2003). Today, sustainable tourism is perceived as a key to economic growth and country development. On its path towards the European Union, sustainable development and sustainable tourism have become a very important goal of Bosnia and Herzegovina, which has the support of the World Bank and the European Union itself (Radić *et al.*, 2021). Sustainable tourism in Bosnia and Herzegovina has been developing in recent years thanks to initiatives from specific destinations, tourism boards, and non-governmental organizations. However, weak governance, political uncertainty, social instability, economic brain drain, and the degradation of natural and cultural heritage sites threaten the long-term sustainability of the tourism sector in Bosnia and Herzegovina (Center of Excellence for Evaluation and Policy Research, 2022). Despite the country facing numerous challenges on its path to sustainability, tourism has become a prosperous economic sector in recent years and one way to achieve sustainable development goals. Thanks to its natural values, cultural heritage, and other characteristics, Bosnia and Herzegovina has made significant progress from the seasonal character of tourism to the development of sustainable forms of tourism (Lugonja, 2014). Sustainable tourism is the key to the success of every destination, and in this context, Bosnia and Herzegovina is a country that, through various collaborations, initiatives, and organizations at all levels, has been intensely striving to develop sustainable selective tourism in recent years. As tourism is based on the cooperation between various sectors, it is necessary to involve tourism companies from the private sector, government and non-governmental organizations, consumers, development agencies, and the local population in its development (Lugonja, 2014) to ensure the destination's success. Since tourism is a rapidly growing economic sector with benefits for the local community and overall economic

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development, a series of entity and cantonal documents emphasize the importance and role of sustainable tourism in Bosnia and Herzegovina. However, despite being recognized in strategic documents, tourism is currently based on a non-integrative approach by relevant institutions (Sultz *et al.*, 2015). In addition, many other weaknesses affect the tourism offer's overall value and significantly slow down the development of sustainable tourism in the country. Petković *et al.* (2014) emphasize the lack of recognizable tourist products, a complicated institutional framework, administrative division, inadequate infrastructure, and insufficient financial support as the main obstacles to the more intensive tourism development in the country. Bosnia and Herzegovina's lack of developed tourism development strategies (Šarenac *et al.*, 2010) and an underdeveloped system of indicators for monitoring sustainable tourism development are also hindrances on its path towards sustainability. A destination must have an efficient developed system to monitor specific sustainability indicators in order to be competitive on the market. Additionally, a system for reporting the progress of individual sustainable development indicators must be established.

OECD has also established and developed successful policies for measuring destination sustainability. According to the OECD, the competitiveness of a tourist destination refers to its ability to optimize tourist attractiveness for both residents and visitors, and to provide consumers with a quality, innovative, and attractive tourist service, but also to gain market share at the domestic and global level, while also ensuring that available resources to support tourism are used efficiently and sustainably (Dupeyras and MacCallum, 2013). The Committee on Tourism of the OECD dealt with the issues and policies of the competitiveness of tourism in various analyses and reports. OECD reports highlighted the multidimensional characteristics of competitiveness and highlighted the lack of a sound system of indicators that can be used to measure the effect of competitiveness in tourism. Competitiveness in tourism is currently not adequately measured and monitored by most countries in transition, and one of the reasons for this is the difficulty in identifying key areas of measurement and indicators for their monitoring. OECD members have recognized the importance of tourism competitiveness, the implementation of which will ultimately result in the formulation of better policy frameworks that will contribute to strengthening the destination's competitive position on the global tourism market. In the past decade, a large number of initiatives were launched to measure competitiveness in tourism (TSA, Nation Brand Index, T&T Competitiveness Index, etc.), however, these initiatives were not equal in content and were mainly biased. In 2013, the OECD developed a specific set of indicators that encompass all dynamic processes related to the motivation and further actions of decision-makers in the tourism market. The OECD tourism competitiveness indicators supplement and support all national and international initiatives for measuring competitiveness and represent a kind of connection between them (Dupeyras and MacCallum, 2013). The ideal number of indicators was a subject of discussion from the beginning, but a comprehensive analysis of the Committee for Tourism in front of the OECD group suggested a total of 11 basic indicators and 4 areas of action. The main goal of the tourism competitiveness indicator is that, by employing a series of measures, the holders of tourism policy achieve the sustainability of the destination and, at the same time, competitiveness on the global tourism market. OECD works in the following areas (Dupeyras and MacCallum, 2013):

1. **Tourism performance and impact** indicators: Tourism Direct Gross Domestic Product, Inbound tourism revenues per visitor by source market, Number of overnight stays in all types of accommodation facilities, export of tourism services;
2. **The ability of the destination to deliver quality and competitive tourist services** – indicators: Labor productivity in tourist services, Purchasing Power Parity and tourism prices, Country entry visa requirements;
3. **The attractiveness of the destination** – indicators: Natural resources and biodiversity, Cultural and creative resources, Visitor satisfaction;
4. **Policy responses and economic opportunities** – indicators: National tourism action plans.

In many developing countries, OECD tourism development indicators still need to be implemented due to a lack of adequate monitoring and reporting systems for measuring progress. Bosnia and Herzegovina lacks a developed system for tracking sustainability indicators, relying mainly on individual studies and partial research conducted by institutions and non-governmental associations that measure only specific indicators. By implementing OECD indicators, insights into the destination's competitiveness and level of sustainability would be gained (Dupeyras and MacCallum, 2013). The future tourism development in Bosnia and Herzegovina must be based on the implementation of all sustainability principles, as well as the involvement of the local community and the public sector in all processes.

2. LITERATURE REVIEW

A minimal number of analysed articles dealt with the issue of OECD indicators and areas of activity for measuring competitiveness in tourism. Demir *et al.* (2020) emphasized the importance of economic development and trade openness of OECD member countries and those that are not for more intensive tourism development. Gavurova *et al.* (2020) investigated how tourist consumption affects the competitiveness of tourism in OECD member countries. Paramati *et al.* (2019) investigated the extent to which tourism affects the increase in real estate prices in OECD member countries, while H. Li (2019) examined whether investments in tourism in OECD economies have an impact in terms of energy on the transport and housing sectors. Ivankova *et al.* (2021) studied the relationship between road traffic and tourism in OECD countries, where they concluded that countries with a higher level of development had positive coefficients of spending on road traffic compared to those with a lower level. Gavurova *et al.* (2020), in their study on sustainable tourism, examined the relationship between the determinants of tourism development and the economic productivity of OECD member countries.

Most authors dealt with the economic impact of tourism in OECD member countries, while not a single paper tackled the issue of implementing competitiveness and tourism sustainability indicators in countries that are not members of the OECD group.

3. METHODOLOGY

By collecting various pieces of information and documents and based on previous findings, the work analysed the areas of activity and the OECD indicators for measuring the competitiveness of tourism in Bosnia and Herzegovina and, at the same time, the current position of the country in the Western Balkans was also processed. Through the work, areas that need to be further improved and problems in the development of the tourism sector that Bosnia and Herzegovina are facing have been identified. Statistical indicators and publicly available data obtained from various correct sources (World Economic Forum, World Tourism and Travel Council, the OECD report for Southeast European countries, BiH Statistics Agency, BiH Civil Aviation Directorate) were used in the preparation. The main methods used in the work are, first of all, the method of analysis and synthesis, the statistical method, and a point scale by which the areas of activity were assigned a numerical rating according to the level of development and implementation. In the end, an overall scoring was done in order to assess the competitiveness of tourism in Bosnia and Herzegovina. A significant limitation for conducting a more in-depth analysis was primarily the lack of statistical data on tourism in this country, as tourism statistics are maintained separately for both entities (the Federation of Bosnia and Herzegovina and the Republika Srpska). There is no measurement system for assessing OECD indicator implementation aside from the OECD Commission's five-year reports on the country's overall progress towards

sustainability, which also hindered the research. These limitations led to the author's subjective scoring scale, reflecting the country's progress based on the achieved results with respect to specific implemented indicators and areas of activity. Official OECD indicators for measuring tourism competitiveness developed in 2013 were used to define the areas of activity and the related indicators for the purpose of this article (Dupeyras and MacCallum, 2013).

Table 1

Score scale for measuring the competitiveness of the destination according to the OECD area of activity

Score scale	Description	OECD area of activity
1–2	Very little progress	1. Tourism performance and impacts
2–3	Moderate progress	2. The ability of the destination to deliver quality and competitive tourist services
3–4	Very good progress	3. Attractiveness of the destination
4–5	Significant progress	4. Policy responses and economic opportunities
5–6	Excellent progress	

Source: Authors, 2023.

4. RESULTS AND DISCUSSION

Area of work: Tourism performance and impacts – applicable indicators: Tourism direct GDP and number of overnight stays in all types of accommodation facilities (Dupeyras and MacCallum, 2013);

Before the pandemic, in 2019, Bosnia and Herzegovina had a positive economic growth trend, while in 2020 the recession caused a drop of 4.3% in total GDP, which was the largest drop in the post-war period (OECD, 2021). Tourism in Bosnia and Herzegovina was a very important economic branch in the pre-pandemic period, and its direct and indirect contribution to GDP increased to 9.7% in 2019. The restrictive measures associated with the COVID-19 pandemic consequently led to reduced mobility and the closure of a large number of businesses, so the two most affected sectors were tourism and catering. For these reasons, the participation of tourism in the total GDP in 2020 was 5.0%, which is a drop of about 52% compared to 2019 (WTTC, 2022). A slight increase in the share of tourism in the total GDP was noticeable in 2021 when tourism accounted for 6.6%, which means an increase of about 1.6% compared to the previous year, 2020. Before the pandemic, exports of services accounted for 11% of the GDP from 2017 to 2019. Among exported services, tourism ranked first, with travel and transportation services accounting for around 70% of the total exports. Exports of services in the total GDP fell to 6.4% in 2020 precisely because of restrictions related to the pandemic. Passenger services accounted for about 50% of the total export of services, while transport services made up only 20%. The share of exported services in the total GDP amounted to more than 60% in 2021, with services related to tourism (trade, transport, food, and accommodation) accounting for 1/5 of the total realized GDP. In 2022, exported services, primarily the tourism sector, made up 21.7% of the total registered GDP, compared to 19.7% in 2021. According to the data provided by the Agency for Statistics of Bosnia and Herzegovina (BHAS, 2023), the number of tourists' overnight stays in all categories of tourist accommodation amounted to 1.3 million in 2020, 2.2 million in 2021, and increased to 3.2 million in 2022. The highest number of overnight stays in 2021 and 2022 was achieved during the summer months (July, August, and September), and the lowest during the winter period (December, January, and February). Based on the table, we may conclude that about 43.2% of tourist overnight stays in 2021 and 37.6% of tourist overnight stays in 2022 were related to the summer season, while about 18.5% of tourist overnight stays in 2021 and 17.6% of tourist overnight stays in 2022 happened during the winter months.

Table 2

The total structure of tourist overnight stays in 2021 and 2022

Total overnight stays (January–December)	2021	2022
	2,230,920	3,194,681
	Overnight stays (domestic+foreign)	Overnight stays (domestic+foreign)
January	122,738	185,033
February	121,661	174,160
March	99,553	179,613
April	84,495	165,903
May	134,078	289,346
June	207,520	301,619
July	341,185	402,258
August	382,315	469,671
September	238,427	328,620
October	206,364	292,857
November	150,700	201,880
December	169,567	203,721
Total summer season (July, August, September)	961,927 43.2%	1,200,549 37.6%
Total winter season (December, January, February)	413,966 18.5%	562,914 17.6%
Total % (summer-winter season)	61.7%	55.2%

Source: Compiled by the author according to data provided by the Agency for Statistics of Bosnia and Herzegovina, 2023.

In total, during the 2021 summer-winter tourist season, 61.7% and 55.2% of tourist overnight stays were realized in 2022. The rest of tourist overnight stays, i.e., 38.3% in 2021 and 44.8% in 2022, are spread over the remaining months of the year, which does not represent serious seasonal fluctuations (Fig. 1). Taking into account the criteria of seasonality (three months with the highest number of overnight stays), one may conclude that Bosnia and Herzegovina is in the green zone (Mrkaić, 2019), meaning that there are no major problems with the seasonal character of the tourist offer.

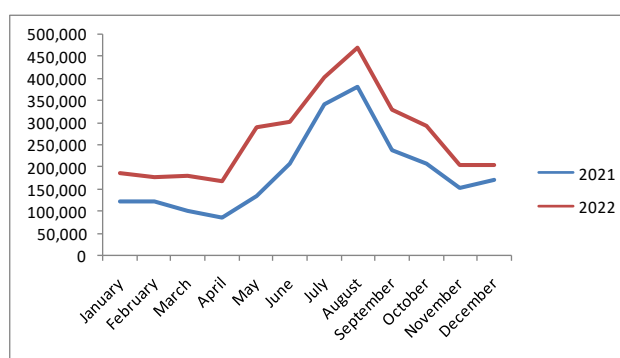


Fig. 1 – Tourist arrivals and overnight stays in 2020 and 2021. Source: BHAS, 2023.

Such statistical indicators point to the fact that, as a tourist destination, Bosnia and Herzegovina does not have a particularly seasonal character, as was emphasized in previous reports on the state of tourism in the country.

After a detailed analysis of this area of activity, it can be concluded that Bosnia and Herzegovina has made significant progress, and the authors awarded the destination 2 points according to the previously established point scale.

Area of work: The ability of the destination to provide quality and competitive tourist services – applicable indicators: Labor productivity in tourist services, country entry visa requirements (Dupeyras and MacCallum, 2013); Bosnia and Herzegovina still does not have a defined framework for

the liberalization of the visa regime, nor has it implemented any other measures to make it easier for residents to cross the border, which is a limiting factor for a more intensive development of outbound tourism.

According to data provided by the Directorate of Civil Aviation of Bosnia and Herzegovina (BHDCA) for 2021, international airports recorded 107,653 passengers from January to December, while in 2022, they achieved a passenger traffic of 2,205,521, meaning an increase of approximately 5%. In terms of passenger numbers, Sarajevo International Airport led the way in both 2021 and 2022, with around 1.4 million international passengers recorded in the latter year. Following Sarajevo, the Tuzla international airport also received a significant amount of passenger traffic due to the introduction of frequent low-budget flights to many European countries, which greatly improves the total tourist traffic of the country. On the other hand, the airport in Mostar has the lowest performance in international air traffic, with less than 1% of the total number of international flights (Fig. 2). Bosnia and Herzegovina has a complex educational system under the jurisdiction of its entities, which has hindered progress in training professional and highly educated tourist staff. In fact, according to the World Economic Forum data (2019), Bosnia and Herzegovina's position in terms of the competitiveness index (T&T) has worsened, dropping 36 places in the "human resources and labour market" category, from the 106th place to the 140th. Developing human resources is one of the main challenges facing the development of tourism and hospitality. While secondary/vocational schools do train students for specific professions, such as waiter, cook, and catering technician, mandatory practical classes are organized in cooperation with the private sector. The curricula and programs for vocational education were updated in 2018 to introduce new standards for occupational qualifications. However, private stakeholders have expressed dissatisfaction with the limited involvement in the curriculum modernization process, particularly in relation to subjects more relevant to the tourism industry, such as digital marketing, destination management, and foreign languages. This has resulted in a lack of development of practical skills among graduates. Furthermore, the lack of adequate equipment in vocational schools hinders the quality of the teaching process. Bosnia and Herzegovina does not have a dedicated two-year higher education framework for tourism, but tourism is included in higher education programs at universities. There are currently 10 faculties (eight in the Federation of Bosnia and Herzegovina and two in the Republika Srpska). Segmented, some offer the study of tourism, while others offer studies in hotel management, hospitality, and tourism marketing. In terms of visa procedures, Bosnia and Herzegovina has not made significant efforts to facilitate the process, and while there has been some progress in terms of increased air traffic and new airline introductions, the country received only 1 point from the authors upon analysing this area of activity.

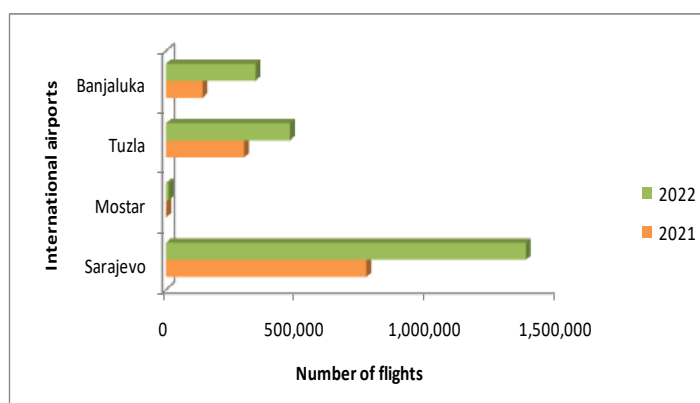


Fig. 2 – Number of international flights from international airports in Bosnia and Herzegovina in 2020 and 2021.
Source: BHDCA, 2023.

Area of work: Attractiveness of the tourist destination – applicable indicators: Natural resources and biodiversity, cultural and creative resources (Dupeyras and MacCallum, 2013).

Bosnia and Herzegovina is making great efforts to include its rich cultural and natural heritage in the development of tourism. However, the framework for the improvement of natural and cultural heritage in tourism is still in the early stages of development. Natural and cultural heritage is included in several strategic documents at state and entity level, such as the Strategy of Cultural Policy in Bosnia and Herzegovina (adopted in 2008), the Strategy and Action Plan for the Protection of Biological Diversity 2008–2015, the Tourism Development Strategy of the Republika Srpska 2015–2025 and the Tourism Development Strategy of the Federation of Bosnia and Herzegovina 2022–2027. The Environmental Protection Strategy of the Federation of Bosnia and Herzegovina 2022–2032 provided a long-term framework for planning and enabling the implementation of coherent environmental practice. The improvement of natural and cultural heritage in tourism should be included in the new tourism development strategies that are to be created in the coming years. There is no defined policy framework that includes clear measures for the promotion of sustainable tourism and business in Bosnia and Herzegovina. Although sustainable development has become an important goal supported by the World Bank and the European Union, the integration of the concept of sustainability into tourism strategies and policies is still slight. Consequently, assessment and monitoring of destination sustainability have not been established. Given the lack of a strategic framework for sustainable development and assessment, sustainability in tourism stems from individual business initiatives, individual destinations, and non-governmental organizations. Therefore, the main pillars of sustainable tourism in Bosnia and Herzegovina are connections between private, public, and non-governmental actors and their cooperation through projects, especially transnational ones. Bosnia and Herzegovina is developing different investment policies in tourism innovations by organizing international events, fairs, and festivals. The tourism branding and marketing strategy was not adopted due to the existing legislation, which has repercussions on the reduced visibility of Bosnia and Herzegovina as a tourist destination on the global market. The development of tourism branding and marketing differs between entities. In the Republika Srpska, the Tourist Organization is responsible for branding and marketing, while in the Federation of Bosnia and Herzegovina, there is no established tourist organization at the entity level, and marketing activities are carried out by the tourist boards of the main tourist destinations. The marketing framework of digital tourism is at an early stage of development. In Republika Srpska, digital marketing is included in the marketing strategy, and in the Federation of Bosnia and Herzegovina, digital marketing tools are used in the marketing activities of tourist destinations.

Given that numerous strategic documents have been adopted at the level of both entities and that Bosnia and Herzegovina abounds in both natural and cultural tourism resources, some of which are on the World Heritage List (UNESCO), the authors assigned the destination 1.5 points. In particular, the competitiveness and sustainability of this area are supported by the fact that, due to psychological reasons triggered by the COVID-19 pandemic, tourists are looking for remote, nature-based attractions where Bosnia and Herzegovina can make a significant contribution.

Area of work: Policy responses and economic opportunities – applicable indicators: National tourism action plans; (Dupeyras and MacCallum, 2013).

The complex constitutional and political system of Bosnia and Herzegovina demands a specialized management structure for the tourism sector. At the state level, the Tourism Department within the Ministry of Foreign Trade and Economic Relations (MVTEO, 2023) is responsible for tourism activities. To coordinate tourism activities between the entities and Brčko District, MVTEO established the Tourism Working Group in 2007. Its main objectives include regulating the tourism sector in compliance with EU standards, improving organization and regulation to harmonize activities and establish a unified economic space in Bosnia and Herzegovina, as well as developing an efficient

regulatory framework for tourism. The working group consists of representatives from the tourism ministries of both entities and Brčko District, as well as the Foreign Trade Chamber of Bosnia and Herzegovina. However, the current management and institutional structures require significantly more human and financial resources compared to other economies in the region, and partnership with stakeholders at the state level remains relatively weak. Apart from the Chamber of Foreign Trade, no other private stakeholders are included in the established Working Group for Tourism. The private sector is included in various working groups in both entities, and meetings are organized with ministries. Currently, there is no established monitoring or evaluation system to measure the level of public-private cooperation at the destination level. Efforts to improve public-private cooperation have been made by providing support for the development of tourist clusters. However, the framework of vertical cooperation and coordination from the state to the local/destination level remains weak. There is a need to improve the structure of tourism management at the local level, particularly since many municipalities lack the financial resources and qualified personnel needed to manage tourism development effectively. At the entity level, the Ministry of Environment and Tourism of the Federation of Bosnia and Herzegovina, the Ministry of Trade and Tourism of the Republika Srpska, and the Department for Economic Development, Sports and Culture of Brčko District are responsible for implementing the legislative framework, adopting tourism strategies, and overseeing comprehensive tourism development. While the Republika Srpska has a management structure for tourism that is similar to other economic branches, the management structure and institutional framework in the Federation of Bosnia and Herzegovina is more complex, with tourism development divided between the Ministry of Environment and Tourism and the Ministries of Cantons. The cantons also adopted their own laws and regulations because the Law on Tourism of the Federation of Bosnia and Herzegovina was repealed in 2014, and the new one has not yet been adopted. Bosnia and Herzegovina has established a system of data collection on tourism as a basis for tourism statistics. The Agency for Statistics of Bosnia and Herzegovina is responsible for the production and development of tourism statistics in accordance with the country's Law on Statistics. Currently, the Statistics Agency distributes data on accommodation capacities, as well as on the number of tourist arrivals, overnight stays, and countries of origin of tourists. The Republika Srpska and the Federation of Bosnia and Herzegovina also have statistical institutions, namely the Institute for Statistics of the Republika Srpska and the Federal Institute for Statistics. The high degree of decentralization has a great impact on various business regulations and procedures, making the business environment of Bosnia and Herzegovina unfavourable and unsafe. When it comes to the last area of activity, the authors assigned the country 0 points, since there is not a single Ministry dealing with tourism at the state level. All competencies are attributed to the federal, cantonal, and local levels of governance. The results of this research confirmed previously expressed findings from other studies, highlighting that Bosnia and Herzegovina faces numerous challenges on its path to becoming a sustainable tourist destination, since the tourism sector develops spontaneously and is not regulated by laws at the country level. According to Radić *et al.* (2021), improving competitiveness will be achieved through collaboration with all stakeholders and institutional arrangements at the national level. The authors assigned 0 points to this activity area, consistent with results from other studies. Concerning other analysed areas of activity, the authors found that the natural and cultural heritage of Bosnia and Herzegovina is its sole comparative advantage that can make the country more visible in the market. According to the Centre of Excellence for Evaluation and Policy Research (2022), the "hotspots" of cultural tourism are large cities, primarily Sarajevo, Mostar, and Banjaluka. The authors emphasized that these cities also host international airports, facilitating tourism mobility. However, systemic reforms are needed for international airports to function fully. Legal regulations to govern airport and airline operations are lacking, as are promotion and marketing activities to attract airlines so that they may establish bases. Despite being the capital and most developed city, Sarajevo faces significant issues with its airport operations due to high aviation taxes, making such flights unprofitable for airlines. The

findings of this research and the new insights provided by the authors will serve all stakeholders, primarily relevant ministries at the entity and cantonal levels, to identify issues and focus on finding solutions for priorities. This notably includes the potential application of specific OECD sustainability indicators and establishing a system for monitoring them. As Hall (1994) notes, there are seven government functions related to tourism development: coordination, planning, legislation and regulation, entrepreneurship, stimulation, the role of social tourism, and a broader role in protecting interests. If one of these functions is absent, the entire system is compromised, as is the case in Bosnia and Herzegovina, where the governments of both entities are not aligned on tourism development and do not work synergistically for the greater community's benefit.

5. THE COMPETITIVENESS AND SUSTAINABILITY OF TOURISM IN BOSNIA AND HERZEGOVINA COMPARED TO OTHER WESTERN BALKAN COUNTRIES

Tourism is a crucial economic sector in the Western Balkans (WB6) region, as evidenced by the fact that all six countries (Albania, Bosnia and Herzegovina, Kosovo¹, Macedonia, Montenegro, and Serbia) have established tourism frameworks and institutions. In the past decade, the WB6 countries have made significant efforts to promote and enhance their tourism sectors, with Albania, Montenegro, and Serbia leading the way, as reported by the OECD in 2019. The growing importance of tourism in the WB6 region is evident from the share of tourism in their respective GDPs, with Montenegro ranking first and Albania second. Bosnia and Herzegovina is better positioned in the area of tourism performance and impact compared to Macedonia and Serbia, which achieved the worst results in 2021 (Fig. 3).

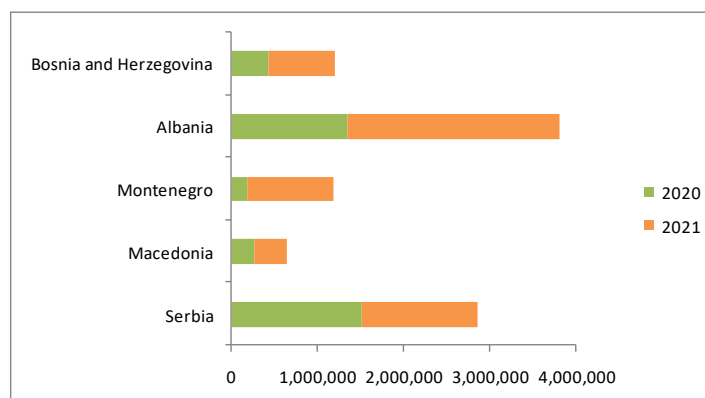


Fig. 3 – Actual tourist consumption in the countries of the Western Balkans.
Source: WTTC, 2023.

The region attracts a large number of tourists, including an increasing number of cruise passengers and crew members, particularly in Montenegro, where elite cruise tourism has been expanding. All countries in the Western Balkans, including Bosnia and Herzegovina, receive a significant number of visitors from distant destinations, particularly North and South America, the Far East (China, Japan, and Korea), and the Pacific (Australia and New Zealand). To fully achieve the potential of the region, it is essential to develop sustainability tourism, target specific markets, devise effective promotion and branding strategies, and focus on developing specific forms of tourism, such as cultural, adventure, and gastronomic tourism (OECD, 2016).

¹ No data available for Kosovo.

Table 3

The share of tourism in the total GDP of the countries of the Western Balkans

Country	% of Travel and Tourism in GDP (2020)	% of Travel and Tourism in GDP (2021)
Albania	10.5	17.4
Bosnia and Herzegovina	5.0	6.6
Serbia	3.7	3.6
Montenegro	7.7	25.5
North Macedonia	4.8	5.6
Kosovo	–	–

Source: Authors, according to WTTC data, 2023.

Looking only at tourist consumption in the analysed Western Balkan countries, Bosnia and Herzegovina appears to compete relatively well with the rest of the region, except for the two leading tourist countries of Albania and Serbia. However, in order for Bosnia and Herzegovina to become a truly competitive and sustainable destination, it will need to address a number of challenges, first within the Western Balkans region and then in Europe as a whole.

Bosnia and Herzegovina has made significant progress in the area regarding the “effect and influence of tourism”, as evidenced by indicators such as the direct share of tourism in GDP and the number of overnight tourist stays. However, there is still much room for improvement in the area of “destination attractiveness”, which the authors believe has the greatest potential for further development and promotion. The country has achieved the lowest progress in the area of “political responses and economic opportunities” due to the lack of a national Ministry of Tourism that should deal with tourism, its direction, development, and promotion. There are numerous ministries and associations at the entity, cantonal and municipal levels that are not harmonized or do not cooperate with each other. Additionally, very little progress has been made in the area of the “ability of the destination to provide quality and competitive tourist services”, which is partly attributed to the lack of progress in visa liberalization and improvements, innovations, and capital projects that will improve the operation of all four international airports. So far, two centres – clusters –, namely Sarajevo and Tuzla, stand out in terms of the number of international flights and arriving passengers.

Table 4

Overall evaluation of tourism competitiveness of Bosnia and Herzegovina according to OECD areas of work

Area of work	Score
Tourism performance and impacts	2
The ability of the destination to deliver quality and competitive tourist services	1
Attractiveness of the destination	1.5
Policy responses and economic opportunities	0
Total: 4.5	

Source: Authors, 2023.

The results of the tourism competitiveness analysis show that Bosnia and Herzegovina has made significant progress, achieving a total score of 4.5 points on the previously established scale for the period of 2019–2022. Although significant, this progress is still insufficient for the country to compete with other Western Balkan countries. Bosnia and Herzegovina scored the lowest in the areas of providing quality and competitive tourist services, policy responses, and economic opportunities, with the only applicable indicators being measured and monitored in these areas. The greatest progress was

made on the topic of the effects and influence of tourism, with indicators such as the direct share of direct tourism GDP and the number of overnight stays. Despite the progress, the tourism economy of Bosnia and Herzegovina lags behind that of the leading tourist countries of the Western Balkans, namely Montenegro and Albania. The authors identified the areas that need further improvement for tourism in Bosnia and Herzegovina to be competitive. First of all, the tourist infrastructure remains the biggest challenge, in addition to the fact that the governments of both entities do not invest any funds, nor do they prioritize travel and tourism, despite the country's very good cultural-historical and natural tourist base.

6. CONCLUSIONS

A big hurdle for measuring the competitiveness of a tourist destination is the lack of efficient and continuous implementation, monitoring, and upgrading of OECD indicators. Despite making some progress in tourism policy implementation, Bosnia and Herzegovina's efficiency remains lower than that of other Western Balkan countries (WB6). Bosnia and Herzegovina has below-average competitiveness results. The country achieved the lowest results in the area of the destination's ability to provide quality and competitive tourist services and in the area of policy responses and economic opportunities. Within the two mentioned areas, it is possible to measure and continuously monitor only those indicators that are applicable at the destination. The greatest progress was achieved with respect to the effects and influence of tourism through indicators concerning the direct tourism GDP and the number of overnight stays. The tourism economy of the country is lagging behind. This indicates that the tourism policy framework in Bosnia and Herzegovina is not sufficiently competitive and that the tourism sector faces several challenges that need further improvement. The guidelines for further action in the improvement of tourism in Bosnia and Herzegovina include the development of human resources through training and the employment of qualified workforce, as well as the liberalization of the visa regime, the facilitation of procedures for obtaining visas, and the reform of all policies related to this aspect. It is necessary to significantly improve marketing and promotional activities on the global tourist market because Bosnia and Herzegovina as a destination is insufficiently visible in other competitive markets. On a more positive note, the country has made significant progress in terms of the seasonal character of the tourist offer; that is, it has achieved satisfactory results only regarding this indicator. In order to completely abolish the seasonal character, one of the solutions would be to expand the tourist offer to rural areas and lesser-known tourist destinations. In the short term, this would help the tourism sector recover from the crisis caused by the past COVID-19 pandemic. Bosnia and Herzegovina needs systemic reforms, as well as the establishment of a unique system for controlling and monitoring the areas of activity, in addition to the related OECD indicators for measuring the competitiveness of tourism. The applicability of OECD indicators would result in defining the sustainability of the destination; however, the main obstacle to progress appears to be the country's complex political-territorial organization and the division of powers at different levels.

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MAPPING THE GROUNDWATER POTENTIAL IN SUB-SAHARAN AFRICA: THE CASE OF LOUMBILA COMMUNE, BURKINA FASO

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Key-words: Geomatics (Remote sensing-GIS), AHP, groundwater potential, Loumbila (Burkina Faso).

Abstract. The objective of this study is to identify and map potential groundwater resource areas in the rural commune of Loumbila in order to assess the potential water accessibility in the area. A spatial data analysis was applied to identify potential groundwater resource areas for drilling. To this end, geomatics tools (Geographic Information Systems and Remote Sensing) and a multi-criteria analysis using the Analysis Hierarchy Process (AHP) technique were deployed. A total of eight (decision) factors with a strong influence on the groundwater storage potential (i.e., soil types, fracture network density, land use, slope, hydrogeology, alterity thickness and drainage density, precipitation) were selected and mapped. An appropriate weight has been assigned to each factor, which were further normalized using the Analytical Hierarchy Process (AHP). Based on the analysis, the rural commune of Loumbila was qualitatively classified into five groundwater potential zones: very low, low, medium, high and very high groundwater potential. The results obtained show that 9.80% (14.75 km²), 22.02% (33.16 km²), 30.68% (46.19 km²), 18.47% (27.81 km²) and 19.03% (28.65 km²) of the rural municipality of Loumbila have very high, high, medium, low and very low groundwater potential, respectively. The groundwater potential mapping aims to identify the areas with the highest potential for the sustainable management of groundwater resources, enabling informed decisions to be taken for its management and conservation.

1. INTRODUCTION

Groundwater is a major resource for rural populations in the sub-Saharan area, as surface water is not sustainable due to high evapotranspiration rates or poor quality. It is the only source of water that can be of drinking quality without prior treatment, and it also influences the population's food security (Ouattara, 2016). Accessibility to drinking water is one of the major objectives of development projects worldwide. In developing countries, groundwater is a primary resource for supplying drinking water to the population because it is of relatively good quality and low cost (Yao *et al.*, 2016). In Burkina Faso, the drinking water supply in rural and semi-urban areas is mainly provided by modern wells, boreholes and standpipes (Ministry of Water and Sanitation, 2016). The geological context of Burkina Faso is characterized by a large coverage of the territory over nearly 80% by crystalline rocks, making it difficult to obtain underground water in sufficient quantity and quality (Koussoubé, 1996). According to a study by the Office of Mines and Geology of Burkina Faso (OMGBF)², knowledge of Burkina Faso's

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² http://www.bumigeb.bf/BUMIGEB/images/info/40j2_resource_eau_souter.pdf.

groundwater resources is very inadequate because there has been no real in-depth research, particularly on the functioning of the deep-water table and its alteration.

The rural commune of Loumbila, which is the subject of our study, is faced with numerous problems in the operation and sustainability of boreholes, with a non-functional rate of 15.7% compared to 11.2% nationally in 2017 (Ouédraogo, 2019). Additionally, 78% of boreholes are in a poor state, the rate of abandonment is 32.58% and the rate of breakdowns is 11.23%, the flow rate of the water supplied and the accessibility at the level of some boreholes not meeting national standards (Ouédraogo, 2019). The groundwater potential of the commune of Loumbila is not well known. Nevertheless, this water is mobilized through boreholes and large diameter wells (PCD, 2021). The most important water resource is Loumbila dam, which is used for hydro-agricultural purposes and makes a major contribution to the supply of drinking water to the city of Ouagadougou, with a capacity of 42.200.000 m³ (PCD, 2021). The Loumbila dam, whose main purpose is to supply with drinking water the rural commune of Loumbila and the city of Ouagadougou, is used for market gardening and fishing, as well as for construction and public works (BTP) activities, thus threatening its existence and potability because of fertilizer use in agriculture (Sabi Bou Gnon Kanni, 2022). However, the population's need for drinking water is constantly increasing due to the growing population. The population of the commune is 36,465 inhabitants, i.e. a density of 195 inh/km² (INSD, 2019). From the above, it is clear that one of the major challenges of the rural commune of Loumbila in terms of water is the knowledge, management and mobilization of this precious resource for life.

Therefore, the objective of this study is to identify and map the groundwater potential zone. For this purpose, geomatics tools combined with a multi-criteria analysis using the Analytic Hierarchy Process (AHP) were used for the prospection and evaluation of potential groundwater areas in the rural commune of Loumbila in order to facilitate the management of drilling facilities. Previous studies have proven the effectiveness of this approach for the assessment of potential groundwater areas, such as: Selvam *et al.*, 2015; Haile, 2022; Hyann, 2015; Vaddadi Natraj *et al.*, 2023; Shuhang Li, Mohamed Abdelkareem, 2023; Avdullahi & Hajra, 2023; Priya *et al.*, 2022. With the help of the literature review, as well as data availability for the region, the following natural factors have been selected and used as decision criteria in the studies mentioned above, thus guiding the analysis in the current paper: precipitation, soil types, fracture network density, land use, slope, hydrogeology, alterity thickness and drainage density.

2. METHODOLOGY

2.1. Study area

The commune of Loumbila is located in the province of Oubritenga, in the Central Plateau region of Burkina Faso. It is one of the eight communes of the province, 25 km from the capital city of Ouagadougou, and 13 km from Ziniaré, the capital of the province to which it belongs. It covers an area of approximately 177 km², i.e. 6.16% of the total area of the province of Oubritenga, and has 31 villages with a population of 36,465 inhabitants³ (11,59% of the total number of inhabitants of the province).

According to the political and strategic orientation document for the rural commune of Loumbila (Municipal Development Plan, 2017–2021), the characteristics of the commune's natural environment are as follows: a peneplain relief, a tropical Sudano-Sahelian climate (600 mm and 900 mm isohyets), temperatures ranging from 21°C (minimum) to 45°C (maximum), with an annual mean of 33°C, the harmattan (a cool, dry wind) as the prevailing wind. The plant cover is essentially characterized by grassy savannahs, shrub savannahs and gallery forests, the three types of soil encountered are poorly developed soils on gravelly materials (erosion-induced soils), lithosols (skeletal soils) and hydromorphic soils and, last but not least, the hydrographic regime consists of a few dams and reservoirs with a tropical rainfall regime.

³ File of Localities of the 5th RGPH, June 2022.

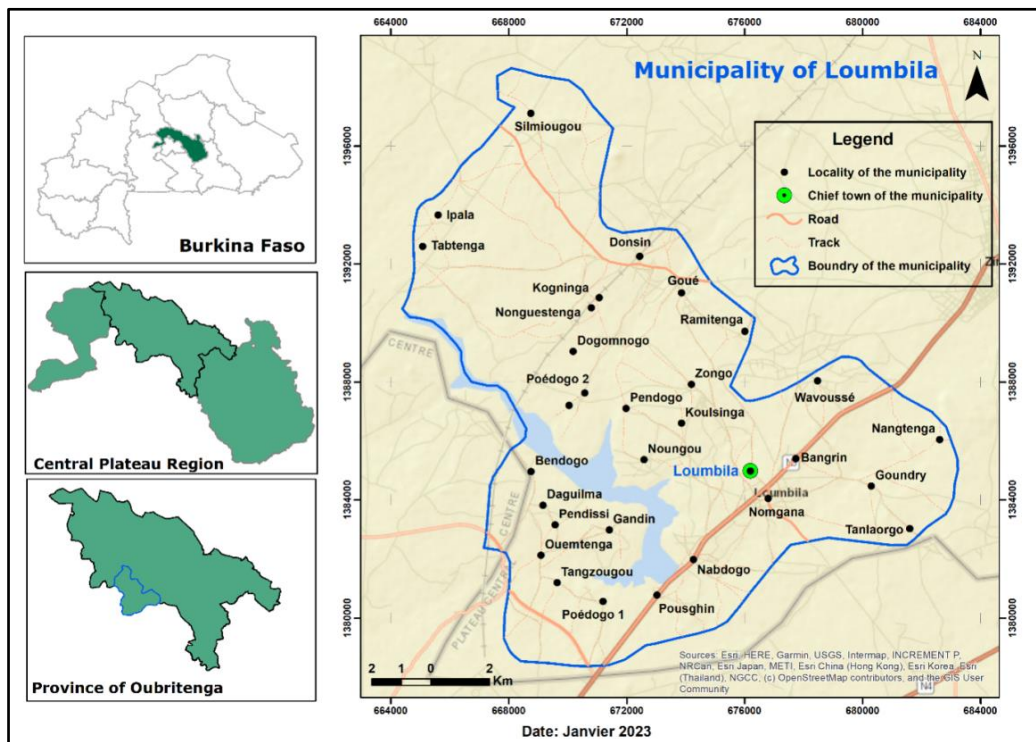


Fig. 1 – Location of the rural commune of Loumbila.

2.2. Data and tools

Several data sources and tools were used to carry out this study. These include satellite data, data from the state institutions, as well as data collected in the field.

2.2.1. Satellite data

The satellite data used belong to Landsat 7 and 8 missions⁴. Landsat 7 ETM+ (bands 7,4,2) involved corrected and ortho-rectified optical satellite images of the year 2000 of the scene 195/051, acquired on 12/08/2000, while Landsat 8 OLI (bands 7,5,3) referred to the corrected and ortho-rectified optical satellite images of the year 2020 of the scene 195/051, acquired on 28/10/2020. Additionally, DEM (Digital Elevation Model) data with a resolution of 30 m from the SRTM (Shuttle Radar Topography and Mapping) mission were used. Finally, precipitation data were retrieved from the Climate Hazards Group InfraRed Precipitation with Station Data (CHIRPS) using Google Earth Engine.

2.2.2. Data from state institutions

Data from the national archives were acquired from the Burkina Geographical Institute (BGI) and National Soil Office (NSO) in shapefile format. These comprised hydrogeological data, soil data, and the National Topographic Data Base (NTDB) in the same format. The technical data of the hydraulic structures were obtained from the General Directorate of Water Resources/Directorate of Water Studies and Information (GDWR/DWSI) in an excel file.

⁴ The Landsat 7 and 8 data were kindly provided by the Permanent Secretariat of the National Council for Sustainable Development (PS/NCSD) of Burkina Faso.

2.2.3. Field data

The GPS points indicating the geographical position of the boreholes and wells in the study area were taken during a fieldwork undertaken in July 2020. A Garmin 72H Global Positioning System (GPS) was used for this purpose. Around 123 borehole water points were collected.

2.2.4. Data processing and analysis software

Data processing and analysis was performed using Envi 5.4 (supervised and unsupervised classification and NDVI for a LULC map), Geomatica PCI 9.1 (for the lineament extraction), QGIS 2.18 (spatial database creation, management, mapping and AHP modelling), and Excel 2016 (database creation and management, calculations).

2.2.5. AHP method

The methodological approach in this study consists in a multi-criteria decision support mapping based on the use of the AHP method. The method, developed in 1977 by Thomas L. Saaty, allows the decomposition of a complex problem into a hierarchical system. This method essentially consists of three major steps: the identification of decision criteria, the classification and normalization of these criteria, and the weighting of the criteria and their aggregation. This approach makes use of a multi-source and multi-format data in a GIS. Figure 2 below shows the general methodological framework of the study, based on a method already used by several researchers and applied in studies on mapping the suitability of groundwater (Inaytoulaye *et al.*, 2023; Bebi *et al.*, 2021; Yıldırım, 2021; Djilali *et al.*, 2019; Ake *et al.*, 2018; Al-Bakri & Al-Jahmany, 2013).

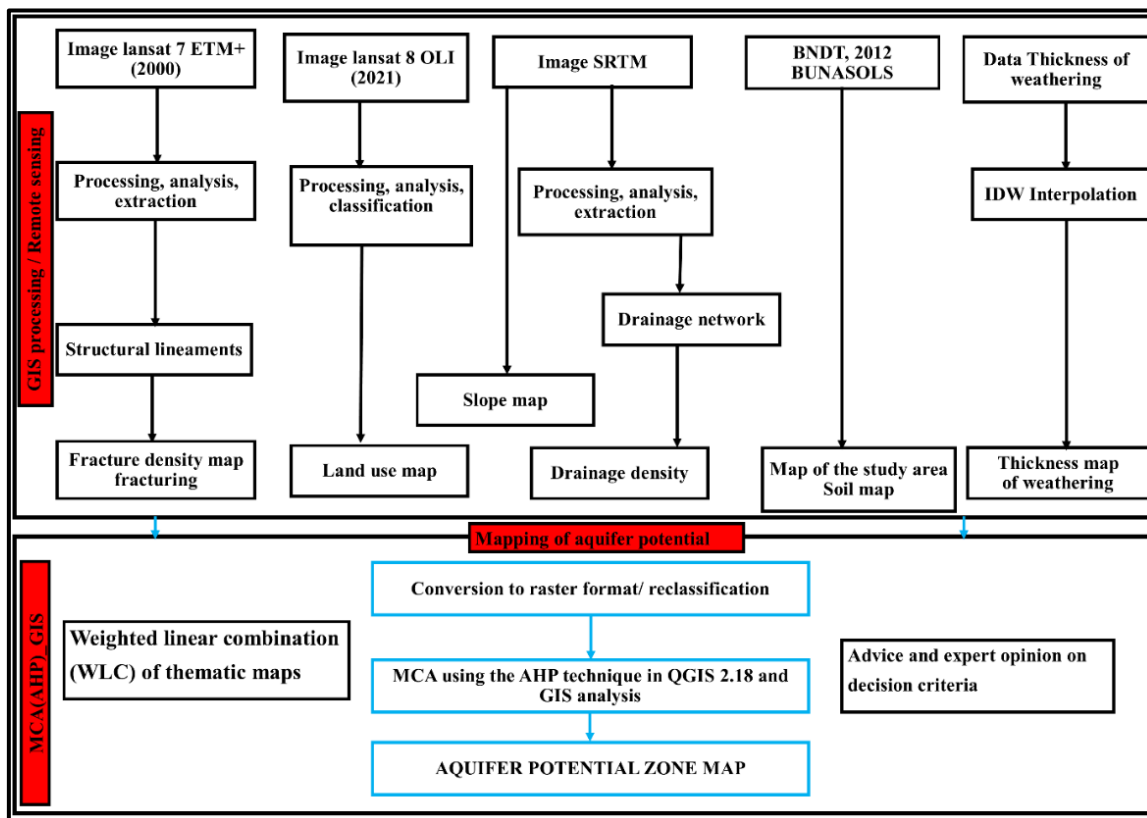


Fig. 2 – Methodological stages of the study.

2.3. Selection of decision factors

The literature review (Koudou *et al.*, 2013; Khodaei & Nassery, 2013; Kanohin Fulvie Epe Otchoumou, Saley Mahaman Bachir, Aké Gabriel Etienne, 2013; Oscar *et al.*, 2016; Essahlaoui, 2016; Sidi Mohamed *et al.*, 2017; Djilali *et al.*, 2019; Allafta *et al.*, 2021; Inaytoulaye *et al.*, 2023) allowed the researchers to select and evaluate a number of criteria for making the different thematic maps of potential indicators with an influence on groundwater resources. The decision criteria used in these studies include soil type, fracture network density, land use, slope, hydrogeology, weathering thickness and drainage density, rainfall, geological formations, distance to river, depth of water table, effective infiltration, etc. It should be noted that the number of criteria is not limitative and depends on the availability of data and the environmental settings of the study area.

Following an expert knowledge approach, the criteria considered important and relevant in the case of the current study are: fracture network density, drainage density, hydrogeology, slope, alteration thickness, pedology, land use/cover and precipitation. Their selection was triggered also by their availability for the case-study area.

2.4. Mapping of decision factors

a. The fracture network density factor

The interpretation of lineament densities for hydrogeological purposes relies on the idea that a much higher intensity of lineaments in relation to the bedrock probably generates faulted zones that conduct groundwater. The analysis of the structural lineaments in the study area reveals that the area has a low fracturing. The fracture density varies from 0 m/Km² to 2,593 m/Km² and this means that the zone is not faulty enough. The lineament density is classified into five (5) major groups, by reclassifying the image in QGIS.

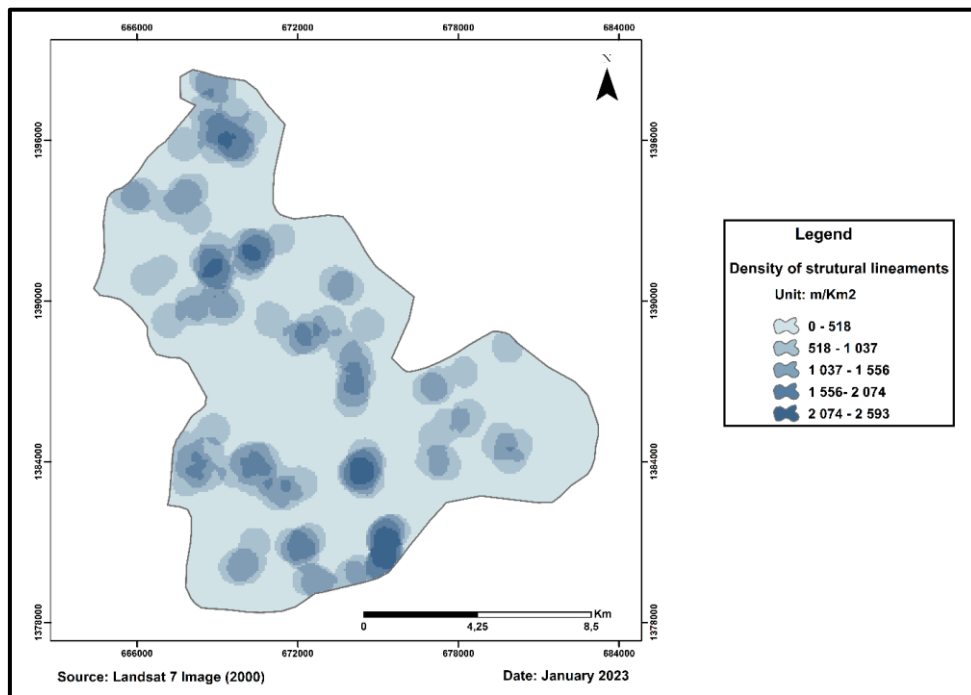


Fig. 3 – Density of the fracture network in the rural commune of Loumbila.

b. The drainage density factor

Drainage density is the cumulative length of stream segments of all orders in a region divided by the area of the region. Drainage density is a good indicator for predicting infiltration rates and their relationship with surface runoff (Allafta *et al.*, 2021). The drainage density in the study area is obtained after the pre-processing and processing of the SRTM image in ArcGIS 10.8. The drainage density map shows a low drainage density in the rural commune of Loumbila. The drainage density was split in five density classes ranging from lowest to highest value. The density values vary from 0 m/km² to 0.55 m/Km² in density. The 5 classes occupy, in ascending order, 34.80%; 23.32%; 22.53%; 14.20% and 5.13% (Fig. 4) of the communal territory in terms of drainage density.

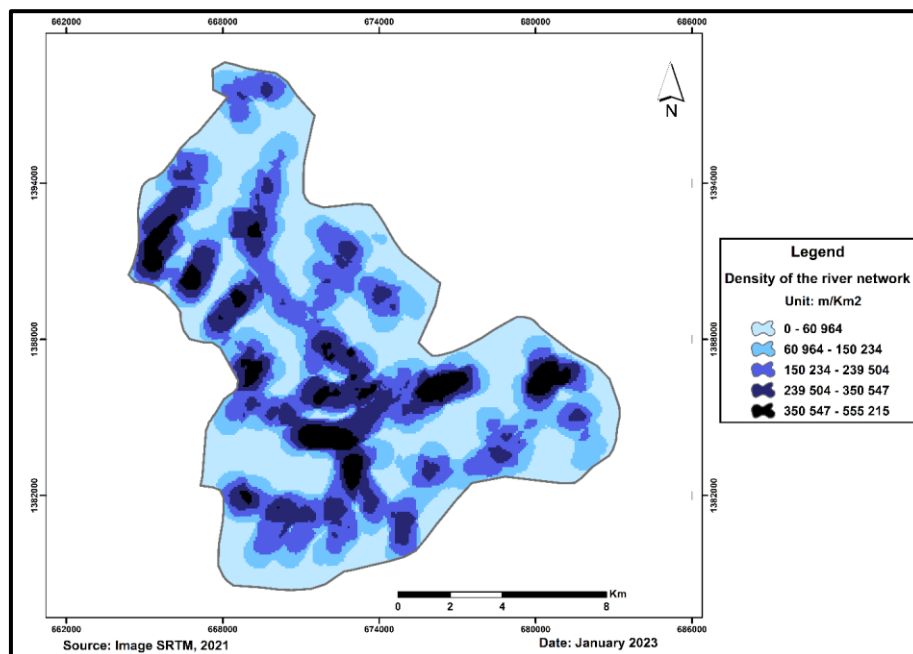


Fig. 4 – Drainage density factor.

c. The hydrogeological factor

The hydrogeological units were obtained by digitizing the hydrogeological map of Burkina Faso. In the rural commune of Loumbila, the hydrogeological system is based on a geological layer of ante-Birimian granites with highly cultivated ferruginous soils over a surface area of 36.24 km² (19.40% of the commune), on the one hand, and on ante-Birimian granites with degraded ferruginous soils over a surface area of 150.52 km² (80.59% of the commune), on the other hand (Fig. 5).

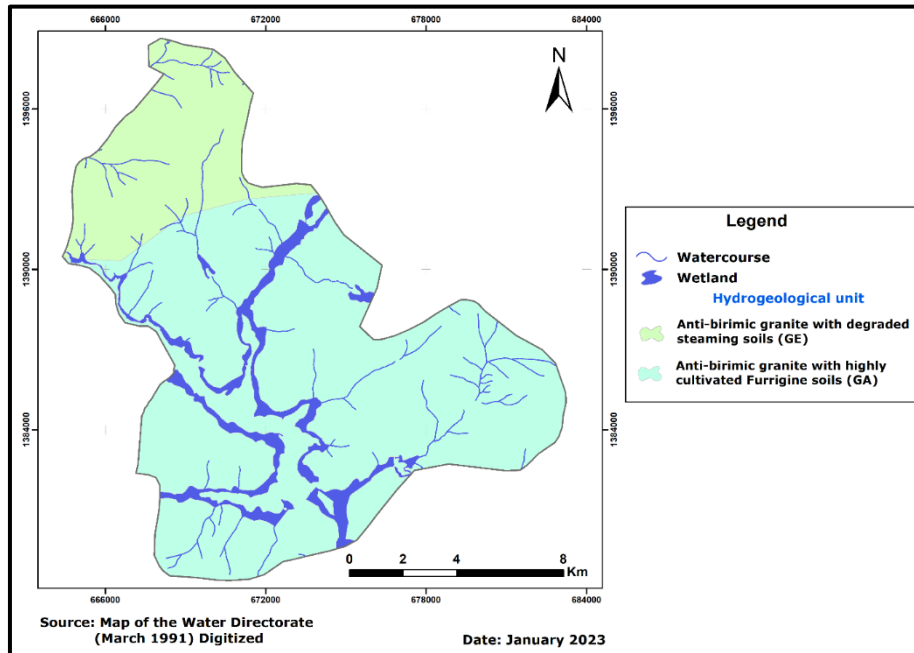


Fig. 5 – The hydrogeological factor.

d. The slope factor

The slope is taken into account to integrate the influence on the water transfer paths and their distribution between runoff and infiltration components (Fig. 6). The slope data were derived using the DEM/SRTM raster at a resolution of 30 m. Areas with low slope are considered favourable to infiltration and, therefore, to groundwater recharge. Steep slopes favour the rapid runoff and drainage of meteoric water.

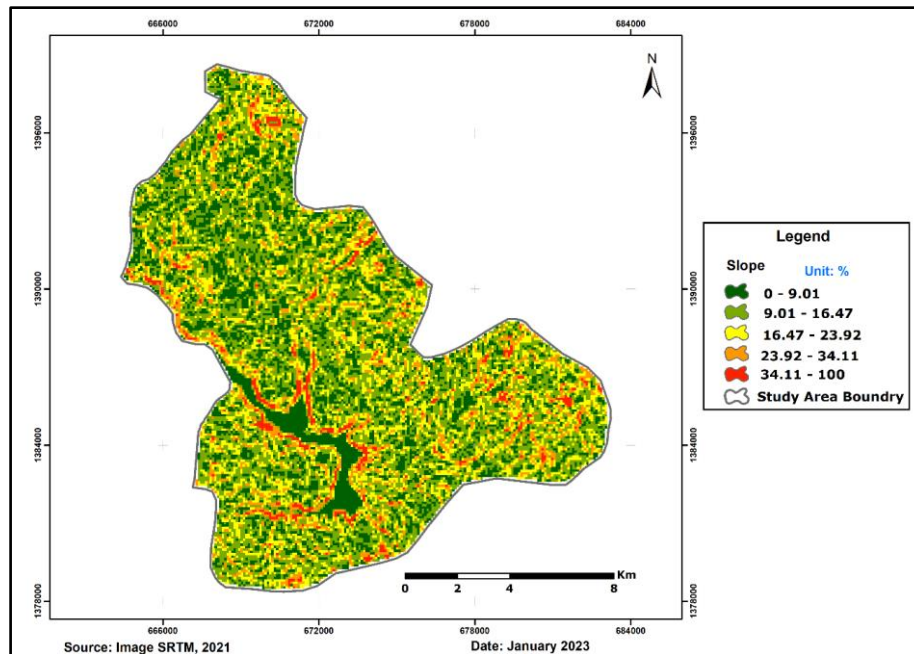


Fig. 6 – The slope factor.

e. The weathering thickness factor

Alterites are residual surface formations resulting from the weathering and fragmentation of the parent rock and they form water underground reservoirs called alterite aquifers (Koudou *et al.*, 2013). The thickness of alterites is retrieved from the data sheet of the Directorate General for Water Resources (DGWR). This parameter shows variable values over the study area. Areas with high alteration thickness are likely to indicate the presence of reservoirs in the aquifers, unlike areas with low alteration thicknesses. The generalization of the extent of the weathering cover over all formations indicates the importance of fracturing. The average thickness of the weathering layer is 19.88 m, the maximum is 53 m and the minimum thickness is 3 m in a sample of 114 boreholes. Using IDW interpolation, the weathering layer thickness has been calculated and divided into five thickness zones: (1) 0.98 to 9.68, (2) 9.69 to 15.02, (3) 15.02 to 19.75, (4) 19.75 to 24.17, and (5) 24.17 to 37.89 (Fig. 7).

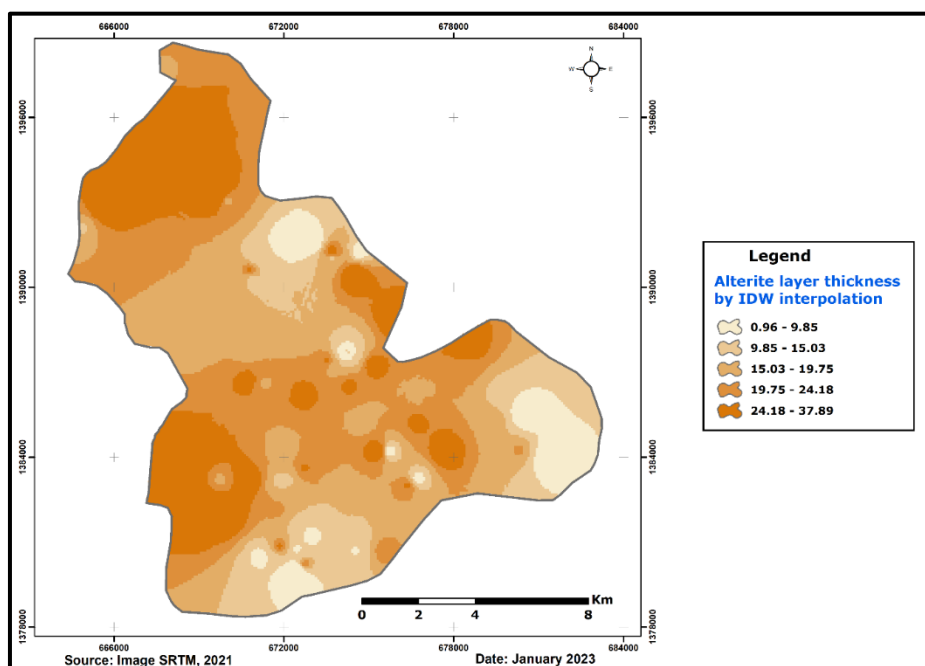


Fig. 7 – The thickness of weathering layers' factor.

f. The land use/ land cover factor

Knowledge of the land use categories provides information on the terrain permeability to allow rainwater to infiltrate. According to the rate of vegetation cover, 3 types of land use have been derived using Landsat 8 OLI images: a grassy savannah, a shrubby savannah and a gallery forest at the edge of watercourses (Fig. 8). Moreover, it should be mentioned that the presence of crops is a sign of strong demographic pressure. These are: *Mangifera indica* (Mango tree), *Psidium guajava* (Guava tree), *Borassus aethiopicum* (Rônier) and *Eucalyptus glonulus* (Eucalyptus).

g. The soil factor

Soil plays a major role in groundwater recharge (Haile, 2022). Because the infiltration rate is determined by the permeability of the soil and its water retention capacity (Lee *et al.*, 2014). The main types of soil in the study area are poorly developed soils on gravelly materials (erosion soil) covering approximately 142 km², i.e. 80.13% of the municipal territory. Lithosols (skeletal soils) are mainly made

up of ferruginous cuirasses on residual relief (lithosols on cuirasses) or outcrops of various unaltered or slightly altered rocks (lithosols on rocks) characterised by the absence of any pedogenetic evolution. They cover 4.7 km², i.e. 2.65% of the municipality. Hydromorphic soils are made up of sandy materials and have evolved under the influence of a temporary or permanent excess of water. These soils cover 30.46 km², that is, 17.21% of the municipality (Fig. 9).

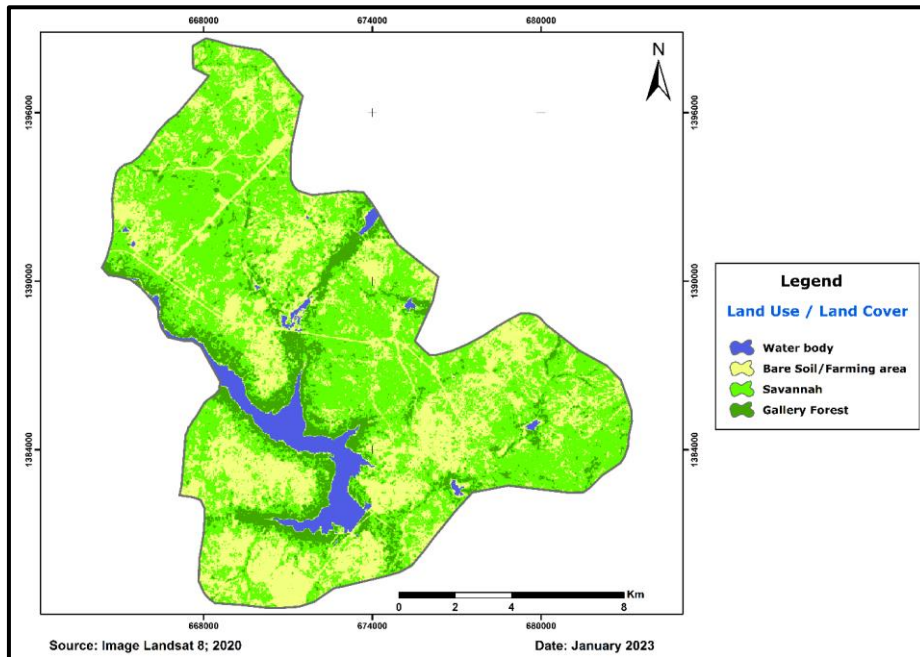


Fig. 8 – The land cover and land use factor.

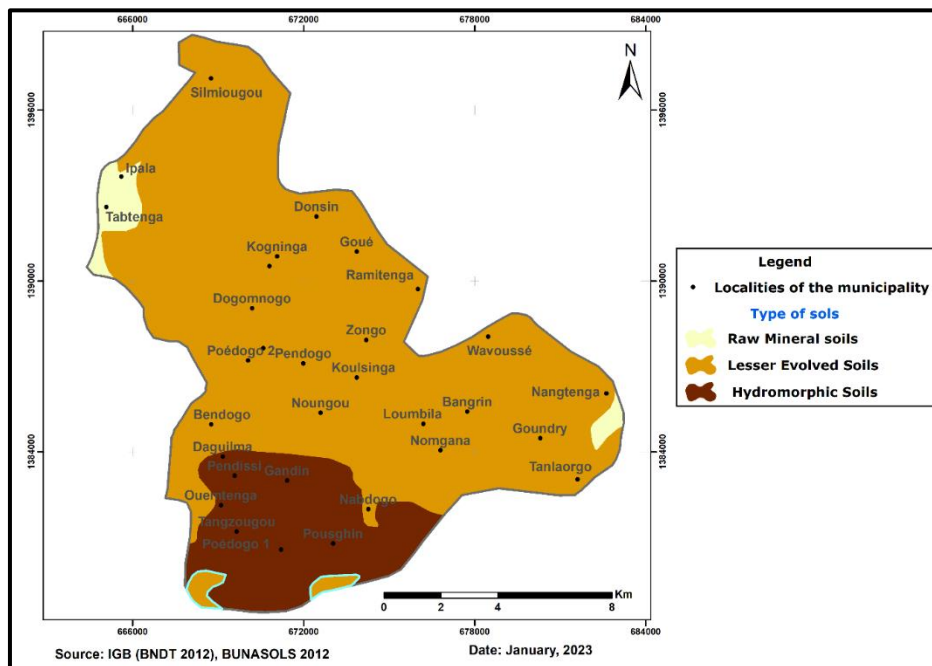


Fig. 9 – The soil types factor.

h. The precipitation factor

Precipitation is essential for groundwater recharge. Rainfall is the main source of groundwater recharge, while irrigation areas, rivers, ponds, lakes, etc. are secondary sources (Vaddadi Natraj *et al.*, 2023). Our study area is located in the Soudano-Sahelian climatic zone of Burkina Faso. It therefore benefits from an average rainfall of 850 mm/year. The rainfall map below was obtained by the Inverse Distance Weighting (IDW) interpolation of rainfall data. A total of 33 homogeneously distributed points were used.

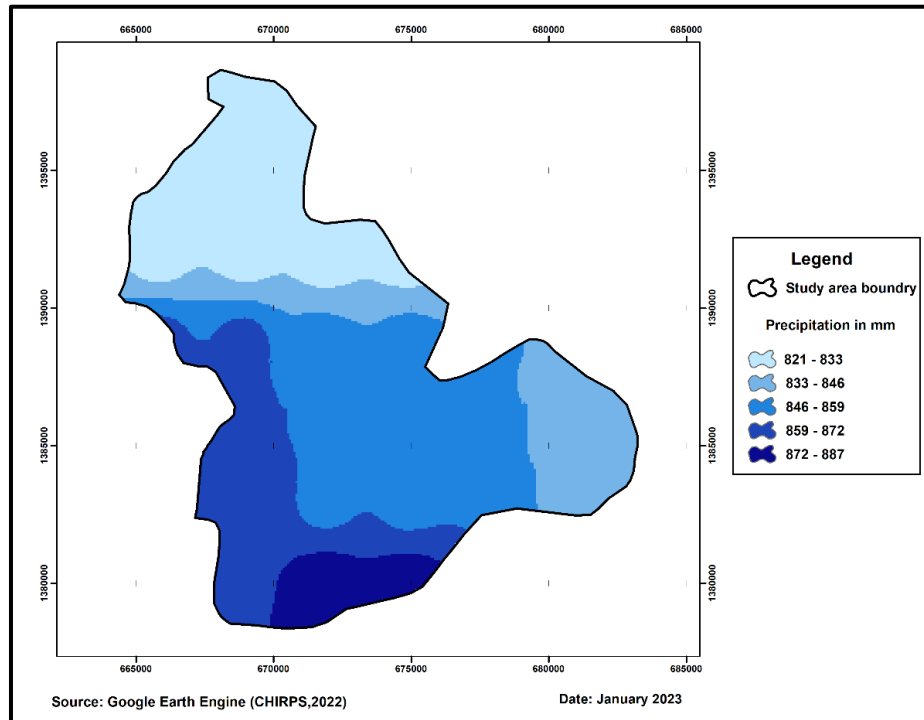


Fig. 10 – The annual average precipitation factor.

2.5. Classification, evaluation and normalization of decision criteria

Each identified criterion is subdivided into classes representing either a particular environment or a range of values. For each criterion, five classes were defined (very weak, weak, medium, strong and very strong) in order to improve the interpretation conditions. Furthermore, for a good multi-criteria analysis, the different classes for each criterion are hierarchically ranked according to their influence on groundwater formation. The intermediate classes have an intermediate rating according to an increasing or decreasing linear distribution. Table 1 below illustrates the classification, evaluation and normalization of decision criteria.

Table 1

Classification, evaluation and normalization of decision criteria

Criteria	Units	Sub-criteria	Suitability class ranges and ratings	Suitability class ratings	Weights Normalized through AHP calculation
Soil types	Level	Raw Mineral soils	Very high	9	0.054
		Lesser Evolved Soils	High	7	
		Hydromorphic Soils	Medium	5	
Land use / Land cover	Level	Gallery Forest	Very high	9	0.094
		Savannah	High	7	
		Bare Soil	Medium	5	
		Wetland	Low	3	
Slope	%	0 – 7.13	Very low	9	0.074
		7.13 – 9.9	Low	7	
		9.9 – 17.03	Medium	5	
		17.03 – 35.38	High	3	
		35.38 – 82.54	Very high	1	
Lineament density	m/km ²	0 – 518	Very low	1	0.208
		518 – 1,037	Low	3	
		1,037 – 1,556	Medium	5	
		1,556 – 2,074	High	7	
		2,074 – 2 593	Very high	9	
Thickness of weathering layers	m	96 – 9.85	Very low	1	0.039
		9.85 – 15.03	Low	3	
		15.03 – 19.75	Medium	5	
		19.75 – 24.189	High	7	
		24.18 – 37.89	Very high	9	
Drainage density	m/km ²	0 – 60,964	Very low	9	0.139
		60,964 – 150,234	Low	7	
		150,234 – 239,504	Medium	5	
		239,504 – 350,547	High	3	
		350,547 – 555,215	Very high	1	
Precipitation	mm	821–833	Very low	1	0.357
		833–846	Low	3	
		846–859	Medium	5	
		859–872	High	7	
		872–887	Very high	9	
Hydro-geology	Level	Ante-birrimian granite, highly cultivated ferruginous soils (GA)	High	7	0.034
		Ante-birrimian granite, degraded ferruginous soils (GE)	Very high	9	

Source: literature review, results of AHP processing in QGIS.

2.6. Thomas Saaty's scale

In order to evaluate the different criteria, Saaty proposed in 1984 a scale of values. Saaty's assessment scale ranging from 1 to 9 was used. A score of 9 is assigned to the class of criteria deemed "very strong", depending on whether it reinforces the presence of reservoirs in the study area. If not, the class is rated 1 – "very weak" (Table 2).

Table 2

Scale proposed by Saaty in 1984

Level of importance	Verbal scale
1	Equal importance of both elements
3	One element is slightly more important than the other
5	One element is more important than the other
7	One element is much more important than the other
9	One element is absolutely more important than the other
2, 4, 6, 8	Intermediate values between two judgements, used to refine the judgement

Source: Thomas Saaty's scale table, 1984.

3. RESULTS AND DISCUSSION

3.1. Pairwise comparisons of decision criteria

The technique for assigning weight to each criterion is based on Saaty's multi-criteria hierarchy method of 1977. The weighting criterion reflects the relative importance of each criterion in the formation of the aquifer reservoir. The weighting values from a series of pairwise comparisons of the selected criteria are listed in Table 3. The weights assigned to each criterion vary between 0 and 1.

Table 3

Pairwise comparisons of identified criteria (AHP)

	P	Ld	Dd	Luc	Sl	S	Wt	Hydrogeo	
P	1	3	3	5	5	5	7	7	$\lambda_{\max}=8.238$ CI = 0.034 CR= 0.024
Ld	0.333	1	2	3	3	5	5	5	
Dd	0.333	0.5	1	1	2	3	5	5	
Luc	0.2	0.333	1.0	1	1	2	3	3	
Sl	0.2	0.333	0.5	1.0	1	1	3	3	
S	0.2	0.2	0.333	0.5	1.0	1	1	2	
Wt	0.143	0.2	0.2	0.333	0.5	1.0	1	1	
Hydrogeo	0.143	0.2	0.2	0.333	0.333	0.5	1.0	1	

Source: Calculation using the AHP method.

Table reading scale: P = precipitation, S = soil, Dd = drainage density, Wt = weathering thickness, Ld = lineament density, Hydrogeo = hydrogeology, Luc = land use/land cover, Sl = slope.

3.2. Normalized Weight Percentage of each influencing decision criteria

The normalised weight (Table 4) of each decision factor determines the relative importance of that factor in terms of its role in recharging the aquifer in the rural commune of Loumbila. In our context, priority is given to the precipitation factor, followed by the density of structural lineaments and land use/cover.

Table 4

Decision criteria weight

Decision criteria	Weight %
Precipitation	35.7
Lineament density	20.8
Drainage density	3.9
Land use/land cover	9.4
Slope	7.4
Soil type	5.4
Weathering thickness	3.9
Hydrogeology	3.4

3.3. AHP analysis by calculation

To obtain the groundwater potential map, a number of indices have been calculated: eigenvalue, coherence index, coherence ratio and random coherence index. These indicators are calculated using QGIS and its Easy AHP extension.

3.3.1. Calculation of the eigenvalue

The matrix A is multiplied by the elements of the priority vector (x), where x is the eigenvalue of the priority vector (n), and the average of the values found is calculated. The result is called the *max value*; Saaty suggested that the largest max eigenvalue is:

$$\lambda_{\max} = \text{aij} \cdot \frac{W_i}{W_j}$$

The eigenvalue calculated using the above formula gives a result equal to $\lambda_{\max} = 8.238$.

3.3.2. Calculation of the Coherence Index IC

During the judgement explanation stage, redundant comparisons are made to improve the validity of responses, given that decision-makers may be uncertain or make poor judgements when comparing a few elements (Rakotoarivelo, 2015). The coherence index is the ratio of the difference between the max eigenvalue minus the number of comparisons on it minus one. The formula for the coherence index is:

$$IC = \text{average consistency} - \text{number of elements} / (\text{number of elements} - 1)$$

$IC = \frac{\lambda_{\max} - n}{n - 1}$ Evaluation of the Global Consistency Index (GCI) of the judgements gave a value of $IC=0.034$, expressing satisfactory consistency of judgements according to Saaty, 1984.

3.3.3. Calculation of the Coherence Ratio CR

The Coherence Ratio (CR) is the ratio of the coherence index calculated on the matrix corresponding to the decision-maker's judgements and the IA random index of a matrix of the same dimension. If $RC \leq 0.1$ or $RC \leq 10\%$, the matrix is considered to be sufficiently coherent. If this value exceeds 10%, the assessments may need to be revised (Rakotoarivelo, 2015).

$$RC = \text{Consistency index} / \text{random consistency}$$

$RC = \frac{IC}{IA}$; the calculated consistency ratio equal to $CR=0.024$ or 2.4%, which means that our matrix is sufficiently coherent.

3.4. Integration of decision criteria in a GIS

The weights and normalized values of each criterion make it possible to calculate a Groundwater Potential Zone (GwPZ). The following equation was used to determine the areas of groundwater potential:

$$\text{GwPZ} = (W_i) \times (X_i) = (S+0.054) \times (Ld+0.208) \times (Lu+0.094) \times (SI+0.074) \\ \times (\text{hydrogeo}+0.034) \times (Wt+0.039) \times (Dd+0.139) \times (P+0.357)$$

where, GwPZ = Groundwater Potential Zone, W_i = the weight of criterion i, and X_i = the normalized value of criterion i.

3.5. Groundwater potential map

The map below (Fig. 10) illustrates the groundwater potential areas in the commune of Loumbila obtained by integrating AHP analysis into GIS environment. This ground water potential was classified into five areas: very low, low, moderate, high and very high.

The use of GIS and AHP multi-criteria analysis led to the production of a groundwater potential map in the rural commune of Loumbila. The multi-criteria analysis method, coupled with GIS, has been used by many authors and has enabled the mapping of areas suitable for boreholes (Akkari, 2022, Oularé *et al.*, 2017, Khan *et al.*, 2022). In fact, this method has proved to be effective in assessing areas with aquifer potential. It also has the advantage of being a low-cost approach to proposing aquifers.

However, the method is not without its limitations. The main difficulty lies in defining the class limits of the factors and the weights assigned to the various factors used in the GIS (Kisiki *et al.*, 2022, Faye *et al.*, 2021). It should be noted that these limitations should not be seen as tangible barriers to the validity of the method.

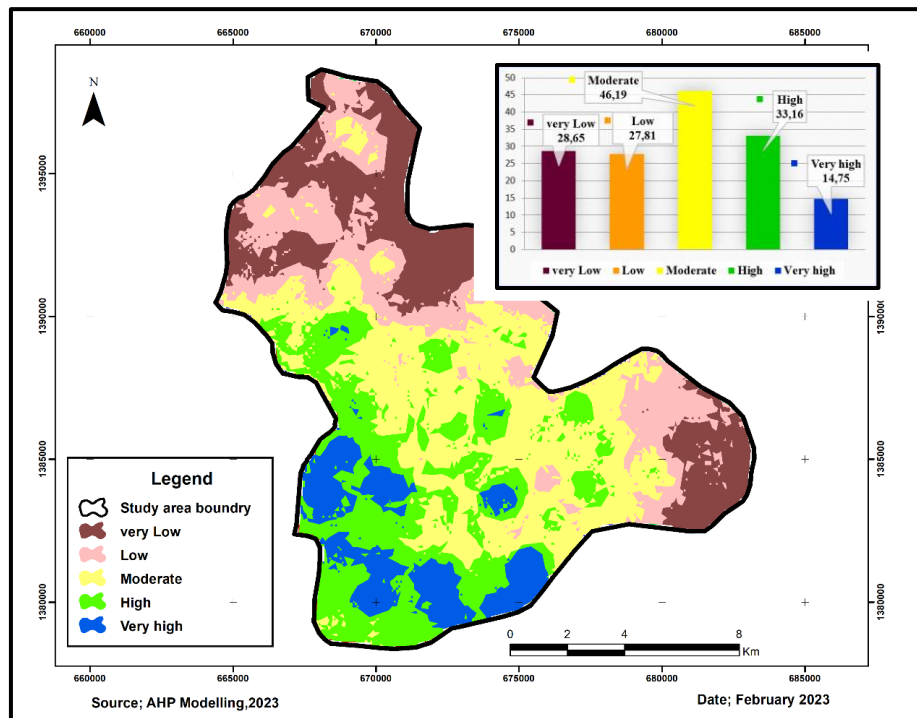


Fig. 10 – The map of groundwater potential of the rural commune of Loumbila.

4. CONCLUSIONS

In this study, the potential of groundwater resources in the commune of Loumbila was mapped. The mapping is obtained by integrating data on soil type, fracture network density, land use, slope, hydrogeology, weathering thickness and drainage density into an AHP multi-criteria analysis and the GIS environment.

The results highlighted the areas most suitable for exploiting the municipality's groundwater resources. The resulting map of groundwater potential areas is classified into five levels of potentiality zones, characterized as very low, low, moderate, high or very high groundwater. The results indicate a

generally very low groundwater potential, as only around 9.80% of the commune's territory lies in a very high groundwater potential. The study demonstrates the importance of using advanced AHP mapping and modelling techniques to assess the availability of groundwater resources. However, certain limitations of this study should be noted, in particular the use of available data and its reliability. Further research is needed to refine the results.

This work provides a useful decision-making tool for groundwater resource management strategies, as well as for prospecting borehole sites in a rural area with low access to data and resources. This work contributes to a better understanding of the availability of groundwater resources in Loumbila commune, and provides a solid basis for informed decisions on water resource management. It also paves the way for future research aimed at improving the understanding of groundwater resources, which is important for ensuring sustainable access to water resources. This study is all the more interesting in that we recommend similar studies in other communes in Burkina Faso. To further minimize drilling failures, the results of this study need to be refined by geophysical measurements in the field.

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SPATIAL CORRELATION BETWEEN SUFFOSION PROCESSES AND LAND USE IN SĂLCUȚA PLAIN (SOUTHWESTERN ROMANIA)

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Key-words: Loess, micro-depressions, morphometry, compaction, agricultural land, soil, GIS.

Abstract. The present study aims to establish how the agricultural lands in Sălcuța Plain, a piedmont subunit of the Romanian Plain, are affected by the presence of micro-depressions on loess deposits. The formation of these micro-depressions is closely related to the chemical and mechanical compaction process, which is conditioned by several factors, including the thickness of the loess deposit, the quantity of carbonates in the deposit, local morphometry, paleogeographic evolution, and climatic conditions. Based on satellite imagery from the 2010–2019 period, 303 micro-depressions were identified. Out of the total number of depressions, 293 are located on agricultural lands, covering approximately 9.31 km². On the surface of some of these depressions, soils with stagnant horizons (0.7 km²) have formed due to prolonged excess moisture. These types of soils gradually lead to the long-term degradation of agricultural lands. It is recommended to constantly monitor the evolution of soils with stagnant horizons and implement ameliorative agricultural measures in case an expansion of their area is observed in the long term.

1. INTRODUCTION

The process of suffosion is a global issue (Dinar *et al.*, 2021; Herrera-Garcia *et al.*, 2021). It has both natural and anthropogenic origins (Erkens *et al.*, 2015), with hydrogeological processes being some of the main triggering factors (Galloway *et al.*, 2016).

In the studied area, a network of micro-depressions has formed as a result of the subsidence process (Posea *et al.*, 2005). To decipher the formation mechanisms of these micro-depressions in the study area, it is necessary to have a good understanding of the characteristics of loess, loess-like deposits, and local morphometry.

Loess is an unstratified sediment, primarily dusty, friable, and yellowish-brown in colour (Ieleciz *et al.*, 1999; Újvári, 2016). It formed through the accumulation of wind-blown dust during glacial periods (Smalley *et al.*, 2011; Buggle *et al.*, 2011; Újvári, 2016; Peric *et al.*, 2022; Mörtsjö, 2023). The source of the dust is complex, originating from the vicinity of glacial caps, the alluvial plains of hydrographic networks during glacial periods, or even from desert areas (Buggle *et al.*, 2011; Zhuang *et al.*, 2021). Loess can be found either as true deposits with a metastable structure (Smalley and Marković, 2019), or as loess-like deposits that contain other sediments, sometimes interspersed with fossil soils (Meszner *et al.*, 2013; Banak *et al.*, 2013; Constantin *et al.*, 2021). This sediment is composed of a series of minerals, the most important of which are quartz (Perić *et al.*, 2022), clay (Roberts, 2019), and carbonates, especially calcium carbonate (Smalley and Marković, 2019). Loess deposits and loess-like deposits are found on all continents (Marković *et al.*, 2013) and cover about 10% of the continents'

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surface area, being concentrated primarily in the middle latitudes of Eurasia (Újvári *et al.*, 2008; Marković *et al.*, 2013).

The loess in Romania has the following characteristics: macro-porosity and a columnar structure, and is composed of dust (the highest percentage), clay, fine sands, and carbonates (Posea *et al.*, 1974).

In Romania, loess deposits and loessoid deposits cover approximately 40,000 km² (Protopopescu-Pake *et al.*, 1966), with thicknesses of up to 30 meters (Geography of Romania, 1983). The most extensive deposits are located in the Southern and Southeastern parts of Romania, with approximately 28,370 km² found in the Romanian Plain (Geography of Romania, 1983).

On the surface of loess and loessoid deposits, depending on certain circumstances, a series of negative landforms can appear in the form of depressions with various shapes (Kołodźńska-Gawrysiak *et al.*, 2015; Kołodźńska-Gawrysiak and Poesen, 2017; Fagg and Smalley, 2018). In international literature, they are known as micro-depressions, closed depressions, or loess depressions (Grecu *et al.*, 2015). Depending on the stage of evolution, these depressions have the following names in Romanian specialized literature: “*crovuri*” – with diameters of up to 1 km (which were formed by the mechanical and chemical compaction of loess deposits), “*găvane*” – representing the next stage of evolution resulting from the expansion or merging of “*crovuri*”, and “*padine*” – which have surfaces of several square kilometres and consist of multiple “*crovuri*” (Posea, 2006; Boengiu, 2008; Grecu *et al.*, 2015; Achim, 2016; Grecu, 2019).

According to the existing literature, there are several mechanisms for the formation of micro-depressions on the surface of loess deposits, which can occur separately or together:

- The chemical and mechanical compaction of the deposit, a mechanism conditioned by factors such as the thickness of the deposit, the amounts of salts, especially calcium carbonate (CaCO₃), slope and relief fragmentation, paleogeographic evolution, and climate regime (Tufescu, 1966). This process occurs due to vertical water circulation, facilitated by the high permeability and porosity of this sediment (Florea, 1970). The salts within the deposit, especially calcium carbonate (CaCO₃), dissolve in water and are transported to the base of the sediment, resulting in voids that are mechanically compacted under the weight of the deposit. This leads to the formation of unevenness at the topographic surface, which can later evolve into depressions (Florea, 1970; Costea, 2018).
- Deflation (Kołodźńska-Gawrysiak and Poesen, 2017), which involves the wind-driven removal of fine particles from the surface of the loess deposit. The shape of the resulting depressions is influenced by the predominant wind direction in the area.
- Depressions influenced by the paleo relief beneath the deposit, in which case loess takes on the shape of certain depressions or valleys that were part of the original relief (Kołodźńska-Gawrysiak, 2019).
- Anthropogenic depressions formed as a result of human activities, including the excavation of deposits, the collapse of underground galleries in limestone mines, and the creation of mining craters (Kołodźńska-Gawrysiak and Poesen, 2017).

The purpose of this study is to highlight how the agricultural lands in Sălcuța Plain, a small lowland unit in Southwestern Romania, can be directly affected by the excess moisture associated with loess depression, and indirectly impacted through the degradation of the soils on the surface of these depressions.

2. STUDY AREA

Sălcuța Plain is a subunit of the Oltenia Plain with an approximate area of 220 square kilometres, located in the Southwest of Romania, between the following geographical coordinates: 23°36'48" – 23°52'40" eastern longitude and 44°01'07" – 44°14'30" northern latitude (Fig. 1).

According to the 2018 *Corine Land Cover data*, 10 land use categories were identified (Table 1, Fig. 2): non-irrigated arable land (156.98 km²), broad-leaved forests (23.13 km²), pastures (14.06 km²), vineyards (9.61 km²), discontinuous urban fabric (6.06 km²), complex cultivation patterns (5.92 km²), land principally occupied by agriculture with significant areas of natural vegetation (3.17 km²), fruit trees and berry plantations (0.83 km²), industrial or commercial units (0.62 km²), transitional woodland-shrub (0.21 km²).

The geographic position on the continent places this region in the temperate-continental climate zone. This area is periodically invaded by masses of dry and hot, and sometimes humid air from Northern Africa or the Mediterranean Sea Basin (Vlăduț, 2011).

From the perspective of the genetic type of relief it falls into, Sălciuța Plain is an old piedmont plain, an extension into the plain of the Getic Piedmont to the North (Posea, 2006; Grecu, 2019).

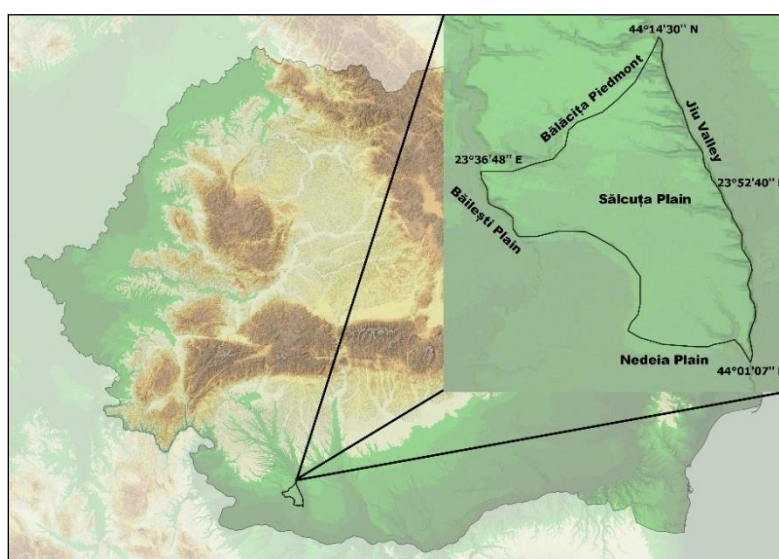


Fig. 1 – The location of Sălciuța Plain at the national level.

Table 1

Land use in Sălciuța Plain (2018)

Land use categories	Area (km ²)
Vineyards	9.61 – 961
Non-irrigated arable land	156.98 – 15,698
Industrial or commercial units	0.62 – 62
Broad-leaved forest	23.13
Transitional woodland-shrub	0.21
Discontinuous urban fabric	6.06
Complex cultivation patterns	5.92
Pastures	14.06
Land principally occupied by agriculture with significant areas of natural vegetation	3.17
Fruit trees and berry plantations	0.83

Source: Corine Land Cover 2018.

Considering the genetic type of relief (piedmont plain), the altitude of the entire area ranges between 52 and 175 meters (Fig. 3). Overall, altitudes between 145 and 160 meters predominate (Fig. 3). A significant level difference of approximately 80 meters has been identified between the upper part of the

slopes and the parallel valley low points that intersect the Eastern half of the study area. This level difference is due to strong erosion in friable formations, caused by native hydrographic organisms and the gradual deepening of the Jiu River, the main collector.

The studied area is clearly outlined to the West by the Desnățui River Valley, and to the East by the Jiu River Valley, looking like an interfluvium with a low slope ranging between 0 and 2 degrees (Fig. 3). An exception to this rule is found on the slopes of the previously mentioned parallel valleys, where steep slopes of over 15 degrees are recorded (Fig. 3).

The degree of relief fragmentation is generally low, with the indicator of relief fragmentation depth having low values ranging between 0 and 85 meters (Fig. 4). In this case, the relief energy is low, characteristic of a plain relief. Similarly, the indicator of relief fragmentation density has low values (0 - 3.27 km/km²), indicating a poorly developed drainage network (Fig. 4).

The main types of soils that are found in the study area are Chernozems, Phaeozems and Preluvsols. The solification rocks, on which these soils were formed, consist of loamy deposits (Simulescu & Grigoraș, 2016). Due to these loamy deposit in “crovuri” and “padine” cambic and argic chernozems, stagnic phaeozems, albic and preluvic stagnosols were formed. The structure of these soil types, the high content of loess, and the land use favour the intensification of hydric erosion processes.

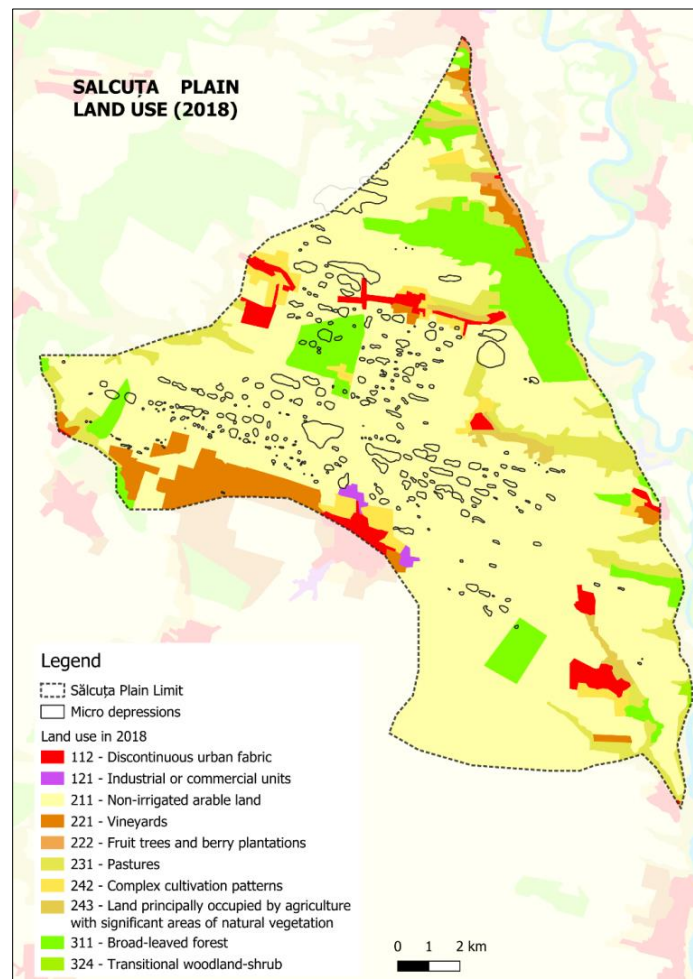


Fig. 2 – Land use and land cover in Sălcuța Plain (2018).

Source: Corine Land Cover 2018, <https://land.copernicus.eu/>.

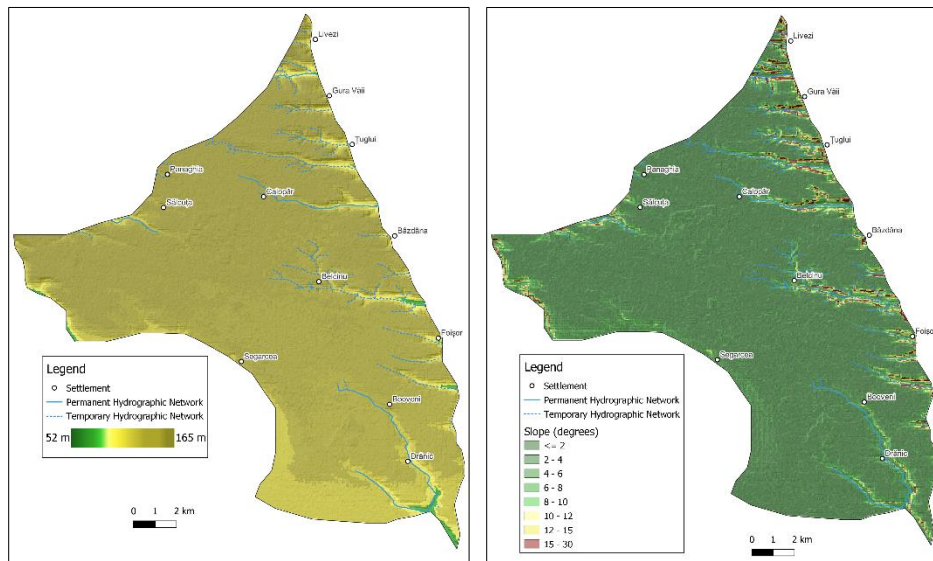


Fig. 3 – The value of altitude and slope steepness in Sălcuța Plain
 Source: Tănase *et al.*, 2023.

The entire surface of Sălcuța Plain is covered in loess deposits measuring approximately 10 to 15 meters in various areas (Coteț, 1957). In the vicinity of Podari settlement in the Northern part of the study area, the loess deposits measure 15 meters, while further South, in the vicinity of Bâzdana settlement, the thickness of the deposits decreases to 10 meters (Coteț, 1957). Geological profiles were created in the areas mentioned above (Coteț, 1957), revealing that the loess deposits are interspersed with fossil soils appearing as dark-coloured bands.

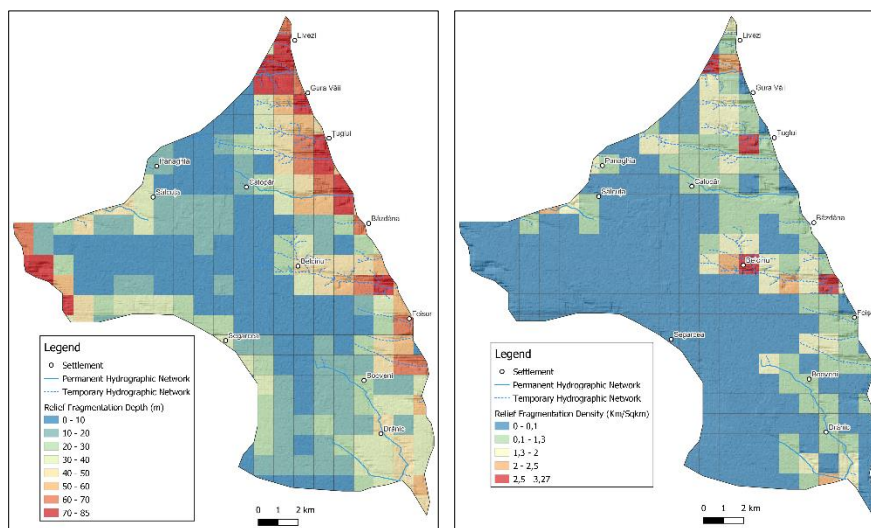


Fig. 4 – The value of relief fragmentation depth and relief fragmentation density in Sălcuța Plain.

According to dating conducted through the magnetostratigraphic and paleomagnetic methods in three subsections near Drănic locality in the Southern part of Sălcuța Plain by Rădan & Rădan in 1998, it was concluded that the age of the loess deposits reaches as far back as the Middle to Upper Pleistocene (Rădan, 2012).

2.1. Data and methods

The basis of this study consists in the analysing and interpretation of a complex geospatial database that includes both vector data and grid or raster data. All morphometric and statistical data were automatically calculated using the QGIS 3.22 software.

The vector delineation of the study area was obtained from the geo-spatial.org site and was carried out by Bogdan Candrea, Petronela Candrea, and Mihai Daniel Niță based on the “Geomorphological Regionalization of Romania - 1984” map compiled by Grigore Posea and Lucian Badea.

The vector data corresponding to the hydrographic network and localities were obtained from OpenStreetMap.

The entire geospatial dataset was georeferenced and reprojected in the Pulkovo 1942(58) / Stereo70 projection – EPSG 3844.

The working methods used in the identification and characterization of micro-depressions consist in the use of GIS tools (surfaces, spatial and nonspatial statistics, selection and extraction, overlay and proximity) in the analysis of different cartographic materials that reproduce the relief conditions, lithology, land use and land cover of the study area. Morphometric characteristics (elevation, slope, terrain fragmentation) of the study area were generated using SAGA GIS 7.8 based on the digital elevation model (DEM) with a spatial resolution of 20 meters, made available by the National Agency for Cadastre and Land Registration. Raster data takes a different approach. We used raster data as a backdrop to be used behind vector layers in order to provide more meaning to the future vector information.

For this study, the authors use QGIS 3.22 software tools for automatically calculated depression morphometry (area, perimeter, minimum and maximum extent). Land use determination was carried out through the analysis of the vector “Corine Land Cover” dataset from 2018 for to Sălcuța Plain. The soils affected by frost and stagnant processes were identified using the “Soil Map of Romania” on a scale of 1:200,000 published by the Institute of Pedology and Agrochemistry in Bucharest, from which all soil types in the study area were manually vectorized. The identified soil types were reclassified according to the Romanian Soil Taxonomy System of 2012.

Finally, depressions were identified and mapped using a series of satellite images from Google Earth Pro and Microsoft Bing platforms from the 2012–2019 period. Subsequently, the results were validated through field observation campaigns.

3. RESULTS AND DISCUSSIONS

3.1. Relief conditions

Following the inventory and mapping process using satellite imagery and field campaigns, 303 depressions have been identified (Fig. 2). These are concentrated in the Central and Western part of the study area where terrain fragmentation is low, and the drainage network is poorly developed. In addition to the reduced terrain fragmentation, the low inclination of the slopes (< 2 degrees) has enabled the formation and evolution of these depressions (Tănase *et al.*, 2023).

The number of depressions has decreased over the past hundred years due to applied agricultural techniques, unclogging ploughing works (Stroe, 2003), and drainage channels, which have drained a significant portion of the depressions, causing many to disappear (Răducă *et al.*, 2021). The removal of excess moisture and, consequently, compaction has allowed for land cultivation, but it has not eliminated the stagnant soil imprint and has contributed to bringing the carbonate illuvial horizon to the surface.

3.2. Main features of soil suffosion forms

From the total surface area of 220.59 km² of Sălcuța Plain, depressions take up 11.45 km² (5.2%), with an average density of 1.6 depressions/km², the highest density of depressions, ranging from 10 to 12 depressions/km², is recorded in the Central-Eastern part of the study area (Tănase *et al.*, 2023).

The surface area of depressions varies from 0.00015 km² (minimum) to 1.26 km² (maximum), with an average of 0.04 km² (Table 2). The average perimeter is 0.58 km, with a maximum value of 5.81 km and a minimum value of 0.0455 km (Table 2).

Table 2

Values of the morphometric indicators for micro-depressions

Indicator	Average value	Maximum value	Minimum value
Area (m ²)	0.04 km ²	1.26 km ²	0.00015km ²
Perimeter (m)	0.58 km	5.81 km	0.0455km
Maximum extension (m)	0.22 km	2.32 km	0.0171km
Minimum extension (m)	0.13 km	0.86 km	0.0115 km

The shape of depressions varies from circular, oval, elliptical, elongated to irregular in some special cases. The dominant direction of elongation of micro-depressions is influenced by the direction of underground drainage (Fig. 2).

3.3. Soil degradation and LULC categories

Of all the land use categories (Table 1), 7 are affected by the presence of depressions (Table 3): non-irrigated arable land (9 km²), Broad-leaved forests (0.31 km²), pastures (0.03 km²), complex cultivation patterns (0.02 km²), vineyards (0.01 m²), industrial or commercial units (0.01 km²), discontinuous urban fabric (0.0058 km²).

Table 3

Land use categories affected by micro-depressions

Land use categories	Spatial extension of micro-depressions (km ²)
Vineyards	0.01
Non-irrigated arable land	9.3
Broad-leaved forests	0.31
Industrial or commercial units	0.01
Discontinuous urban fabric	0.0058
Complex cultivation patterns	0.02
Pastures	0.03

The classes raising the most significant problems are non-irrigated arable land (Fig. 5), secondary pastures, complex crop areas, and vineyards because the presence of depressions in these areas leads to the accumulation of a significant amount of water at the surface topography level. In this case, two problems arise for agricultural crops, one in the short term and one in the long term.

The short-term problem is the excess of moisture that forms due to water accumulation. The direct and short-term effect is the alteration of the soil gas exchange process, affecting photosynthesis and respiration by reducing the oxygen supply to the plant roots (Cannarozzi *et al.*, 2018). The risk in this case is a decrease in agricultural production or even complete crop failure if the water stagnates for a prolonged period of time, a subject which will be tackled in a future research endeavour.



Fig. 5 – Non-irrigated arable land cultivated with wheat, affected by excess moisture – North of Calopăr, Sălcuța Plain.
Photo by Tănase G, 2023.

On the long term, excess water leads to soil degradation through the formation of stagnogleic horizons, which are the product of surface water stagnation (Grigoraș *et al.*, 2004). The genesis of stagnogleic horizons is closely related to excessive moisture and reduced aeration over a certain timeframe, leading to reduction processes and the appearance of reduced iron (Fe) and manganese (Mn) compounds with a greenish-grey colour (Grigoraș *et al.*, 2004; Grigoraș *et al.*, 2009). In depressions, two types of soils with stagnogleic horizons have been identified: stagnant argic phaeozems and luvic stagnosols. Stagnant argic phaeozems take up about 0.4 km², have a clay-loamy texture, and pose a moderate risk of excess water in rainy years (*Soil Map of Romania* 1:200,000, 1964–1994). Luvic stagnosols cover a smaller area of about 0.3 km², have a similar structure but experience prolonged water excess each year (*Soil Map of Romania* 1:200,000, 1964–1994). Soil degradation through the formation of stagnogleic horizons in the agricultural area of these depressions is a medium- and long-term issue that can lead to a gradual decline in agricultural production.

A part of the micro-depressions, especially those with large surfaces, has been drained through drainage channels. Currently, the efficiency of drainage through this network of channels is low due to sedimentation and the vegetation cover.

In this case, the continuous monitoring of stagnogleization process in the depression area and the implementation of ameliorative measures are necessary. The most important ameliorative measure is draining the excess water from the depressions by extending the existing surface channel network. In this regard, a slight slope of the relief from West to East facilitates drainage. Through this measure, besides slowing down the stagnogleization process, the short-term problem of excess moisture can be controlled.

4. CONCLUSIONS

The chemical and mechanical compaction of loess deposits is the fundamental process that has led to the formation of 303 micro-depressions. The occurrence of the compaction process was favoured by the morphometric characteristics of the area, especially the low inclination (less than 2 degrees) and the limited fragmentation of the relief. The generally elongated shape of the micro-depressions is a result of the overall West-to-East inclination of the terrain, which allowed for easy surface water drainage along the aforementioned direction.

The most vulnerable categories are non-irrigated arable lands and areas with complex crops, as in these areas, micro-depressions have the largest spatial extent (9.31 km²) and the highest density (around 10 micro-depressions/km²).

Within the aforementioned categories, argic stagnic facies and luvisc stagnosols have been identified, which exhibit stagnant gley horizons.

The depressions in the loess deposits at the level of Sălcuța Plain pose a serious problem for agricultural lands. In this regard, in the future, the issue may be extended to analyse how the accumulation of water at the topographic surface level has led to a reduction in cereal production in years with excessive precipitation.

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<https://land.copernicus.eu/pan-european/corine-land-cover/clc2018>
<https://www.openstreetmap.org/>

THE ECOLOGICAL ASSESSMENT OF SMALL RIVERS IN UKRAINE UNDER CONDITIONS OF INTENSIVE WAR IMPACT

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Key-words: ecological assessment, anthropogenic impact, water pollution index (WWI).

Abstract. Aquatic ecosystems are perpetually exposed to anthropogenic sources of pollution, wherein the quality of subterranean and surface waters undergoes influence from both natural and anthropogenic processes. This interaction results in environmental predicaments and, occasionally, environmental crises. Small rivers, in particular, bear a pronounced impact from human interventions on the environment. The investigation undertaken by the researchers commenced in 2021 with the primary objective of scrutinizing the ecological condition of the Irsha River. Regrettably, due to the military aggression of the Russian Federation, the regions through which the river courses were temporarily occupied, subjecting it to considerable anthropogenic disturbances. Specifically, two bridges spanning the Irsha River in the Malyn area were demolished, and military operations transpired along the riverbanks, leading to the accumulation of damaged military equipment. Consequently, it was deemed imperative during the course of our study to conduct an analysis of the natural water in the Irsha River subsequent to the military activities. The outcomes of a comprehensive assessment of surface water quality, employing a graphical method, revealed that, during the period of 2021–2022, the river waters within the Irsha River exhibited an overall failure to meet quality standards in both monitoring locations. Elevated values of Maximum Permissible Concentration (MPC) exceeding the norm were noted for the Chemical Oxygen Demand (COD) indicator, the dissolved oxygen indicator, as well as the general iron and iron of permanganate oxidizability parameters in both samples. The highest degree of pollution was discerned in the Malyn Reservoir, whereas the Irsha Reservoir manifested comparatively lower pollution levels in the aquatic environment.

1. INTRODUCTION

The use of small river ecosystems in modern ecological conditions is extensive and destructive for them (Kunakh *et al.*, 2023; Zhukov *et al.*, 2018). This is manifested in the excessive anthropogenic use of river basins (deforestation, the ploughing of more than 80% of the territory, residential, communal and industrial construction, etc.), the increase in the volume of polluted economic, communal and industrial wastewater entering the river waters, the destruction of the river bed due to the intensification of water and erosion processes (Kotsiuba *et al.*, 2022; Fryirs, 2017), the flowing of drainage water from unauthorized landfills into water bodies (Kotsiuba *et al.*, 2023). It is small rivers that form the hydrochemical composition and water quality of the medium and large rivers of Ukraine. Due to the small catchment areas, they are the most vulnerable to destructive anthropogenic influence, so they

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require a constant monitoring of water quality. And, in cases of significant pollution, they require expensive methods of water purification (Tarasevich *et al.*, 2008; Kotsiuba *et al.*, 2019).

Beyond regional boundaries, today's global studies (such as Abbott *et al.*, 2019; Abdar *et al.*, 2021; Allen and Holling, 2010; Aravinthasamy *et al.*, 2020; Batabyal, 2018; Chin *et al.*, 2013; Downs *et al.*, 2013; Florsheim *et al.*, 2013; Francis, 2011; Graf, 2001; Irvan *et al.*, 2021; Stojković *et al.*, 2018; Kenniche *et al.*, 2022; Kılıç, 2018; van Vliet, M. T. H., 2023; Varadharajan *et al.*, 2022; Urooj *et al.*, 2019) contribute to a broader understanding of water quality issues. They provide a nuanced understanding of water quality in different geographical contexts, highlighting the need for integrated approaches to address regional challenges, anthropogenic impacts, climate change and the role of advanced methodologies in water quality assessment.

The present-day state water quality monitoring system in Ukraine is focused on monitoring the hydrochemical composition of water in large and medium-sized rivers, while small rivers are practically not included in the monitoring network. The lack of reliable data on small river water quality makes it impossible to carry out a comprehensive assessment of the ecological state of their basins and to develop measures for its optimization. Based on the above mentioned, it becomes relevant to study the chemical composition of small river waters with a comprehensive and in-depth analysis of the direction of hydrochemical processes occurring in them, as a result of the combined effect of natural and anthropogenic factors on an open hydrochemical system.

The main task of this work is to carry out a comprehensive ecological assessment of the Irsha River surface water quality based on the analytical method.

2. STUDY AREA CHARACTERISTICS

The following tasks are completed to achieve the goal of the study:

1. The Irsha River basin is characterized within the study area;
2. A comprehensive assessment of the Irsha River surface water quality is performed based on the graphical method;
3. The level of river pollution is assessed according to the modified index.

The relevance of the topic is determined not only by the importance of using the Irsha River water for various purposes: a source of drinking water supply, energy, as a recreational facility, for irrigation, fishing, etc. The results of this work can be used to assess the impact of the Russian Federation's aggression on the environment.

The main polluters of the Irsha River in the pre-war period were housing and communal enterprises (4 enterprises). Their share is 90% of the polluted return waters. Complexes of sewage treatment facilities of communal enterprises are outdated and work inefficiently, so they need to be reconstructed with the introduction of modern wastewater treatment technologies.

3. DATA AND METHODS

The data of hydrochemical observations from two control bodies of the river network of Zhytomyr region (Ukraine) were used as initial information for the study of the Irsha River qualitative state. The water quality monitoring of the Irsha River was carried out at the approved state water quality monitoring point 93 km from the mouth (Fig. 1), Irsha Reservoir, in the drinking water intake of Nova Borova village and at the point which is 31 km from the mouth in the drinking water intake of Malyn (Fig. 2).

Various methods are used to study the surface water quality and level of pollution (APHA, 1985; Archfield *et al.*, 2015; Arya *et al.*, 2021; Diamantin *et al.*, 2018; Comber *et al.*, 2022; Kikuchi *et al.*,

2022; Petrie *et al.*, 2015; Karunanidhi *et al.*, 2021; Muangthong and Shrestha, 2015; Nair *et al.*, 2021; Solovey *et al.*, 2021; Stackpoole *et al.*, 2019; Sprague *et al.*, 2017; Taylor *et al.*, 2016), in particular the analytical-synthetic method, the geo-informational (cartographic modelling) method, and the analysis of information sources. To determine the Irsha River water quality and the level of its pollution, a graphical method of comprehensive assessment of surface water quality and a modified pollution index were applied in our work.

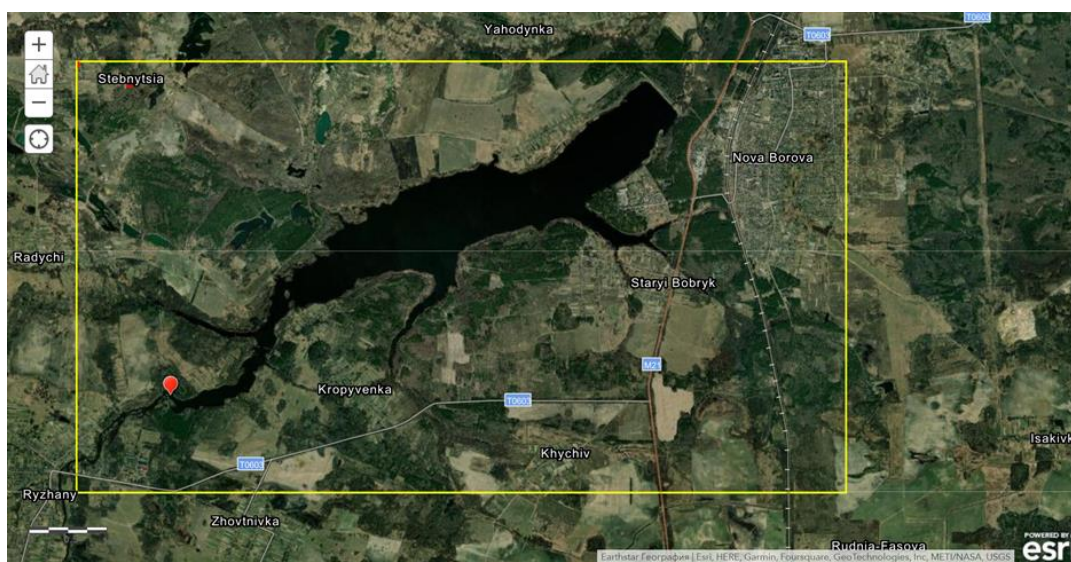


Fig. 1 – The object of the study: Irsha River, Nova Borova district.
Source: <https://livingatlas.arcgis.com>.

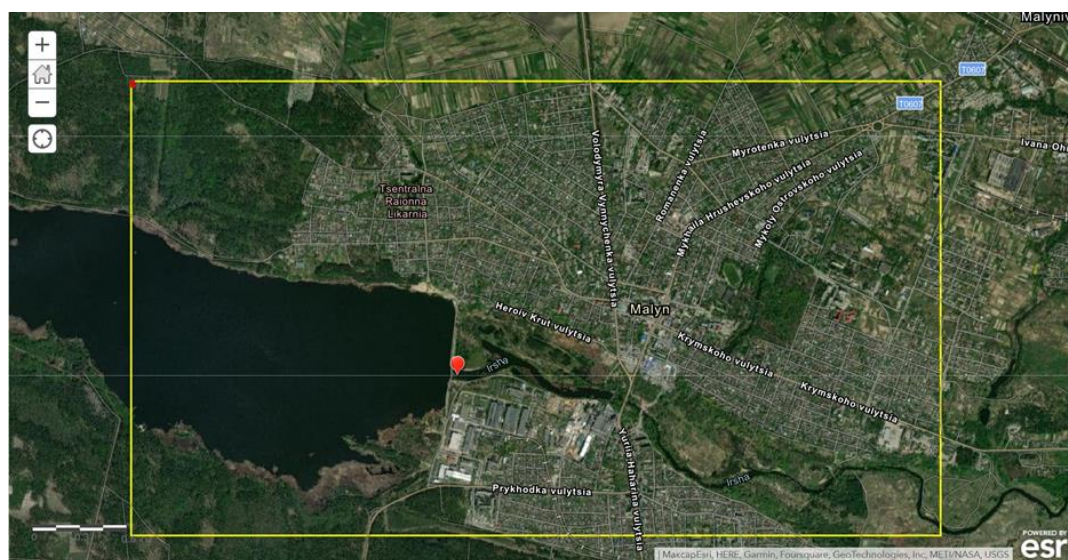


Fig. 2 – The object of the study: Irsha River, Malyn district. Source: <https://livingatlas.arcgis.com>.

The graphical method regarding the complex assessment of surface water quality is based on the compilation of a graphical model of surface water quality, which is a circular diagram with scale-radii corresponding to a certain hydrochemical indicator. The value of each radius division is equal to the maximum concentration value of the indicator that determines the suitability of water for a certain type

of water use, that is, the maximum permissible concentrations (MPC) of pollutants in the water body. The graphical model consists of two diagrams. One is a circle with a unit radius, and the second is a polygon with the number of vertices equal to the number of hydrochemical indicators. The border of the circle is the border of the ecological optimum, i.e., the ecological state of the water body when the content of all pollutants does not exceed the MPC (Muangthong and Shrestha, 2015).

The assessment of water quality according to the pollution index (PI) is carried out according to a limited number of indicators. The average arithmetic value of chemical analyses results for each of the indicators is determined. The found average arithmetic value of each of the indicators is compared with their MPC. The pollution Index (PI) is estimated by equation 1:

$$PI = \frac{1}{n} \sum_{i=1}^n \frac{C_i}{MPC_i}$$

where MPC_i – maximum permissible concentration (value) of the i -th indicator; C_i is the actual concentration (value) of the i -th indicator; n is the number of indicators.

This method of water quality assessment consists in calculating the water pollution index based on hydrochemical parameters, and then, based on the values of the calculated PI, the water under investigation is assigned to the appropriate quality class. Based on the results of the assessment, the following water quality classes are distinguished (Kolisnyk, *et al.*, 2019; Ali *et al.*, 2021): I – very clean ($PI < 0,3$); II – clean ($0,3 < PI < 1$); III – moderately polluted ($1 < PI < 2,5$); polluted ($2,5 < PI < 4$); IV – dirty ($4 < PI < 6$); V – very dirty ($6 < PI < 10$); VI – extremely dirty ($PI > 10$).

The study uses a modified method of calculating the PI, when some of the indicators are constant, and the others are taken as the indicators with the greatest relationship to the MPC. This allows a more complete use of the available hydrochemical information (Kolisnyk *et al.*, 2019).

4. RESULTS

The assessment of surface water quality in the Irsha River was performed on the basis of the graphical method for 2021-2022 in two control bodies: the Irsha River, the left tributary of the Teteriv River, 93 km from the mouth, Irsha Reservoir, the drinking water intake of Nova Borova village; Irsha river, 31 km from the mouth, Malyn reservoir, Malyn drinking water intake. Figures 3, 4 present the results for 2021.

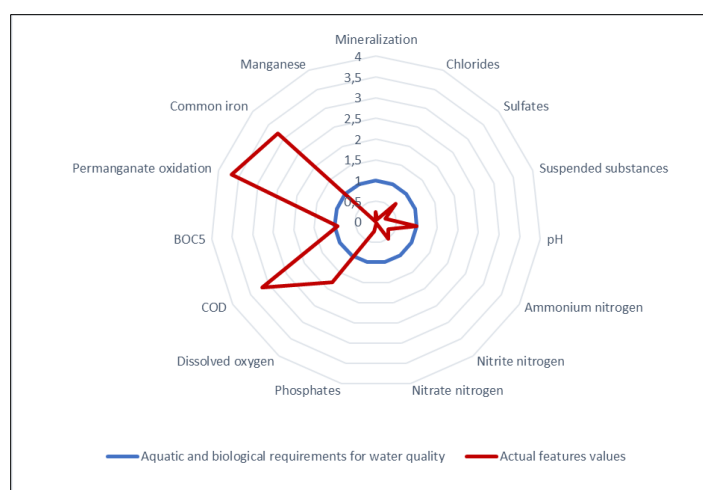


Fig. 3 – Concentrations of substances in control water bodies (Irshansk Reservoir, body 1) for the year 2021, in multiplicity units of the corresponding MPC.

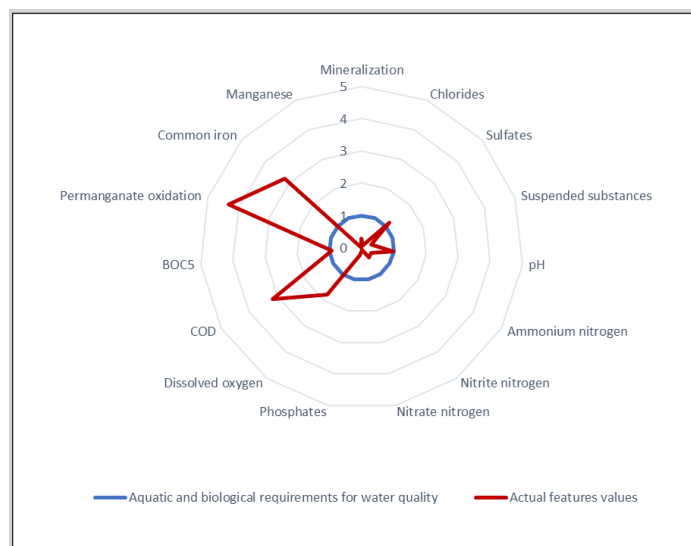


Fig. 4 – Concentrations of substances in control water bodies (Malyn Reservoir, body 2) for the year 2021, in multiplicity units of the corresponding MPC.

The quality of river waters in the region was found to be satisfactory in 2021. All quality indicators, including mineralization, chlorides, suspended matter, pH, ammonium nitrogen, nitrite nitrogen, nitrate nitrogen, phosphates, dissolved oxygen, BOD5 and manganese, met the requirements for river water quality.

The MPC multiplicity indicator in excess for sulphates during the entire period varied between 1.15 MPC and 1.3 MPC, as the highest value of the multiplicity indicator was observed in 2021 in the Malyn reservoir. According to the COD indicator (3.18 MPC-3.44 MPC), the highest MPC exceedance of 3.44 times was noted in the water of the same body. The Irsha River water quality in both bodies is unsatisfactory in terms of iron content; the highest value of the MPC multiplicity indicator in excess for iron was noted in both bodies of the Irsha River water (3.2 MPC).

According to the water permanganate oxidizability indicator, the greatest exceedance of the MPC, by 5.3 times, was observed in 2021 in the Irshansk Reservoir. This is the maximum excess among all hydrochemical indicators.

Analysing the graphs displaying the results of river water quality assessment in 2021, it should be noted that:

- in reservoir 1 (Irshansk Reservoir), the water is least polluted by manganese (0.006 MPC) and chlorides (0.07 MPC), and the most significant is permanganate oxidizability (3.7 MPC);
- in reservoir 2 (Malyn Reservoir) there is a high level of pollution according to the COD indicator (3.18 MPC) and total iron (3.2 MPC), and the highest value of the MPC exceeding the frequency indicator is acquired by permanganate oxidation (4.3 MPC). Compared to the previous year (2018), the concentration of sulphates (1.12 MPC) in this body decreased, in 2019, to a level below the norm (0.66 MPC).

Table 1 displays the results of a comprehensive assessment of surface water quality using the graphical method. The data clearly shows high values of the maximum permissible concentration (MPC) for COD, dissolved oxygen, general iron, and iron of permanganate oxidizability in both bodies during 2021–2022. In general, the river water in the two observation areas of the Irsha River does not meet the quality requirements.

Table 1

The results of the assessment of the river water pollution level according to the modified pollution index

Bodies	2021–2022		
	Pollution index	Class	Feature
Irsha river, 93 km from the mouth, Irshansk Reservoir, drinking water intake, Nova Borova village	1,074	III	moderately polluted
Irsha river, 31 km from the mouth, Malyn Reservoir, drinking water intake, Malyn	1,153	III	moderately polluted

The pollution index calculation by year in different bodies for the 2021–2022 period showed a decrease in water pollution in both bodies. Thus, a 12% reduction in pollution was observed in the Irshansk Reservoir, and pollution was reduced by 5.5% in the Malyn Reservoir.

5. CONCLUSIONS

A comprehensive assessment of surface water quality using graphical methods revealed that in 2021–2022 both bodies of water had high levels of indicators that exceeded the maximum permissible concentration of COD, dissolved oxygen, general iron, and iron of permanganate oxidizability. Therefore, one may conclude that the water in the Irsha River at the two observation sites does not meet quality requirements.

The Malyn reservoir (Irsha river, 31 km) has been identified as having the highest pollution level based on the revised pollution index. It is worth noting that both bodies of water in the Irsha River are classified as 'moderately polluted' and belong to class III of water quality, which indicates a significant anthropogenic impact. This impact is close to the limit of ecosystem sustainability.

To protect the environment and make rational use of natural resources, it is essential to implement the measures outlined in state and regional target programs. These measures will help to reduce the anthropogenic load and improve the condition of surface water bodies, especially in the Irsha River where pollution levels are currently high.

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