



ENHANCING SAFETY STANDARDS IN ALBANIAN INLAND WATERWAYS

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Abstract

Albania's inland waterways represent an underused resource with the potential to support tourism, recreational activities, and local transport. However, the development of these waterways has been constrained by inadequate navigation infrastructure, an incomplete legal framework, and limited implementation of safety management practices. As a result, navigation safety remains one of the main challenges. This study explores the current state of navigation

safety in Albania's inland waterways by examining the views of the key stakeholders involved in navigation activities. Information was gathered through a structured questionnaire distributed to local authorities, private operators, and individual vessel operators. The collected data were analysed using descriptive statistical methods together with the Relative Importance Index (RII), allowing the study to identify the safety issues considered most critical and to establish priorities for future improvements. The findings suggest that, while national regulations are applied in some navigation areas, the overall safety system remains fragmented and falls short of internationally accepted standards. Respondents consistently highlighted the absence of emergency response plans and rescue services, the limited availability of navigational aids, insufficient alignment with international regulations, and shortcomings in basic navigation infrastructure. The survey also revealed a strong consensus on the need for better institutional coordination, more comprehensive training for vessel operators, and a clearer regulatory framework specifically designed for inland waterway navigation. This research provides one of the first evidence-based assessments of inland waterway navigation safety in Albania. The results can support national authorities in strengthening safety management, reducing operational risks, protecting inland aquatic ecosystems, and creating the conditions for the sustainable development of Albania's inland waterways in line with European practice.

Keywords: Inland waterways, navigation safety, stakeholders, navigational infrastructure, environmental protection

INTRODUCTION

Albania is a maritime country and has several commercial ports and marinas along its coast. On the other hand, various navigational activities are taking place in inland waterways. There are three significant lakes bordering Albania, with a few navigable rivers used primarily for passenger transport. These lakes and rivers play a crucial role in the country's inland navigation system (European Commission, 2011; UNECE, 2020). Lakes Bordering Neighbouring Countries are:

- Lake of Shkodra, bordered by Montenegro,
- Lake of Ohrid (Pogradec), bordered by North Macedonia,
- Lake of Prespa, bordered by North Macedonia and Greece.

To regulate and facilitate the cross-border navigation activities, there are bilateral agreements between Albania and neighbouring countries such as North Macedonia and Montenegro.

As for the rivers, the main navigation activities used to take place in these rivers:

- The Buna River, also known as the Bojana, is a 41-kilometer-long river in Albania and Montenegro that flows out of Lake Shkodra and empties into the Adriatic Sea. Until the last century (mid-70s), this river was navigable from the lake to the Adriatic Sea. Still, after that time, due to the deviation of one branch of the Drini riverbed and merging it with the Buna River, the sediments from the Drini River made it difficult to navigate.
- The Drini River is the longest in Albania, 285 kilometres long, with two major tributaries crossing through both Kosovo and North Macedonia – the White Drin and the Black Drin, and two distributaries – one discharging into the Adriatic Sea in the Gulf of Drin and the other into the Bojana (Buna) River.
- The Vjosa is a river in northwestern Greece and southwestern Albania. Its total length is approximately 272 kilometres, with 80 kilometres in Greece and 192 kilometres in Albania. This river was once navigable only in a short segment near the sea. Small vessels could travel upstream for a certain distance, but beyond that, the flow was too strong, making it unsuitable for navigation activities. There are no navigation activities taking place except for small-scale fishing.

This paper offers an overview and evaluation of Albania's inland waterways, examining their current state of safety and security, environmental sustainability, and role in the country's infrastructure. Albania's river systems, lakes, and other inland water bodies are vital resources for the ecosystem and various economic sectors, including transportation, fisheries, agriculture, and tourism (Bu, F., & Nachtmann, H. 2023). However, these waterways are not fully utilized due to several challenges related to governance, infrastructure, and environmental pressures. (Barros et al., 2022; Calderón-Rivera et al., 2024)

METHODOLOGY

This study adopted a quantitative survey approach to examine the current state of navigation safety on Albania's inland waterways. The research was designed to gather the opinions and practical experiences of stakeholders directly involved in inland navigation, as these groups are best positioned to evaluate the existing safety conditions and identify the most pressing challenges.

Data were collected using a single structured questionnaire specifically developed for this research. The questionnaire included closed-ended questions covering key aspects of inland waterway safety, including the existence and implementation of safety regulations, compliance with national and international standards, the availability of navigational aids,

emergency preparedness, supporting infrastructure, and the perceived importance of measures that could improve navigation safety. Most questions required respondents to select predefined answers, while a five-point Likert scale was used to assess the relative importance of different safety-related issues.

The survey was administered to a purposive sample of stakeholders representing the principal groups involved in inland navigation activities in Albania. These included representatives of local authorities, private operators, and individual vessel operators. This sampling approach ensured that the study captured perspectives from those with direct operational knowledge and practical experience of navigation on Albania's inland waterways.

After the questionnaires were collected, the responses were coded and analysed using descriptive statistical methods. Frequencies and percentages were calculated to provide an overview of the existing safety conditions and to illustrate the distribution of responses across the different stakeholder groups. To identify which safety measures were considered the highest priorities, the Relative Importance Index (RII) was calculated for the Likert-scale questions. The RII is a widely used technique for ranking factors according to respondents' evaluations and was computed using the following expression:

$$RII = \frac{\sum W}{A \times N}$$

Where,

W represents the weight assigned by each respondent, A is the highest possible rating on the Likert scale (5), and N is the total number of respondents. The resulting values range from 0 to 1, with higher values indicating greater perceived importance. The following table 1, shows the importance scale of the RII.

No	RII Value	Scale of importance
1	0.80 – 1.00	Very high importance
2	0.60 – 0.79	High Importance
3	0.40 – 0.59	Moderate importance
4	0.20 – 0.39	Low importance
5	0.00 – 0.19	Low importance

The combination of descriptive statistics and the Relative Importance Index provided a straightforward but robust basis for assessing the current safety situation and identifying the areas where stakeholders believe improvements are most urgently required. This methodological approach was considered appropriate given the exploratory nature of the study and the limited empirical evidence currently available on inland waterway navigation safety in Albania.

RESULTS

A total of 25 valid questionnaires were collected from stakeholders directly involved in or familiar with inland waterway transport in Albania. Respondents represented three main stakeholder groups:

- individual users (48%),
- local authorities (28%), and
- private operators (24%), ensuring that the survey captured perspectives from both public institutions and waterway users (Table 1).

Table 1. Respondent profile

Variable	Category	N	%
Stakeholder	Local authority	7	28%
	Individual	12	48%
	Private operator	6	24%
	Total	25	100%

Existing Safety Management Practices

The survey revealed considerable deficiencies in the current safety management framework governing Albanian inland waterways (Table 2). While 60% of respondents acknowledged the existence of safety regulations, only 48% believed that national regulations are effectively implemented in practice. Even fewer respondents (16%) indicated that international regulations are applied.

A notable finding is that all respondents (100%) confirmed that vessel operators are licensed, suggesting that licensing requirements are generally enforced. However, this positive finding contrasts sharply with the lack of operational safety infrastructure. None of the respondents reported the existence of emergency response plans or emergency services, while only 13.6% confirmed the presence of navigation aids within the waterways. These findings indicate that although administrative licensing procedures are in place, the supporting safety infrastructure and emergency preparedness systems remain largely underdeveloped.

Table 2. Existing safety management practices

Question	Yes	No	Percentage
Do the safety regulations exist?	15	10	60%
Are operators licensed	25	0	100%
Are national regulations applied?	12	13	48%

Table 2...

Are international regulations applied?	4	21	16%
Are there emergency plans available?	0	25	0%
Are there navigation aids in the nav. area?	3	22	13,6%
Are there emergency services available?	0	25	0%

Perceived Infrastructure Priorities

Respondents were asked to evaluate the importance of several infrastructure improvements using a five-point Likert scale. The Relative Importance Index (RII) was calculated to rank the proposed interventions.

Overall, general improvement of inland waterway infrastructure received the highest priority (RII = 0.864), followed by improved signaling systems (RII = 0.808). These two measures were considered to be of very high importance, indicating a strong consensus among respondents regarding the urgent need to modernize existing infrastructure.

The installation of navigation aids ranked third (RII = 0.728), followed closely by improvements in port facilities (RII = 0.712). Although these measures were still considered highly important, they were perceived as secondary to broader infrastructure modernization.

In contrast, dredging and increasing water depth (RII = 0.520) and channel maintenance (RII = 0.432) received comparatively lower rankings, although both remained within the moderate importance category.

The relatively small standard deviations (0.80–1.04 for the highest-ranked measures) indicate a reasonable degree of agreement among respondents.

Table 3. Perceived infrastructure priorities

Improvement	Mean	Median	St Err	St. dev	ΣW	RII	Rank
Improv. of infrastructure	4,32	5	0.160416125540213	0.802080627701064	108	0,864	1
Installation of Nav, aids	3,64	3	0.207203603572267	1.03601801786134	91	0,728	3
Dredging/ Water depth	2,6	2	0.382970843102535	1.91485421551268	65	0,52	5
Channel maintenance	2,16	2	0.19731531449265	0.986576572463249	54	0,432	6
Signaling	4,04	4	0.168126936172246	0.840634680861232	101	0,808	2
Port facilities	3,56	4	0.173973178009332	0.86986589004666	89	0,712	4

Sustainable Development Priorities

Respondents also evaluated measures considered essential for promoting sustainable inland waterway transport. Among the proposed initiatives, waste management emerged as the highest priority (RII = 0.816), representing the only measure classified as having very high importance.

Environmental assessment (RII = 0.776), implementation of green technologies (RII = 0.768), and regulatory improvements (RII = 0.760) all received similarly high evaluations, suggesting that respondents perceive environmental protection and regulatory strengthening as complementary components of sustainable waterway management.

Public awareness campaigns received the lowest rating (RII = 0.672), although this still falls within the category of high importance.

Overall, the results demonstrate that respondents prioritize practical environmental management actions over awareness-raising initiatives.

Table 4. Sustainable development

Improvement	Mean	Median	St Err	St. dev	ΣW	RII	Rank
Improvement of regulations	3,8	4	0.1914854215512 68	0.9574271077563 38	95	0,76	4
Environment assessment	3,88	4	0.1665332799572 91	0.8326663997864 53	97	0,776	3
Waste management	4,08	4	0.1624807680927 19	0.8124038404635 95	102	0,816	1
Public awareness	3,36	3	0.1989974874213 24	0.9949874371066 2	84	0,672	5
Green technologies	3,72	4	0.1781385228784 99	0.8906926143924 93	96	0,768	3

Role of Policy Makers

Respondents assigned a high level of responsibility to public institutions in improving inland waterway transport. Funding for infrastructure and development received the highest evaluation (RII = 0.912), making it the most important policy intervention identified in the survey.

The introduction of new regulations ranked second (RII = 0.800), indicating strong support for strengthening the legislative framework governing inland navigation.

Support for research and innovation (RII = 0.728) and stakeholder cooperation (RII = 0.640) were also regarded as important, although they received lower rankings than financial investment and regulatory reform.

These findings suggest that respondents consider institutional commitment and financial support to be the principal drivers for the future development of inland waterway transport in Albania.

Table 5. Role of Policy makers

Improvement	Mean	Median	St Err	St. dev	ΣW	RII	Rank
New regulations	4	4	0.191485421551268	0.957427107756338	100	0,8	2
Funding	4,56	4	0.153622914957372	0.76811457478686	114	0,912	1
Stakeholder cooperation	3,2	3	0.182574185835055	0.912870929175277	80	0,64	4
Research support	3,64	3	0.190438091427809	0.952190457139046	91	0,728	3

DISCUSSION

The results of this study offer one of the first stakeholder-based assessments of the current state of inland waterway safety and sustainable management in Albania. Although the survey was exploratory and involved a relatively small number of respondents, several clear patterns emerged that provide valuable insights into the challenges facing the sector and the priorities for its future development.

One of the most striking findings is the gap between the existence of regulations and their implementation. While most respondents acknowledged that safety regulations exist and all confirmed that vessel operators are licensed, less than half believed that national regulations are effectively applied in practice, and only a small minority reported the implementation of international standards. This suggests that the issue is not simply the absence of legislation, but rather the limited capacity to enforce it consistently. Such a gap between regulatory frameworks and practical implementation is not uncommon in countries where inland waterway transport is still at an early stage of development. This finding is consistent with previous European assessments highlighting implementation gaps (UNECE, 2020; European Commission, 2021).

The survey also revealed significant weaknesses in the existing safety infrastructure. The complete absence of emergency response plans and emergency services, together with the very limited availability of navigation aids, points to important shortcomings in the current safety system. Safe navigation depends not only on qualified operators but also on an

environment that supports safe vessel operations. Navigation aids, emergency preparedness, hydrographic information, and rescue services are fundamental elements of every modern inland waterway network. Their absence increases navigational risks and limits the opportunities for both commercial and recreational use of inland waterways. Similar safety components are emphasized by the ISM Code and PIANC guidance (IMO, 2021; PIANC, 2014).

These concerns are reflected in the respondents' ranking of infrastructure priorities. General infrastructure improvement received the highest importance rating, followed by improvements in signalling systems. Stakeholders clearly consider the current physical condition of inland waterways to be the main obstacle to their safe operation. Interestingly, dredging and channel maintenance were ranked lower than improvements to infrastructure and signalling. This may indicate that respondents perceive deficiencies in basic navigational infrastructure as a more immediate problem than channel depth itself. In other words, improving the visibility, accessibility, and overall functionality of waterways appears to be a higher priority than increasing navigable depth under current conditions.

The responses related to sustainable development reveal a similarly practical perspective. Waste management emerged as the highest-ranked environmental priority, followed by environmental assessment, green technologies, and improvements to the regulatory framework. These findings suggest that respondents associate sustainability with tangible environmental measures that can produce visible improvements in water quality and ecosystem protection. Although public awareness campaigns were also considered important, they received a lower ranking, possibly because stakeholders believe that institutional action and infrastructure investments should precede awareness-raising initiatives.

Another important outcome concerns the role of public institutions. Funding was identified as the most critical factor for improving inland waterway transport, followed by the introduction of new regulations. This reflects a broad recognition that meaningful progress cannot be achieved without sustained public investment. Infrastructure rehabilitation, installation of navigation aids, hydrographic surveys, environmental monitoring, and emergency response systems all require financial resources and long-term institutional commitment. At the same time, respondents also emphasized the importance of research and stakeholder cooperation, highlighting the need for evidence-based decision-making and closer collaboration among public authorities, local communities, and private operators.

Taken together, these findings suggest that improving inland waterway transport in Albania requires a coordinated and integrated approach. Infrastructure development, regulatory reform, environmental protection, and institutional strengthening should not be addressed as separate issues but as interconnected components of the same system. Experience from

European inland waterway networks demonstrates that safety and sustainability depend on the interaction between physical infrastructure, effective governance, technical standards, and continuous investment. Albania is still at an early stage in this process, but the priorities identified by stakeholders provide a clear roadmap for future action.

From a policy perspective, the results indicate several immediate priorities. The establishment of emergency response procedures, the installation of navigation aids, and the development of a modern signalling system should be considered essential first steps. These measures should be accompanied by stronger implementation of existing regulations, greater alignment with European inland navigation standards, and increased investment in technical capacity and institutional coordination. Such actions would not only improve navigational safety but would also create the conditions necessary for the future development of tourism, local transport, and environmentally sustainable economic activities along Albania's inland waterways. These priorities are consistent with the NAIADES III strategy and RIS recommendations (European Commission, 2021; UNECE, 2024).

This study has some limitations that should be acknowledged. The number of respondents was relatively small, reflecting the limited size of the inland waterway sector in Albania and the exploratory nature of the research. Consequently, the findings should not be interpreted as statistically representative of all stakeholders. Nevertheless, the consistency of the responses across different stakeholder groups provides confidence that the results capture many of the key issues currently affecting the sector. Future studies should expand the sample size and combine stakeholder perceptions with technical assessments of navigability, accident records, hydrographic surveys, and environmental data. Such an integrated approach would provide a more comprehensive basis for planning and policy development.

Overall, the study highlights that the challenges facing inland waterway transport in Albania are not limited to infrastructure alone. They also involve governance, institutional capacity, environmental management, and long-term investment. Addressing these issues through a coordinated national strategy will be essential if inland waterways are to become a safe, reliable, and sustainable component of Albania's transport system.

CONCLUSIONS

This study explored how different stakeholder groups perceive the current state of safety and sustainable management of inland waterway transport in Albania. Although inland waterways have considerable potential to support tourism, local transport, and regional economic development, the findings indicate that significant improvements are still needed before this potential can be fully realized.

One of the main conclusions is that the existence of regulations alone is not sufficient to ensure safe navigation. While respondents confirmed that vessel operators are licensed and that a basic regulatory framework exists, they also pointed to weaknesses in the practical implementation of these regulations, particularly with respect to international standards. This highlights the need to move beyond legislative compliance and focus on strengthening institutional capacity, monitoring, and enforcement. (Directive (EU) 2016/1629; UNECE, 2021)

The study also revealed major deficiencies in the existing safety infrastructure. The limited availability of navigation aids, together with the absence of emergency response plans and emergency services, represents a serious constraint for the safe operation of inland waterways. These findings suggest that improving physical infrastructure should be considered a national priority if inland waterway transport is to become a reliable component of Albania's transport system. (PIANC, 2014; IMO, 2021)

The ranking analysis further showed that respondents place the greatest importance on general infrastructure improvements, better signaling systems, and the installation of navigation aids. At the same time, environmental sustainability emerged as another key priority, with waste management, environmental assessment, and cleaner technologies receiving consistently high evaluations. These results indicate that stakeholders view safety and environmental protection as complementary rather than competing objectives.

An equally important outcome concerns the role of public institutions. Respondents clearly identified public investment as the most critical driver of future development, followed by regulatory improvements and support for research. This reflects a widespread perception that the successful development of inland waterways will depend on strong institutional leadership, long-term financial commitment, and effective cooperation among all relevant stakeholders.

Overall, the findings suggest that the development of inland waterway transport in Albania requires a comprehensive and coordinated approach. Investments in infrastructure should be accompanied by improvements in governance, stronger implementation of regulations, enhanced environmental management, and greater collaboration between public authorities, private operators, and local communities. Taken together, these measures would create the conditions necessary for safer navigation and contribute to the sustainable use of Albania's inland waterways. This integrated approach is also recommended in international guidance (PIANC, 2019; UNECE, 2020).

Although exploratory in nature, this research provides an initial evidence base on an area that has received very limited scientific attention in Albania. It is hoped that the results will contribute to future policy development and encourage further research on inland waterway transport as an integral part of the country's sustainable transport system.

LIMITATIONS AND FUTURE RESEARCH

Like any exploratory research, this study has several limitations that should be taken into account when interpreting the findings.

The first limitation relates to the size of the sample. The survey included 25 respondents representing the main stakeholder groups involved in inland waterway activities. While this number reflects the relatively limited development of the sector in Albania, it inevitably restricts the extent to which the findings can be generalized. The results should therefore be considered indicative of current stakeholder perceptions rather than representative of the wider population.

A second limitation is that the study is based on respondents' experiences and opinions. Perception-based surveys are valuable because they capture the views of those directly involved in the sector, but they do not always reflect actual operational performance. Individual experiences, professional backgrounds, and familiarity with specific waterways may influence how respondents assess existing conditions.

In addition, the research focused primarily on stakeholder perceptions and did not include technical investigations such as hydrographic surveys, navigability assessments, accident analyses, environmental monitoring, or economic feasibility studies. Incorporating these types of data would provide a more comprehensive understanding of the challenges and opportunities associated with inland waterway transport in Albania.

Finally, inland waterway transport in Albania is currently undergoing gradual institutional and infrastructural development. As new investments are made and regulatory reforms are introduced, stakeholder priorities and perceptions are likely to change. For this reason, the findings presented here should be regarded as a snapshot of the current situation rather than a definitive assessment of the sector.

Future research should build on this work by involving a larger number of respondents from different regions of the country and by combining survey-based methods with technical, environmental, and economic analyses. Such an interdisciplinary approach would provide stronger evidence to support strategic planning and policymaking for the sustainable development of Albania's inland waterways.

Despite these limitations, the study offers valuable baseline information on an area where empirical research remains scarce. By identifying the principal safety concerns, infrastructure needs, environmental priorities, and institutional challenges, it provides a useful starting point for both future academic research and evidence-based policy development.

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Author's individual contribution: Conceptualization – O. M. and SH.P. Methodology – O.M., SH.P Formal analysis – O.M and S.S and K.M. Resources E.TH and SH.P Curation – O. M and K. M. Writing- O. M. S.S and SH P.

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