River Restoration and Revitalisation in Urban Areas: Exploring Opportunities for the Elassonitis River in Elassona, Greece

NIKOLAOS SAMARAS[1], EVRYDIKI TSOLA[2], CHRISTOS SAMARAS[3], ARIS SAPOUNAKIS[4]
[1]Department of Planning and Regional Development,
University of Thessaly,
Volos,
GREECE

[2]Faculty of Spatial Planning, Technical University of Dortmund,
Dortmund,
GERMANY

[3]Department of Architecture, University of Patras,
Patras,
GREECE

[4]University of Thessaly,
Volos,
GREECE

Abstract: - Throughout history, the role of rivers in urban areas has been vital and complex. Water elements have defined and embodied urban areas' structure, character, growth, economic relations, and social and environmental dynamics. Today, local authorities focus on restoration and revitalization projects in urban rivers as key urban elements for sustainable development. These efforts aim to enhance citizens' cultural memory and integrate rivers as essential elements of urban environments. The paper argues the importance of water elements in urban regeneration projects. It explores the possibilities for river restoration and revitalization through a case study of the Elassonitis River in the urban area of Elassona, Greece. We aim to identify the river's role in the community's life and the opportunities arising from its restoration. The methods used include surveys with the local community. The surveys detail the community's perceptions, needs, and expectations regarding river restoration. Lastly, it highlights the benefits of integrating water elements into urban regeneration, including environmental, social, and economic benefits. The case study of the Elassonitis River can influence similar projects in other regions, demonstrating the potential for rivers to become central elements of sustainable urban development.

Key-Words: - river, restoration, revitalization, regeneration, sustainable development, urban areas, Greece.

Received: June 4, 2024. Revised: October 14, 2024. Accepted: November 13, 2024. Published: December 3, 2024.

1 Introduction

Water has historically played an important role in the structure and development of urban areas. Many of the world's civilizations were set up near rivers, using these water sources for subsistence and economic growth. Rivers' proximity to urban areas supports transport and commercial activities, vital for economic relationships and cultural exchanges, [1]. In addition, rivers have influenced urban areas' cultural and artistic quality, functionality, and scale, [2].

In Europe, urban areas are often located close to rivers, which define the urban landscape and have historically acted as a source of energy for industrial activities, [3]. However, rivers also began to act as landmarks for urban areas, with buildings of significant architectural importance often located close to them. This contributed to the city's cultural identity, [4].

Greece is characterized by diverse and highly fragmented small—to medium-sized rivers and streams flowing through steep, narrow valleys. However, settlements were established in dry

climates to reduce the risks associated with diseases and extreme weather conditions, such as floods, intense rainfall events, and sudden snow or melt in high mountainous areas, [5].

In recent years, rapid urbanization and climate change have led to significant transformations of riversides in urban areas, [6]. These efforts primarily address social and environmental issues, contributing to and increasing the resilience of the river environment and broader urban areas, [7].

Modern water legislation aims to protect and restore rivers and their surroundings through sustainable water resource management, [8]. However, urban rivers are also prone to pollution that is related to household and industrial waste, [9]. Restoration of river ecosystems, enhancement of cultural and recreational value, improvement of water quality, development of green infrastructure, and adaptation to climate change are among the key outcomes of these revitalization and restoration projects, [10]. Riverside revitalization and restoration can be traced back to the regeneration projects in Paris in the 19th century. These projects aimed to revitalize degraded riverbanks by creating open green spaces and enhancing the quality of urban life within urban areas, [11]. As various scholars have demonstrated, rivers across the globe have been characterized by pollution and deterioration, [12]. The prevailing approach was transforming these spaces into new central areas to influence urban fabrics through regeneration projects. Western European countries, including Germany, France, the UK, Spain, and the Netherlands, promoted riverfront regeneration projects to improve the rivers and their surrounding areas, [13].

One of the most comparable examples of a river restoration project is the River Skerne in the UK. It was conducted by the River Restoration Project (RRP) between 1995 and 1998. The restoration project aimed to transform the abandoned urban industrial landscape into a riverside that the local community could use. The restoration focused on river morphology, using historical maps to guide the reintroduction of natural features. It is essential to mention that the restoration involved various organizations and stakeholders to ensure the river's aesthetic character and functionality, [14]. Another case is the Emscher River restoration project in the Ruhr Metropolitan Area, Germany, which aimed to transform the river from a heavily modified wastewater channel into a near-natural stream system. The project started in 1990; the 30-year project is driven by the need to comply with the European Water Framework Directive and enhance the river system's ecological and human benefits, [15]. In this project, several public engagement strategies were implemented. These comprise interactive areas along the river, information events, entertainment events, and follow-up information disseminated via various online platforms. These initiatives aim to inform and involve the local community, thereby raising general awareness about water management, [16].

Based on the above, participatory approaches are essential for incorporating diverse stakeholder perspectives and identifying collaborative solutions best suited for local cultures and societies. The involvement of different actors, especially the local community, can achieve better local economic and social outcomes, enhanced livelihoods, and mitigation of climate change, [17].

Fig. 1: The riverside of Elassonitis River

Our case study is about Elassona, a town in the southern region of Thessaly, Greece, located at the base of Mount Othrys. The municipality is primarily rural but also has some urban characteristics. The Elassonitis River, an important tributary of the Pineios River, divides the town of Elassona into two districts: the historic old city and the new town. The river plays a vital role in the Elassona environment, as its riverside includes diverse flora and fauna,

[18]. In addition, the river is linked to significant architectural and cultural elements of interest, such as the Stone Bridge and the Muslim Mosque. However, several issues, such as flooding and pollution from local industries, have affected the river. Furthermore, some riverside parts are vacant, abandoned, and inaccessible to the local community. The lack of restoration and management affects the local economy, environment, and social fabric, [19].

Our paper aims to examine the potential opportunities and strengths of the Elassonitis River in Greece, focusing on the perspectives of the local community. In particular, surveys were conducted with the local community to gain insight into the complex issues that are arising in the city of Elassona due to the river and to ascertain the river's role in the local community.

2 Methodology

The methodology carried out was field research, which is a qualitative method involving direct observations in the case study area and interactions with participants, [20]. This method focuses on the possibilities of upgrading the centers of settlements through the exploitation of the water element, through typical examples in Greece and abroad, and fieldwork that concerns the detection of the opinions of residents, entrepreneurs, and visitors of the city in the direction of exploring the potential of the Elassonitis River in Elassona, Greece, and the expectations of citizens from the regeneration of the river. The results based on the interviews will be analyzed through a correlation test that will be carried out between the responses of the citizens, visitors, and entrepreneurs. The One-Way ANOVA method was used, applying Tukey's test, [21].

The survey consists of two phases. During Phase A of the research, a 12-question structured questionnaire was addressed to a random sample of 35 visitors, 35 residents, and 20 entrepreneurs (Table 1) of the city of Elassona in September 2020, and it was completed face-to-face in the city of Elassona.

The questionnaire was repeated in Phase B, from 26/1 to 6/2/2021, to record possible changes in participants' perception of the Elassonitis River due to the mobility and publicity surrounding the announcement of the Architectural Competition for the riverside redevelopment. Due to the emergency measures in place to limit the transmission of COVID-19, this second Phase was completed by completing an online questionnaire using Google Forms. A total of 291 questionnaires were answered: 181 from residents of Elassona, 88 from visitors to the city, and 22 from entrepreneurs of the town.

Table 1. Questionnaire for the residents, the entrepreneurs, and the visitors of the city of Elassona

Questionnaire for the residents of the city	**Questionnaire for the visitors to the city**
Demographic Information	
Questions regarding the gender, age, and the educational level	
Questions About Living in Elassona	***Questions About Visiting Elassona***
Were you born in Elassona? If not, why did you move to Elassona? How long have you lived in Elassona?	Where do you live? Why did you visit Elassona? (Please specify the purpose of your visit)
In which neighborhood do you live in Elassona?	How many times have you visited the city of Elassona?
What do you like about the city of Elassona?	
What do you dislike about the city of Elassona?	
Would you recommend living in the city of Elassona to someone else?	
Would you recommend visiting the city of Elassona to someone else?	
City Characteristics	
Could you specify seven important characteristics related to the city of Elassona?	
Elassonitis River	
Does the Elassonitis River play a vital role in the character of the city? If yes, why?	
What would you like to be maintained or preserved in the Elassonitis River during the restoration/revitalization process?	
What is the most distracting or annoying thing for you about the Elassonitis River that should be changed in the revitalization process?	
How often do you visit the Elassonitis River? (e.g., very often, rarely, etc.)	
What uses would you like to see the riverside gain through the revitalization/restoration process? (e.g., public space, athletic facilities, cultural and artistic venues)	
Would you like to add any comments or suggestions regarding the Elassonitis River?	

The Phase A questionnaire, completed in person, was structured in two distinct parts. Part 1 was about Elassona, while Part 2 was about the Elassonitis River and its imminent regeneration. The questions of Part 2 of the Questionnaire: "What would you like to be maintained or preserved in the Elassonitis River during the restoration /revitalization process?" and "What is the most distracting or annoying thing for you about the

Elassonitis River?", in the process of a redevelopment, were 'open-ended' and allowed for a spontaneous response, freely formulated by the respondents, residents, visitors and entrepreneurs of the city. We asked the respondents to tell us what they thought were the best and worst things about the Elassonitis River.

The six answers that gathered the highest percentages among the answers of Phase A to the question about the Positive Elements of the Elassonitis River were the six choices in the corresponding question of Phase B, which was now formulated as a closed-ended questionnaire since the impossibility of completing the questionnaire by the face-to-face procedure could not ensure conditions of spontaneity in the answers. Similarly, the seven responses that scored the highest percentages among the reactions of Phase A to the question on the Negative Elements of the Elassonitis River constituted the seven choices in the corresponding closed-ended question of Phase B.

The IBM SPSS Statistics statistical processing program was utilized to analyse the results of the respondents' answers and characteristics combinations to identify statistically significant correlations. Correlation tests were conducted to ascertain the relationship between the responses of the three groups.

3 Results

The questions in Part 2 of the questionnaire: "What would you like to be maintained or preserved in the Elassonitis River during the restoration/revitalization process?" and "What is the most distracting or annoying thing for you about the Elassonitis River that should be changed in the revitalization process?" were 'open-ended' and allowed for a spontaneous response. The statistical analysis of the reactions is reflected below in Table 2, Table 3, Table 4 and Figure 3, Figure 4, Figure 5 (for positive items) and in Table 5, Table 6, Table 7 and Figure 6, Figure 7, Figure 8 (for negative items) for the Elassonitis River. Thus, among the responses of the city residents, in terms of what they like most about the Elassonitis River and would like to see preserved in the process of an upcoming redevelopment, 'The Riverside Vegetation' emerged 1st with 45%, 2nd 'The Stone Bridge' with 26%, 3rd 'The Natural Element' with 23% and 4th 'The Water Element' with 3%. 3% of respondents answered 'No Element'. Among the responses of visitors to the city, in terms of what they like most about the Elassonitis River and would like to see preserved in the process of an upcoming revitalisation, 'The Stone Bridge' was ranked 1st with a percentage of 31%, along with 'The Riverside Vegetation' and 'The Natural Element' in 2nd place with a percentage of 29% and 'The Water Element' in 4th place with a percentage of 3%. A percentage of 5% of the respondents answered 'Never Heard of It', and 3% of the respondents answered 'No Element'. Among the responses of the city's entrepreneurs, in terms of what they like most about the Elassonitis River and would like to see preserved in the process of an upcoming redevelopment, 'The Riverside Vegetation' was ranked 1st with 40%, 'The Natural Element' was ranked 2nd with 30%, and 'The Stone Bridge' was ranked 3rd with 20%. A percentage of 10% of respondents answered 'No Element'.

Table 2. The positive elements of the river should be preserved during its redevelopment, according to residents

Element	Frequency	Percent
The Stone Bridge	9	26%
The Riverside Vegetation	16	45%
The Natural Element	8	23%
The Water Element	1	3%
No Element	1	3%
Total	35	100%

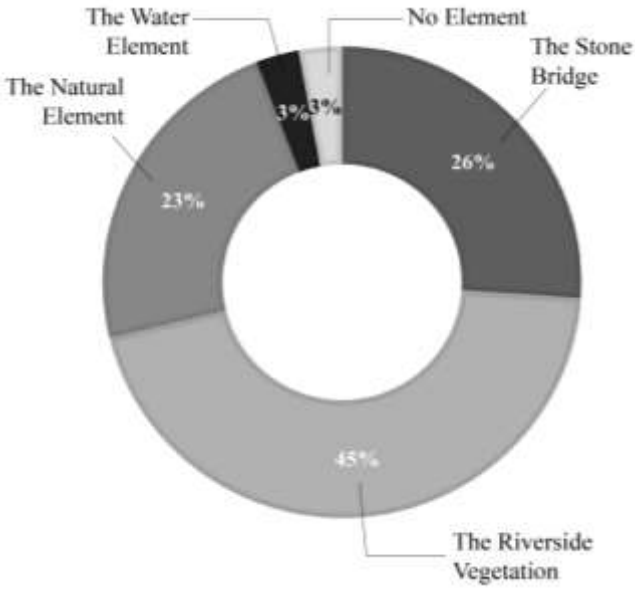

Fig. 3: The positive elements of the river that should be preserved during its redevelopment, according to residents.

Table 3. The positive elements of the river should be preserved during its redevelopment, according to visitors

Element	Frequency	Percent
The Stone Bridge	11	31%
The Riverside Vegetation	10	29%
The Natural Element	10	29%
The Water Element	1	3%
Never Heard of It	2	5%
No Element	1	3%
Total	35	100%

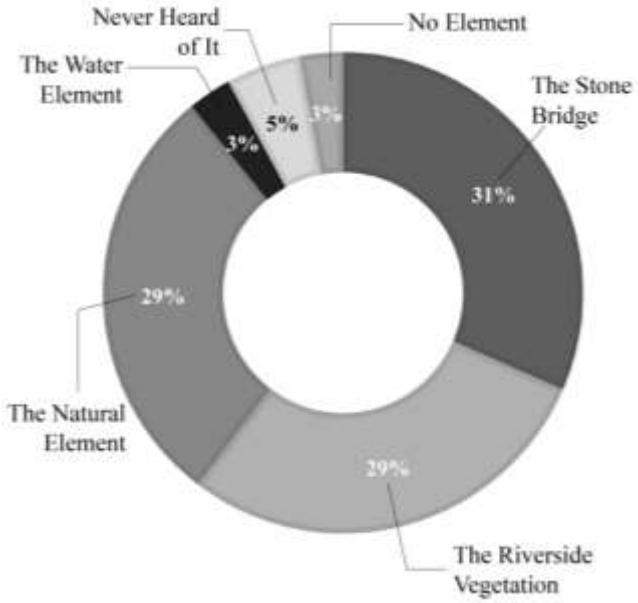

Fig. 4: The positive elements of the river that should be preserved during its redevelopment, according to visitors

Table 4. The positive elements of the river should be preserved during its redevelopment, according to entrepreneurs

Element	Frequency	Percent
The Stone Bridge	4	20%
The Riverside Vegetation	8	40%
The Natural Element	6	30%
No Element	2	10%
Total	20	100%

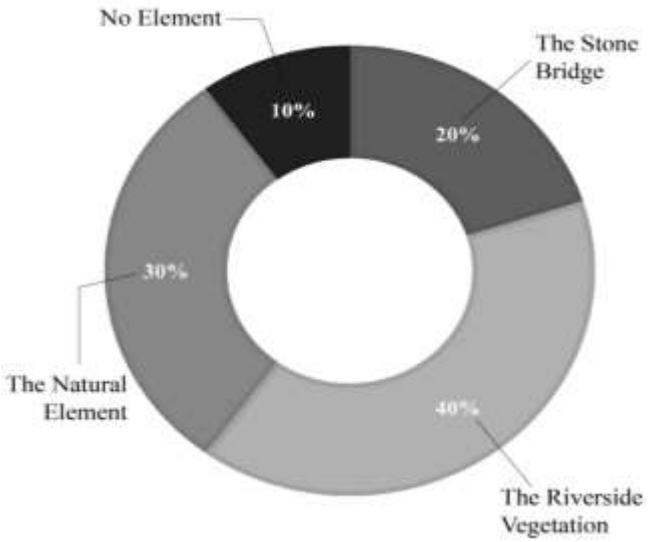

Fig. 5: The positive elements of the river that should be preserved during its redevelopment, according to entrepreneurs

As for the responses of the residents and visitors of the city, the statistical correlations (x^2) gave no result to indicate that: "What they would like to be maintained or preserved in the Elassonitis River during the restoration/revitalization process" relates to some of the "characteristics of the interviewed residents/visitors". The gender, age, occupation, and level of education of the interviewed residents and visitors did not differentiate the answers. With regard to the responses of the entrepreneurs in the city, the statistical correlation (x^2) was unable to demonstrate a relationship between the desire to maintain or preserve aspects of the Elassonitis River during the restoration and revitalization process and the type of economic activity.

Regarding what is most distracting in the Elassonitis River and should be corrected in the process of an upcoming redevelopment, among the residents of the city, 'The Industrial Pollution' and 'The Lack of Cleanliness' came in 1st place with a combined 34%, 'The Difficulty of Access' came in 3rd with 17%, 'The Unsteady Water Flow' came in 4th with 12%, and 'The City Divide' came in 5th with 3%. Among the responses from visitors to the city, in terms of what is most disturbing about the Elassonitis River that they would like to see corrected in the process of an upcoming redevelopment, 'The Unsteady Water Flow' came 1st with 34%, 2nd 'The Lack of Cleanliness' with 25%, 3rd 'The Difficulty of Access' with 14%, 4th 'The Industrial Pollution' with 9%, 5th 'The Unsightly Image' with 3%. A percentage of 6% of the respondents answered 'Never Heard of It', and 9% of the respondents answered 'No Element'. Among the responses of the entrepreneurs, in terms

of what is most distracting about the Elassonitis River and what they would like to see changed during the process of an upcoming redevelopment, 'The Unsteady Water Flow' emerged 1st with a percentage of 30% along with 'The Industrial Pollution' and 'The Difficulty of Access' in 2nd place with 20%, 'The Unsightly Image' in 4th place with 15%, 'The Lack of Cleanliness' in 5th place with 10% and 'The City Divide' in 6th place with 5%.

Table 5. The negative elements of the river should be preserved during its redevelopment, according to residents

Element	Frequency	Percent
The Industrial Pollution	12	34%
The Lack of Cleanliness	12	34%
The City Divide	1	3%
The Difficulty of Access	6	17%
The Unsteady Water Flow	4	12%
Total	35	100%

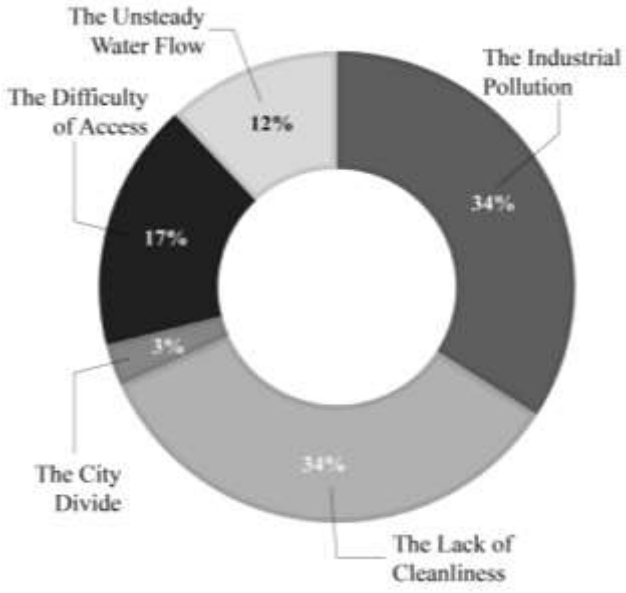

Fig. 6: The negative elements of the river that should be preserved during its redevelopment, according to residents

Table 6. The negative elements of the river should be preserved during its redevelopment, according to visitors

Element	Frequency	Percent
The Industrial Pollution	3	9%
The Lack of Cleanliness	9	25%
The Difficulty of Access	5	14%
The Unsteady Water Flow	12	34%
Never Heard of It	2	6%
The Unsightly Image	1	3%
No Element	3	9%
Total	35	100%

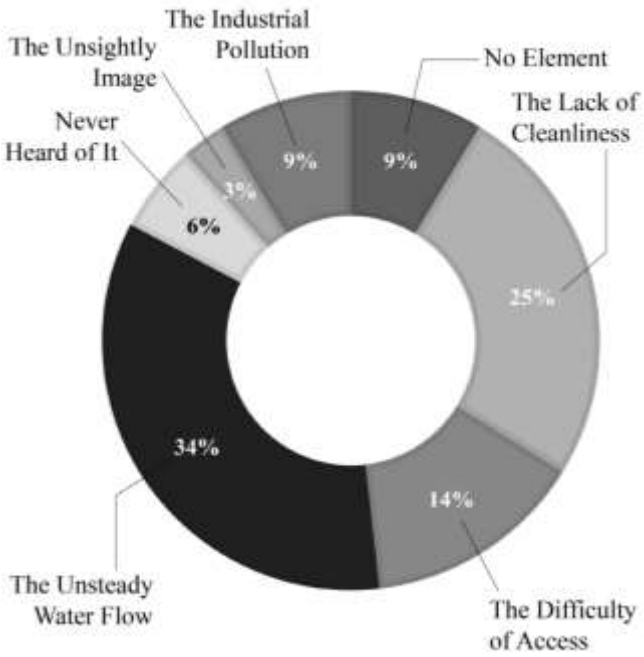

Fig. 7: The negative elements of the river that should be preserved during its redevelopment, according to visitors

Table 7. The negative elements of the river should be preserved during its redevelopment, according to entrepreneurs

Element	Frequency	Percent
The Industrial Pollution	4	20%
The Lack of Cleanliness	2	10%
The City Divide	1	5%
The Difficulty of Access	4	20%
The Unsteady Water Flow	6	30%
The Unsightly Image	3	15%
Total	20	100%

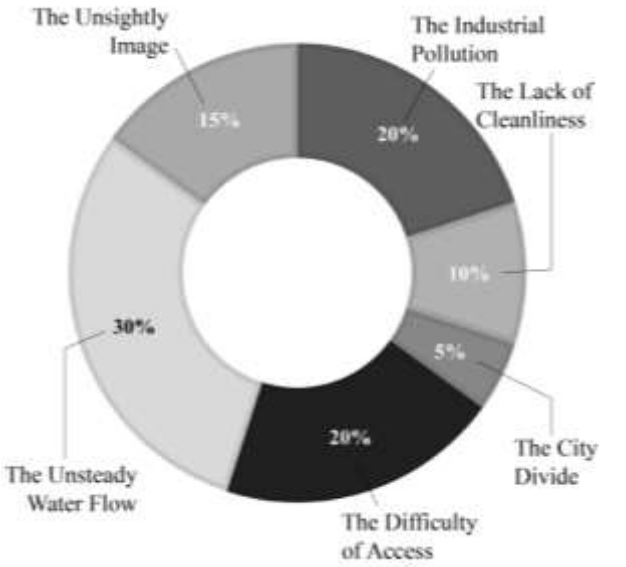

Fig. 8: The negative elements of the river that should be preserved during its redevelopment, according to entrepreneurs

Regarding the answers of the residents and visitors of the city referring to the harmful elements of the river, the statistical correlations (x^2) gave no result to indicate that: "What they consider as most distracting in the Elassonitis River and should be corrected in the process of an upcoming redevelopment" relates to some of the "characteristics of the interviewed residents/visitors". The gender, age, occupation, and level of education of the interviewed residents and visitors did not differentiate the answers. As for the responses of the entrepreneurs of the city, the statistical correlation (x^2) did not work to show that: "What they consider as most distracting in the Elassonitis River and should be corrected in the process of an upcoming redevelopment" relates to "the type of economic activity".

When the entrepreneurs of the city were asked the question: 'Do you think that the existence of the Elassonitis river helps in some way to carry out your business activity?' out of a total of 20 entrepreneurs interviewed, only 2 (10%) answered YES and 18 (90%) answered NO. Interestingly, the next 'open-ended' question is: 'Do you think the Elassonitis River, once redeveloped, could contribute to your business? If YES, in what way?', among the 18 entrepreneurs who answered NO to the previous question, 10 (56%) answered 'By attracting customers', 2 (11%) answered 'By expanding commercial activity to the countryside', and 6 (33%) said that they did not think that the river could contribute to their business activity 'But they want it to be redeveloped' (Figure 9).

Table 8. The contribution of the Elassonitis River, once redeveloped, to business activity, according to entrepreneurs

Way of contribution	Frequency	Percent
The redevelopment Will Attract Customers	10	56%
By Expanding Commercial Activity to the Countryside	2	11%
Will not Assist me But I Want it to be Redeveloped	6	33%
Total	18	100%

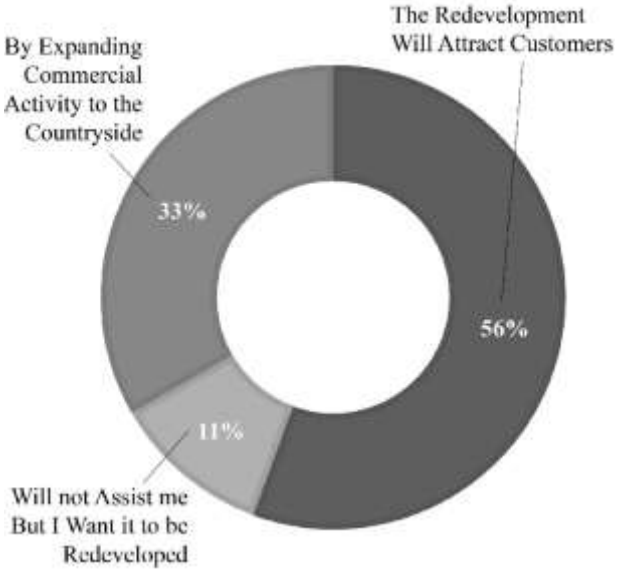

Fig. 9. The contribution of the Elassonitis River, once redeveloped, to business activity, according to entrepreneurs

A correlation test was conducted between the responses of the residents, visitors, and entrepreneurs to analyze the results of the three groups of respondents to the questions concerning the perceived positive and negative aspects of the Elassonitis River (Table 8). The One-Way ANOVA method was used, applying Tukey's test (Table 9). The comparison between the responses of the three groups of respondents indicated statistically significant differences in the question concerning the negative elements of the river, between the responses of residents and visitors, and between residents and entrepreneurs, but no statistically significant differences between the reactions of visitors and entrepreneurs.

Table 9. Multiple Comparisons between the responses of the three groups of respondents (residents/group 1, visitors/group 2, and entrepreneurs/group 3), about the Positive aspects and the Negative elements of the Elassonitis River, using the One-Way ANOVA method and applying Tukey's test

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Significance	95% Confidence Interval	
						Lower Bound	Upper Bound
What should be maintained? (Positive aspects)	1	2	-,17143	,29089	,826	-,8650	,5222
		3	-,35714	,34110	,549	-1,1705	,4562
	2	1	,17143	,29089	,826	-,5222	,8650
		3	-,18571	,34110	,850	-,9991	,6276
	3	1	,35714	,34110	,549	-,4562	1,1705
		2	,18571	,34110	,850	-,6276	,9991
What should be changed? (Negative elements)	1	2	-1,74286*	,43305	<,001	-2,7754	-,7103
		3	-1,52857*	,50779	,009	-2,7394	-,3177
	2	1	1,74286*	,43305	<,001	,7103	2,7754
		3	,21429	,50779	,907	-,9965	1,4251
	3	1	1,52857*	,50779	,009	,3177	2,7394
		2	-,21429	,50779	,907	-1,4251	,9965

*The mean difference is significant at the 0.05 level.

The comparison between the answers of the three groups of participants did not reveal any statistically significant differences in the question concerning the Positive aspects of the river. Indeed, among the answers of all three groups of respondents (residents, entrepreneurs, and visitors of the city), regarding what they like most about the Elassonitis River and would not want to see lost in the process of a forthcoming redevelopment, the first three positions emerged with exceptionally high percentages (Table 1, Table 2, Table 3 and Figure 1, Figure 2 and Figure 3), 'The Riverside Vegetation' (45% of residents, 40% of entrepreneurs, 29% of visitors), 'The Natural Element' (30% of entrepreneurs, 29% of visitors, 23% of residents), and 'The Stone Bridge' (31% of visitors, 26% of residents, 20% of entrepreneurs).

The observed increase in the percentage of responses 'The Riverside Vegetation', 'The Stone Bridge', 'The Natural Element' and 'The Water Element', and the corresponding decrease in the responses 'Never Heard of It' and 'No Element', from Phase A to Phase B, may not necessarily represent a change in people's perception of the Elassonitis River, due to the mobility and publicity surrounding the announcement of the Architectural Competition for the redevelopment of the river's riparian zone, and may be because these options were now among the proposed six responses. However, it is noteworthy that there is a convergence among the three groups of respondents (residents, entrepreneurs, and visitors to the city) in their top 3 responses in terms of what they like most about the Elassonitis River and would not want to see it lost in the process of an upcoming redevelopment.

4 Discussion

The relationship between rivers, cities, and surrounding landscapes has evolved. Rivers have consistently played a vital role in freshwater provision, sewage disposal, irrigation, transportation, and defense. People have frequently used rivers for specific needs, [22]. In the contemporary era, rivers are connected to leisure activities, societal norms, and cultural aspects within urban environments, [23]. However, several issues have emerged regarding riversides that need to be considered. The literature shows the importance of restoration and regeneration projects in riverside areas, addressing the challenges posed by climate change and high-density urbanization and providing suitable living environments and urban spaces, [24]. This paper aimed to examine the potential for restoration and revitalization of the Elassonitis River in Elassona, Greece. To this end, field research was conducted, focusing on surveys of the citizens of Elassona, the local entrepreneurs, and visitors to the area. The surveys tried to investigate the role of the Elassonitis River in the urban environment, its connection with other elements, and its strengths and weaknesses, as perceived by the participants.

Exploring the views of residents and entrepreneurs on "what they want their city to be like in the future" is a prerequisite for determining the objective goals of city marketing, [25]. The British and broader European experience highlights the vital role that civil society plays in the spaces that people manage. These places develop through use - rather than based on function - that promote inclusive collaboration and participation, are open to new members, and have the infrastructure for bottom-up management, [26]. Moreover, the involvement of residents in the place branding process is considered necessary, with three different roles they play: as an integral part of the place through their characteristics and behavior, as ambassadors with unquestioned credibility in communicating the message, and as citizens and

voters for political legitimacy. These three roles make residents a significant target group since only conscious participation and consultation can produce effective and sustainable - rather than an 'artificial' - place branding, which utilizes and reinforces, among other things, a lived - rather than an invented – tradition, [27], [28]. They are also prerequisites for marketing as a long-term process: a collective understanding and appreciation of place/city marketing and the achievement of broad cooperation with a clear division of roles, [29].

The findings of the field research showed that the necessity of restoration and regeneration of the riverside of Elassonitis is perceived by all participants. Residents and visitors of the city of Elassona expect, through an upcoming redevelopment of the river, the improvement and correction of negative elements such as 'Industrial Pollution', 'Lack of Cleanliness', 'Difficulty of Access', Unstable Water Flow', 'The Division of the City'. The entrepreneurs of the city, even if they do not believe that the river, after redevelopment, could contribute to their business activity, 'Want it to be Redeveloped'.

As in other case studies worldwide, the local community and visitors recognized the riverside's strengths and weaknesses within the urban area and identified interactions between the natural and the built environments, [24]. In particular, the environmental elements, including the water element, native vegetation, fauna, and flora, are noteworthy and require maintenance and protection. Furthermore, the participants acknowledged the significance of the area's cultural heritage, particularly the stone bridge as a prominent landmark and an integral component of the riverside landscape. Consequently, the cultural reclamation of the river by connecting the riverside with the cultural heritage of the area through paths and public spaces can enhance the attractiveness of the area and give a new image to the city of Elassona. On the other hand, the survey participants highlighted concerns regarding industrial and household pollution in the riverside, as well as the lack of cleanliness and accessibility in the riverside area. All of these characteristics that have affected the riversides are incorporated into restoration and regeneration programs.

The waterfront areas should be designated as recreational zones. The principal means of achieving this objective can be categorized as follows: firstly, the ecological functionality of the watercourse as an ecosystem should be enhanced; secondly, flood protection should be provided; thirdly, the residential, cultural, and recreational value of the area should be increased; and fourthly, permanently sustainable use of watercourses and their river valleys should be secured, [30].

Last but not least, it is crucial to emphasize the significance of the involvement of civil society, public administration, and individual citizens in urban restoration and regeneration projects. The decentralization of collective decision-making throughout all societal levels, including local communities, enables the acquisition of participatory skills. This, in turn, facilitates effective participation in the formulation of decisions that affect these communities, as well as the achievement of their aspirations and the strengthening of the community fabric, [31].

5 Conclusion

This research aimed to explore the relationships, influences, and opportunities arising from the restoration and revitalization of rivers in urban areas.

The study's results showed that most participants recognize the riverside's ecological features as strengths and opportunities to be considered in the restoration and revitalization process. Nevertheless, the riverside's pollution, caused by the area's industries, and the lack of accessibility and cleanliness are some of the weaknesses that the participants have identified.

The restoration and revitalization of rivers present challenges and opportunities important to urban areas' sustainable development and resilience. Due to their economic, cultural, and environmental benefits, rivers have always been important for the growth and development of civilizations. However, several challenges have been created in urban areas, such as rapid urbanization, and climate change, which should be addressed with a holistic approach based on the principles of sustainable development. In particular, it is important to prioritize the following objectives:

- Ecological restoration
- Enhancement of cultural and recreational values
- Improvement of water quality
- Development of green infrastructure and adaptation to climate change

Regarding river restoration projects, our case study could showcase the importance of community involvement and the influence of public opinion. Future regeneration projects should examine the

connection between the intervention area, the surrounding area, and the main transport axes. Furthermore, the integration of cultural and historical elements should be considered. It is essential to respect the landscape's character, especially the role of ecosystems in the waterfront areas, and to manage them sustainably. It's also important to recognize the area's history, including how we preserve and integrate some notable urban elements. The materials used in the intervention should be environmentally friendly and mitigate the high temperatures. Bioclimatic design approaches should ensure comfort and cooling conditions while avoiding effects such as glare from material reflections.

The present study has limitations. In particular, we did not have the opportunity to collect as many questionnaires as planned due to the COVID-19 restrictions. Lastly, given the methodological challenges involved, further research should focus on the impact of local community participation in river restoration and regeneration projects.

Acknowledgement:
We would like to express our gratitude to all the participants of the survey, as well as the public administration, for their invaluable contributions to the research process.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work the authors used Grammarly for language editing. After using this service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

References:

[1] L. H. Phong, 'The Relationship Between Rivers And Cities: Influences Of Urbanization On The Riverine Zones – A Case Study Of Red River Zones In Hanoi, Vietnam', *Sustainable Development and Planning*, vol. 193, pp. 27–43, 2015.

[2] E. Abshirini and D. Koch, 'Rivers as integration devices in cities', *City, Territory and Architecture*, vol. 3, no. 1, p. 1, 2016, doi: 10.1186/s40410-016-0030-4.

[3] European Environment Agency, 'Rivers and lakes in European cities', European Environment Agency, [Online]. https://www.eea.europa.eu/publications/rivers-and-lakes-in-cities (Accessed Date: June 26, 2024).

[4] M. Al Ani, 'Place Identity in Defining Urban Space of Border Rivers in Historical City Centres', *University of Baghdad Engineering Journal, ISSN: 1726-4073*, vol. 20, no. 2, pp. 150–168, 2014, doi: 10.31026/j.eng.2014.02.11.

[5] Mariolakos, I.D.. Ancient Greece and Water: Climatic Changes, Extreme Events, Water Management, and Rivers in Ancient Greece. In: Skoulikidis, N., Dimitriou, E., Karaouzas, I. (eds) *The Rivers of Greece. The Handbook of Environmental Chemistry*, vol 59. Springer, Berlin, Heidelberg, 2017, https://doi.org/10.1007/698_2017_474.

[6] M. Scott, M. Lennon, D. Haase, A. Kazmierczak, G. Clabby, and T. Beatley, 'Nature-based solutions for the contemporary city/Re-naturing the city/Reflections on urban landscapes, ecosystems services and nature-based solutions in cities/Multifunctional green infrastructure and climate change adaptation: brownfield greening as an adaptation strategy for vulnerable communities?/Delivering green infrastructure through planning: insights from practice in Fingal, Ireland/Planning for biophilic cities: from theory to practice', *Planning Theory & Practice*, vol. 17, no. 2, pp. 267–300, 2016, doi: 10.1080/14649357.2016.1158907.

[7] P. Veelen, 'Developing Resilient Urban Waterfronts: Integrating Adaptation into Urban Development and Management', pp. 189–218, 2017, doi: 10.1007/978-3-658-16759-2_9.

[8] J. Sendzimir and S. Schmutz, 'Challenges in Riverine Ecosystem Management', in *Riverine Ecosystem Management: Science for Governing Towards a Sustainable Future*, S. Schmutz and J. Sendzimir, Eds., Cham: Springer International Publishing, pp. 1–16, 2018, doi: 10.1007/978-3-319-73250-3_1.

[9] F. Mihai, L. Apostol, A. Ursu, and P. Ichim, 'Vulnerability of mountain rivers to waste dumping from Neamț County, Romania_Geographia Napocensis', *Geographia Napocensis*, vol. 6, no. 2, pp. 51–59, 2012, doi: 10.5281/zenodo.19126.

[10] L. Shi, S. Maruthaveeran, and M. J. Mohd Yusof, 'The Usage and Constraints of Urban River Corridor from a Socio-ecological Perspective: a Systematic Review: A Systematic Review', *Landscape Online*, p. 1121, 2024, doi: 10.3097/LO.2024.1121.

[11] K. Andersen, 'Spatial Equity in River Access. Measuring the Public Space Potential of Urban Riverbanks in Valdivia, Chile', *International Journal of Sustainable Development and Planning*, vol. 17, no. 1, pp. 1–12, 2022, doi: 10.18280/ijsdp.170101.

[12] R. K. Mishra, S. S. Mentha, Y. Misra, and N. Dwivedi, 'Emerging pollutants of severe environmental concern in water and wastewater: A comprehensive review on current developments and future research', *Water-Energy Nexus*, vol. 6, pp. 74–95, 2023, doi: 10.1016/j.wen.2023.08.002.

[13] J. Tort-Donada, A. Santasusagna, S. Rode, and M. T. Vadrí, 'Bridging the gap between city and water: A review of urban-river regeneration projects in France and Spain', *Science of The Total Environment*, vol. 700, p. 134460, 2020, doi: 10.1016/j.scitotenv.2019.134460.

[14] J. Prior, 'Urban river design and aesthetics: a river restoration case study from the UK', *Journal of Urban Design*, vol. 21, no. 4, pp. 1–18, 2016, doi: 10.1080/13574809.2016.1187557.

[15] N. V. Gerner, I. Nafo, C. Winking, K. Wencki, C. Strehl, T. Wortberg, A. Niemann, G. Anzaldua, M. Lago, S. Birk., 'Large-scale river restoration pays off: A case study of ecosystem service valuation for the Emscher restoration generation project', *Ecosystem Services*, vol. 30, part B, pp. 327–338, 2018, doi: 10.1016/j.ecoser.2018.03.020.

[16] J. Euler and S. Heldt, 'From information to participation and self-organization: Visions for European river basin management', *Science of The Total Environment*, vol. 621, no. 1, pp. 905–914, 2018, doi: 10.1016/j.scitotenv.2017.11.072.

[17] S. Moore, 'Researching Local Development Cultures: Using the Qualitative Interview as an Interpretive Lens', *International Planning Studies*, vol. 20, no. 4, pp. 390–406, 2015, doi: 10.1080/13563475.2015.1034253.

[18] N. Dimitrios, T. Souzana, and P. Stavroula, 'Arch Stone Bridges: Procedures for Evaluation of Structural Integrity', *International Journal of Architectural Heritage*, vol. 17, no. 9, pp. 1484–1504, 2023, doi: 10.1080/15583058.2022.2042624.

[19] S. Sboras, S. Pavlides, A. Kilias, D. Galanakis, A. Chatziioannou, and A. Chatzipetros, 'The Geological Structure and Tectonic Complexity of Northern Thessaly That Hosted the March 2021 Seismic Crisis', *Geotechnics*, vol. 2, no. 4, pp. 935–960, 2022, doi: 10.3390/geotechnics2040044.

[20] A. Tosun, A. Basar, B. Çağlayan, G. Çalikli, and B. Turhan, 'Field Studies', in *Recommendation Systems in Software Engineering*, pp. 329–355, 2014, doi: 10.1007/978-3-642-45135-5_13.

[21] A. Nanda, A. Mahapatra, and B. Mohapatra, 'Multiple comparison test by Tukey's honestly significant difference (HSD): Do the confident level control type I error', *International Journal of Applied Mathematics and Statistics*, vol. 6, no. 1, pp. 59–65, 2021, doi: 10.22271/maths.2021.v6.i1a.636.

[22] C. Hein, M. D'Agostino, C. Donkor, and Z. Sliwinska, 'Rivers as Connectors of Culture and Nature', *Blue Papers*, vol. 3, no. 1, pp. 6–9, 2024, doi: 10.58981/bluepapers.2024.1.ed.

[23] E. Anderson, S. Jackson, R.Tharme, M. Douglas, J.Flotemersch, M.Zwarteveen, Chi cu Lokgariwar, Mariana Montoya, Alaka Wali, G. Tipa, T. Jardine, J. Olden, Lin Cheng, J. Conallin, B. Cosens, C. Dickens, D. Garrick, D. Groenfeldt, J. Kabogo, D. Roux, A. Ruhí, A. Arthington, 'Understanding rivers and their social relations: A critical step to advance environmental water management', *WIREs. Water*, vol. 6, no. 6, pp. 1-21, 2019.

[24] M. B. Schlee, K. R. Tamminga, and V. R. Tangari, 'A Method for Gauging Landscape Change as a Prelude to Urban Watershed Regeneration: The Case of the Carioca River, Rio de Janeiro', *Sustainability*, vol. 4, no. 9, pp. 2054–2098, 2012, doi: 10.3390/su4092054.

[25] P. Kotler, C. Asplund, I. Rein, and D. Haider, Marketing Places Europe: How to Attract Investments, Industries, Residents and Visitors to Cities, Communities, Regions, and Nations in Europe. *Financial Times*, London, 1999.

[26] R. Gower, 'People-managed places', *Journal of Place Management and Development*, vol. 1, no. 3, pp. 315–321, 2008, doi: 10.1108/17538330810911299.

[27] E. Braun, M. Kavaratzis, and S. Zenker, 'My city - my brand: The different roles of residents in place branding', *Journal of Place Management and Development*, vol. 6, no. 1, pp. 18-28 2013, doi: 10.1108/17538331311306087.

[28] E. J. Hobsbawm, Ed., *The invention of tradition*, Canto ed., 18. print. in Canto. Cambridge: Cambridge Univ. Press, 2010.

[29] M. Kavaratzis and G. J. Ashworth, 'Place marketing: How did we get here and where are we going?', *Journal of Place Management and Development*, vol. 1, no. 2, pp. 150–165, Jul. 2008, doi: 10.1108/17538330810889989.

[30] T. Alokhina, 'Rivers revitalisation: approaches to decision', *E3S Web of Conferences*, vol. 166, no. 2, p. 01010, 2020, doi: 10.1051/e3sconf/202016601010.

[31] H. Sanoff, 'Community participation in riverfront development', *CoDesign: International Journal of CoCreation in Design and the Arts*, vol. 1, no. 1, pp. 61–78, 2010, doi: 10.1080/15710880512331326022.

Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

The authors equally contributed to the present research, at all stages from the formulation of the problem to the final findings and solution.

Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself Report potential sources of funding if there are any

The research project "Investigation of the possibilities of upgrading the Elassonitis River, in the city of Elassona" (Greece, October 2020 - February 2021), was funded by the Municipality of Elassona, with the administrative cooperation of the Special Account for Research Funds of the University of Thessaly.

Conflict of Interest

The authors have no conflicts of interest to declare.