

# Preparing, Adapting, Reconstructing: actions to promote climate change adaptation and risk disaster resilience in Italian and Croatian sensitive ecosystems

Work Package 1 - Activity 1.3 - Deliverable 1.3

“Reports mapping the relevant local stakeholders’ needs”

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## INTRODUCTION

In the framework of impacts related to climate change, water stock management is crucial to address and mitigate extreme phenomena that determine an overabundance or scarcity of water resources, with impacts on local production systems, citizens well-being and land management. To tackle this challenge, bePrepARed project aims to coordinate and integrate risk management tools, systems and policies aimed at improving the resilience of vulnerable ecosystems and landscapes historically managed on both sides of the Adriatic Sea, with a focus on water management. This is to create new high competence skills and practices for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia targeted areas, adapting them to a sustainable use of water resources in rural-urban landscapes, raising awareness of institutions and civil society on the risks related to water scarcity and the need for water saving and adaptation policies.

Two of the main aims of the project are:

- Creating **new high competence skills and practices** for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia areas, adapting them to a sustainable use of water resources in rural-urban landscapes.
- **Raising awareness of institutions and civil society** on the risks related to water scarcity and the need for water saving and adaptation policies.

In this framework, **activity 1.3** aimed at **identifying and networking all the institutional and social / economic stakeholders of the territorial communities** addressed by the project , to assess their current awareness state about the nature and seriousness of the challenge for water landscapes sustainable management and typify their needs for information, for recommendations for a change in behaviour in facing water and climate-related risks, for cultural and capacity building, towards a higher attentiveness to the implications of an ecosystem management more sound to the present, evolutionary, climate conditions.

The deliverable is made of 6 reports, one per each of the target areas of the project. The reports share a common introduction on the methodology used for stakeholders' mapping and for the



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preparation of the online questionnaires, while including different results specific for each of the 6 geographies.

## Delta del Po, Emilia-Romagna, ITALY

### THE IMPORTANCE OF STAKEHOLDER MAPPING IN CLIMATE ADAPTATION

The stakeholder mapping process is essential to ensure that decisions related to climate change adaptation are inclusive, representative, and based on solid evidence. Engaging various actors, from citizens to institutions, enhances the relevance, effectiveness, and credibility of adaptation plans, building trust and a collective mandate for implementing the necessary actions. By integrating local insights and concerns, mapping helps complement top-down approaches, fostering a sense of shared ownership and clarifying common goals.

In the context of the project, a structure has been adopted that considers the need to accurately identify and categorize the involved stakeholders. This process is crucial for building a solid evidence base, gaining political support, establishing effective governance structures, and understanding the roles and responsibilities of each actor. The framework used for mapping stakeholders is based on an analytical methodology that ensures accurate identification, avoiding biases that could compromise the representativeness and effectiveness of the engagement.

By adopting a transparent and robust approach, the mapping process allows the collection of key information on the behaviors, intentions, connections, resources, and influence of stakeholders. This information is then used to guide political decisions, improve understanding of the social and political feasibility of proposed actions, and effectively guide future developments in adaptation policies.

### STAKEHOLDER MAPPING FRAMEWORK

The structure of the stakeholder mapping for the bePrepARed project was carefully designed using the Tandem Guidance approach, which was also applied in the [Adaptation AGORA project](#). The Tandem framework serves as a valuable tool for fostering transdisciplinary collaboration and ensuring that stakeholder engagement is purposeful, systematic, and aligned with project objectives. It provides a structured set of elements and guiding questions, informed by empirical cases and prior



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frameworks, that enable stakeholders to engage meaningfully in collaborative learning processes, address shared challenges, and align on governance, risks, goals, and solutions. In the bePrepARed project, the stakeholder mapping for the Delta del Po case study follows this framework, with the goal of identifying the key actors involved, understanding their roles and interests, and determining how their involvement can shape both the issues at hand and the solutions proposed. The mapping structure includes several key components:

1. **Stakeholder Identification:** Each stakeholder or target group is clearly identified, including their contact details, role, and organizational affiliation. This ensures that the right individuals are engaged and that their contributions can be tracked throughout the project.
2. **Stakeholder Roles and Interests:** The roles that each stakeholder plays (e.g., decision-maker, expert, community member) are identified, along with the key interests or issues they care about. This helps to ensure that the project considers the priorities of all relevant stakeholders and addresses their specific concerns.
3. **Key Issues and Solutions:** For each stakeholder, we assess the specific issues they are either affecting or affected by, and similarly, the solutions they can contribute to or benefit from. This provides a comprehensive understanding of each stakeholder's position and potential impact on the project.
4. **Interest and Type of Participation:** The mapping includes a clear assessment of the level of interest each stakeholder has in participating in the project. Stakeholders are categorized based on their interest (e.g., high, low, none) and the type of participation they are expected to contribute (e.g., awareness, information sharing, consultation, discussion, co-design, co-decision making). This helps ensure that stakeholders are engaged at the appropriate level, allowing for meaningful contributions without overwhelming less interested parties.
5. **Means of Engagement:** Various engagement methods are identified, ranging from emails and phone calls to more interactive forms of participation like workshops or co-design sessions. This ensures that each stakeholder is reached using the most appropriate and effective communication channels.
6. **Engagement Status:** The mapping also tracks the status of each stakeholder's engagement (e.g., contacted, not contacted), which helps to monitor progress and identify any gaps in stakeholder inclusion.

An example of how the stakeholder mapping file was sent to each case study is present in the following image.



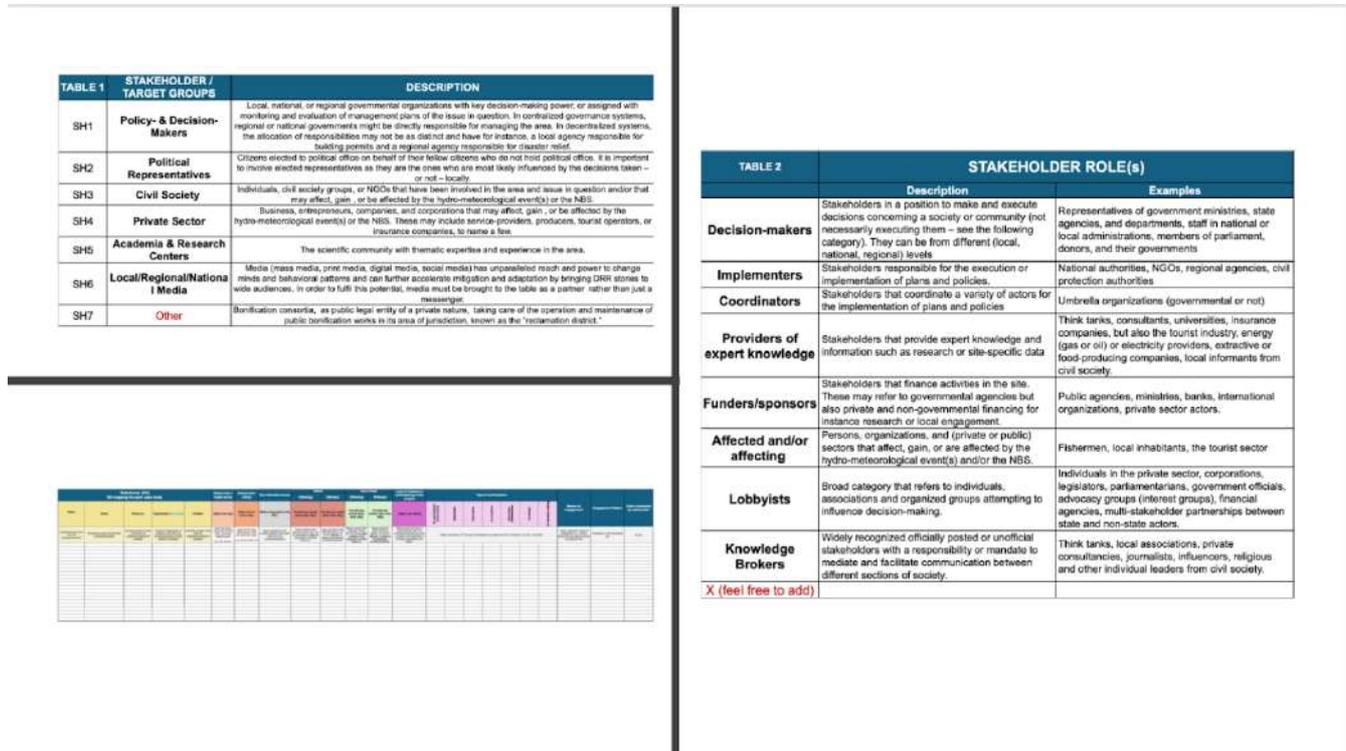


Figure 1

This structured approach to stakeholder mapping ensures that the bePrepARed project captures a diverse range of perspectives and effectively integrates stakeholders into the decision-making process. By using the Tandem framework, the project establishes a transparent, inclusive, and participatory foundation for tackling climate change and water resource management challenges in the Po Delta, within the Emilia-Romagna region.

Number of identified stakeholders in the Stakeholder Mapping process for the Po Delta case study: **38.**

## QUESTIONNAIRE ON NEEDS ASSESSMENT, STRUCTURE

The questionnaire has been structured to serve as a robust tool for gathering essential insights within the bePrepARed project. Its design reflects the need to conduct a comprehensive needs assessment, ensuring that the perspectives of key stakeholders - identified in the previous phase based on the structure described above - are accurately captured and integrated into the project's strategic development. By addressing various dimensions of water resource management and climate change



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adaptation, the questionnaire aims to bridge knowledge gaps, identify local challenges, and highlight opportunities for more effective and sustainable solutions.

To achieve this, the questionnaire is divided into seven thematic sections, each focusing on a specific aspect of stakeholder engagement and expertise. The first two sections (1-2) gather contextual information, identifying the respondent's role and their organization's involvement in water management and adaptation efforts. This allows for a clear mapping of stakeholders and their influence within the system. The third section (3) delves into perceptions of climate change impacts and associated risks, providing valuable qualitative and quantitative insights into how different actors experience and interpret these challenges in their respective regions. The fourth (4) and fifth (5) sections explore water both as a resource—identifying key needs, priorities, and constraints in its management—and as a source of impacts, assessing how water-related issues, such as floods or droughts, affect communities, economies, and ecosystems. The sixth section (6) is dedicated to Nature-Based Solutions (NBS), evaluating the feasibility and relevance of these innovative approaches within the respondents' local contexts. Finally, the seventh section (7) offers an open space for additional input, ensuring that the questionnaire captures perspectives that may not have been explicitly addressed in the structured questions.

A mix of multiple-choice and open-ended questions has been employed to balance structured data collection with the flexibility needed to incorporate stakeholder-specific insights. This methodological approach allows us to extract both quantifiable trends and nuanced qualitative responses, enhancing the reliability and applicability of the findings.

Ultimately, this questionnaire is more than just a data-gathering tool—it is a collaborative effort to shape effective climate adaptation and water management strategies. By participating, stakeholders directly contribute to the development of evidence-based solutions that align with real-world needs, reinforcing the overarching objectives of the bePrepARed project.

## INSIGHTS FROM THE NEEDS ASSESSMENT QUESTIONNAIRE

**Number of Participants:** 17

**List of the organizations and institutions involved in the questionnaire on local stakeholders' perceptions of water-related risks, opportunities, and challenges in Delta del Po, Emilia-Romagna, Italy:**

- Comune di Goro
- Consorzio di Bonifica della Romagna Occidentale
- FONDO AMBIENTE ITALIANO
- Former Director at the Emilia Romagna Region (now retired)
- Comune di Cervia



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### bePrepARed

- Consorzio di Bonifica Pianura di Ferrara
- Regione Emilia-Romagna
- Comune di Comacchio
- delta 2000 GAL/GalPA
- C.A.D.F. S.p.A.
- Regione Emilia-Romagna
- Associazione Volano Borgo Antico ODV
- Comune di Codigoro
- Regione Umbria
- Autorità di bacino distrettuale del fiume Po
- International Council of Museums Icom - Italia
- ANBI Emilia Romagna

#### **Role of the participants in their institution/organization:**

The participants hold a variety of roles within their institutions/organizations, including positions such as Technical Officer, Technical Director, and Regional Delegate for Environment, Climate, and Biodiversity. Some have responsibilities such as managing soil defense services in Ferrara and the Emilia Romagna coast, while others serve as Urban Planning Officials, European Project Managers, or Ecological Transition and Climate Change Coordinators within the Presidential Cabinet of the Regional Government. The group also includes positions like Chief Technical Officer in Planning Offices, Managing Directors, Department Heads, Delegates for UNESCO sites and protected areas, and Presidents of various sectors related to culture, tourism, and libraries. Additionally, there are roles such as Technical Environmental Officer, Presidents, and Coordinators.

#### **Geographical scale of reference of the respondents:**

All respondents to the questionnaire referenced the Delta del Po, Emilia-Romagna, Italy, as their primary geographic focus.

#### **Organization's role in the context of water resource management and/or climate change adaptation:**

The organization's role in the context of water resource management and/or climate change adaptation, as indicated by the survey participants, primarily focuses on **land and/or water resource planning, management, and protection**. Many respondents also emphasized the importance of **promoting environmental policies** and **monitoring and evaluating climate risks**. Additionally, several highlighted the significance of **economic and social development** in the region, along with **engaging local communities** in decision-making processes. Some responses also included an **"Other"** category, with participants suggesting further actions to be specified.



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**Perception related to the severity of climate change impacts in Delta del Po, Emilia-Romagna, Italy:**

Come valuteresti la gravità degli impatti del cambiamento climatico nella tua area?

17 risposte

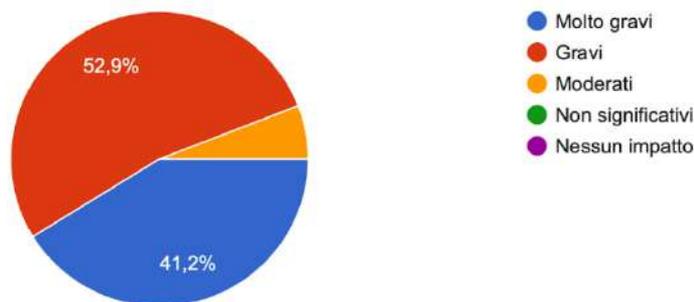


Figura 2

*Molto gravi* = **Very serious (41.2%)**

*Gravi* = **Serious (52.9%)**

*Moderati* = **Moderate (5.9%)**

*Non significativi* = **Not significant**

*Nessun impatto* = **No impact**

The results show that the majority of participants rated the issues as serious, with 52.9% choosing this option. A significant portion, 41.2%, considered the issues to be very serious, while a smaller group, 5.9%, rated them as moderate. No participants considered the issues to be not significant or of no impact.

**Main climate risks that affect Delta del Po, Emilia-Romagna, Italy:**

The main climate risks that affect the **Delta del Po**, in Emilia-Romagna, Italy, as highlighted by the survey responses, are multifaceted and represent a combination of both gradual and extreme climate impacts. The most prominent concern is **prolonged droughts**, which are seen as a significant threat to the availability of water resources in the region. These droughts, alongside **reduced river flow**, can lead to a shortage of water for agriculture, the ecosystem, and the local population, compounding the pressures already faced by the Delta's delicate natural environment.

**Extreme weather events**, such as **floods** and **storms**, are another major concern. The region is particularly vulnerable to the consequences of these events due to its geographical location and the dynamics of the river and coastal areas. These extreme weather events can cause direct damage to infrastructure, affect the daily life of local communities, and also harm ecosystems. Floods, in



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particular, pose a threat to agricultural land and habitats, potentially leading to long-term ecological and economic losses.

Another significant issue is **coastal and/or soil erosion**. The Delta del Po's coastal and wetland areas are particularly vulnerable to erosion due to both natural and human-induced factors. Rising sea levels, changes in rainfall patterns, and human interventions can exacerbate soil erosion, threatening habitats, agricultural land, and the region's overall resilience to climate change.

In addition to these immediate physical impacts, there is also concern over **the loss of biodiversity and natural habitats** in the Delta. This includes the destruction of wetlands and the degradation of other key habitats that support local wildlife. The combination of reduced water availability, changing weather patterns, and coastal erosion is making it increasingly difficult for these ecosystems to thrive, affecting both biodiversity and ecosystem services that are critical for the region. Finally, the **increase in average temperatures** adds another layer of complexity to the situation. Higher temperatures can exacerbate existing challenges such as drought, affect plant and animal life, and further impact agricultural productivity in the region.

Quali sono i rischi climatici maggiori che la tua area sta subendo? (Seleziona tutte le opzioni che ritieni rilevanti)

17 risposte

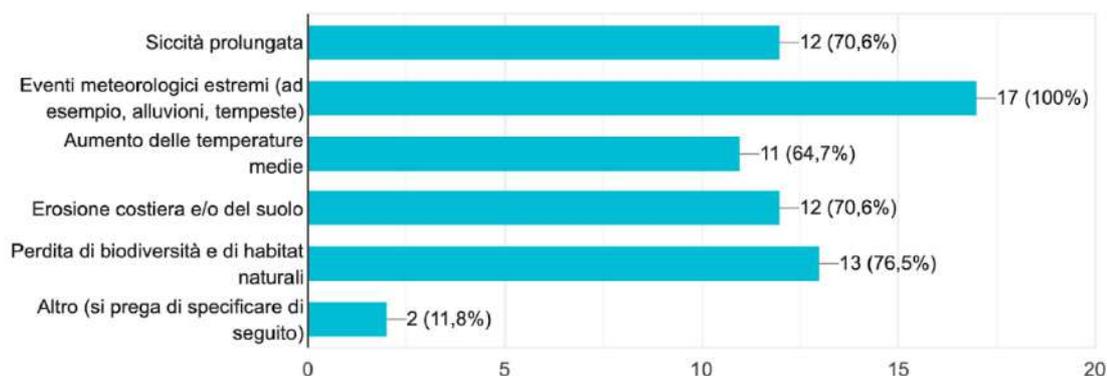


Figura 3

Siccità prolungata = **Prolonged droughts (70.6%)**

Eventi meteo estremi (e.g., flood, storm) = **Ext. weather events (e.g. floods, storms) (100%)**

Aumento temperature medie = **Increase in average temperatures (64.7%)**

Erosione costiera e/o suolo = **Coastal and/or soil erosion (70.6%)**

Perdita di biodiversità e habitat naturali = **Loss of biodiversity and nat. habitats (76.5%)**

Altro = **Other (11.8%)**



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The survey results show that extreme weather events (e.g., floods, storms) were identified as the most significant influence, with 100% of respondents highlighting this risk. Other key concerns include prolonged droughts (70.6%), coastal and/or soil erosion (70.6%), and loss of biodiversity and natural habitats (76.5%). Increase in average temperatures was also a notable factor, with 64.7% of participants acknowledging it. Additionally, 11.8% of respondents selected the "Other" category, indicating some additional influences not specified in the predefined options.

### **Primary Needs in Water Resource Management in Delta del Po, Emilia-Romagna, Italy:**

The primary needs in water resource management in the Delta del Po, Emilia-Romagna, Italy, identified through the survey responses, highlight several critical aspects of water management that are essential for the region's sustainability and resilience to climate change. A major concern expressed by participants is the prevention of water resource pollution, which has been frequently mentioned as a top priority. This reflects a strong awareness of the importance of maintaining water quality in the delta, given its vital role for local ecosystems, agriculture, and drinking water supply.

Another key need identified is promoting the sustainable use of water resources. Respondents recognize the need for careful management and conservation practices to ensure the availability of water for future generations while also supporting economic activities, particularly in agriculture and industry. This includes strategies such as reducing wasteful water use, improving efficiency, and fostering a more circular approach to water management. In addition to these concerns, there is a significant focus on improving the efficiency of irrigation and distribution systems. This need arises from the region's dependence on irrigation for agricultural activities, especially in the face of increasing droughts and irregular rainfall patterns linked to climate change. Optimizing irrigation systems is seen as crucial to maintaining crop yields and reducing water wastage, particularly during dry periods. The need for investments in water storage, particularly for irrigation purposes, is also emphasized, as securing a reliable supply of water during droughts is essential. Even though the Po River provides significant water flows, crises such as the one experienced in 2022 underline the vulnerability of the region to water shortages in times of prolonged drought. Another important consideration is the **saline wedge** intrusion, which poses a significant risk to the quality of water resources, especially for agricultural and drinking water use. Addressing this issue is critical to maintaining the region's water security.

Finally, ensuring a sufficient supply of drinking water was also identified as a pressing issue. Ensuring that the population has access to clean and safe drinking water is fundamental to public health, and the region's increasing vulnerability to climate impacts makes it essential to secure and manage water resources effectively. It was also highlighted that urban planning policies related to **green urban areas in coastal zones** need to be revised to enhance their role in managing water resources and mitigating climate change impacts. Furthermore, beyond physical interventions, it is equally important to foster **awareness and knowledge among citizens**. Solutions must be developed and



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communicated at the territorial level, ensuring that local communities are actively involved in decision-making processes.

Quali sono i principali bisogni relativi alla gestione delle risorse idriche nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

17 risposte

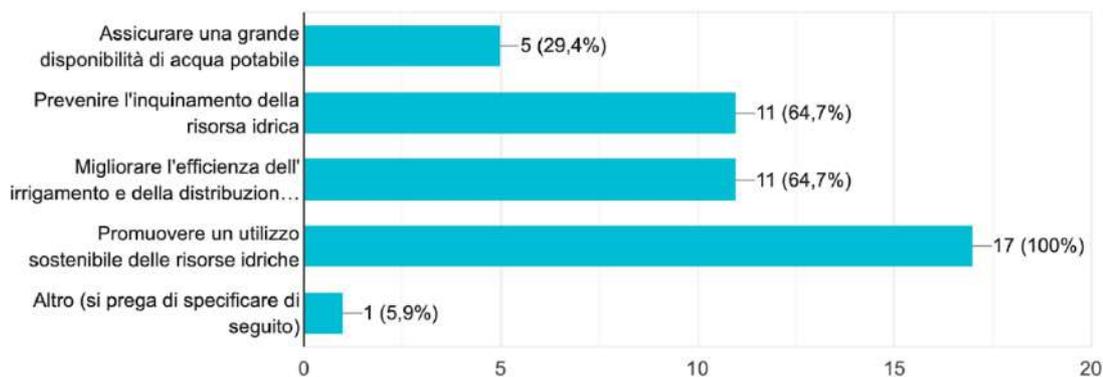


Figura 4

Assicurare una grande disponibilità di acqua potabile = **Ensure greater availability of drinking water (29.4%)**

Prevenire inquinamento della risorsa idrica = **Preventing pollution of water resources (64.7%)**

Migliorare l'efficienza dell'irrigamento e della distribuzione di acqua = **Improving the efficiency of irrigation and distribution systems (64.7%)**

Promuovere un utilizzo sostenibile delle risorse idriche = **Promoting sustainable use of water resources (100%)**

Altro = **Other (5.9%)**

The survey results show that 100% of participants highlighted the importance of promoting sustainable use of water resources, while 64.7% emphasized the need for preventing water resource pollution and improving the efficiency of irrigation and distribution systems. Additionally, 29.4% of respondents indicated the need to ensure greater availability of drinking water, and 5.9% selected



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"Other" as a response. These results underscore a clear consensus on the importance of sustainability and efficiency in water resource management.

### **Main Challenges in Water Resource Management in Delta del Po, Emilia-Romagna, Italy:**

The main challenges in water resource management in Delta del Po, Emilia-Romagna, Italy, as identified through the survey, are complex and multifaceted. One significant challenge is the **lack of awareness and/or technical expertise** among local stakeholders, which hinders effective water management. This issue is compounded by the **lack of adequate infrastructure**, which is increasingly inadequate to address the growing demands imposed by climate change effects. For instance, existing infrastructure must be adapted to cope with the changing water availability and the more extreme weather patterns that are being observed. The need for these adjustments is urgent to maintain water security in the region. Another key challenge is the **intensification of water use for agricultural crops**, particularly those that are becoming increasingly water-intensive and have been introduced without proper planning. The expansion of these crops, in the absence of sustainable water management strategies, adds additional pressure to already strained water resources. The competing demands from agriculture, industry, and tourism create **conflicts between different water users**, further complicating management efforts. Moreover, the region faces significant **demographic pressures and urbanization**, which exacerbate the stress on water resources. As populations grow and urban areas expand, the demand for water increases, further intensifying the conflicts between various sectors. A critical barrier to overcoming these challenges is the **lack of funds for investments** in the region, which limits the ability to implement the necessary changes in both infrastructure and practices. Without proper funding, addressing the effects of climate change, improving water management systems, and adapting to new agricultural practices becomes exceedingly difficult. These interconnected challenges emphasize the need for a comprehensive, integrated approach to water resource management, one that involves better planning, improved technical expertise, sufficient investment, and a balance of interests among all



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stakeholders.

Quali sono le maggiori sfide relative alla gestione delle risorse idriche nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

17 risposte

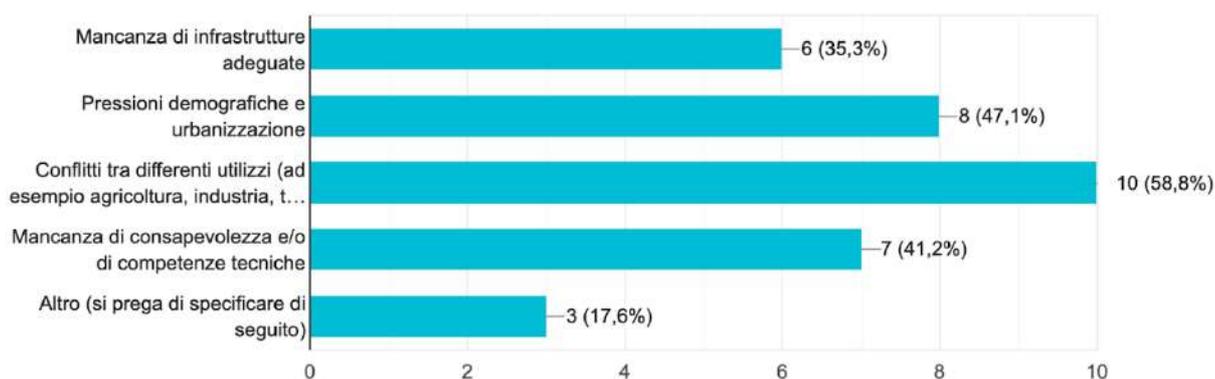


Figura 5

Mancanza di infrastrutture adeguate = **Lack of adequate infrastructure (35.3%)**

Pressioni demografiche e urbanizzazione = **Demographic pressure and urbanization (47.1%)**

Conflicti tra differenti utilizzi) e.g., agricoltura, industria, ..) = **Conflicts between different uses (e.g. agriculture, industry, tourism) (58.8%)**

Mancanza di consapevolezza e/o di competenze tecniche = **Lack of awareness and/or technical skills (41.2%)**

Altro = **Other (17.6%)**

The survey results show that the main challenges in water resource management are conflicts between different uses (e.g., agriculture, industry, tourism), which were identified by 58.8% of participants. Additionally, demographic pressure and urbanization were highlighted by 47.1%, while lack of awareness and/or technical skills was noted by 41.2%. Lack of adequate infrastructure was identified by 35.3% of respondents, and 17.6% selected "Other" as a response, suggesting additional factors not covered by the listed options.

### Priority Actions for Preserving Water Resources in Delta del Po, Emilia-Romagna, Italy:

Priority actions for preserving water resources in Delta del Po, Emilia-Romagna, Italy, emphasize the need for sustainable resource use across various sectors. Key actions involve implementing water accumulation systems and improving distribution efficiency, such as using basin systems to retain water during periods of both excessive rainfall and drought. Enhancing water use efficiency in agriculture and reducing waste within the drinking water supply chain are also crucial. Another priority is the promotion of sustainable irrigation systems and increased recycling of wastewater in urban areas. Infrastructure investments, including systems for storing and reusing water during dry



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periods, are essential to address water scarcity. Additionally, fostering better coordination and collaboration among decision-making bodies, sharing information, and aligning efforts are necessary to manage water resources effectively. Addressing the lack of adequate infrastructure and raising public awareness on the sustainable use of water, such as highlighting practices like watering lawns while closing public fountains, are also critical steps. Supporting investments in climate resilience and adopting a proactive, joint approach to managing extreme weather events, rather than relying on emergency measures, is fundamental. Lastly, integrating water and climate change topics into school curricula and creating cultural observatories that involve local associations and museums are also key initiatives.

### Main Influences on Water Resource Management in Delta del Po, Emilia-Romagna, Italy:

The main influences on water resource management in Delta del Po, Emilia-Romagna, Italy, include water quality issues such as river pollution, aquifer contamination, and saltwater intrusion, along with damages to infrastructure, people, and the built environment caused by extreme events like floods and torrential rains. There is also concern over reduced water availability, which is linked to prolonged droughts and decreased river flow. Furthermore, the loss of water-dependent ecosystems due to habitat degradation and the draining of wetlands is a significant factor. Economic and social impacts, including damage to agriculture and tourism, as well as conflicts over water use between sectors and communities, are additional key challenges.

Quali sono gli impatti maggiori relativi alla gestione delle risorse idriche nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

17 risposte

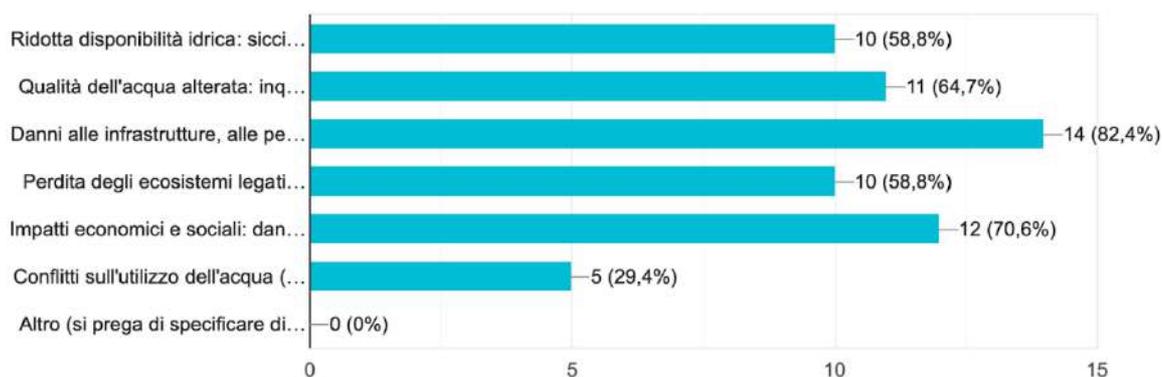


Figura 6

Ridotta disponibilità idrica = **Reduced water availability: prolonged droughts and/or reduced river flow (58.8%)**



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Qualità dell'acqua alterata = **Altered water quality: pollution of rivers, aquifers and/or saltwater intrusion (64.7%)**

Danni alle infrastrutture = **Damage to infrastructure, people and/or the built environment due to extreme events (e.g., floods, flash floods) (82.4%)**

Perdite degli ecosistemi legati all'acqua = **Loss of water-related ecosystems: reduction of natural habitats and/or draining of wetlands (58.8%)**

Impatti economici e sociali = **Economic and social impacts: damage to agriculture, tourism and high management costs (70.6%)**

Conflitti sull'utilizzo dell'acqua = **Conflicts over water use (between sectors and/or communities) (29.4%)**

Altro = **Other (0%)**

The survey results show that the most significant concern among participants is damage to infrastructure, people, and/or the built environment due to extreme events (82.4%), followed by altered water quality due to pollution and/or saltwater intrusion (64.7%). Additionally, economic and social impacts, including damage to agriculture and tourism (70.6%), and reduced water availability due to prolonged droughts and/or reduced river flow (58.8%) were also recognized as major issues. Loss of water-related ecosystems, such as reduction of natural habitats and draining of wetlands (58.8%), was another important concern, while conflicts over water use (29.4%) received less attention. No participants selected the "Other" category (0%).

### **Economic sectors most affected by water-related impacts in Delta del Po, Emilia-Romagna, Italy:**

In the Delta del Po region, Emilia-Romagna, Italy, the economic sectors most affected by water-related impacts are predominantly **agriculture**, which was mentioned in nearly every response. Other affected sectors include **tourism, public services and infrastructure**, and **industry**, with agriculture and tourism being particularly highlighted as the most vulnerable sectors. The combination of **agriculture, tourism, and public services and infrastructure** emerged as a significant concern across several responses, reflecting the broad impact of water-related challenges



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on both the local economy and infrastructure. er extreme weather events place additional burdens on local governments and taxpayers.

Quali settori economici sono più colpiti dagli impatti legati all'acqua? (Seleziona tutte le opzioni che ritieni rilevanti)

17 risposte

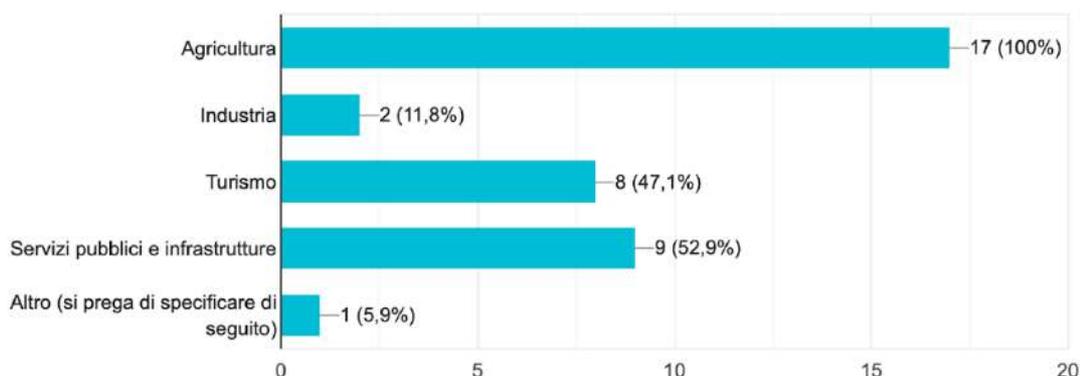


Figura 7

*Agricoltura* = **Agriculture**

*Industria* = **Industry**

*Turismo* = **Tourism**

*Servizi Pubblici e Infrastrutture* = **Public Services and Infrastructure**

*Altro* = **Other**

### Elements or factors most vulnerable to water-related impacts in Delta del Po, Emilia-Romagna, Italy:

In the context of water-related impacts in the Delta del Po, Emilia-Romagna, Italy, several factors are considered highly vulnerable. The area is particularly at risk from flooding due to intense weather events and water scarcity during drought periods. The coastal zone is among the most vulnerable, with marine erosion and the saltwater wedge intrusion threatening ecosystems, infrastructure, settlements, and tourism, which remains a key economic driver for the region. In general, the entire territory is vulnerable, impacting social systems, infrastructure, tourism, and agriculture. Among the most pressing concerns are rainwater drainage capacity, water quality in groundwater and rivers, and the effects of saltwater intrusion, particularly during drought periods that coincide with the peak summer tourism season. Agricultural crops, settlements in unsuitable areas, and the overall biodiversity of the region are also at risk. Effective and sustainable water management, the responsible use of water resources, and the quality and continuity of water distribution are critical factors. Challenges like flooding, coastal erosion, and saltwater intrusion also significantly impact



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tourism and agriculture. Due to the large area covered, the definition of the most vulnerable elements might be limiting. It is believed that all environmental systems connected to water resources, along with their related socio-economic sectors, are vulnerable, albeit to varying degrees and scales. Specifically, for the delta area, the main impacts are on the management of water resources, both in times of scarcity and during flooding events, with particular emphasis on agricultural activities and the availability of potable water.

### **Adaptation measures or solutions to be prioritized in Delta del Po, Emilia-Romagna, Italy:**

In the Delta del Po, Emilia-Romagna, Italy, the adaptation measures or solutions to prioritize should focus on sustainable resource management, including the development of irrigation water storage infrastructure and flood event regulation infrastructure. Key recommendations include enhancing land use planning, taking into account natural territorial characteristics, and promoting soil naturalization while reducing impermeabilization. Efforts to limit erosion phenomena with low environmental impact measures, as well as relocation and retreats in severely affected areas, are also crucial.

A more rationalized water resource management system, ensuring excess water is not wasted but reused during drier periods, is essential. In addition, the construction of systems that collect water during rainfall events for later use in irrigation should be prioritized. Infrastructural adjustments, including hydraulic safety interventions and energy and technological efficiency, are necessary to improve water quality and reduce water losses. The implementation of coastal defenses to protect against rising sea levels is also a priority.

Further, the introduction of water-saving policies, such as the expansion of rainwater harvesting basins and irrigation canals, is needed, along with efficient energy practices, especially regarding water use.

Green measures like renaturalization or Nature-Based Solutions (NBS) should also be prioritized, particularly in emergency management and long-term risk planning. The use of early warning systems, monitoring, and education on water resource management is vital. Moreover, integrating innovations, technologies, and water reuse will play a central role in achieving more sustainable water management in the region.

### **Adopted and Implemented Adaptation Policies and Measures in Delta del Po, Emilia-Romagna, Italy:**

In the Delta del Po, Emilia-Romagna, Italy, several adaptation policies and measures have been adopted and implemented in response to environmental challenges, particularly in water resource management and climate change adaptation. These measures include sustainable resource management, with actions like timely maintenance, project design for coastal defense and water management, and efforts to raise awareness among relevant authorities. There has also been a focus



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on citizen awareness regarding key environmental issues such as climate change, water management, and biodiversity.

Regarding coastal erosion, several causes have been identified, including reduced sediment transport to the sea, subsidence effects, the disappearance of dune systems, and the construction of rigid coastal structures such as port jetties and breakwaters. As a result, coastal defense interventions primarily focused on beach nourishment using sand from nearby areas and offshore deposits, while efforts to minimize rigid structures have been prioritized. However, the challenges have increased with the effects of climate change, such as sea level rise and more frequent and severe weather events.

In terms of water management, initiatives like the reduction of soil impermeability, attention to runoff speed, and the creation of retention basins have been implemented to protect urban areas. Collaboration between water management entities has facilitated infrastructure upgrades, studies, and defense actions against soil erosion, including the establishment of water retention basins and the promotion of water efficiency systems in agriculture.

Significant projects, such as the hydraulic safety improvement plan for Lidi Nord, aim to restore flood protection for urban areas, addressing intense rainfall events and improving drainage capacity. Furthermore, the GAL Delta 2000 supports sustainability initiatives through funding programs and environmental education in schools, emphasizing the importance of efficient water use and water quality improvement.

Local initiatives have also contributed to water sustainability, including water-saving actions and the promotion of reusable water bottles to reduce plastic consumption. Monitoring of water resources is carried out through systems like DEWS (Drought Early Warning System), used for both water use management and planning activities. Additionally, while some actions are still in the planning phase, such as engaging regional museums for education, there is a strong focus on efficient water usage and irrigation research in the region.

### **Relevant or Priority Nature-Based Solutions for Water Resource Management in Delta del Po, Emilia-Romagna, Italy:**

The responses from the questionnaire indicate that several Nature-Based Solutions (NbS) are considered highly relevant and a priority for water resource management and climate change adaptation in the Delta del Po, Emilia-Romagna, Italy.

River ecosystem restoration is a key focus across responses, emphasizing the importance of revitalizing river systems to enhance water quality, support biodiversity, and strengthen the resilience of the landscape to climate-related stresses. This solution is frequently highlighted as a critical intervention to restore natural processes and improve the overall health of the ecosystem. Another prominent priority is tree planting to improve water absorption and climate regulation. Participants suggest that increasing tree cover can significantly enhance the capacity of the land to absorb excess water, mitigate flooding, and help regulate local temperatures. This solution not only



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addresses water management but also plays a crucial role in promoting climate adaptation, improving air quality, and supporting biodiversity. The use of green infrastructure for flood mitigation also stands out, reflecting an increasing recognition of the role green solutions such as permeable surfaces, green roofs, and restored wetlands can play in managing stormwater, reducing flood risks, and enhancing overall urban and rural resilience. These nature-based approaches are seen as more sustainable and cost-effective alternatives to traditional grey infrastructure. The creation of wetlands for water management emerges as a vital solution in the region’s water management strategy. Wetlands are seen as essential for improving water retention, supporting biodiversity, and filtering pollutants. Their capacity to regulate water flow and mitigate the impacts of both droughts and floods is highly valued in the context of changing climate patterns. Lastly, biodiversity conservation is recognized as a foundational aspect of climate resilience. By preserving and enhancing biodiversity, ecosystems become more robust and better able to adapt to the pressures of climate change. This is closely tied to the protection of habitats and the overall health of the ecosystem, ensuring that the landscape can continue to support essential services such as water filtration, pollination, and soil stabilization.

Quale soluzione basata sulla natura consideri rilevante o una priorità per la gestione della risorsa idrica nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

17 risposte

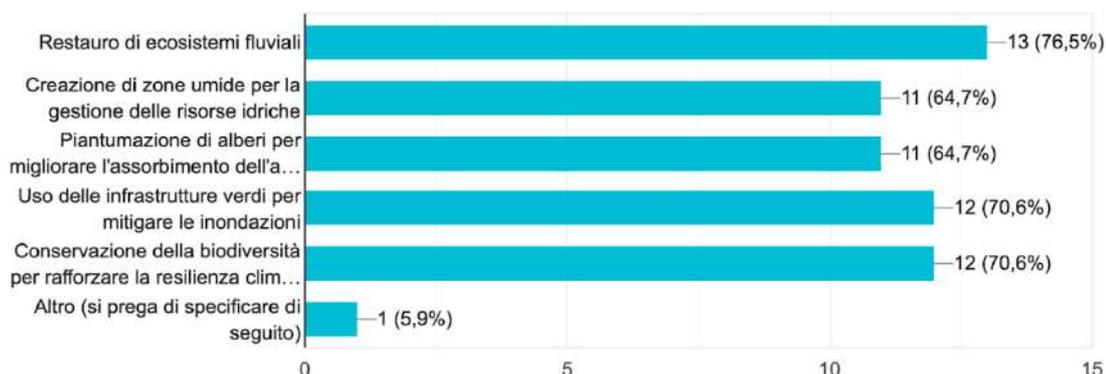


Figura 8

Restauro di ecosistemi fluviali = **River ecosystem restoration (76.5%)**

Creazione di zone umide per la gestione delle risorse idriche = **Creating wetlands for water management (64.7%)**

Piantumazione di alberi per migliorare l'assorbimento dell'acqua = **Planting trees to improve water absorption and climate regulation (64.7%)**

Uso delle infrastrutture verdi per mitigare le inondazioni = **Using green infrastructure for flood mitigation (70.6%)**

Conservazione della biodiversità per rafforzare la resilienza climatica = **Preserving biodiversity to strengthen climate resilience (70.6%)**



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Altro = **Other (5.9%)**

The survey participants showed strong support for River ecosystem restoration (76.5%), with Using green infrastructure for flood mitigation (70.6%) and Preserving biodiversity to strengthen climate resilience (70.6%) also receiving significant approval. Creating wetlands for water management (64.7%) and Planting trees to improve water absorption and climate regulation (64.7%) garnered moderate support. Lastly, Other (5.9%) received minimal responses.

### **Barriers to Implementing Nature-Based Solutions in Delta del Po, Emilia-Romagna, Italy:**

The implementation of Nature-Based Solutions (NbS) in the Delta del Po, Emilia-Romagna, Italy, faces several significant barriers. One of the primary challenges is the **lack of funding**. This issue is frequently cited, as financial resources are often limited or insufficient to support large-scale environmental projects. Without adequate funding, many proposed NbS initiatives cannot move beyond the planning phase or be effectively implemented.

Another major barrier is **policy conflicts**. Different sectors or levels of government may have conflicting priorities, leading to a lack of alignment in policies and objectives. This can cause delays in decision-making, duplication of efforts, or even the abandonment of promising projects. For example, policies aimed at economic development may clash with those focusing on environmental conservation, creating a tension that hinders progress in implementing NbS. In addition to policy conflicts, there is also a concern about **insufficient knowledge or technical support**. The lack of expertise in designing and implementing NbS means that solutions may not be properly tailored to local needs, or they may not be as effective as they could be. Technical challenges related to monitoring, data collection, and assessment also hinder the successful application of NbS, especially when the knowledge base is not fully developed or accessible. **Governance structures** present another barrier. The region's governance systems may be fragmented or lack the coordination necessary to implement NbS effectively. Multiple stakeholders, from local municipalities to national agencies, need to work together to create an integrated approach to environmental management. However, unclear roles, bureaucratic hurdles, or fragmented decision-making processes can lead to inefficiencies and delays in project implementation. Finally, **social or cultural resistance** can also pose a significant challenge. Local communities may be hesitant to adopt NbS if they are perceived as disruptive to traditional practices or land use. Cultural attitudes toward environmental management can vary, and in some cases, local stakeholders may prefer more conventional or proven methods over innovative nature-based approaches. This resistance can result in delays or even rejection of NbS projects, particularly if they are not aligned with the needs and preferences of the communities they aim to benefit.

In sum, these barriers—ranging from financial limitations to governance issues and cultural resistance—collectively complicate the successful implementation of Nature-Based Solutions in the Delta del Po. Addressing these challenges requires a coordinated effort across sectors, enhanced



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funding mechanisms, improved knowledge-sharing, and active community engagement to overcome resistance and build support for NbS initiatives.

Quali ostacoli prevedi nell'implementazione delle soluzioni basate sulla natura nel territorio su cui eserciti le tue funzioni? (Seleziona tutte le opzioni che ritieni rilevanti)

17 risposte

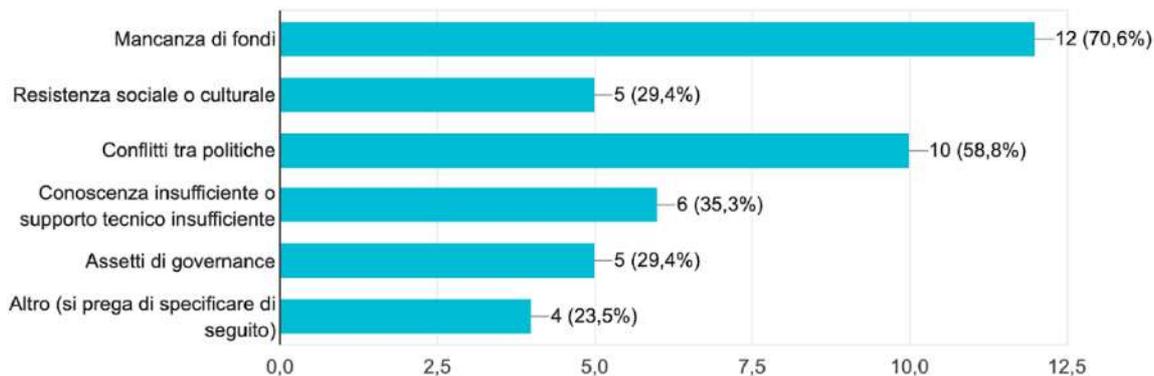


Figura 9

Mancanza di fondi = **Lack of funds (70.6%)**

Resistenza sociale e culturale = **Social or cultural resistance (29.4%)**

Conflitti fra politiche = **Conflicts between policies (58.8%)**

Conoscenza insufficiente o supporto tecnico insufficiente = **Insufficient knowledge or technical support (35.3%)**

Assetti di governance = **Management settings (29.4%)**

Altro = **Other (23.5%)**

The survey participants voted as follows: 70.6% identified lack of funds as the main issue, 58.8% pointed to conflicts between policies, and 35.3% highlighted insufficient knowledge or technical support. 29.4% mentioned social or cultural resistance and management settings, while 23.5% selected others.



### Interest in Receiving Key Results from the Questionnaire:

Desideri essere informato sui principali risultati del questionario?

17 risposte

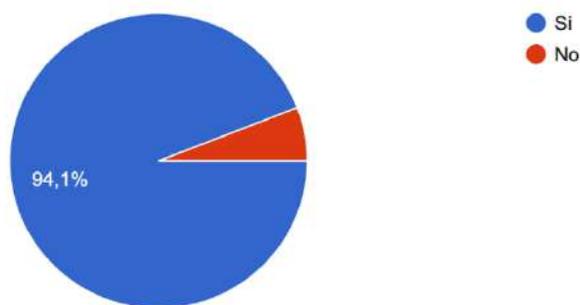


Figura 10

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# Preparing, Adapting, Reconstructing: actions to promote climate change adaptation and risk disaster resilience in Italian and Croatian sensitive ecosystems

Work Package 1 - Activity 1.3 - Deliverable 1.3

“Reports mapping the relevant local stakeholders’ needs”

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## INTRODUCTION

In the framework of impacts related to climate change, water stock management is crucial to address and mitigate extreme phenomena that determine an overabundance or scarcity of water resources, with impacts on local production systems, citizens well-being and land management. To tackle this challenge, bePrePARED project aims to coordinate and integrate risk management tools, systems and policies aimed at improving the resilience of vulnerable ecosystems and landscapes historically managed on both sides of the Adriatic Sea, with a focus on water management. This is to create new high competence skills and practices for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia targeted areas, adapting them to a sustainable use of water resources in rural-urban landscapes, raising awareness of institutions and civil society on the risks related to water scarcity and the need for water saving and adaptation policies.

Two of the main aims of the project are:

- Creating **new high competence skills and practices** for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia areas, adapting them to a sustainable use of water resources in rural-urban landscapes.
- **Raising awareness of institutions and civil society** on the risks related to water scarcity and the need for water saving and adaptation policies.

In this framework, **activity 1.3** aimed at **identifying and networking all the institutional and social / economic stakeholders of the territorial communities** addressed by the project, to assess their current awareness state about the nature and seriousness of the challenge for water landscapes sustainable management and typify their needs for information, for recommendations for a change in behaviour in facing water and climate-related risks, for capacity building, towards a higher attentiveness to the implications of an ecosystem management more sound to the present, evolutionary, climate conditions.

The deliverable is made of 6 reports, one per each of the target areas of the project. The reports share a common introduction on the methodology used for stakeholders mapping and for the preparation of the online questionnaires, while including different results specific for each of the 6 geographies.



## Parco San Bartolo, Marche, ITALY

# THE IMPORTANCE OF STAKEHOLDER MAPPING IN CLIMATE ADAPTATION

The stakeholder mapping process is essential to ensure that decisions related to climate change adaptation are inclusive, representative, and based on solid evidence. Engaging various actors, from citizens to institutions, enhances the relevance, effectiveness, and credibility of adaptation plans, building trust and a collective mandate for implementing the necessary actions. By integrating local insights and concerns, mapping helps complement top-down approaches, fostering a sense of shared ownership and clarifying common goals.

In the context of the project, a structure has been adopted that considers the need to accurately identify and categorize the involved stakeholders. This process is crucial for building a solid evidence base, gaining political support, establishing effective governance structures, and understanding the roles and responsibilities of each actor. The framework used for mapping stakeholders is based on an analytical methodology that ensures accurate identification, avoiding biases that could compromise the representativeness and effectiveness of the engagement.

By adopting a transparent and robust approach, the mapping process allows the collection of key information on the behaviors, intentions, connections, resources, and influence of stakeholders. This information is then used to guide political decisions, improve understanding of the social and political feasibility of proposed actions, and effectively guide future developments in adaptation policies.

## STAKEHOLDER MAPPING FRAMEWORK

The structure of the stakeholder mapping for the bePrepared project was carefully designed using the Tandem Guidance approach, which was also applied in the [Adaptation AGORA project](#). The Tandem framework serves as a valuable tool for fostering transdisciplinary collaboration and ensuring that stakeholder engagement is purposeful, systematic, and aligned with project objectives. It provides a structured set of elements and guiding questions, informed by empirical cases and prior frameworks, that enable stakeholders to engage meaningfully in collaborative learning processes, address shared challenges, and align on governance, risks, goals, and solutions. In the bePrepared project, the stakeholder mapping for the Parco San Bartolo case study follows this framework, with the goal of identifying the key actors involved, understanding their roles and interests, and determining how their involvement can shape both the issues at hand and the solutions proposed. The mapping structure includes several key components:



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1. **Stakeholder Identification:** Each stakeholder or target group is clearly identified, including their contact details, role, and organizational affiliation. This ensures that the right individuals are engaged and that their contributions can be tracked throughout the project.
2. **Stakeholder Roles and Interests:** The roles that each stakeholder plays (e.g., decision-maker, expert, community member) are identified, along with the key interests or issues they care about. This helps to ensure that the project considers the priorities of all relevant stakeholders and addresses their specific concerns.
3. **Key Issues and Solutions:** For each stakeholder, we assess the specific issues they are either affecting or affected by, and similarly, the solutions they can contribute to or benefit from. This provides a comprehensive understanding of each stakeholder's position and potential impact on the project.
4. **Interest and Type of Participation:** The mapping includes a clear assessment of the level of interest each stakeholder has in participating in the project. Stakeholders are categorized based on their interest (e.g., high, low, none) and the type of participation they are expected to contribute (e.g., awareness, information sharing, consultation, discussion, co-design, co-decision making). This helps ensure that stakeholders are engaged at the appropriate level, allowing for meaningful contributions without overwhelming less interested parties.
5. **Means of Engagement:** Various engagement methods are identified, ranging from emails and phone calls to more interactive forms of participation like workshops or co-design sessions. This ensures that each stakeholder is reached using the most appropriate and effective communication channels.
6. **Engagement Status:** The mapping also tracks the status of each stakeholder's engagement (e.g., contacted, not contacted), which helps to monitor progress and identify any gaps in stakeholder inclusion.

An example of how the stakeholder mapping file was sent to each case study is present in the following image.



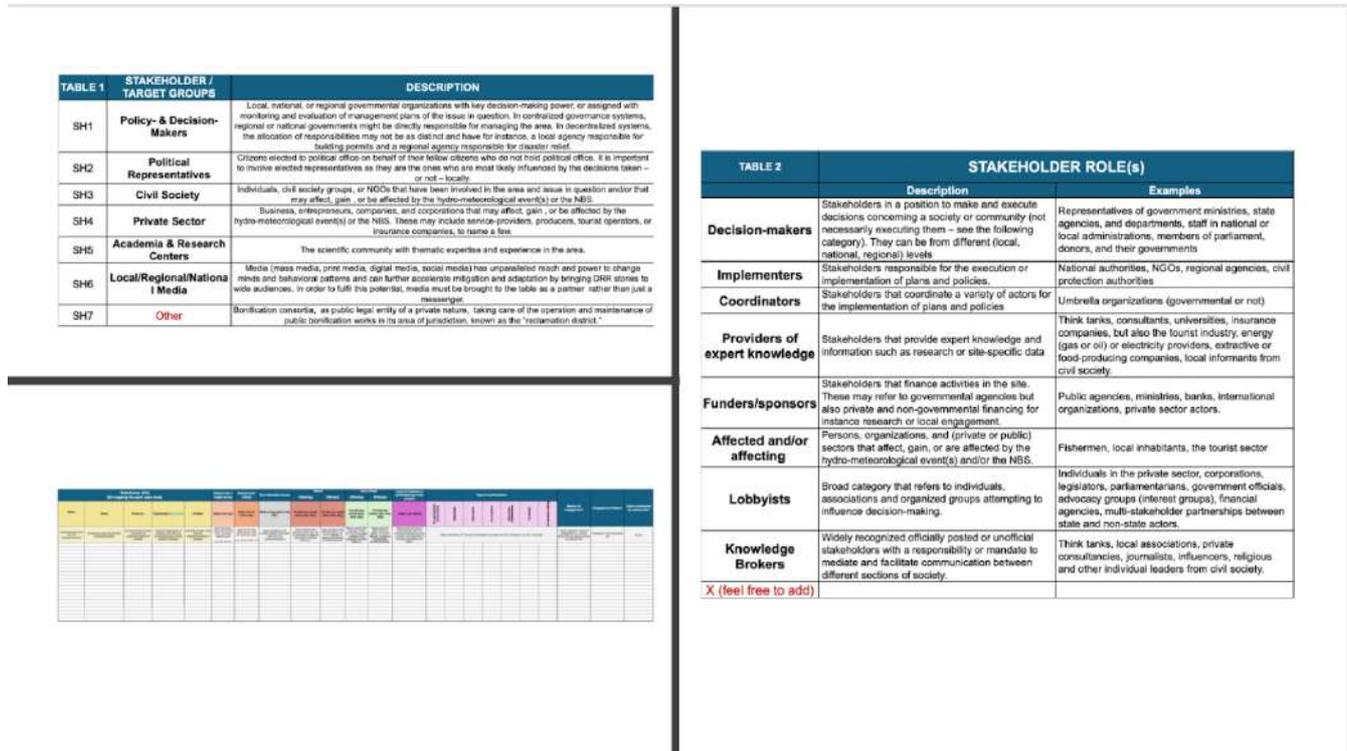


Figure 1

This structured approach to stakeholder mapping ensures that the bePrepared project captures a diverse range of perspectives and effectively integrates stakeholders into the decision-making process. By using the Tandem framework, the project establishes a transparent, inclusive, and participatory foundation for tackling climate change and water resource management challenges in the San Bartolo Park area, within the Marche region.

Number of identified stakeholders in the Stakeholder Mapping process for the San Bartolo Park case study: **26**.

## QUESTIONNAIRE ON NEEDS ASSESSMENT, STRUCTURE

The questionnaire has been structured to serve as a robust tool for gathering essential insights within the bePrepared project. Its design reflects the need to conduct a comprehensive needs assessment, ensuring that the perspectives of key stakeholders - identified in the previous phase based on the structure described above - are accurately captured and integrated into the project's strategic development. By addressing various dimensions of water resource management and climate change



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adaptation, the questionnaire aims to bridge knowledge gaps, identify local challenges, and highlight opportunities for more effective and sustainable solutions.

To achieve this, the questionnaire is divided into seven thematic sections, each focusing on a specific aspect of stakeholder engagement and expertise. The first two sections (1-2) gather contextual information, identifying the respondent's role and their organization's involvement in water management and adaptation efforts. This allows for a clear mapping of stakeholders and their influence within the system. The third section (3) delves into perceptions of climate change impacts and associated risks, providing valuable qualitative and quantitative insights into how different actors experience and interpret these challenges in their respective regions. The fourth (4) and fifth (5) sections explore water both as a resource—identifying key needs, priorities, and constraints in its management—and as a source of impacts, assessing how water-related issues, such as floods or droughts, affect communities, economies, and ecosystems. The sixth section (6) is dedicated to Nature-Based Solutions (NBS), evaluating the feasibility and relevance of these innovative approaches within the respondents' local contexts. Finally, the seventh section (7) offers an open space for additional input, ensuring that the questionnaire captures perspectives that may not have been explicitly addressed in the structured questions.

A mix of multiple-choice and open-ended questions has been employed to balance structured data collection with the flexibility needed to incorporate stakeholder-specific insights. This methodological approach allows us to extract both quantifiable trends and nuanced qualitative responses, enhancing the reliability and applicability of the findings.

Ultimately, this questionnaire is more than just a data-gathering tool—it is a collaborative effort to shape effective climate adaptation and water management strategies. By participating, stakeholders directly contribute to the development of evidence-based solutions that align with real-world needs, reinforcing the overarching objectives of the bePrepared project.

## INSIGHTS FROM THE NEEDS ASSESSMENT QUESTIONNAIRE

**Number of Participants:** 7

**List of the organizations and institutions involved in the questionnaire on local stakeholders' perceptions of water-related risks, opportunities, and challenges in Parco San Bartolo, Marche, Italy:**

Parco del Conero

Italian Alpine Club (CAI) – Pesaro Section

Municipality of Gabicce Mare

Greenpeace

Association La Lupus in Fabula Odv



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La Ginestra del San Bartolo

### **Role of the participants in their institution/organization:**

Several representatives from various organizations and institutions participated in the questionnaire, holding diverse roles within their respective entities. Among them were a Director, two Vice Chairperson(s), a Vice Mayor, a Volunteer, the Head of the Environment Office and Contract Management, and a Secretary/Office Manager. Their different positions reflect a broad range of expertise and responsibilities, contributing valuable perspectives on water-related hazards, opportunities, and challenges in their respective areas.

### **Geographical scale of reference of the respondents:**

All respondents to the questionnaire referenced the Parco San Bartolo, Marche region, as their primary geographic focus.

### **Organization's role in the context of water resource management and/or climate change adaptation:**

The work of the respondents focus on key areas such as planning, management, and protection of land and water resources, promotion of environmental policies, monitoring and evaluation of climate risks, economic and social development of the area, and involvement of local communities. Additionally, their efforts include supporting sustainable infrastructure—such as excursion trail systems and secondary roads—to foster territorial development through regenerative economic, environmental, and social policies. A crucial aspect of their work is also raising awareness and proposing solutions to environmental challenges, ensuring that local communities are informed and actively engaged in sustainable initiatives.

### **Perception related to the severity of climate change impacts in Parco San Bartolo, Marche, Italy:**



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Come valuteresti la gravità degli impatti del cambiamento climatico nella tua area?

7 risposte

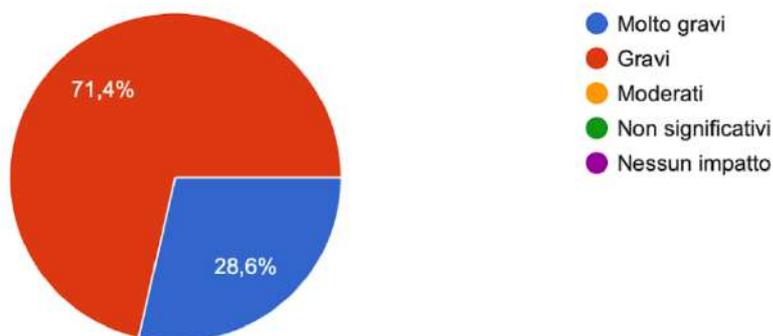


Figure 2

*Molto gravi* = **Very serious (28.6%)**

*Gravi* = **Serious (71.4%)**

*Moderati* = **Moderate**

*Non significativi* = **Not significant**

*Nessun impatto* = **No impact**

Most respondents indicated that they perceive the severity of climate change impacts in the area as serious (71.4%) or very serious (28.6%).

### Main climate risks that affect Parco San Bartolo, Marche, Italy:

Parco San Bartolo faces several significant climate-related risks that threaten its natural environment and biodiversity. **Long-lasting drought** and **extreme weather events**—such as **drought, heatwaves and wildfires**—are among the most frequently reported challenges, posing a threat to both ecosystems and infrastructure. Drought and extreme weather events linked to the effects of climate change significantly increase the risk of forest fires and other disasters with catastrophic effects. The intervention actions aim to prevent damage to forest systems and to hydrogeological instability linked to drought, strong winds and floods.

Precipitation plays a fundamental role in the humidity level and therefore in the probability of the risk of forest fires. Prolonged periods of drought in the summer period, although typical of the Mediterranean climate, if linked to the extreme increase in temperatures and strong winds, the danger for the spread is very high and unfortunately coincides with the period of maximum anthropic use of the Park for the influx of tourists. The temperature acts on the plant material in the sense that a dry material preheated by the sun is more flammable. Strong winds further accelerate the spread



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of fires by providing oxygen to the flames and removing atmospheric humidity, which significantly dries out the vegetation. During the day, warm air currents rise along the valleys, while in the evening and at night, cooler air descends, altering wind patterns and influencing fire behavior. Additionally, wind can carry burning plant matter from affected areas to new, unburned regions, increasing the likelihood that the fire will spread over long distances.

Another major concern is **coastal and soil erosion**, which accelerates land degradation and threatens the stability of coastal areas. These factors, combined with the **loss of biodiversity and natural habitats**, underscore the vulnerability of the park’s ecosystems to climate change. Addressing these risks requires targeted adaptation strategies to ensure the long-term resilience of the area.

Quali sono i rischi climatici maggiori che la tua area sta subendo? (Seleziona tutte le opzioni che ritieni rilevanti)

7 risposte

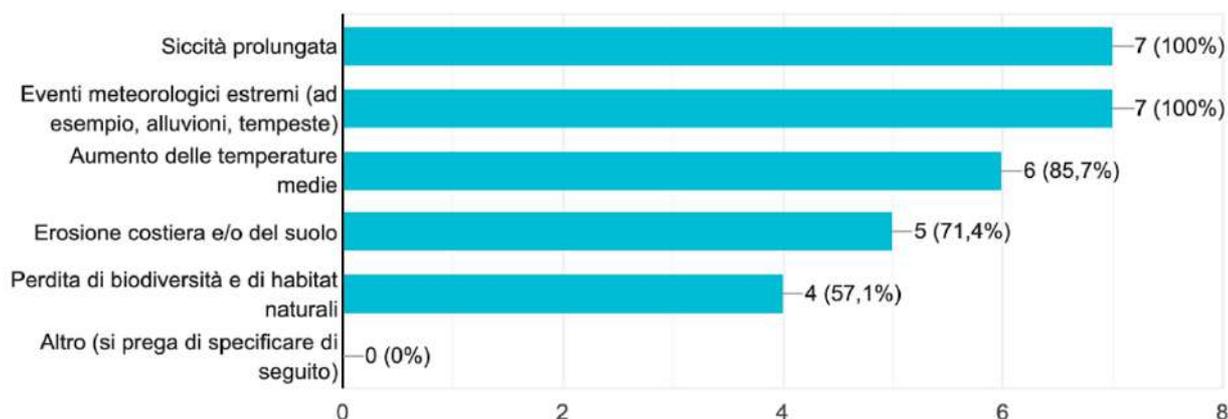


Figure 3

*Sicci a prolungata* = **Prolonged droughts (100%)**

*Eventi meteo estremi (e.g., flood, storm)* = **Ext. weather events (e.g. floods, storms) (100%)**

*Aumento temperature medie* = **Increase in average temperatures (85.7%)**

*Erosione costiera e/o suolo* = **Coastal and/or soil erosion (71.4%)**

*Perdita di biodiversit  e habitat naturali* = **Loss of biodiversity and nat. habitats (57.1%)**

*Altro* = **Other (0%)**

Parco San Bartolo faces several significant climate-related risks that threaten its natural environment and biodiversity. The most commonly reported challenges include **Prolonged droughts (100%)** and



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**Extreme weather events, such as drought, heatwaves and wildfires (100%)**, which pose severe threats to ecosystems and infrastructure. In particular, prolonged droughts increase the risk of fire spread and expansion by making vegetation more flammable. Strong winds further accelerate fire propagation by supplying oxygen to the flames and removing atmospheric moisture, which significantly dries out vegetation. During the day, warm air currents rise along valleys, while in the evening and at night, cooler air descends, altering wind patterns and influencing fire behavior. Moreover, wind can carry burning plant particles from affected areas to new, unburned regions, increasing the likelihood of fire spreading over long distances. Additionally, **an increase in average temperatures (85.7%)** exacerbates water stress and habitat shifts, further impacting local flora and fauna. Another major concern is **coastal and/or soil erosion (71.4%)**, which accelerates land degradation and threatens the stability of coastal areas. Furthermore, **the loss of biodiversity and natural habitats (57.1%)** highlights the vulnerability of local ecosystems to climate change. Notably, no respondents indicated additional climate risks under the **Other (0%)** category. Addressing these risks requires targeted adaptation strategies to ensure the long-term resilience of the area.

### **Primary Needs in Water Resource Management in Parco San Bartolo, Marche, Italy:**

The management of water resources in Parco San Bartolo and surrounding areas faces several critical challenges that require targeted interventions. The **prevention of water resource pollution** emerged as a top priority, with respondents emphasizing the need to safeguard water quality against contaminants from industrial, agricultural, and domestic activities. Pollution not only threatens local ecosystems but also compromises the availability of clean water for both human use and wildlife.

Another significant need identified is the **promotion of sustainable water use**. This involves raising awareness about efficient water consumption practices among local communities and sectors such as agriculture and tourism. By fostering sustainable habits, it becomes possible to extend the lifespan of available water resources, ensuring they remain viable for future generations.

**Improving the efficiency of irrigation and distribution systems** was also highlighted as a major area of focus. As climate change increases the frequency and intensity of droughts, the efficient use of water in agriculture becomes increasingly important. Modernizing irrigation systems to reduce water waste and enhance distribution can optimize water use in agriculture, thus improving food security and reducing pressure on local water resources.

Additionally, ensuring **a high availability of drinking water** was flagged as an essential need, particularly as population pressures and changing climate conditions may affect groundwater levels and surface water availability. Effective management strategies, including better water storage, conservation measures, and infrastructure improvements, are key to maintaining access to clean, safe drinking water for local communities.



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Quali sono i principali bisogni relativi alla gestione delle risorse idriche nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

7 risposte

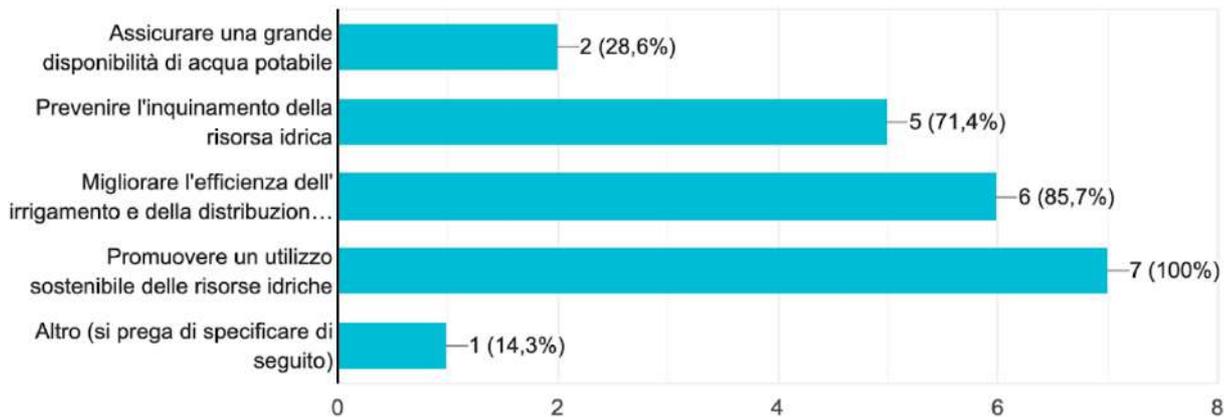


Figure 4

*Assicurare una grande disponibilità di acqua potabile* = **Ensure greater availability of drinking water (28.6%)**

*Prevenire inquinamento della risorsa idrica* = **Preventing pollution of water resources (71.4%)**

*Migliorare l'efficienza dell'irrigamento e della distribuzione di acqua* = **Improving the efficiency of irrigation and distribution systems (85.7%)**

*Promuovere un utilizzo sostenibile delle risorse idriche* = **Promoting sustainable use of water resources (100%)**

*Altro* = **Other (14.3%)**

The primary needs in water resource management in Parco San Bartolo focus on promoting sustainable water use (100%), improving the efficiency of irrigation and distribution systems (85.7%), and preventing water pollution (71.4%). Ensuring a greater availability of drinking water was also highlighted by 28.6% of respondents. Additionally, 14.3% identified other specific needs, reflecting the complexity of managing water resources in the area. These priorities indicate the importance of adopting a comprehensive approach that balances sustainability, efficiency, pollution control, and access to clean water.

### Main Challenges in Water Resource Management in Parco San Bartolo, Marche, Italy:

The Monte San Bartolo Parco is located between the Tavollo torrent basin and the Foglia river basin. The Park territory does not have a significant water network, but is essentially composed of a minor water network made up of rainwater drainage ditches. The water courses, therefore, are short and drain the two slopes, especially the steeper northern one, forming the characteristic triangular and



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trapezoidal facets of the cliff. The short water courses with an evident torrential character, which drain the slope, cut through the escarpment, showing a comb-like morphology.

Another critical challenge is the **conflict between different uses of water**, particularly in the context of agriculture, industry, and tourism. These sectors often compete for access to the same water sources, leading to conflicts over water allocation and sometimes unsustainable practices. When tourism reaches seasonal peaks in demand, particularly in areas of natural beauty such as the San Bartolo Park, competing demands on water sources create considerable pressure on the area's water systems and can lead to over-extraction of water sources.

Furthermore, there is a pervasive **lack of awareness and technical skills** regarding the importance of sustainable water management. This gap in knowledge hinders the adoption of best practices in water conservation and the implementation of innovative solutions. Without sufficient technical expertise, local authorities, businesses, and communities struggle to effectively address water-related challenges, leading to inefficient water use and a lack of coordinated efforts to mitigate the impact of climate change on water availability.

Quali sono le maggiori sfide relative alla gestione delle risorse idriche nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

7 risposte

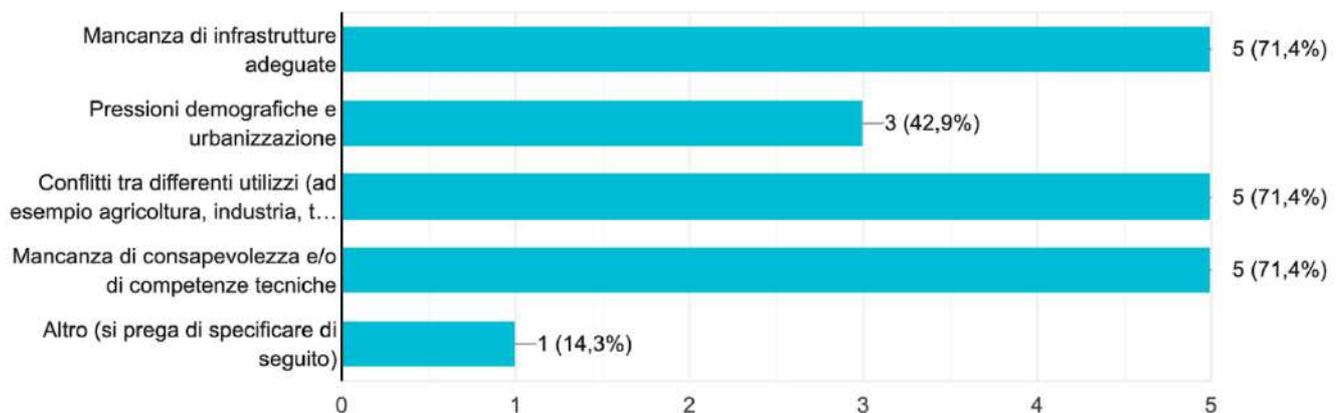


Figure 5

*Mancanza di infrastrutture adeguate* = **Lack of adequate infrastructure (71.4%)**

*Pressioni demografiche e urbanizzazione* = **Demographic pressure and urbanization (42.9%)**

*Conflitti tra differenti utilizzi (e.g., agricoltura, industria, ..)* = **Conflicts between different uses (e.g. agriculture, industry, tourism) (71.4%)**

*Mancanza di consapevolezza e/o di competenze tecniche* = **Lack of awareness and/or technical skills (71.4%)**



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*Altro* = **Other (14.3%)**

The main challenges in water resource management identified by the survey include the lack of adequate infrastructure (71.4%), conflicts between different water uses (71.4%), and the lack of awareness and/or technical skills (71.4%), all of which hinder sustainable water management. Demographic pressure and urbanization (42.9%) further strain resources, while other issues (14.3%) were also noted. Addressing these challenges requires improvements in infrastructure, capacity building, and resolving conflicts between sectors.

### **Priority Actions for Preserving Water Resources in Parco San Bartolo, Marche, Italy:**

To effectively preserve water resources in Parco San Bartolo, several priority actions have been identified. **Education and awareness** play a central role in encouraging mindful use of water resources among local communities and businesses. Providing **information and training** on efficient water use and conservation is essential to reduce waste and promote responsible consumption.

Another key action is the **strict monitoring of water networks**, including **rainwater storage systems**, to ensure their proper functioning and prevent unnecessary losses. Additionally, **proper planning** and the development of **infrastructure designed to limit water resource loss** are crucial for improving efficiency. This includes the **reconditioning of water pipelines** and finding innovative solutions for **rainwater harvesting** and its utilization, particularly during dry periods.

Moreover, there is a need for **economic and technical support** from higher authorities to assist municipalities in implementing these actions, as well as **reinvesting profits** into reducing network losses and improving service efficiency. Finally, encouraging **citizen participation** in water cycle management is vital for fostering a sense of shared responsibility and ensuring long-term sustainability in water resource management.

### **Main Influences on Water Resource Management in Parco San Bartolo, Marche, Italy:**

Water resource management in Parco San Bartolo is strongly influenced by several interconnected challenges. One of the primary concerns is **reduced water availability**, driven by **long-lasting droughts** and **reduced river flow**, which significantly impact both natural ecosystems and water supply for local communities. Additionally, the **altered water quality**, caused by **pollution of rivers, aquifers, and saline intrusion**, further complicates water management, making it harder to secure clean and safe water resources.

The **loss of water-related ecosystems**, including the **reduction of natural habitats** and the **draining of wetlands**, is also a major factor, as these areas play a critical role in water filtration and flood regulation. **Water use conflicts** between sectors and communities—such as agriculture, tourism, and urban needs—add another layer of complexity, exacerbating pressure on limited water resources.



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Extreme weather events, such as **floods** and **torrential rains**, cause **damage to infrastructure, people, and the built environment**, further straining water management systems and increasing vulnerability. The **economic and social impacts** are also significant, with damage to **agriculture, tourism**, and **high management costs** being commonly reported. Additionally, the **presence of nitrates in the aquifer** complicates water extraction, forcing reliance on springs and costly water treatment solutions.

Quali sono gli impatti maggiori relativi alla gestione delle risorse idriche nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

7 risposte

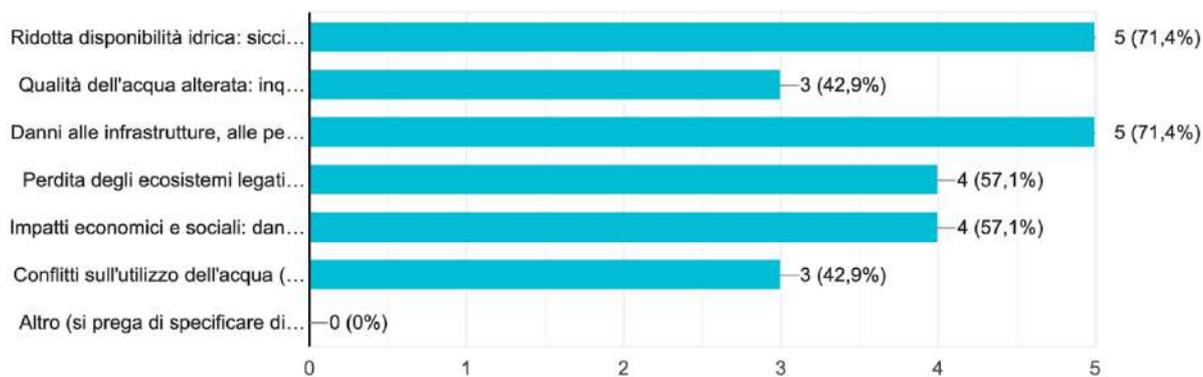


Figure 6

Ridotta disponibilità idrica = **Reduced water availability: prolonged droughts and/or reduced river flow (71.4%)**

Qualità dell'acqua alterata = **Altered water quality: pollution of rivers, aquifers and/or saltwater intrusion (42.9%)**

Danni alle infrastrutture = **Damage to infrastructure, people and/or the built environment due to extreme events (e.g., floods, flash floods) (71.4%)**

Perdite degli ecosistemi legati all'acqua = **Loss of water-related ecosystems: reduction of natural habitats and/or draining of wetlands (57.1%)**

Impatti economici e sociali = **Economic and social impacts: damage to agriculture, tourism and high management costs (57.1%)**

Conflitti sull'utilizzo dell'acqua = **Conflicts over water use (between sectors and/or communities) (42.9%)**

Altro = **Other (0%)**

The management of water resources in Parco San Bartolo faces several challenges, including reduced water availability (71.4%) due to prolonged droughts and reduced river flow, and damage to infrastructure from extreme weather events (71.4%). The loss of water-related ecosystems (57.1%)



## Italy – Croatia

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and economic and social impacts from damage to agriculture and tourism (57.1%) further complicate management. Other issues include altered water quality (42.9%) and conflicts over water use (42.9%). These challenges highlight the need for comprehensive water resource management strategies in the region.

### **Economic sectors most affected by water-related impacts in Parco San Bartolo, Marche, Italy:**

The economic landscape of Parco San Bartolo is heavily influenced by water-related challenges, with several key sectors experiencing significant impacts. Agricultural activity in this territory occupies most of the surface area that is assigned multifunctional importance. Most of the territory is occupied by agricultural areas used for the cultivation of arable crops, olives and vines. Private property, consisting of small to medium-sized areas, accounts for almost half of the territory of the Monte San Bartolo Nature Park, the surface area of which is considerably fragmented. Most of the land is occupied by agricultural activities, where the main crops are mainly arable crops with classic renewal-depletion-improvement rotations. Tourism, a vital economic pillar for the region, is also deeply affected by water-related impacts. The park's natural beauty, which attracts visitors for hiking, sightseeing, and other outdoor activities, is threatened by environmental changes like droughts. It is important to activate a strategy to promote tourism and the social use of the Park, with the aim of encouraging and stimulating those activities that involve an appropriate, extensive and widespread use of the natural and cultural heritage, generating economic and social benefits for local communities and contributing to the active conservation of resources. The management of tourist use takes on a particular importance in the area of Mount San Bartolo, due to its urban park aspect, as it is included in areas with a strong urbanisation and tourist vocation.



## Italy – Croatia



Quali settori economici sono più colpiti dagli impatti legati all'acqua? (Seleziona tutte le opzioni che ritieni rilevanti)

7 risposte

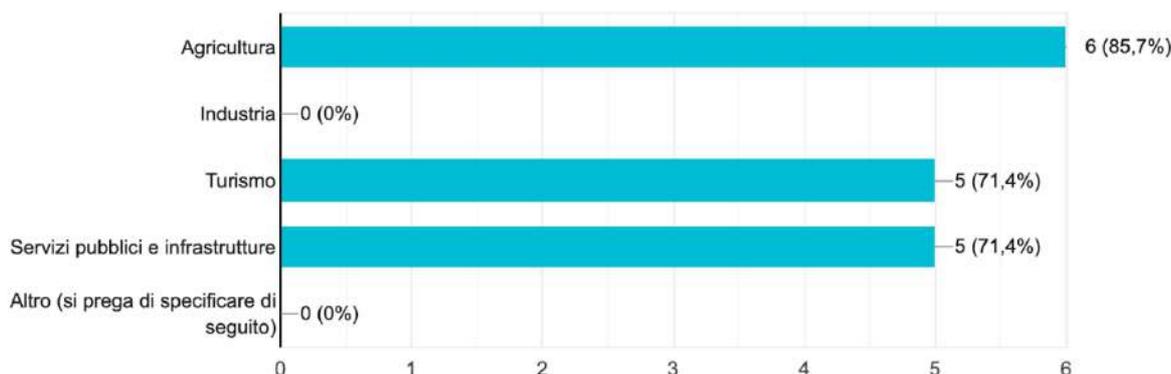


Figure 7

*Agricoltura* = **Agriculture**

*Industria* = **Industry**

*Turismo* = **Tourism**

*Servizi Pubblici e Infrastrutture* = **Public Services and Infrastructure**

*Altro* = **Other**

### Elements or factors most vulnerable to water-related impacts in Parco San Bartolo, Marche, Italy:

The Park includes part of the low sandy coast of Colle S. Bartolo. The cliffs are of an active type, made up of sandstone hills of Messinian age. The sector of Colle S. Bartolo is characterized by a pebbly beach. The vegetation found there is typical of these environments: the low coastlines are characterized by the typical succession of dunes, some of which are well preserved.

These coastal environments are extremely degraded and fragmented, despite their importance in terms of biodiversity. The pressures on the site are mainly of a tourist nature - bathing. Landslides, fires, coastal works, tourism and bathing activities and untreated sewage are the main factors affecting the area.

Several elements in Parco San Bartolo are highly vulnerable to water-related impacts, with significant consequences for both the environment and local communities. The **loss of biodiversity** is a major concern, as water scarcity and the degradation of ecosystems severely affect plant and animal species, leading to habitat loss and decreased species diversity. **Erosion and runoff**, exacerbated by the combined effects of **drought and extreme rainfall**, are another critical issue.



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The **quality of life for citizens** and **tourism** are also vulnerable, as water shortages and pollution negatively impact daily living conditions and the attractiveness of the area to visitors. In addition, the **waste of water resources** due to inefficient management practices places further stress on local water supplies, particularly in times of drought. Lastly, the **socio-economic impacts** of potential projects to address water issues, especially those focused on economic approaches to educate users about eco-sustainable water practices, could also present challenges. Effective education and engagement are needed to ensure that these initiatives are well-received and lead to meaningful change.

### **Adaptation measures or solutions to be prioritized in Parco San Bartolo, Marche, Italy:**

To address the water-related and climate challenges in Parco San Bartolo, a variety of **adaptation measures** and **solutions** should be prioritized. One of the key strategies is to **increase awareness** among local communities and stakeholders about the importance of sustainable water use, climate change risks, and adaptation actions. This can empower individuals and organizations to make informed decisions that align with long-term environmental goals.

In terms of **environmental management**, it is critical to implement **systematic monitoring of slopes and catchment areas**, focusing on the **cleaning of ditches**, planting, and **reforestation** to improve water retention, reduce soil erosion, and enhance biodiversity. Additionally, **public investments** and **increased oversight** of water-related policies and practices will help ensure that these measures are effective and well-coordinated.

To address specific water management challenges, a comprehensive approach is needed, including the **restoration of the water network**, the creation of **small storage lakes**, and the promotion of **water conservation policies**. Supporting **afforestation** and **biodiversity maintenance**, along with the adoption of **agricultural crops that are more resilient to the changing climate** and practices like **shallow plowing**, will improve the land's ability to retain water and reduce vulnerability to drought.

In addition, investing in the separation of public sewer systems, particularly for rainwater and wastewater, and promoting the collection and use of rainwater will optimise water resources while reducing the risk of contamination. Finally, ensuring the **maintenance of water services**, conducting **environmental quality control**, and focusing on **land security** in areas at risk of **wildfires** are critical to protecting both natural ecosystems and communities from the adverse effects of climate change.

Measures to mitigate hydrogeological and geomorphological risks are also crucial. These include controlling access to coastal areas and cliffs, where intervention is limited to the protection of ecosystems and landscapes, regulating slope stabilization and consolidation of surface landslides, and ensuring the preservation and restoration of small hydrographic networks through appropriate methodologies.



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### **Adopted and Implemented Adaptation Policies and Measures in Parco San Bartolo, Marche, Italy:**

In Parco San Bartolo, several adaptation policies and measures have been adopted to address water-related challenges and promote environmental sustainability. One of the primary actions is the creation and management of protected natural areas, which helps preserve critical ecosystems and ensure the long-term viability of water resources. This is complemented by awareness campaigns that aim to educate the public about water conservation, climate change impacts, and sustainable practices.

Another notable measure is the creation of an urban forest using native species, which aids in soil conservation, water retention, and habitat preservation. Additionally, there have been efforts to increase waste collection actions and provide environmental education, helping foster a more sustainable relationship between local communities and their natural resources.

The expansion of the network of ground fire hydrants along the Pesaro-Gabicce scenic road is a fundamental measure to improve fire prevention and emergency response. Given the proximity of the sea, the primary water supply for aerial firefighting is already guaranteed, eliminating the need for temporary or permanent water tanks.

### **Relevant or Priority Nature-Based Solutions for Water Resource Management in Parco San Bartolo, Marche, Italy:**

To address the growing water-related challenges in Parco San Bartolo, several **nature-based solutions** have been identified as priorities for sustainable water resource management.

The **creation of wetlands** for water resource management is another key solution. Wetlands act as natural filters, improving water quality by trapping pollutants and providing essential habitats for wildlife. They also help in regulating water levels, especially during periods of heavy rainfall, reducing the risk of flooding and preserving local ecosystems.

**Tree planting** is also a vital component, as it improves **water absorption** by the soil and enhances **climate regulation**. Trees help mitigate the effects of both droughts and floods by absorbing excess water during heavy rains and releasing it gradually during dry periods. In addition, trees play a significant role in reducing the urban heat island effect and promoting overall climate resilience.

The implementation of **green infrastructure** solutions, such as permeable surfaces, green roofs, and rain gardens, is essential for **flood mitigation**. Green infrastructure helps manage stormwater, reduces surface runoff, and lowers the risk of localized flooding, while also providing aesthetic and recreational benefits to the community.

Finally, the **conservation of biodiversity** is a cornerstone of building **climate resilience** in the region. Protecting and enhancing biodiversity strengthens ecosystems, making them more adaptable to climate change and better able to provide the services that are crucial for water management and overall environmental health.



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Quale soluzione basata sulla natura consideri rilevante o una priorità per la gestione della risorsa idrica nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

7 risposte

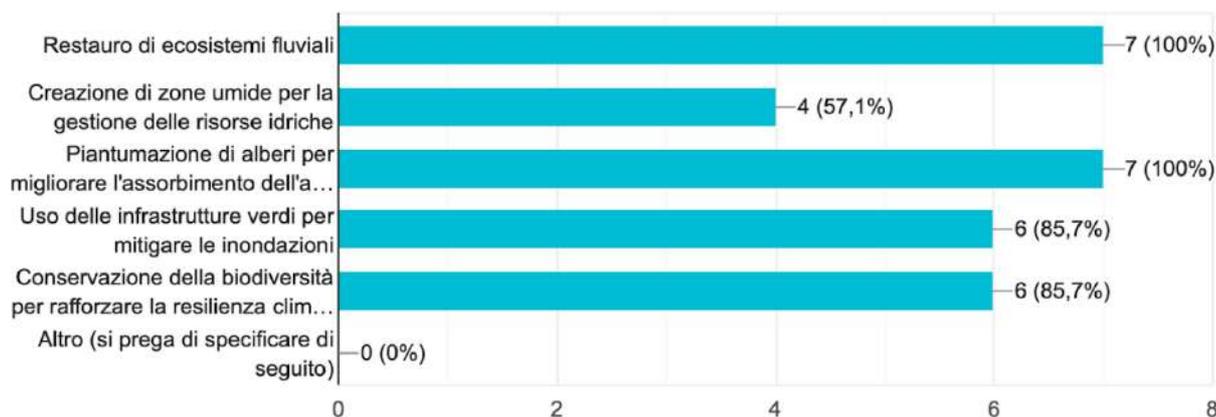


Figure 8

*Restauro di ecosistemi fluviali* = **River ecosystem restoration (100%)**

*Creazione di zone umide per la gestione delle risorse idriche* = **Creating wetlands for water management (57.1%)**

*Piantumazione di alberi per migliorare l'assorbimento dell'acqua* = **Planting trees to improve water absorption and climate regulation (100%)**

*Uso delle infrastrutture verdi per mitigare le inondazioni* = **Using green infrastructure for flood mitigation (85.7%)**

*Conservazione della biodiversità per rafforzare la resilienza climatica* = **Preserving biodiversity to strengthen climate resilience (85.7%)**

*Altro* = **Other (0%)**

The survey participants showed strong support for River ecosystem restoration (100%) and Planting trees to improve water absorption and climate regulation (100%). Using green infrastructure for flood mitigation (85.7%) and Preserving biodiversity to strengthen climate resilience (85.7%) also received high approval. Meanwhile, creating wetlands for water management (57.1%) had a moderate level of support, and no participants selected the "Other" category (0%).

### Barriers to Implementing Nature-Based Solutions in Parco San Bartolo, Marche, Italy:

Barriers to implementing Nature-Based Solutions in Parco San Bartolo, Marche, Italy, as identified through the questionnaire responses, include social and cultural resistance, often linked to



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overlapping and conflicting competencies in planning and implementing environmental restoration projects. Economic constraints also play a significant role, as effective prevention requires timely investments in projects and infrastructure, which depend on specific funding from higher government authorities. Additionally, policy conflicts arise due to competing interests, with different stakeholders believing they have the best solution to address the issues. A lack of urgency perception further hinders progress, particularly among administrators, due to cultural resistance and a short-term vision regarding adaptation and resilience measures. Moreover, economic interests strongly influence policy conflicts, leading to decisions that do not always align with real needs and, in some cases, even hinder them.

Quali ostacoli prevedi nell'implementazione delle soluzioni basate sulla natura nel territorio su cui eserciti le tue funzioni? (Seleziona tutte le opzioni che ritieni rilevanti)

7 risposte

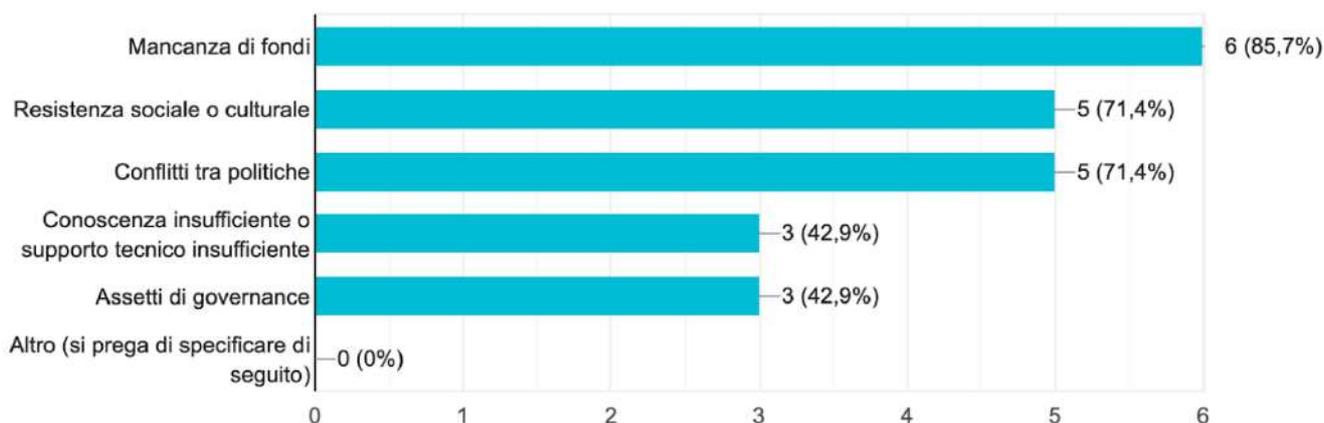


Figure 9

Mancanza di fondi = **Lack of funds (85.7%)**

Resistenza sociale e culturale = **Social or cultural resistance (71.4%)**

Conflitti fra politiche = **Conflicts between policies (71.4%)**

Conoscenza insufficiente o supporto tecnico insufficiente = **Insufficient knowledge or technical support (42.9%)**

Assetti di governance = **Management settings (42.9%)**

Altro = **Other (0%)**

The survey results highlight that the most significant barrier identified is lack of funds (85.7%), followed by social or cultural resistance (71.4%) and conflicts between policies (71.4%), both of which were recognized as major challenges. Insufficient knowledge or technical support (42.9%) and



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management settings (42.9%) received moderate concern. No participants selected the "Other" category (0%).

### Interest in Receiving Key Results from the Questionnaire:

Desideri essere informato sui principali risultati del questionario?

7 risposte

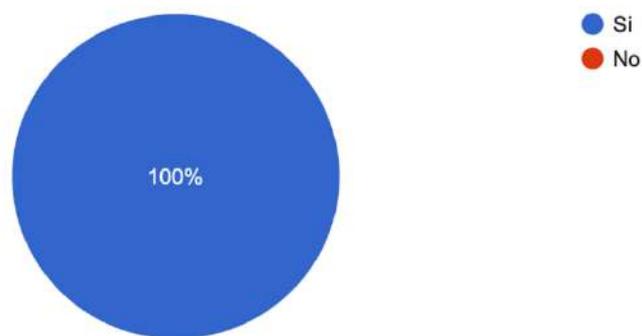


Figure 10

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# Preparing, Adapting, Reconstructing: actions to promote climate change adaptation and risk disaster resilience in Italian and Croatian sensitive ecosystems

Work Package 1 - Activity 1.3 - Deliverable 1.3

“Reports mapping the relevant local stakeholders’ needs”

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## INTRODUCTION

In the framework of impacts related to climate change, water stock management is crucial to address and mitigate extreme phenomena that determine an overabundance or scarcity of water resources, with impacts on local production systems, citizens well-being and land management. To tackle this challenge, bePrePARED project aims to coordinate and integrate risk management tools, systems and policies aimed at improving the resilience of vulnerable ecosystems and landscapes historically managed on both sides of the Adriatic Sea, with a focus on water management. This is to create new high competence skills and practices for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia targeted areas, adapting them to a sustainable use of water resources in rural-urban landscapes, raising awareness of institutions and civil society on the risks related to water scarcity and the need for water saving and adaptation policies.

Two of the main aims of the project are:

- Creating **new high competence skills and practices** for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia areas, adapting them to a sustainable use of water resources in rural-urban landscapes.
- **Raising awareness of institutions and civil society** on the risks related to water scarcity and the need for water saving and adaptation policies.

In this framework, **activity 1.3** aimed at **identifying and networking all the institutional and social / economic stakeholders of the territorial communities** addressed by the project , to assess their current awareness state about the nature and seriousness of the challenge for water landscapes sustainable management and typify their needs for information, for recommendations for a change in behaviour in facing water and climate-related risks, for cultural and capacity building, towards a higher attentiveness to the implications of an ecosystem management more sound to the present, evolutionary, climate conditions.

The deliverable is made of 6 reports, one per each of the target areas of the project. The reports share a common introduction on the methodology used for stakeholders' mapping and for the preparation of the online questionnaires, while including different results specific for each of the 6 geographies.



## Egnazia, Puglia, ITALY

# THE IMPORTANCE OF STAKEHOLDER MAPPING IN CLIMATE ADAPTATION

The stakeholder mapping process is essential to ensure that decisions related to climate change adaptation are inclusive, representative, and based on solid evidence. Engaging various actors, from citizens to institutions, enhances the relevance, effectiveness, and credibility of adaptation plans, building trust and a collective mandate for implementing the necessary actions. By integrating local insights and concerns, mapping helps complement top-down approaches, fostering a sense of shared ownership and clarifying common goals.

In the context of the project, a structure has been adopted that considers the need to accurately identify and categorize the involved stakeholders. This process is crucial for building a solid evidence base, gaining political support, establishing effective governance structures, and understanding the roles and responsibilities of each actor. The framework used for mapping stakeholders is based on an analytical methodology that ensures accurate identification, avoiding biases that could compromise the representativeness and effectiveness of the engagement.

By adopting a transparent and robust approach, the mapping process allows the collection of key information on the behaviors, intentions, connections, resources, and influence of stakeholders. This information is then used to guide political decisions, improve understanding of the social and political feasibility of proposed actions, and effectively guide future developments in adaptation policies.

## STAKEHOLDER MAPPING FRAMEWORK

The structure of the stakeholder mapping for the bePrepared project was carefully designed using the Tandem Guidance approach, which was also applied in the [Adaptation AGORA project](#). The Tandem framework serves as a valuable tool for fostering transdisciplinary collaboration and ensuring that stakeholder engagement is purposeful, systematic, and aligned with project objectives. It provides a structured set of elements and guiding questions, informed by empirical cases and prior frameworks, that enable stakeholders to engage meaningfully in collaborative learning processes, address shared challenges, and align on governance, risks, goals, and solutions. In the bePrepared project, the stakeholder mapping for the Egnazia case study follows this framework, with the goal of identifying the key actors involved, understanding their roles and interests, and determining how their involvement can shape both the issues at hand and the solutions proposed. The mapping structure includes several key components:



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1. **Stakeholder Identification:** Each stakeholder or target group is clearly identified, including their contact details, role, and organizational affiliation. This ensures that the right individuals are engaged and that their contributions can be tracked throughout the project.
2. **Stakeholder Roles and Interests:** The roles that each stakeholder plays (e.g., decision-maker, expert, community member) are identified, along with the key interests or issues they care about. This helps to ensure that the project considers the priorities of all relevant stakeholders and addresses their specific concerns.
3. **Key Issues and Solutions:** For each stakeholder, we assess the specific issues they are either affecting or affected by, and similarly, the solutions they can contribute to or benefit from. This provides a comprehensive understanding of each stakeholder's position and potential impact on the project.
4. **Interest and Type of Participation:** The mapping includes a clear assessment of the level of interest each stakeholder has in participating in the project. Stakeholders are categorized based on their interest (e.g., high, low, none) and the type of participation they are expected to contribute (e.g., awareness, information sharing, consultation, discussion, co-design, co-decision making). This helps ensure that stakeholders are engaged at the appropriate level, allowing for meaningful contributions without overwhelming less interested parties.
5. **Means of Engagement:** Various engagement methods are identified, ranging from emails and phone calls to more interactive forms of participation like workshops or co-design sessions. This ensures that each stakeholder is reached using the most appropriate and effective communication channels.
6. **Engagement Status:** The mapping also tracks the status of each stakeholder's engagement (e.g., contacted, not contacted), which helps to monitor progress and identify any gaps in stakeholder inclusion.

An example of how the stakeholder mapping file was sent to each case study is present in the following image.



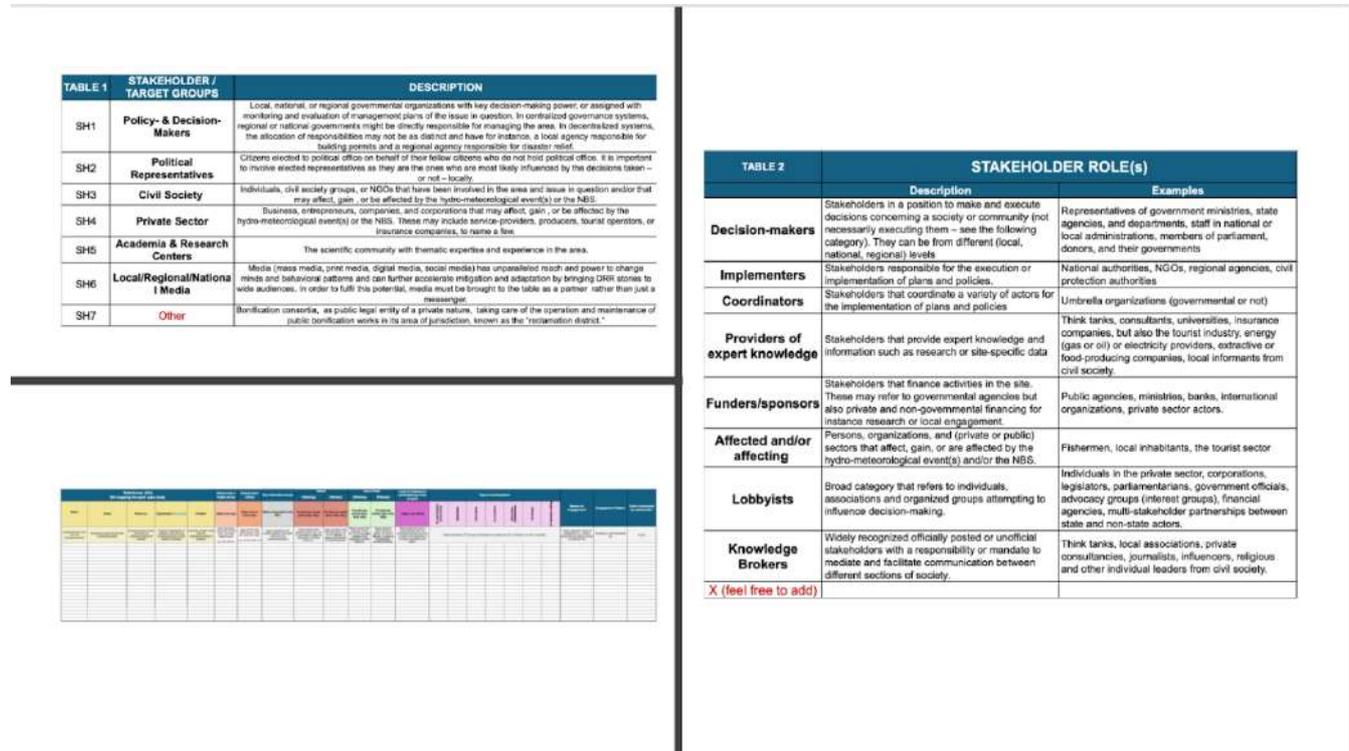


Figure 1

This structured approach to stakeholder mapping ensures that the bePrepared project captures a diverse range of perspectives and effectively integrates stakeholders into the decision-making process. By using the Tandem framework, the project establishes a transparent, inclusive, and participatory foundation for tackling climate change and water resource management challenges in the Egnazia Park, within the Puglia Region.

Number of identified stakeholders in the Stakeholder Mapping process for Egnazia Park: **14**.

## QUESTIONNAIRE ON NEEDS ASSESSMENT, STRUCTURE

The questionnaire has been structured to serve as a robust tool for gathering essential insights within the bePrepared project. Its design reflects the need to conduct a comprehensive needs assessment, ensuring that the perspectives of key stakeholders - identified in the previous phase based on the structure described above - are accurately captured and integrated into the project's strategic development. By addressing various dimensions of water resource management and climate change



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adaptation, the questionnaire aims to bridge knowledge gaps, identify local challenges, and highlight opportunities for more effective and sustainable solutions.

To achieve this, the questionnaire is divided into seven thematic sections, each focusing on a specific aspect of stakeholder engagement and expertise. The first two sections (1-2) gather contextual information, identifying the respondent's role and their organization's involvement in water management and adaptation efforts. This allows for a clear mapping of stakeholders and their influence within the system. The third section (3) delves into perceptions of climate change impacts and associated risks, providing valuable qualitative and quantitative insights into how different actors experience and interpret these challenges in their respective regions. The fourth (4) and fifth (5) sections explore water both as a resource—identifying key needs, priorities, and constraints in its management—and as a source of impacts, assessing how water-related issues, such as floods or droughts, affect communities, economies, and ecosystems. The sixth section (6) is dedicated to Nature-Based Solutions (NBS), evaluating the feasibility and relevance of these innovative approaches within the respondents' local contexts. Finally, the seventh section (7) offers an open space for additional input, ensuring that the questionnaire captures perspectives that may not have been explicitly addressed in the structured questions.

A mix of multiple-choice and open-ended questions has been employed to balance structured data collection with the flexibility needed to incorporate stakeholder-specific insights. This methodological approach allows us to extract both quantifiable trends and nuanced qualitative responses, enhancing the reliability and applicability of the findings.

Ultimately, this questionnaire is more than just a data-gathering tool—it is a collaborative effort to shape effective climate adaptation and water management strategies. By participating, stakeholders directly contribute to the development of evidence-based solutions that align with real-world needs, reinforcing the overarching objectives of the bePreparedproject.

## INSIGHTS FROM THE NEEDS ASSESSMENT QUESTIONNAIRE

**Number of Participants:** 14

**List of the organizations and institutions involved in the questionnaire on local stakeholders' perceptions of water-related risks, opportunities, and challenges in Egnazia, Puglia, Italy:**

The questionnaire involved the Regione Puglia, particularly its Sezione Risorse Idriche department, which was consistently represented across responses.

**Role of the participants in their institution/organization:**



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The participants hold various roles within their institutions or organizations, primarily as officials (Funzionari) and instructors (Istruttori), with some specializing in specific areas such as economic and financial resources or technical instruction.

### Geographical scale of reference of the respondents:

All respondents to the questionnaire referenced the Egnazia, Puglia region, as their primary geographic focus.

### Organization's role in the context of water resource management and/or climate change adaptation:

In the context of water resource management and climate change adaptation, the organization's role primarily focuses on planning, managing, and protecting land and water resources, which emerged as the most frequently mentioned responsibility. Additionally, several respondents highlighted involvement in environmental policy promotion, climate risk monitoring and assessment, socio-economic development of the territory, and community engagement. While planning and management remain the core activities, the integration of policy advocacy, risk assessment, and stakeholder involvement reflects a comprehensive approach to sustainability and resilience.

### Perception related to the severity of climate change impacts in Egnazia, Puglia, Italy:

Come valuteresti la gravità degli impatti del cambiamento climatico nella tua area?

14 risposte

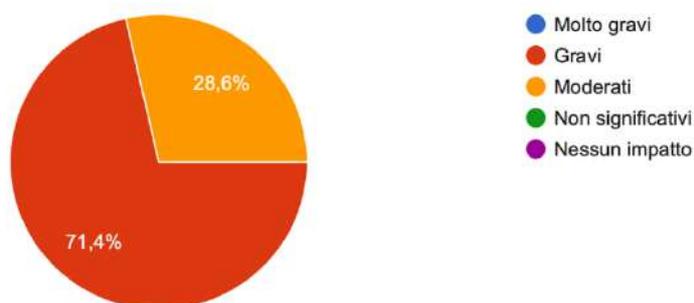


Figura 2

*Molto gravi* = **Very serious (0%)**

*Gravi* = **Serious (71.4%)**

*Moderati* = **Moderate (28.6%)**



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Non significativi = **Not significant**

Nessun impatto = **No impact**

The survey results indicate that the majority of participants perceive the issue as serious (71.4%), while 28.6% consider it moderate. No respondents rated it as very serious (0%), and no votes were recorded for "Not significant" or "No impact".

### Main climate risks that affect Egnazia, Puglia, Italy:

The main climate risks affecting Egnazia, Puglia, Italy, as identified through the survey, include prolonged drought, which was the most frequently mentioned threat. Other significant risks highlighted by respondents are coastal and soil erosion, rising average temperatures, and loss of biodiversity and natural habitats. Additionally, extreme weather events such as floods and storms were noted as a concern by several participants. These risks collectively indicate a pressing need for adaptation and mitigation strategies in the region.

Quali sono i rischi climatici maggiori che la tua area sta subendo? (Seleziona tutte le opzioni che ritieni rilevanti)

14 risposte

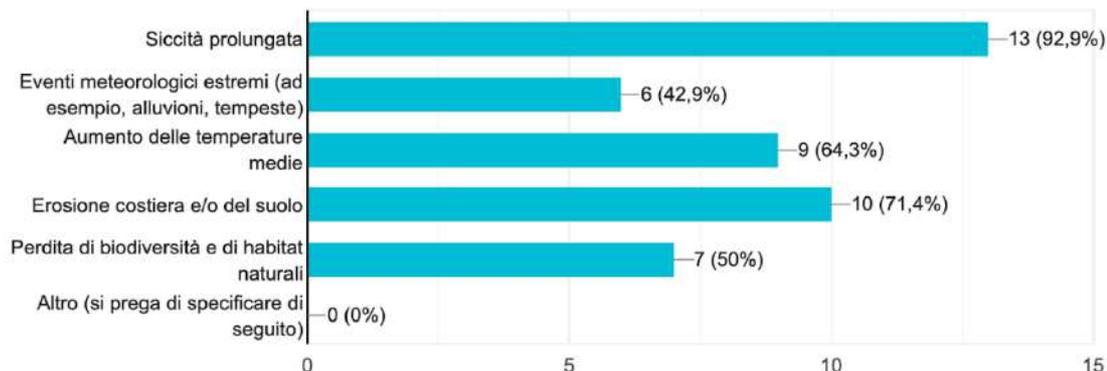


Figura 3

Siccit  prolungata = **Prolonged droughts (92.9%)**

Eventi meteo estremi (e.g., flood, storm) = **Ext. weather events (e.g. floods, storms) (42.9%)**

Aumento temperature medie = **Increase in average temperatures (64.3%)**

Erosione costiera e/o suolo = **Coastal and/or soil erosion (71.4%)**

Perdita di biodiversit  e habitat naturali = **Loss of biodiversity and nat. habitats (50%)**

Altro = **Other (0%)**



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The survey results indicate that the most critical climate risk identified is prolonged droughts (92.9%), followed by coastal and/or soil erosion (71.4%) and an increase in average temperatures (64.3%). Additionally, loss of biodiversity and natural habitats (50%) and extreme weather events such as floods and storms (42.9%) were also recognized as significant concerns. No respondents selected the "Other" category (0%).

### **Primary Needs in Water Resource Management in Egnazia, Puglia, Italy:**

The primary needs in water resource management for Egnazia, Puglia, Italy, as identified by survey respondents, focus on several key areas. Ensuring a sufficient supply of potable water emerged as the most urgent priority, highlighting concerns about water scarcity and the need for reliable access to clean drinking water. Preventing water pollution was also widely emphasized, reflecting the importance of safeguarding water quality from contaminants that could compromise both human health and ecosystems.

Another critical need is improving the efficiency of irrigation and distribution systems, as inefficient water use in agriculture and infrastructure can lead to unnecessary waste and resource depletion. Additionally, respondents strongly supported the need to promote the sustainable use of water resources, underscoring the importance of long-term planning and responsible water management practices.

These responses suggest a comprehensive approach to addressing water security challenges in the region, recognizing the interconnectedness of water availability, quality, distribution, and sustainability. Addressing these needs will require coordinated efforts between policymakers, local communities, and stakeholders to implement effective water management strategies.



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Quali sono i principali bisogni relativi alla gestione delle risorse idriche nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

14 risposte

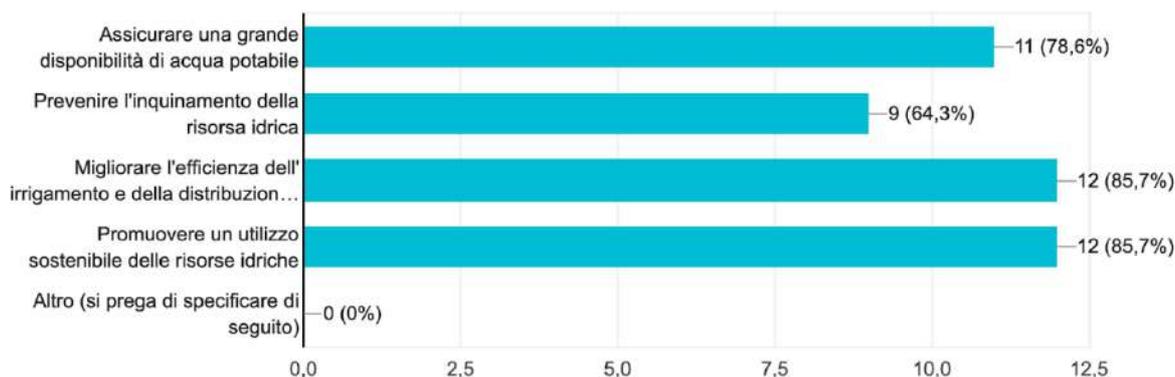


Figura 4

*Assicurare una grande disponibilità di acqua potabile* = **Ensure greater availability of drinking water (78.6%)**

*Prevenire inquinamento della risorsa idrica* = **Preventing pollution of water resources (6.34%)**

*Migliorare l'efficienza dell'irrigamento e della distribuzione di acqua* = **Improving the efficiency of irrigation and distribution systems (85.7%)**

*Promuovere un utilizzo sostenibile delle risorse idriche* = **Promoting sustainable use of water resources (85.7%)**

*Altro* = **Other (0%)**

The survey results indicate that the most pressing needs in water resource management for Egnazia, Puglia, Italy, are improving the efficiency of irrigation and distribution systems (85.7%) and promoting the sustainable use of water resources (85.7%), highlighting the importance of optimizing water use and ensuring long-term sustainability. Ensuring greater availability of drinking water (78.6%) was also a key priority, reflecting concerns about water security. In contrast, preventing pollution of water resources (6.34%) received significantly lower attention, suggesting that respondents may perceive other issues as more urgent. No additional priorities were indicated under the "Other" category (0%).

### Main Challenges in Water Resource Management in Egnazia, Puglia, Italy:

The main challenges in water resource management in Egnazia, Puglia, Italy, as highlighted by survey respondents, revolve around several interconnected issues. Inadequate infrastructure emerged as one of the most critical concerns, with multiple participants emphasizing the need for improved



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water management systems to address increasing pressures on resources. Conflicts between different water uses—such as agriculture, industry, and tourism—were also frequently mentioned, reflecting competition over limited water supplies and the difficulty in balancing economic, environmental, and social priorities.

Demographic pressures and urbanization were another key challenge, with expanding populations and growing tourism further straining local water resources. This is compounded by a lack of awareness and/or technical expertise, which hinders effective policy implementation and adaptive management strategies. The combination of these factors suggests that a comprehensive, multi-sectoral approach is needed to ensure the sustainable management of water resources in the region. Additionally, some respondents pointed to other unspecified challenges, indicating that the complexity of water management in Egnazia may require further investigation and targeted solutions.

Quali sono le maggiori sfide relative alla gestione delle risorse idriche nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

14 risposte

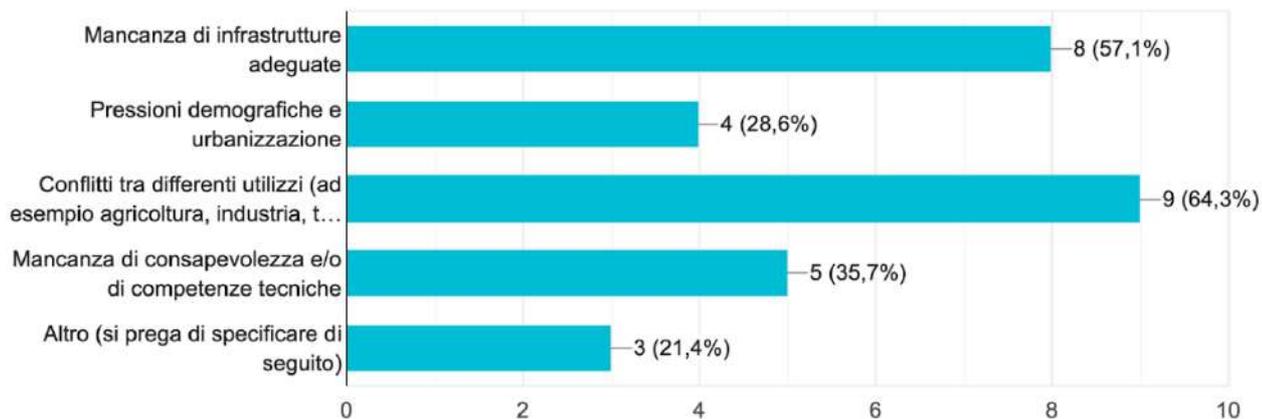


Figura 5

*Mancanza di infrastrutture adeguate* = **Lack of adequate infrastructure (57.1%)**

*Pressioni demografiche e urbanizzazione* = **Demographic pressure and urbanization (28.6%)**

*Conflitti tra differenti utilizzi* (e.g., agricoltura, industria, ...) = **Conflicts between different uses (e.g. agriculture, industry, tourism) (64.3%)**

*Mancanza di consapevolezza e/o di competenze tecniche* = **Lack of awareness and/or technical skills (35.7%)**

*Altro* = **Other (21.4%)**



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The survey results indicate that the most significant challenge in water resource management is conflicts between different uses, such as agriculture, industry, and tourism (64.3%), followed closely by lack of adequate infrastructure (57.1%). Additionally, lack of awareness and/or technical skills (35.7%) and demographic pressure and urbanization (28.6%) were also identified as important concerns. A smaller portion of respondents (21.4%) highlighted other challenges, suggesting that additional factors may also impact water resource management in Egnazia.

### **Priority Actions for Preserving Water Resources in Egnazia, Puglia, Italy:**

The priority actions for preserving water resources in Egnazia, Puglia, Italy, focus primarily on enhancing the reuse of treated wastewater, particularly for irrigation and other permitted uses. Additionally, respondents emphasize the need for rainwater harvesting and storage systems, reducing water losses in distribution networks, and improving agricultural practices to optimize water use. Other key actions include developing infrastructure to diversify water supply sources, such as desalination and groundwater protection, as well as increasing monitoring and control over illegal water extraction and waste disposal. Public awareness and education on sustainable water management are also considered essential measures.

### **Main Influences on Water Resource Management in Egnazia, Puglia, Italy:**

The main influences on water resource management in Egnazia, Puglia, Italy, as identified by the respondents, include reduced water availability due to prolonged droughts and/or reduced river flow. Additionally, economic and social impacts such as damage to agriculture, tourism, and high management costs were frequently mentioned. Other concerns include altered water quality, resulting from river pollution, aquifer contamination, and/or saline intrusion, as well as water-related ecosystem loss, particularly the reduction of natural habitats and drying up of wetlands. Finally, conflicts over water use between sectors and communities were also highlighted as significant influences on water resource management in the area.



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Quali sono gli impatti maggiori relativi alla gestione delle risorse idriche nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

14 risposte

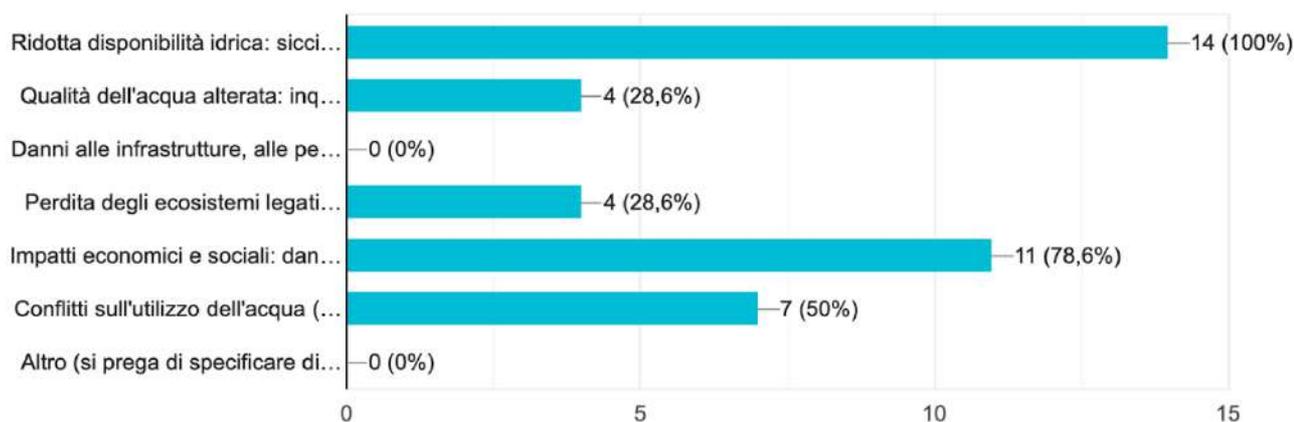


Figura 6

Ridotta disponibilità idrica = **Reduced water availability: prolonged droughts and/or reduced river flow (100%)**

Qualità dell'acqua alterata = **Altered water quality: pollution of rivers, aquifers and/or saltwater intrusion (28.6%)**

Danni alle infrastrutture = **Damage to infrastructure, people and/or the built environment due to extreme events (e.g., floods, flash floods) (0%)**

Perdite degli ecosistemi legati all'acqua = **Loss of water-related ecosystems: reduction of natural habitats and/or draining of wetlands (28.6%)**

Impatti economici e sociali = **Economic and social impacts: damage to agriculture, tourism and high management costs (78.6%)**

Conflitti sull'utilizzo dell'acqua = **Conflicts over water use (between sectors and/or communities) (50%)**

Altro = **Other (0%)**

The survey results show that **100%** of respondents identified **reduced water availability** due to prolonged droughts and/or reduced river flow as a major influence on water resource management. **78.6%** highlighted the **economic and social impacts**, including damage to agriculture, tourism, and high management costs. **50%** mentioned **conflicts over water use** between sectors and/or communities. Additionally, **28.6%** noted **altered water quality**, including pollution of rivers, aquifers, and/or saltwater intrusion, as well as **loss of water-related ecosystems**, such as the reduction of natural habitats and the draining of wetlands. No respondents selected **damage to infrastructure** or the **"Other"** category (0%).



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### Economic sectors most affected by water-related impacts in Egnazia, Puglia, Italy:

The economic sectors most affected by water-related impacts in Egnazia, Puglia, Italy, are predominantly agriculture, as it is highly dependent on water resources for irrigation and crop growth. This sector is particularly vulnerable to prolonged droughts, reduced river flow, and other water scarcity issues. A significant number of respondents also identified tourism as another key sector impacted by water-related challenges, as the area's natural landscapes, which attract tourists, could be affected by water shortages or quality issues. Additionally, industry was mentioned by some participants, with certain industrial processes depending on reliable water access, thus making them vulnerable to water scarcity. Finally, public services and infrastructure, such as water supply and waste management systems, are also at risk, particularly in areas prone to extreme weather events or water pollution. The combination of these sectors being affected underscores the widespread nature of the water-related challenges in Egnazia, highlighting the need for comprehensive water management and adaptation strategies.

Quali settori economici sono più colpiti dagli impatti legati all'acqua? (Seleziona tutte le opzioni che ritieni rilevanti)

14 risposte

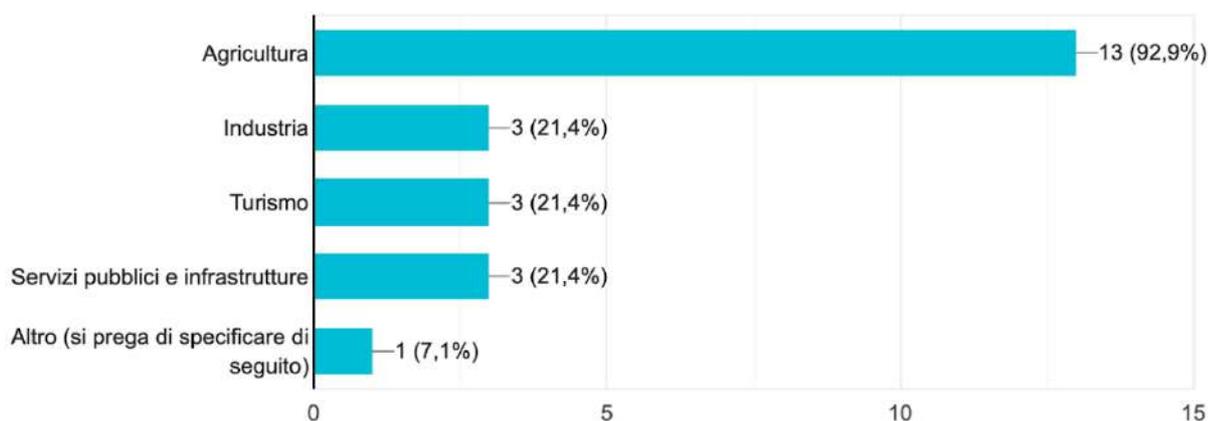


Figura 7

*Agricoltura* = **Agriculture**

*Industria* = **Industry**

*Turismo* = **Tourism**

*Servizi Pubblici e Infrastrutture* = **Public Services and Infrastructure**



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Altro = **Other**

### **Elements or factors most vulnerable to water-related impacts in Egnazia, Puglia, Italy:**

The most vulnerable elements or factors to water-related impacts in Egnazia, Puglia, Italy include groundwater contamination and depletion, as the region heavily depends on this resource, which is the only local water source, while water from other regions is relied upon for additional supply. Additionally, agricultural production and livestock farming are highly susceptible due to the region's dependence on water resources for irrigation. Ecosystems, plant life, and the local population also face significant vulnerability, as the water issues affect the environment and people's daily life. Agriculture, aquifers, underground resources, water infrastructure, and the tourism sector are other critical areas at risk due to water scarcity and contamination. Moreover, the maintenance of infrastructure is an ongoing concern, alongside threats from prolonged droughts and desertification. Water shortages for irrigation purposes and the quality of drinking water are notable concerns, with areas like Bari experiencing limited access to potable, yet polluted and unpleasant-smelling water. Other threats include saline intrusion due to over-extraction of wells and broader issues related to industry, agriculture, and demographic changes, as well as the challenges in groundwater recharge and the agricultural crisis in the region.

### **Adaptation measures or solutions to be prioritized in Egnazia, Puglia, Italy:**

To address the water resource challenges in Egnazia, Puglia, Italy, several adaptation measures should be prioritized. The most immediate action is to significantly reduce water extractions, followed by measures to reduce salinization and overall contamination. There should be a focus on the conscious and rational use of water resources, especially in agriculture, considering both quantity and quality in relation to water supply (e.g., through reuse). The implementation of best agricultural practices such as irrigation efficiency techniques, use of drought-resistant crops, and wastewater recovery systems would contribute to better resource management. Additionally, promoting water-saving awareness campaigns and prioritizing wastewater reuse (including for irrigation) will play an essential role. Measures like desalination and rainwater recharge into aquifers should also be explored. Further, actions such as reducing permitted water extraction, improving integrated groundwater management, and increasing monitoring and control over the activities of water suppliers (AQP) should be adopted. Lastly, promoting sustainable tourism and increasing control over illegal wells are also key steps towards safeguarding water resources in the region.

### **Adopted and Implemented Adaptation Policies and Measures in Egnazia, Puglia, Italy:**

Several adaptation policies and measures have been adopted and implemented, particularly by the Water Resources Section of the Region of Puglia. These measures include reducing groundwater



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extractions, delimiting vulnerable nitrate zones, and enhancing the use of treated wastewater. On a personal level, residents have been encouraged to reduce domestic water waste and install rainwater harvesting systems for irrigation purposes.

Additionally, the Water Emergency Response Plan has been put in place, focusing on reuse and waste reduction, along with regional plans for integrated water resource management. Efforts to reduce water consumption, through awareness-raising policies and adjusting water extraction volumes, have also been prioritized. One specific action, sub-action 2.8.1, aims to reduce losses in the water distribution networks (S.I.I.). However, some individuals reported lack of resources and lack of competence on the subject, preventing further implementation in certain areas.

### **Relevant or Priority Nature-Based Solutions for Water Resource Management in Egnazia, Puglia, Italy:**

The priority Nature-Based Solutions (NbS) for water resource management in Egnazia, Puglia, Italy, identified by the respondents, reflect a broad and integrated approach to addressing both water-related challenges and climate resilience. A significant number of respondents emphasized tree planting as a primary solution. This practice is seen as essential not only for improving water absorption, helping mitigate droughts and prolonged dry spells, but also for enhancing the overall regulation of the local climate. Tree planting can contribute significantly to reducing surface runoff, improving soil quality, and fostering biodiversity. Another key NbS identified was the creation of wetlands for effective water management. Wetlands can serve as natural filters for water, enhancing the quality of both surface and groundwater, and act as buffers to mitigate the impacts of floods and extreme weather events. By restoring or creating these vital ecosystems, local water resources can be better managed, and the area can be more resilient to fluctuating water levels and extreme events like floods and storms. Respondents also highlighted the importance of river ecosystem restoration. Restoring these ecosystems, which are often degraded by human activities, can significantly improve water quality, protect biodiversity, and strengthen natural flood protection mechanisms. Healthy rivers can better regulate water flow and improve water availability, which is crucial in the face of prolonged droughts.

The use of green infrastructure for flood mitigation was another common solution. This approach includes strategies such as permeable surfaces, rain gardens, and vegetated swales to manage stormwater effectively. Green infrastructure helps absorb excess water during heavy rainfall, reducing flood risks, and contributing to improved water quality and ecosystem health. Lastly, the conservation of biodiversity was mentioned as a fundamental component of climate resilience. By preserving diverse species and natural habitats, Egnazia can maintain the ecological balance necessary for long-term sustainability. Biodiversity supports the functioning of ecosystems that are essential for water purification, regulation, and overall resilience to climate impacts.



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Together, these NbS offer a holistic and sustainable way to address water management challenges while simultaneously strengthening the area's resilience to climate change impacts, such as prolonged droughts, rising temperatures, and extreme weather events.

Quale soluzione basata sulla natura consideri rilevante o una priorità per la gestione della risorsa idrica nella tua area? (Seleziona tutte le opzioni che ritieni rilevanti)

14 risposte

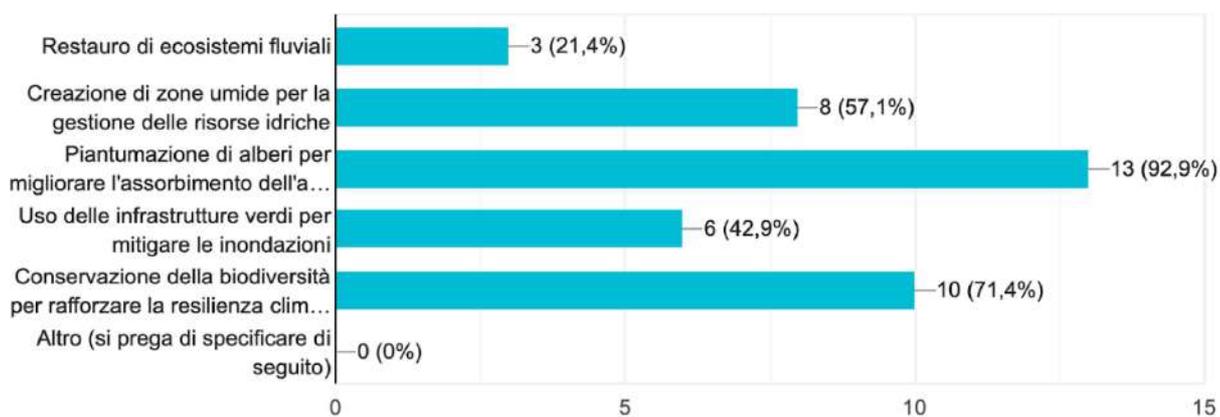


Figura 8

*Restauro di ecosistemi fluviali* = **River ecosystem restoration (21.4%)**

*Creazione di zone umide per la gestione delle risorse idriche* = **Creating wetlands for water management (57.1%)**

*Piantumazione di alberi per migliorare l'assorbimento dell'acqua* = **Planting trees to improve water absorption and climate regulation (92.9%)**

*Uso delle infrastrutture verdi per mitigare le inondazioni* = **Using green infrastructure for flood mitigation (42.9%)**

*Conservazione della biodiversità per rafforzare la resilienza climatica* = **Preserving biodiversity to strengthen climate resilience (71.4%)**

*Altro* = **Other (0%)**

Based on the responses from the survey participants, the most prioritized Nature-Based Solutions for water resource management in Egnazia, Puglia, Italy are planting trees to improve water absorption and climate regulation (92.9%) and preserving biodiversity to strengthen climate resilience (71.4%). Additionally, creating wetlands for water management was selected by 57.1% of the participants, while using green infrastructure for flood mitigation received support from 42.9%. Lastly, river ecosystem restoration was favored by 21.4% of respondents. Interestingly, no participants selected other solutions.



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### Barriers to Implementing Nature-Based Solutions in Egnazia, Puglia, Italy:

The main barriers to implementing nature-based solutions in Egnazia, Puglia, Italy, as identified by the survey participants, include lack of funds, which was frequently mentioned as a major issue. Additionally, conflicts between policies and insufficient knowledge or technical support were also seen as significant barriers. Some respondents also pointed out social or cultural resistance and governance settings as obstacles, with these factors often interacting to hinder progress. In summary, the key challenges for nature-based solutions in the region involve financial constraints, policy conflicts, lack of technical expertise, and cultural resistance, compounded by governance structures that may not facilitate effective implementation.

Quali ostacoli prevedi nell'implementazione delle soluzioni basate sulla natura nel territorio su cui eserciti le tue funzioni? (Seleziona tutte le opzioni che ritieni rilevanti)

14 risposte

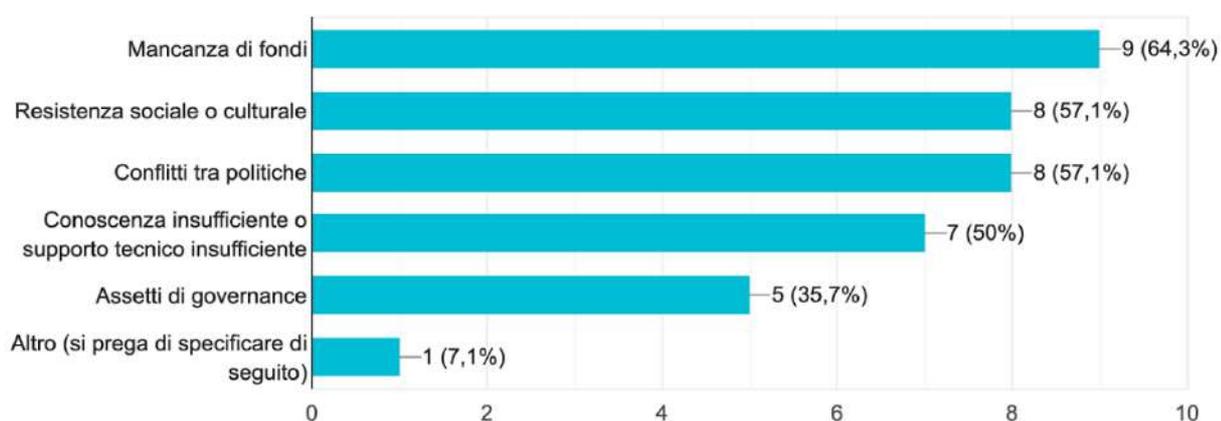


Figura 9

*Mancanza di fondi* = **Lack of funds (64.3%)**

*Resistenza sociale e culturale* = **Social or cultural resistance (57.1%)**

*Conflitti fra politiche* = **Conflicts between policies (57.1%)**

*Conoscenza insufficiente o supporto tecnico insufficiente* = **Insufficient knowledge or technical support (50%)**

*Assetti di governance* = **Management settings (35.7%)**

*Altro* = **Other (7.1%)**

The survey participants highlighted Lack of funds as the most significant barrier to implementing nature-based solutions, with 64.3% of respondents identifying this as a key challenge. Social or cultural resistance and Conflicts between policies were both noted by 57.1% of participants, while



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50% pointed to insufficient knowledge or technical support. Additionally, 35.7% mentioned Management settings as a contributing factor, and 7.1% selected Other barriers. This suggests that financial constraints and policy-related issues are the primary obstacles, along with a need for greater technical support and more favorable governance structures.

### Interest in Receiving Key Results from the Questionnaire:

Desideri essere informato sui principali risultati del questionario?

14 risposte

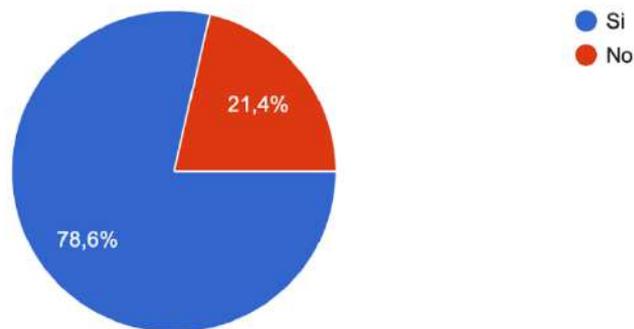


Figura 10

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# Preparing, Adapting, Reconstructing: actions to promote climate change adaptation and risk disaster resilience in Italian and Croatian sensitive ecosystems

Work Package 1 - Activity 1.3 - Deliverable 1.3

“Reports mapping the relevant local stakeholders’ needs”

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## INTRODUCTION

In the framework of impacts related to climate change, water stock management is crucial to address and mitigate extreme phenomena that determine an overabundance or scarcity of water resources, with impacts on local production systems, citizens well-being and land management. To tackle this challenge, bePrePARED project aims to coordinate and integrate risk management tools, systems and policies aimed at improving the resilience of vulnerable ecosystems and landscapes historically managed on both sides of the Adriatic Sea, with a focus on water management. This is to create new high competence skills and practices for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia targeted areas, adapting them to a sustainable use of water resources in rural-urban landscapes, raising awareness of institutions and civil society on the risks related to water scarcity and the need for water saving and adaptation policies.

Two of the main aims of the project are:

- Creating **new high competence skills and practices** for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia areas, adapting them to a sustainable use of water resources in rural-urban landscapes.
- **Raising awareness of institutions and civil society** on the risks related to water scarcity and the need for water saving and adaptation policies.

In this framework, **activity 1.3** aimed at **identifying and networking all the institutional and social / economic stakeholders of the territorial communities** addressed by the project , to assess their current awareness state about the nature and seriousness of the challenge for water landscapes sustainable management and typify their needs for information, for recommendations for a change in behaviour in facing water and climate-related risks, for cultural and capacity building, towards a higher attentiveness to the implications of an ecosystem management more sound to the present, evolutionary, climate conditions.

The deliverable is made of 6 reports, one per each of the target areas of the project. The reports share a common introduction on the methodology used for stakeholders' mapping and for the preparation of the online questionnaires, while including different results specific for each of the 6 geographies.



## Trogir, Split-Dalmatian, CROATIA

### THE IMPORTANCE OF STAKEHOLDER MAPPING IN CLIMATE ADAPTATION

The stakeholder mapping process is essential to ensure that decisions related to climate change adaptation are inclusive, representative, and based on solid evidence. Engaging various actors, from citizens to institutions, enhances the relevance, effectiveness, and credibility of adaptation plans, building trust and a collective mandate for implementing the necessary actions. By integrating local insights and concerns, mapping helps complement top-down approaches, fostering a sense of shared ownership and clarifying common goals.

In the context of the project, a structure has been adopted that considers the need to accurately identify and categorize the involved stakeholders. This process is crucial for building a solid evidence base, gaining political support, establishing effective governance structures, and understanding the roles and responsibilities of each actor. The framework used for mapping stakeholders is based on an analytical methodology that ensures accurate identification, avoiding biases that could compromise the representativeness and effectiveness of the engagement.

By adopting a transparent and robust approach, the mapping process allows the collection of key information on the behaviors, intentions, connections, resources, and influence of stakeholders. This information is then used to guide political decisions, improve understanding of the social and political feasibility of proposed actions, and effectively guide future developments in adaptation policies.

### STAKEHOLDER MAPPING FRAMEWORK

The structure of the stakeholder mapping for the bePrepared project was carefully designed using the Tandem Guidance approach, which was also applied in the [Adaptation AGORA project](#). The Tandem framework serves as a valuable tool for fostering transdisciplinary collaboration and ensuring that stakeholder engagement is purposeful, systematic, and aligned with project objectives. It provides a structured set of elements and guiding questions, informed by empirical cases and prior frameworks, that enable stakeholders to engage meaningfully in collaborative learning processes,



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address shared challenges, and align on governance, risks, goals, and solutions. In the bePrepared project, the stakeholder mapping for the Neretva River Delta case study follows this framework, with the goal of identifying the key actors involved, understanding their roles and interests, and determining how their involvement can shape both the issues at hand and the solutions proposed. The mapping structure includes several key components:

1. **Stakeholder Identification:** Each stakeholder or target group is clearly identified, including their contact details, role, and organizational affiliation. This ensures that the right individuals are engaged and that their contributions can be tracked throughout the project.
2. **Stakeholder Roles and Interests:** The roles that each stakeholder plays (e.g., decision-maker, expert, community member) are identified, along with the key interests or issues they care about. This helps to ensure that the project considers the priorities of all relevant stakeholders and addresses their specific concerns.
3. **Key Issues and Solutions:** For each stakeholder, we assess the specific issues they are either affecting or affected by, and similarly, the solutions they can contribute to or benefit from. This provides a comprehensive understanding of each stakeholder's position and potential impact on the project.
4. **Interest and Type of Participation:** The mapping includes a clear assessment of the level of interest each stakeholder has in participating in the project. Stakeholders are categorized based on their interest (e.g., high, low, none) and the type of participation they are expected to contribute (e.g., awareness, information sharing, consultation, discussion, co-design, co-decision making). This helps ensure that stakeholders are engaged at the appropriate level, allowing for meaningful contributions without overwhelming less interested parties.
5. **Means of Engagement:** Various engagement methods are identified, ranging from emails and phone calls to more interactive forms of participation like workshops or co-design sessions. This ensures that each stakeholder is reached using the most appropriate and effective communication channels.
6. **Engagement Status:** The mapping also tracks the status of each stakeholder's engagement (e.g., contacted, not contacted), which helps to monitor progress and identify any gaps in stakeholder inclusion.

An example of how the stakeholder mapping file was sent to each case study is present in the following image.



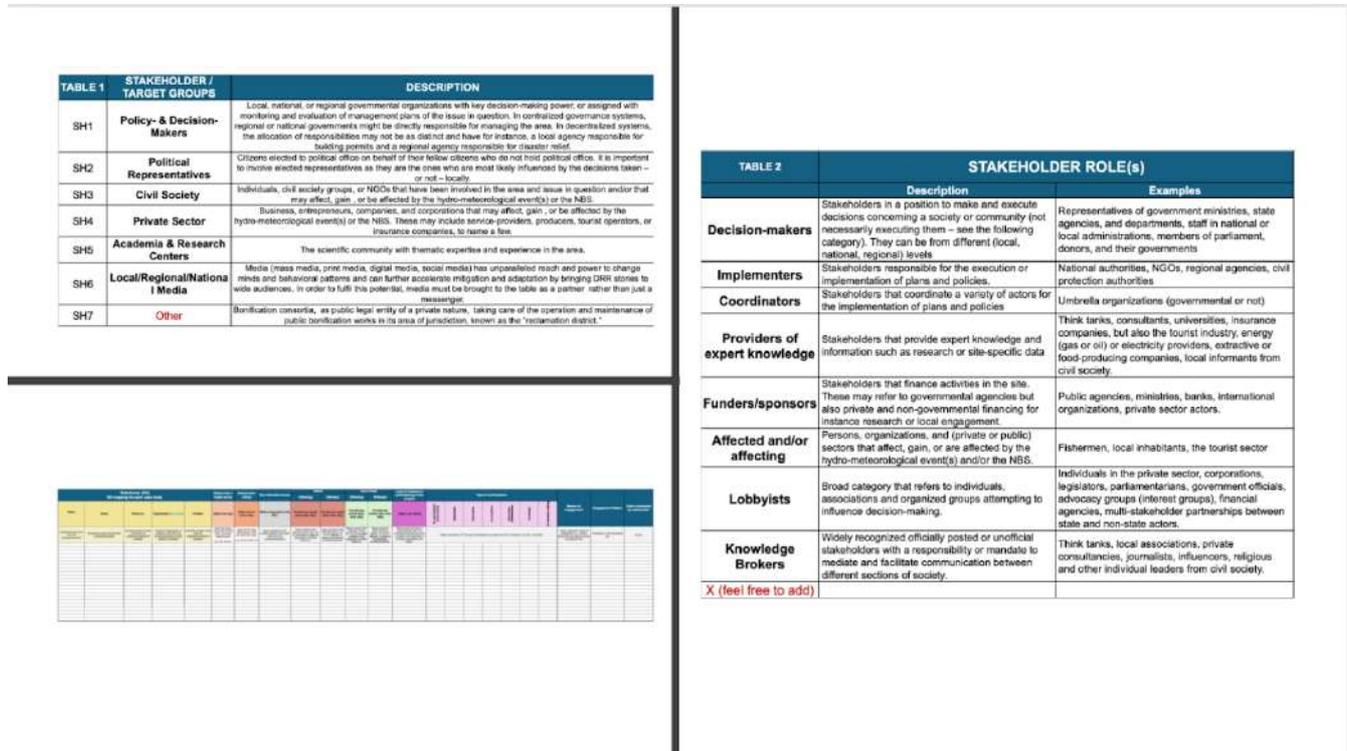


Figure 1

This structured approach to stakeholder mapping ensures that the bePrepared project captures a diverse range of perspectives and effectively integrates stakeholders into the decision-making process. By using the Tandem framework, the project establishes a transparent, inclusive, and participatory foundation for tackling climate change and water resource management challenges in the Trogir, Split-Dalmatian area.

Number of identified stakeholders in the Stakeholder Mapping process for the Trogir, Split-Dalmatian area case study: **11**.

## QUESTIONNAIRE ON NEEDS ASSESSMENT, STRUCTURE

The questionnaire has been structured to serve as a robust tool for gathering essential insights within the bePrepared project. Its design reflects the need to conduct a comprehensive needs assessment, ensuring that the perspectives of key stakeholders - identified in the previous phase based on the structure described above - are accurately captured and integrated into the project's strategic development. By addressing various dimensions of water resource management and climate change



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adaptation, the questionnaire aims to bridge knowledge gaps, identify local challenges, and highlight opportunities for more effective and sustainable solutions.

To achieve this, the questionnaire is divided into seven thematic sections, each focusing on a specific aspect of stakeholder engagement and expertise. The first two sections (1-2) gather contextual information, identifying the respondent's role and their organization's involvement in water management and adaptation efforts. This allows for a clear mapping of stakeholders and their influence within the system. The third section (3) delves into perceptions of climate change impacts and associated risks, providing valuable qualitative and quantitative insights into how different actors experience and interpret these challenges in their respective regions. The fourth (4) and fifth (5) sections explore water both as a resource—identifying key needs, priorities, and constraints in its management—and as a source of impacts, assessing how water-related issues, such as floods or droughts, affect communities, economies, and ecosystems. The sixth section (6) is dedicated to Nature-Based Solutions (NBS), evaluating the feasibility and relevance of these innovative approaches within the respondents' local contexts. Finally, the seventh section (7) offers an open space for additional input, ensuring that the questionnaire captures perspectives that may not have been explicitly addressed in the structured questions.

A mix of multiple-choice and open-ended questions has been employed to balance structured data collection with the flexibility needed to incorporate stakeholder-specific insights. This methodological approach allows us to extract both quantifiable trends and nuanced qualitative responses, enhancing the reliability and applicability of the findings.

Ultimately, this questionnaire is more than just a data-gathering tool—it is a collaborative effort to shape effective climate adaptation and water management strategies. By participating, stakeholders directly contribute to the development of evidence-based solutions that align with real-world needs, reinforcing the overarching objectives of the bePreparedproject.

## INSIGHTS FROM THE NEEDS ASSESSMENT QUESTIONNAIRE

**Number of Participants:** 11



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### List of the organizations and institutions involved in the questionnaire on local stakeholders' perceptions of water-related risks, opportunities, and challenges in Trogir, Split-Dalmatian, Croatia:

- Museum (Director)
  - EU Funds Specialist
  - Department Head
  - Assistant Manager
  - Unit for the Implementation of the National Irrigation and Agricultural Land and Water Management Project
  - Expert Associate for Marketing, Promotion, and Destination Management
  - President (specific organization or association not mentioned)
- 
- Head of the Communications and Advocacy Department
  - Biology and Chemistry Teacher
  - Assistant in the Climate Change Department
  - Head of the Administrative Department for Local Self-Government and City Property

### Role of the participants in their institution/organization:

The respondents reflect a broad spectrum of roles tied to environmental and water resource management, with a significant focus on the planning, management, and protection of land and water resources. Many are involved in the economic and social development of their respective territories, indicating a holistic approach to regional growth alongside environmental considerations. A notable portion of respondents is engaged in fostering community involvement, recognizing the importance of local communities in both managing resources and responding to environmental challenges. Monitoring and assessing climate risks also emerged as a key responsibility among some of the respondents, pointing to the need for data-driven approaches in climate adaptation and water management.

In addition to these core areas, several respondents are dedicated to promoting and implementing environmental protection policies, underscoring the policy-making aspect of environmental governance. The role of cultural heritage protection is also represented, highlighting efforts to balance conservation of local heritage with environmental sustainability. Some organizations, while not directly involved in water management, work toward sustainable tourism practices, aiming to alleviate the pressure on infrastructure and resources, particularly during the summer months. Education plays a critical role in this context, with various respondents focused on educating different



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segments of the population, including children, youth, adults, local governments, and public institutions.

Moreover, there is an emphasis on practical actions, such as executing specific tasks for water-related projects, including report creation, internal strategies, and participation in workshops, illustrating the commitment to collaborative efforts for managing water resources and adapting to climate change. These diverse roles collectively highlight a multifaceted approach to water-related challenges, blending scientific, policy, community, heritage, and educational efforts to ensure sustainable and effective resource management.

### **Geographical scale of reference of the respondents:**

All respondents to the questionnaire referenced the Trogir, Split-Dalmatian area in Croatia as their primary geographic focus.

### **Organization's role in the context of water resource management and/or climate change adaptation:**

The organizations involved in the questionnaire represent a diverse range of roles in the context of water resource management and climate change adaptation. Many respondents are focused on the planning, management, and protection of land and water resources, highlighting the importance of sustainable environmental practices. Several are also engaged in the economic and social development of their territories, underlining the intersection of environmental management with broader regional growth and well-being. Additionally, planning, management, and protection of cultural heritage is an important role for some organizations, indicating a holistic approach to sustainability that incorporates both natural and cultural resources.

Many respondents are also engaged in monitoring and assessing climate risks, suggesting a data-driven approach to understanding and responding to environmental challenges. The promotion of environmental protection policies is another key role, reflecting efforts to shape and influence public policy for sustainable resource management. Community engagement is consistently highlighted, with many organizations working to involve local populations in climate adaptation and water resource management processes. This focus on local involvement indicates a recognition of the importance of community-based solutions in tackling climate and water-related challenges.

In addition, there is a clear emphasis on making tourism sustainable, ensuring that tourism activities in the city are spread throughout the year to avoid overburdening infrastructure, the environment, and resources during peak months. Education plays a central role as well, with organizations focused on raising awareness among children, youth, adults, local government units (LGUs), public institutions, and others. Some organizations are also involved in executing parts of work packages,



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including report creation, internal strategies, and participation in workshops, further illustrating the collaborative approach to climate adaptation and resource management.

### Perception related to the severity of climate change impacts in Trogir, Split-Dalmatian, Croatia:

Kako biste ocijenili ozbiljnost utjecaja klimatskih promjena na vašem području?

11 risposte

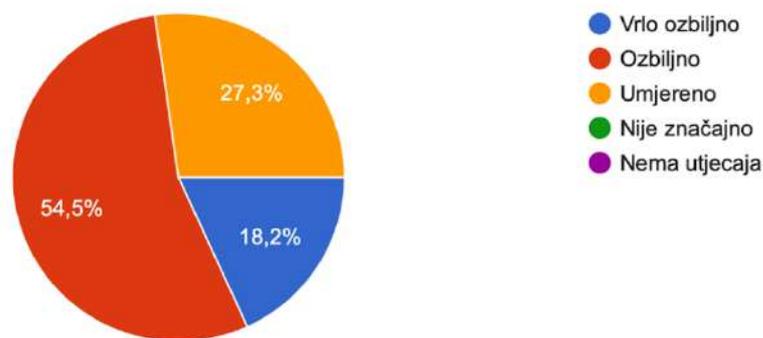


Figura 2

Vrlo ozbiljno = **Very serious (18.2%)**

Ozbiljno = **Serious (54.5%)**

Umjereno = **Moderate (27.3%)**

Nije značajno = **Not significant**

Nema utjecaja = **No impact**

Most of the respondents highlighted that their perception of the severity of the impacts of climate change in the area ranges from moderate (27.3%) to serious (54.5%), if not very serious (18.2%).

### Main climate risks that affect Trogir, Split-Dalmatian, Croatia:

The main climate risks affecting the area revolve around increasing average temperatures, which were consistently identified as a significant concern. Extreme weather events, including floods and storms, were also frequently mentioned, highlighting their disruptive impact on infrastructure, ecosystems, and local communities. Prolonged droughts emerged as a major issue, reflecting concerns over water availability and the strain on agriculture and other water-dependent sectors. Coastal and soil erosion were recognized as additional risks, particularly in relation to the vulnerability of coastal areas to changing climate conditions. Another key challenge is the loss of biodiversity and natural habitats, with respondents emphasizing the degradation of ecosystems due



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to rising temperatures, extreme weather, and unsustainable land use. Additionally, sea level rise was mentioned as a concern, further exacerbating the threats to coastal settlements and ecosystems.

Koji su glavni klimatski rizici koji utječu na vaše područje? (Odaberite sve relevantne opcije)

11 risposte

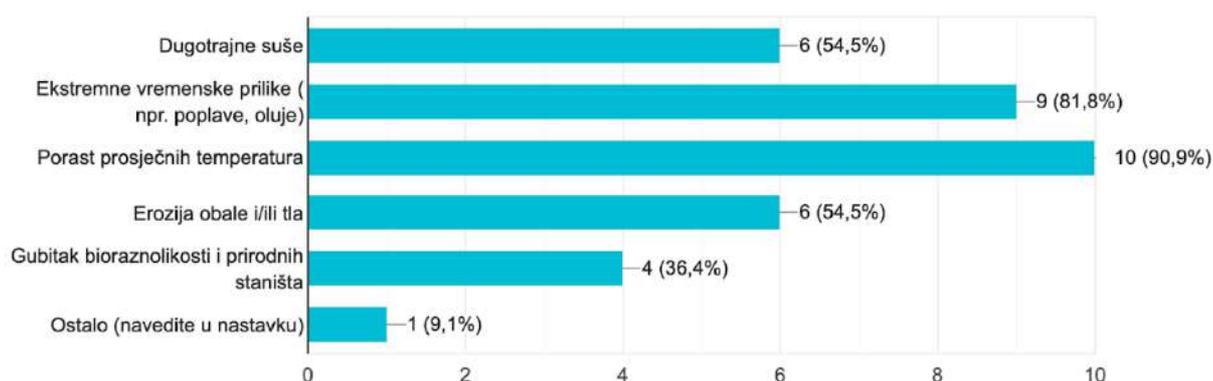


Figura 3

Dugotrajne suše = **Prolonged droughts (54.5%)**

Eks. vremenske prilike (poplave, oluje) = **Ext. weather events (e.g. floods, storms) (81.8%)**

Porast prosječnih temperatura = **Increase in average temperatures (90.9%)**

Erozijska obala i/ili tla = **Coastal and/or soil erosion (54.5%)**

Gubitak bioraznolikosti i prirodnih staništa = **Loss of biodiversity and nat. habitats (36.4%)**

Ostalo (navedite u nastavku) = **Other (please specify below) (9.1%)**

The main climate risks affecting the area include an **increase in average temperatures (90.9%)**, **extreme weather events such as floods and storms (81.8%)**, and **prolonged droughts (54.5%)**. Additionally, **coastal and/or soil erosion (54.5%)** and **loss of biodiversity and natural habitats (36.4%)** were highlighted as significant concerns. A smaller percentage of respondents (**9.1%**) mentioned other risks.

### Primary Needs in Water Resource Management:

The primary needs related to water resource management in the area focus on **ensuring greater availability of drinking water**, which is a key concern given seasonal shortages and increasing demand. **Preventing pollution of water resources** was also frequently mentioned, highlighting the need to protect water quality from contaminants linked to human activities and inadequate infrastructure. Another major priority is **improving the efficiency of irrigation and distribution systems**, reflecting the importance of optimizing water use, particularly in agriculture. Additionally, respondents emphasized the necessity of **promoting the sustainable use of water resources**,



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advocating for long-term strategies to balance consumption with conservation. **Adaptation to sea level rise** also emerged as a critical concern, particularly for coastal communities facing increased risks of flooding, erosion, and saltwater intrusion into freshwater sources.

Koje su primarne potrebe vezane uz upravljanje vodnim resursima u vašem području? (Odaberite sve relevantne opcije)

11 risposte

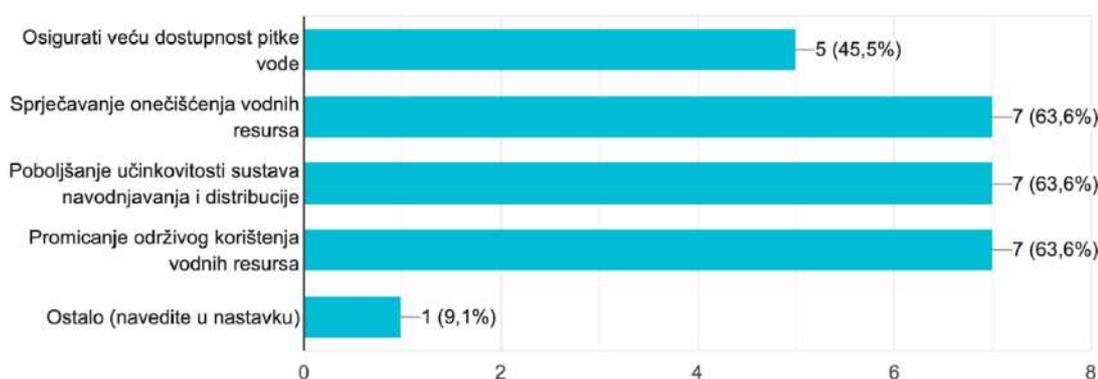


Figura 4

*Osigurati veću dostupnost pitke vode* = **Ensure greater availability of drinking water (45.5%)**

*Sprječavanje onečišćenja vodnih resursa* = **Preventing pollution of water resources (63.6%)**

*Poboljšanje učinkovitosti sustava navodnjavanja i distribucije* = **Improving the efficiency of irrigation and distribution systems (63.6%)**

*Promicanje održivog korištenja vodnih resursa* = **Promoting sustainable use of water resources (63.6%)**

*Ostalo (navedite u nastavku)* = **Other (9.1%)**

The primary needs related to water resource management highlight several key priorities. Ensuring greater availability of drinking water (45.5%) is a significant concern, particularly in areas experiencing seasonal shortages. Preventing pollution of water resources (63.6%) is widely recognized as essential to maintaining water quality and protecting ecosystems. Equally important are improving the efficiency of irrigation and distribution systems (63.6%) and promoting the sustainable use of water resources (63.6%), both of which are crucial for long-term water security and resilience. Additionally, 9.1% of respondents identified other specific needs, further emphasizing the diverse challenges in managing water resources effectively.

### Main Challenges in Water Resource Management in Trogir, Split-Dalmatian, Croatia:



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The main challenges related to water resource management in the area stem from a combination of **demographic pressure and urbanization**, **insufficient infrastructure**, **conflicting water demands among sectors**, and **limited awareness or technical expertise**. **Demographic growth and urban expansion** exert increasing pressure on available water resources, leading to higher consumption and greater strain on existing supply systems. **Inadequate infrastructure** further compounds the issue, as outdated or insufficient water distribution, irrigation, and wastewater treatment systems limit efficiency and sustainability. Moreover, **conflicts between different water users**, including agriculture, industry, and tourism, pose a significant challenge, as each sector competes for limited resources, often without an integrated management approach. **Lack of awareness and technical skills** among stakeholders exacerbates these problems, hindering the implementation of sustainable water management practices and adaptation measures. Together, these challenges highlight the need for improved infrastructure, better governance, increased education and capacity-building, and more integrated planning strategies to ensure long-term water security in the region.

Koji su glavni izazovi vezani uz upravljanje vodama na vašem području? (Odaberite sve relevantne opcije)

11 risposte

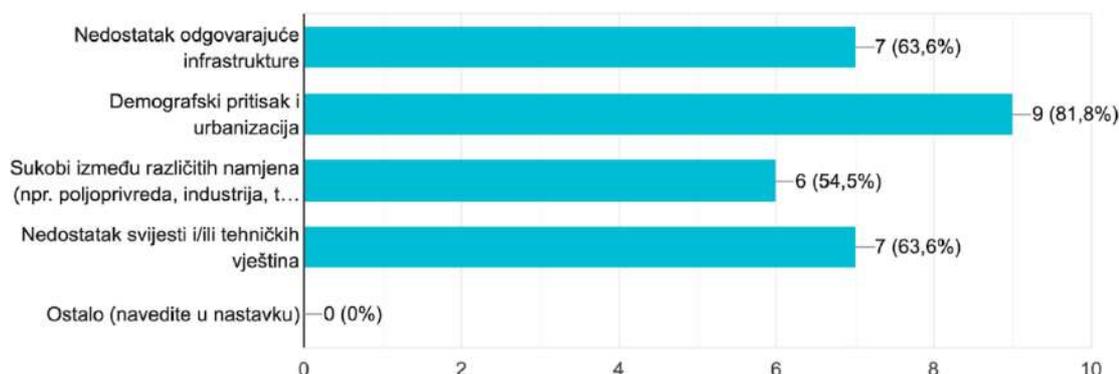


Figura 5



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*Nedostatak odgovarajuće infrastrukture* = **Lack of adequate infrastructure (63.6%)**

*Demografski pritisak i urbanizacija* = **Demographic pressure and urbanization (81.8%)**

*Sukobi između različitih namjena (npr. poljoprivreda, industrija, turizam)* = **Conflicts between different uses (e.g. agriculture, industry, tourism) (54.5%)**

*Nedostatak svijesti i/ili tehničkih vještina* = **Lack of awareness and/or technical skills (63.6%)**

*Ostalo (navedite u nastavku)* = **Other (0%)**

The main challenges related to water resource management in the area include **demographic pressure and urbanization (81.8%)**, which significantly strain existing water systems and infrastructure. **Lack of adequate infrastructure (63.6%)** is another critical issue, highlighting deficiencies in water supply, distribution, and treatment facilities. **Lack of awareness and/or technical skills (63.6%)** further complicates effective water management, as gaps in knowledge and expertise hinder the implementation of sustainable solutions. Additionally, **conflicts between different uses (54.5%)**, such as agriculture, industry, and tourism, create competition for limited water resources, emphasizing the need for integrated and balanced management strategies.

### **Priority Actions for Preserving Water Resources in Trogir, Split-Dalmatian, Croatia:**

The priority actions for preserving water resources in the area focus on several key aspects. **Pollution reduction** is crucial, including the modernization of drainage and wastewater treatment systems, stricter control of agricultural activities to limit pesticide and fertilizer use, and the elimination of illegal waste dumps near water sources. **Sustainable water use** is another major priority, emphasizing infrastructure improvements to reduce water loss, promoting rational water consumption among residents and the tourism sector, and encouraging the collection and use of rainwater, particularly in rural and island areas. **Adaptation to climate change** is also essential, with the development of long-term strategies to manage water resources amid rising temperatures and increasing droughts. Additionally, **scientific research and education** are key to fostering innovative water conservation solutions and raising awareness among the general public. Other highlighted needs include **improving water infrastructure**, ensuring better cooperation between economic entities and local administrations, implementing risk reduction and sustainable management plans, and balancing seasonal water demand by distributing tourism more evenly throughout the year.

### **Main Influences on Water Resource Management in Trogir, Split-Dalmatian, Croatia:**

The main influences related to water resource management in the area are **reduced water availability** due to prolonged droughts and/or reduced river flow, frequently mentioned as a critical concern. **Altered water quality**, such as pollution of rivers, aquifers, and saltwater intrusion, also emerged as a significant issue affecting the region's water resources. In particular, while the area benefits from an abundance of drinking water, challenges arise periodically, especially with the turbidity at the Jadro spring— the primary source of drinking water for multiple surrounding areas. This issue occurs about twenty days each year, potentially affecting water quality. **Damage to**



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**infrastructure, people, and the built environment** caused by extreme weather events like floods and torrents was highlighted as a major influence, alongside **economic and social impacts**, particularly the damage to agriculture, tourism, and high management costs. Furthermore, **the loss of water-related ecosystems**, including the reduction of natural habitats and draining of wetlands, further complicates water management. Concerns were raised about **wastewater disposal**, with untreated wastewater being directly released into the sea, impairing sea quality and endangering marine communities. **Conflicts over water use** between sectors and communities are recognized as an emerging challenge.

Koji su glavni utjecaji povezani s upravljanjem vodama na vašem području? (Odaberite sve relevantne opcije)

11 risposte

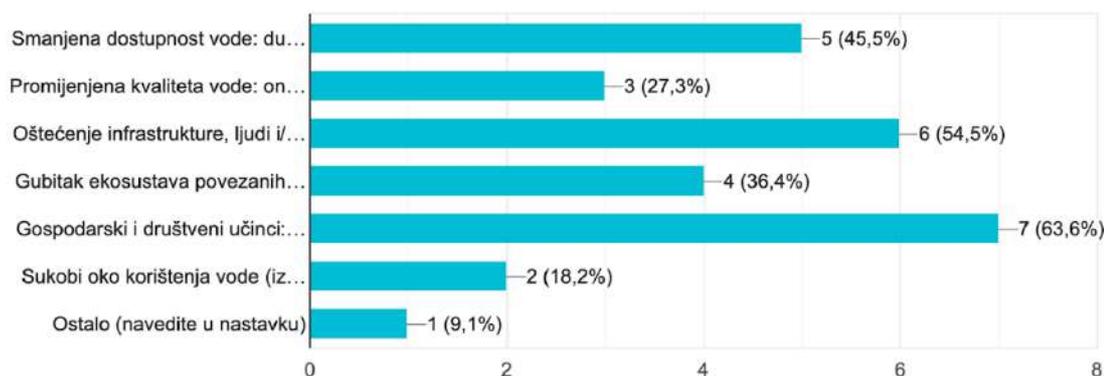


Figura 6

Smanjena dostupnost vode: du... = **Reduced water availability: prolonged droughts and/or reduced river flow (45.5%)**

Promijenjena kvaliteta vode: on... = **Altered water quality: pollution of rivers, aquifers and/or saltwater intrusion (27.3%)**

Oštećenje infrastrukture, ljudi i/... = **Damage to infrastructure, people and/or the built environment due to extreme events (e.g., floods, flash floods) (54.4%)**

Gubitak ekosustava povezanih... = **Loss of water-related ecosystems: reduction of natural habitats and/or draining of wetlands (36.4%)**

Gospodarski i društveni učinci:... = **Economic and social impacts: damage to agriculture, tourism and high management costs (63.6%)**

Sukobi oko korištenja vode (iz... = **Conflicts over water use (between sectors and/or communities) (18.2%)**

Ostalo (navedite u nastavku) = **Other (9.1%)**



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The main influences related to water resource management in the area include economic and social impacts, with 63.6% of respondents noting damage to agriculture, tourism, and high management costs. Damage to infrastructure, people, and the built environment due to extreme events like floods and flash floods was also a significant concern, mentioned by 54.4%. Reduced water availability, due to prolonged droughts and/or reduced river flow, was identified by 45.5% of respondents as a key issue. Loss of water-related ecosystems, such as the reduction of natural habitats and draining of wetlands, was highlighted by 36.4%. Altered water quality, including pollution of rivers, aquifers, and/or saltwater intrusion, was noted by 27.3%. Conflicts over water use between sectors and communities were less frequently cited, with 18.2% of respondents mentioning it. Finally, 9.1% of respondents pointed out other influences that were not specifically listed.

### Economic sectors most affected by water-related impacts in Trogir, Split-Dalmatian, Croatia:

Na koje gospodarske sektore najviše utječu utjecaji povezani s vodom? (Odaberite sve relevantne opcije)

11 risposte

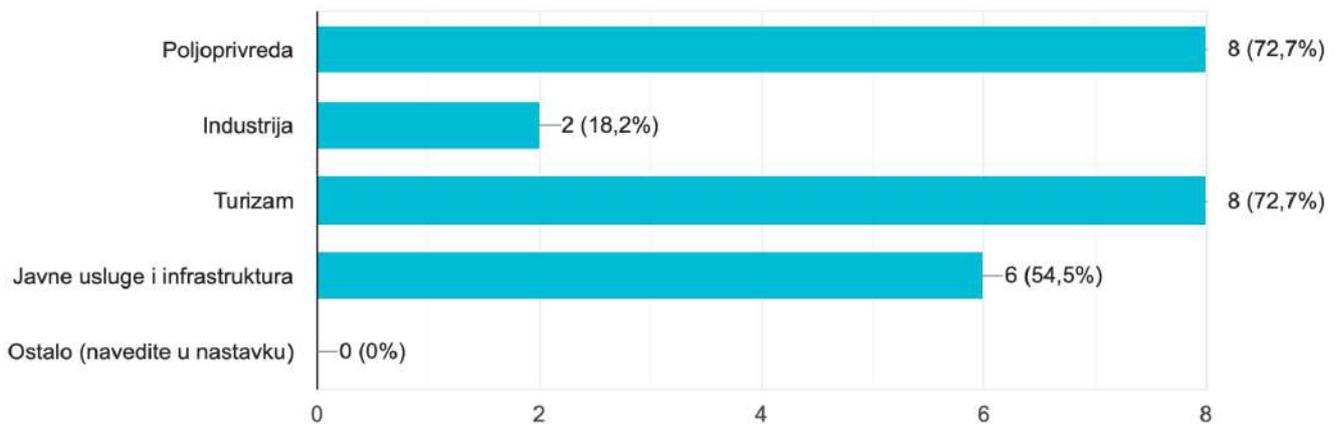


Figura 7

Poljoprivreda = **Agriculture**

Industrija = **Industry**

Turizam = **Tourism**

Javne usluge i infrastruktura = **Public Services and Infrastructure**

Ostalo (navedite u nastavku) = **Other**

The responses indicate that **Agriculture** is the most affected sector by water-related impacts, with almost all respondents highlighting it as a primary concern. This is due to issues such as prolonged



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droughts, reduced water availability, and extreme weather events, which directly influence crop yields, irrigation systems, and the overall viability of agricultural production. **Tourism** and **Public Services and Infrastructure** also emerged as heavily impacted sectors, with respondents noting that water scarcity, pollution, and extreme weather events such as floods and storms disrupt not only tourism activities but also strain public services and infrastructure. These sectors are particularly vulnerable in areas where tourism is a major economic driver, and where water management issues can create significant economic losses. In some cases, **Industry** was also cited as affected, particularly in regions where water resources are critical for manufacturing processes.

### **Elements or factors most vulnerable to water-related impacts in Trogir, Split-Dalmatian, Croatia:**

The responses indicate several key elements and factors that are most vulnerable to water-related impacts in the area. **Water source pollution** is a primary concern, particularly for **drinking water sources**, with **groundwater** and **rivers** being highly susceptible to contamination. **Coastal ecosystems** are also vulnerable, especially due to **wastewater pollution** and the pressures from **excessive construction**. The tourism sector faces challenges from **high water consumption**, particularly during the peak tourist season, which places added strain on available resources, especially in island areas. Climate change is identified as a significant threat, with rising temperatures, more frequent droughts, and extreme precipitation events negatively affecting both **water availability** and **quality**. **Agriculture** is heavily impacted by prolonged droughts, which deprive farmers of water for irrigation, while **public infrastructure** and **citizens' properties** suffer from floods and torrents. **Urbanization, insufficient green spaces**, and the geographical location of places like the old part of **Trogir** further exacerbate vulnerabilities. The growing **intensive tourism traffic** and **insufficiently developed infrastructure** in rural and coastal areas also increase the risks of environmental pollution, making effective water management and adaptation strategies critical to mitigate these impacts.

### **Adaptation measures or solutions to be prioritized in Trogir, Split-Dalmatian, Croatia:**

The responses highlight several key adaptation measures for reducing water-related risks. Strict protection of water sources and the introduction of additional filtration systems were identified as necessary steps to ensure clean and safe water. Improving infrastructure emerged as a critical measure, with a focus on modernizing water distribution systems to reduce losses and improve efficiency. Additionally, there was a call for sustainable water use, including the promotion of water conservation, rainwater harvesting, and recycling water, though some respondents pointed out that this is not a priority currently due to abundant water availability. Adapting to climate change was a prominent theme, with respondents suggesting the development of water management plans during droughts. Physical adaptations, such as infrastructure reconstructions, were also highlighted, alongside actions to prevent soil erosion through afforestation. Other solutions mentioned include



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the rational and responsible use of water, as well as improving coastal defenses and better distribution of tourism throughout the year to reduce strain on water resources.

The promotion of nature-based solutions (NbS) was emphasized, including increasing green areas in urban settings to improve water infiltration, reduce heat effects, and manage stormwater naturally through techniques like rain gardens. Furthermore, there was a call for educating tourists, promoting sustainable tourism, and improving cooperation between local authorities, the public sector, scientific institutions, and citizens in planning and implementing adaptation measures. These combined efforts reflect a holistic approach to managing water resources, adapting to climate change, and ensuring long-term sustainability.

### **Adopted and Implemented Adaptation Policies and Measures in Trogir, Split-Dalmatian, Croatia:**

The responses highlight a range of adaptation measures that have been implemented to address water resource challenges. These include **infrastructure improvement** through EU-funded projects that have modernized water supply and drainage systems, such as the Split-Solin and Kaštela-Trogir Agglomerations. There has been a focus on **sustainable water use**, particularly through initiatives like the Interreg CWC project, which promotes water conservation and encourages rainwater and recycled water use. However, respondents noted that a more comprehensive long-term strategy is needed for systematic progress in this area. Additionally, there are **climate change adaptation** measures, including plans to ensure alternative water supplies, such as the proposed use of the Cetina River for drinking water in case of insufficient capacity at the Jadra source.

Some areas have implemented **public-private partnerships** to co-finance water infrastructure projects and water supply to local governments, especially in emergency situations. **Risk assessments** have been developed for significant monuments, including proposals for risk mitigation, and the development of six-year water management plans with quality monitoring is underway.

In the realm of **tourism**, measures to **disperse tourist demand** throughout the year have been introduced, alongside efforts to modernize infrastructure. Additionally, initiatives aimed at **environmental education**, such as encouraging green areas, building school gardens, and raising awareness about sustainable tourism and water use, are underway. While some respondents have yet to implement specific adaptation measures, there is recognition of the need for broader efforts to address water management challenges in the region.

### **Relevant or Priority Nature-Based Solutions for Water Resource Management in Trogir, Split-Dalmatian, Croatia:**

The responses highlight several nature-based solutions as priorities for water resource management, with a strong emphasis on **planting trees** to improve water absorption and regulate climate, which was consistently mentioned across the responses. Additionally, **using green infrastructure to**



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**mitigate floods** and **preserving biodiversity to strengthen climate resilience** were frequently cited as key solutions. Respondents also emphasized the importance of **restoring river ecosystems** and **creating wetlands for water management** as essential nature-based approaches. Another important consideration was the **reactivation of torrential streams**, which was highlighted as a potential solution to address water flow management and reduce flood risks. The recurring mention of these solutions suggests a clear preference for integrated, eco-friendly methods to manage water resources and address climate change impacts. The diverse nature-based solutions point to a holistic approach to water management, combining ecological restoration, infrastructure adaptation, and biodiversity conservation to build resilience against climate risks.

Koja rješenja koja se temelje na prirodi smatrate relevantnim ili prioritetnim za upravljanje vodnim resursima u vašem području? (Odaberite sve relevantne opcije)

11 isposte

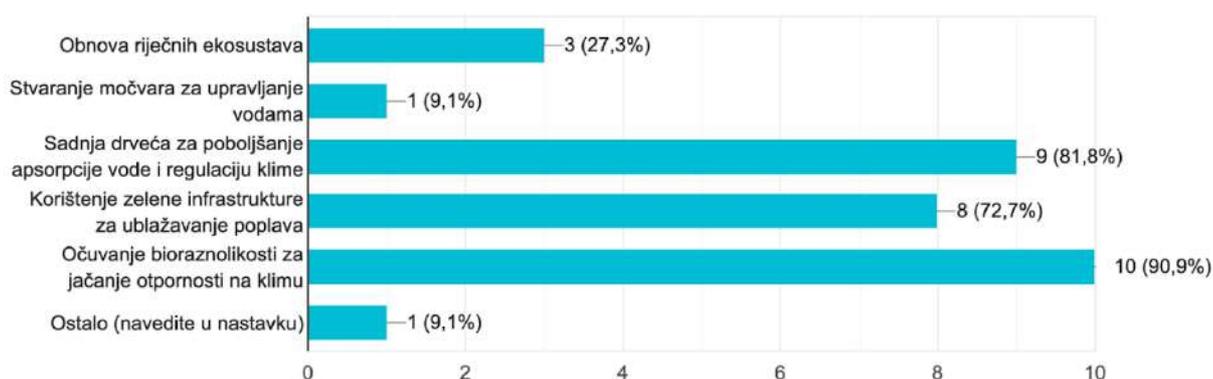


Figura 8

Obnova riječnih ekosustava = **River ecosystem restoration (27.3%)**

Stvaranje močvara za upravljanje vodama = **Creating wetlands for water management (9.1%)**

Sadnja drveća za poboljšanje apsorpcije vode i regulaciju klime = **Planting trees to improve water absorption and climate regulation (81.8%)**

Korištenje zelene infrastrukture za ublažavanje poplava = **Using green infrastructure for flood mitigation (72.7%)**

Očuvanje bioraznolikosti za jačanje otpornosti na klimu = **Preserving biodiversity to strengthen climate resilience (90.9%)**

Ostalo (navedite u nastavku) = **Other (9.1%)**

The nature-based solutions considered most relevant or a priority for water resource management in the area include preserving biodiversity to strengthen climate resilience (90.9%), reflecting the critical role of healthy ecosystems in adapting to climate change. Planting trees to improve water absorption and climate regulation (81.8%) was also highly emphasized, as it helps mitigate both water



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management and climate impacts. Additionally, using green infrastructure for flood mitigation (72.7%) was identified as an important strategy to reduce flood risks and enhance resilience. River ecosystem restoration (27.3%) and creating wetlands for water management (9.1%) were also highlighted as key solutions, though with lower priority. Lastly, a small percentage of respondents mentioned other solutions (9.1%).

### **Barriers to Implementing Nature-Based Solutions in Trogir, Split-Dalmatian, Croatia:**

The main barriers identified in implementing nature-based solutions in the area include insufficient knowledge or technical support, which was frequently cited as a major challenge. A significant factor is the lack of funds and resources, limiting the ability to invest in and scale up these solutions. Many respondents emphasized the need to insist on applying for EU funds to implement pilot projects, which could serve as a roadmap for larger-scale actions, such as using green infrastructure to mitigate urban flooding. Conflicts between policies and lack of coordination at local, regional, and national levels were also highlighted, particularly in relation to local authorities, public sectors, private companies, and NGOs working in isolation. Management settings and preferences were seen as another barrier, especially with fragmented efforts and unclear responsibility division among stakeholders. This fragmentation complicates the integration of nature-based solutions into existing management systems and prolongs implementation timelines.

Property-legal issues and land ownership disputes, particularly in agricultural and undeveloped land, were pointed out as major obstacles, as these affect land use, fire management, and contribute to soil erosion, flash floods, and landslides. The challenge of addressing these issues is further compounded by the need to adhere to UNESCO regulations in some areas, making interventions more expensive and administratively complex. Moreover, the lack of proper education, especially in local communities, and insufficient training for experts and local authorities also emerged as critical barriers. Without adequate educational programs and professional development, the capacity to



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apply the latest nature-based solutions remains limited. Lastly, a clear definition of goals and implementers is often lacking, hindering the effectiveness of these initiatives.

Koje prepreke predviđate u implementaciji rješenja temeljenih na prirodi na vašem području? (Odaberite sve relevantne opcije)

11 risposte

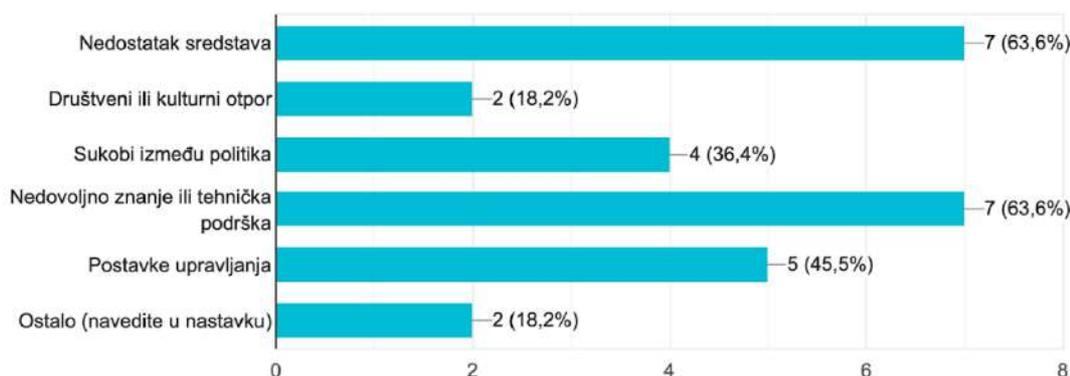


Figura 9

*Nedostatak sredstava* = **Lack of funds (63.6%)**

*Društveni ili kulturni otpor* = **Social or cultural resistance (18.2%)**

*Sukobi između politika* = **Conflicts between policies (36.4%)**

*Nedovoljno znanje ili tehnička podrška* = **Insufficient knowledge or technical support (63.6%)**

*Postavke upravljanja* = **Management settings (45.5%)**

*Ostalo (navedite u nastavku)* = **Other (18.2%)**

The main barriers foreseen in implementing nature-based solutions in the area include lack of funds (63.6%) and insufficient knowledge or technical support (63.6%). Conflicts between policies (36.4%) and management settings (45.5%) were also identified as significant challenges. Social or cultural resistance (18.2%) and other unspecified factors (18.2%) were mentioned by a smaller proportion of respondents.

### Interest in Receiving Key Results from the Questionnaire:



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Želite li biti obaviješteni o ključnim rezultatima iz upitnika?

11 risposte

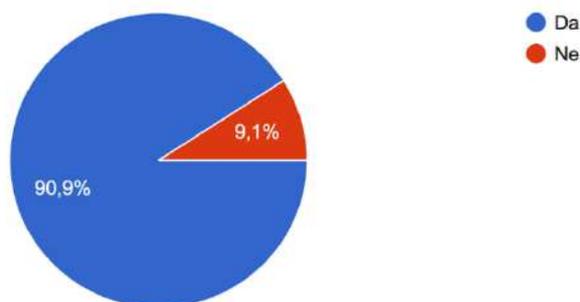


Figura 10

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# Preparing, Adapting, Reconstructing: actions to promote climate change adaptation and risk disaster resilience in Italian and Croatian sensitive ecosystems

Work Package 1 - Activity 1.3 - Deliverable 1.3

“Reports mapping the relevant local stakeholders’ needs”

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## INTRODUCTION

In the framework of impacts related to climate change, water stock management is crucial to address and mitigate extreme phenomena that determine an overabundance or scarcity of water resources, with impacts on local production systems, citizens well-being and land management. To tackle this challenge, bePrePARED project aims to coordinate and integrate risk management tools, systems and policies aimed at improving the resilience of vulnerable ecosystems and landscapes historically managed on both sides of the Adriatic Sea, with a focus on water management. This is to create new high competence skills and practices for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia targeted areas, adapting them to a sustainable use of water resources in rural-urban landscapes, raising awareness of institutions and civil society on the risks related to water scarcity and the need for water saving and adaptation policies.

Two of the main aims of the project are:

- Creating **new high competence skills and practices** for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia areas, adapting them to a sustainable use of water resources in rural-urban landscapes.
- **Raising awareness of institutions and civil society** on the risks related to water scarcity and the need for water saving and adaptation policies.

In this framework, **activity 1.3** aimed at **identifying and networking all the institutional and social / economic stakeholders of the territorial communities** addressed by the project , to assess their current awareness state about the nature and seriousness of the challenge for water landscapes sustainable management and typify their needs for information, for recommendations for a change in behaviour in facing water and climate-related risks, for cultural and capacity building, towards a higher attentiveness to the implications of an ecosystem management more sound to the present, evolutionary, climate conditions.

The deliverable is made of 6 reports, one per each of the target areas of the project. The reports share a common introduction on the methodology used for stakeholders' mapping and for the



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preparation of the online questionnaires, while including different results specific for each of the 6 geographies.

## Paklenica (National Park), CROATIA

### THE IMPORTANCE OF STAKEHOLDER MAPPING IN CLIMATE ADAPTATION

The stakeholder mapping process is essential to ensure that decisions related to climate change adaptation are inclusive, representative, and based on solid evidence. Engaging various actors, from citizens to institutions, enhances the relevance, effectiveness, and credibility of adaptation plans, building trust and a collective mandate for implementing the necessary actions. By integrating local insights and concerns, mapping helps complement top-down approaches, fostering a sense of shared ownership and clarifying common goals.

In the context of the project, a structure has been adopted that considers the need to accurately identify and categorize the involved stakeholders. This process is crucial for building a solid evidence base, gaining political support, establishing effective governance structures, and understanding the roles and responsibilities of each actor. The framework used for mapping stakeholders is based on an analytical methodology that ensures accurate identification, avoiding biases that could compromise the representativeness and effectiveness of the engagement.

By adopting a transparent and robust approach, the mapping process allows the collection of key information on the behaviors, intentions, connections, resources, and influence of stakeholders. This information is then used to guide political decisions, improve understanding of the social and political feasibility of proposed actions, and effectively guide future developments in adaptation policies.

### STAKEHOLDER MAPPING FRAMEWORK

The structure of the stakeholder mapping for the bePrepared project was carefully designed using the Tandem Guidance approach, which was also applied in the [Adaptation AGORA project](#). The Tandem framework serves as a valuable tool for fostering transdisciplinary collaboration and ensuring that stakeholder engagement is purposeful, systematic, and aligned with project objectives.



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It provides a structured set of elements and guiding questions, informed by empirical cases and prior frameworks, that enable stakeholders to engage meaningfully in collaborative learning processes, address shared challenges, and align on governance, risks, goals, and solutions. In the bePrepared project, the stakeholder mapping for the Paklenica case study follows this framework, with the goal of identifying the key actors involved, understanding their roles and interests, and determining how their involvement can shape both the issues at hand and the solutions proposed. The mapping structure includes several key components:

1. **Stakeholder Identification:** Each stakeholder or target group is clearly identified, including their contact details, role, and organizational affiliation. This ensures that the right individuals are engaged and that their contributions can be tracked throughout the project.
2. **Stakeholder Roles and Interests:** The roles that each stakeholder plays (e.g., decision-maker, expert, community member) are identified, along with the key interests or issues they care about. This helps to ensure that the project considers the priorities of all relevant stakeholders and addresses their specific concerns.
3. **Key Issues and Solutions:** For each stakeholder, we assess the specific issues they are either affecting or affected by, and similarly, the solutions they can contribute to or benefit from. This provides a comprehensive understanding of each stakeholder's position and potential impact on the project.
4. **Interest and Type of Participation:** The mapping includes a clear assessment of the level of interest each stakeholder has in participating in the project. Stakeholders are categorized based on their interest (e.g., high, low, none) and the type of participation they are expected to contribute (e.g., awareness, information sharing, consultation, discussion, co-design, co-decision making). This helps ensure that stakeholders are engaged at the appropriate level, allowing for meaningful contributions without overwhelming less interested parties.
5. **Means of Engagement:** Various engagement methods are identified, ranging from emails and phone calls to more interactive forms of participation like workshops or co-design sessions. This ensures that each stakeholder is reached using the most appropriate and effective communication channels.
6. **Engagement Status:** The mapping also tracks the status of each stakeholder's engagement (e.g., contacted, not contacted), which helps to monitor progress and identify any gaps in stakeholder inclusion.

An example of how the stakeholder mapping file was sent to each case study is present in the following image.





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adaptation, the questionnaire aims to bridge knowledge gaps, identify local challenges, and highlight opportunities for more effective and sustainable solutions.

To achieve this, the questionnaire is divided into seven thematic sections, each focusing on a specific aspect of stakeholder engagement and expertise. The first two sections (1-2) gather contextual information, identifying the respondent's role and their organization's involvement in water management and adaptation efforts. This allows for a clear mapping of stakeholders and their influence within the system. The third section (3) delves into perceptions of climate change impacts and associated risks, providing valuable qualitative and quantitative insights into how different actors experience and interpret these challenges in their respective regions. The fourth (4) and fifth (5) sections explore water both as a resource—identifying key needs, priorities, and constraints in its management—and as a source of impacts, assessing how water-related issues, such as floods or droughts, affect communities, economies, and ecosystems. The sixth section (6) is dedicated to Nature-Based Solutions (NBS), evaluating the feasibility and relevance of these innovative approaches within the respondents' local contexts. Finally, the seventh section (7) offers an open space for additional input, ensuring that the questionnaire captures perspectives that may not have been explicitly addressed in the structured questions.

A mix of multiple-choice and open-ended questions has been employed to balance structured data collection with the flexibility needed to incorporate stakeholder-specific insights. This methodological approach allows us to extract both quantifiable trends and nuanced qualitative responses, enhancing the reliability and applicability of the findings.

Ultimately, this questionnaire is more than just a data-gathering tool—it is a collaborative effort to shape effective climate adaptation and water management strategies. By participating, stakeholders directly contribute to the development of evidence-based solutions that align with real-world needs, reinforcing the overarching objectives of the bePreparedproject.



## INSIGHTS FROM THE NEEDS ASSESSMENT QUESTIONNAIRE

**Number of Participants:** 4

**List of the organizations and institutions involved in the questionnaire on local stakeholders' perceptions of water-related risks, opportunities, and challenges in in Paklenica, Croatia:**

**HGSS Station Zadar** - Croatian Mountain Rescue Service (HGSS) station in Zadar, involved in rescue and response to emergencies related to water hazards.

**Eco-Zadar** - Environmental organization focused on promoting sustainable practices and raising awareness on environmental protection.

**Society of 20,000 Miles of Sea Explorers** - A society engaged in marine exploration, possibly contributing to research and awareness of water bodies in the region.

**Public Health Institute Zadar** - Public health institution dealing with water-related health issues, environmental impacts, and public safety related to water quality and access.

**Role of the participants in their institution/organization:**

The respondents to the questionnaire came from a variety of roles, primarily involving management and oversight in their respective fields. These included administrators, project managers, and a vice president with project management experience, all responsible for planning, coordinating, and executing water-related projects. Additionally, the Head of the Department for Health and Water Quality was also represented, providing expertise on the intersection of water management and public health.

**Geographical scale of reference of the respondents:**

All respondents to the questionnaire referenced the Paklenica National Park in Croatia as their primary geographic focus.

**Organization's role in the context of water resource management and/or climate change adaptation:**

The respondents' organizations are primarily involved in promoting environmental protection policies, collaborating with local communities, and supporting the planning, management, and protection of land and water resources. Some organizations also emphasize the promotion of climate-responsible policies, education on climate change adaptation, and conducting scientific research, particularly from a biological perspective, to assess threats and consequences. In addition, there is involvement in health ecology and environmental protection. However, some respondents noted that they have no direct influence on the management of these resources, highlighting a gap in decision-making or governance influence. This diverse range of roles reflects a broad engagement



## Italy – Croatia



in both proactive environmental governance and fostering local participation in water resource management and climate change adaptation.

### Perception related to the severity of climate change impacts in Paklenica, Croatia:

Kako biste ocijenili ozbiljnost utjecaja klimatskih promjena na vašem području?

5 risposte

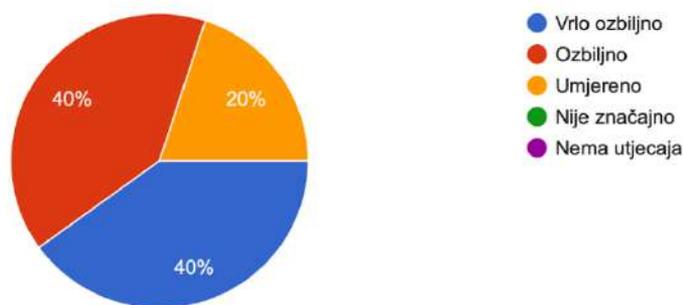


Figura 2

Vrlo ozbiljno = **Very serious (40%)**

Ozbiljno = **Serious (40%)**

Umjereno = **Moderate (20%)**

Nije značajno = **Not significant**

Nema utjecaja = **No impact**

Most of the respondents highlighted that their perception of the severity of the impacts of climate change in the area ranges from moderate (20%) to serious (40%), if not very serious (40%).

### Main climate risks that affect in Paklenica, Croatia:

The responses highlight several key climate risks impacting the area. **Prolonged droughts** were frequently mentioned, underscoring concerns about water scarcity and the potential long-term impact on agriculture, biodiversity, and local communities. **Extreme weather events**, including floods and storms, were also cited as critical risks, pointing to the vulnerability of infrastructure, agriculture, and ecosystems to unpredictable and intense climate events. The **increase in average temperatures** was identified as another significant threat, with implications for both environmental health and human well-being, potentially exacerbating the other risks.

Additionally, the **loss of biodiversity and natural habitats** emerged as a primary concern, signaling the broader ecological consequences of climate change, including the destruction of vital ecosystems and the depletion of species that are crucial for environmental balance. Some respondents also pointed out specific risks such as **coastal and soil erosion**, which could threaten the integrity of the



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landscape, particularly in coastal areas. Overall, these responses reflect a strong sense of urgency about the multifaceted nature of climate change impacts, with implications across environmental, social, and economic dimensions.

Koji su glavni klimatski rizici koji utječu na vaše područje? (Odaberite sve relevantne opcije)

5 risposte

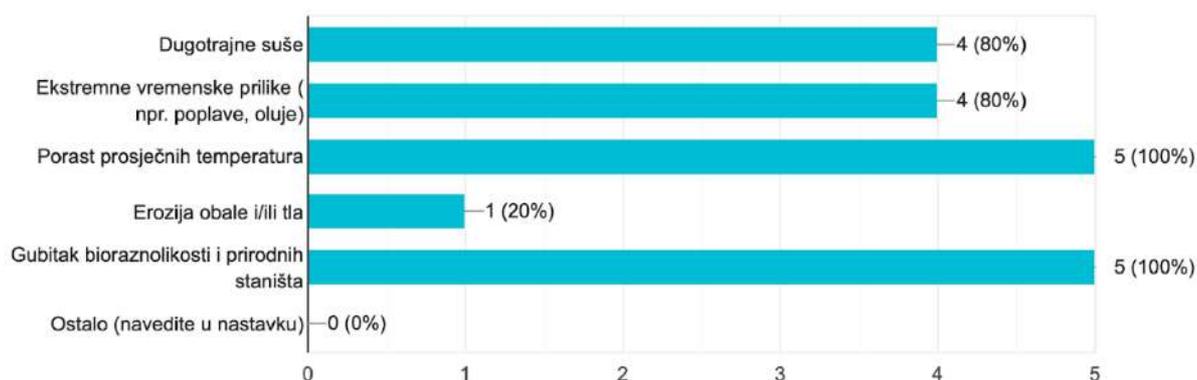


Figura 3

*Dugotrajne suše* = **Prolonged droughts (80%)**

*Eks. vremenske prilike (poplave, oluje)* = **Ext. weather events (e.g. floods, storms) (80%)**

*Porast prosječnih temperatura* = **Increase in average temperatures (100%)**

*Erozija obale i/ili tla* = **Coastal and/or soil erosion (20%)**

*Gubitak bioraznolikosti i prirodnih staništa* = **Loss of biodiversity and nat. habitats (100%)**

*Ostalo (navedite u nastavku)* = **Other (please specify below) (0%)**

The main climate risks affecting the area, according to the responses, include a significant increase in average temperatures (100%), loss of biodiversity and natural habitats (100%), and prolonged droughts and extreme weather events, such as floods and storms, each at 80%. Coastal and soil erosion was noted by a smaller portion of respondents (20%), with no additional risks specified.

### Primary Needs in Water Resource Management:

Respondents highlighted several key needs for effective water resource management, with a strong emphasis on **preventing water pollution** and **promoting the sustainable use** of resources. There is a clear focus on ensuring the availability of drinking water, which is vital for both the population and agriculture. Many also expressed the need to **improve the efficiency of irrigation and water**



## Italy – Croatia



**distribution systems**, reflecting concerns about both the current inefficiencies in water use and the challenges posed by climate change.

Koje su primarne potrebe vezane uz upravljanje vodnim resursima u vašem području? (Odaberite sve relevantne opcije)

5 risposte

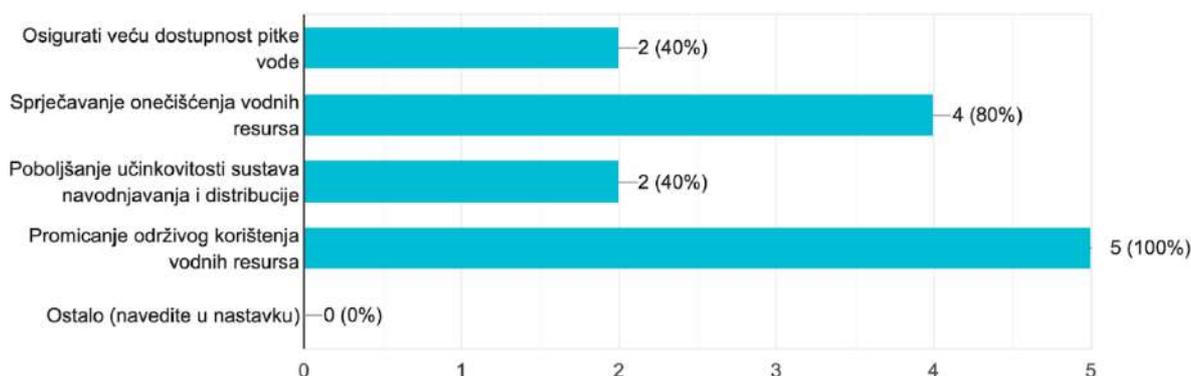


Figura 4

*Osigurati veću dostupnost pitke vode* = **Ensure greater availability of drinking water (40%)**

*Sprječavanje onečišćenja vodnih resursa* = **Preventing pollution of water resources (80%)**

*Poboljšanje učinkovitosti sustava navodnjavanja i distribucije* = **Improving the efficiency of irrigation and distribution systems (40%)**

*Promicanje održivog korištenja vodnih resursa* = **Promoting sustainable use of water resources (100%)**

*Ostalo (navedite u nastavku)* = **Other (0%)**

The primary needs related to water resource management in the area include preventing pollution of water resources (80%), promoting sustainable use of water resources (100%), ensuring greater availability of drinking water (40%), and improving the efficiency of irrigation and distribution systems (40%).

### Main Challenges in Water Resource Management in Paklenica, Croatia:

The primary challenges identified in the area regarding water resource management revolve around several key issues. A significant concern is the lack of adequate infrastructure to support the management and distribution of water, which hinders effective water usage. Additionally, demographic pressure and urbanization contribute to increased demand on water resources, further exacerbating the issue. Another critical challenge is the lack of awareness and technical skills among local populations, which affects the capacity to implement and maintain sustainable water practices.



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Furthermore, conflicts between various sectors such as agriculture, industry, and tourism also create competition for water resources, complicating efforts to manage water effectively and sustainably.

Koji su glavni izazovi vezani uz upravljanje vodama na vašem području? (Odaberite sve relevantne opcije)

5 risposte

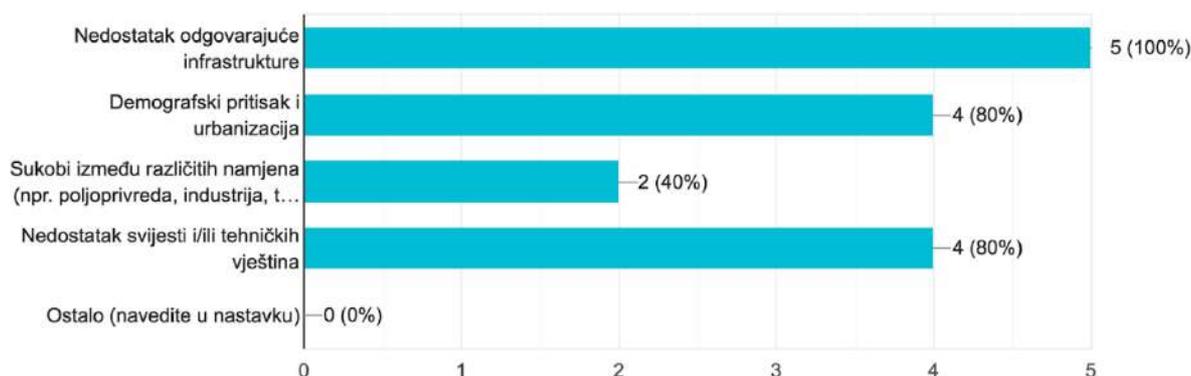


Figura 5

*Nedostatak odgovarajuće infrastrukture* = **Lack of adequate infrastructure (100%)**

*Demografski pritisak i urbanizacija* = **Demographic pressure and urbanization (80%)**

*Sukobi između različitih namjena (npr. poljoprivreda, industrija, turizam)* = **Conflicts between different uses (e.g. agriculture, industry, tourism) (40%)**

*Nedostatak svijesti i/ili tehničkih vještina* = **Lack of awareness and/or technical skills (80%)**

*Ostalo (navedite u nastavku)* = **Other (0%)**

The main challenges related to water resource management in the area include a significant lack of adequate infrastructure (100%), demographic pressure and urbanization (80%), and a lack of awareness and technical skills (80%). Additionally, conflicts between different uses of water, such as agriculture, industry, and tourism, are also a notable concern (40%).

### Priority Actions for Preserving Water Resources in Paklenica, Croatia:

The responses emphasized several crucial actions for preserving water resources in the area. Raising awareness about water conservation emerged as a key priority, with respondents stressing the importance of educating local communities on sustainable practices. Another significant focus is the urgent need to invest in the rehabilitation of the Zadar water supply system, aiming to reduce water losses from the current inefficient pipeline transmission managed by Vodovod - Zadar. There is also strong support for abandoning small hydropower projects along rivers like the Zrmanja, which are seen as harmful to the region's water resources. Further, respondents highlighted the importance of



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implementing rainwater collection systems on buildings and adapting them for various non-drinking water uses. This could be supported by incentivizing the installation of such systems through energy renovation subsidies for buildings. Additionally, there is a call for a more systematic approach to identifying risk areas—both thematically and spatially—and addressing these challenges through interdisciplinary solutions. Experts with a strong background in nature-based solutions (NBS) and sustainable development should lead these efforts. Lastly, significant concern was raised over environmental protection, particularly from agricultural impacts, waste dumps, and illegal discharges in the region's karst areas, where such pollutants could heavily affect the local water resources.

### Main Influences on Water Resource Management in Paklenica, Croatia:

The main influences related to water resource management in the area are multifaceted, with several interrelated factors posing challenges. Reduced water availability, primarily driven by prolonged droughts and/or reduced river flow, is a critical issue, as it limits access to water for both agricultural and human consumption. The quality of water is another major concern, with pollution of rivers, aquifers, and saltwater intrusion affecting the health of local ecosystems and water supplies. Furthermore, extreme weather events such as floods and torrents not only damage infrastructure and the built environment but also exacerbate existing vulnerabilities in water systems, hindering effective management. The economic and social consequences are also significant, with agriculture, tourism, and high management costs being heavily impacted. Finally, conflicts over water use between different sectors and local communities create further complications, making collaborative and integrated management strategies even more crucial for addressing these issues effectively.

Koji su glavni utjecaji povezani s upravljanjem vodama na vašem području? (Odaberite sve relevantne opcije)

5 risposte

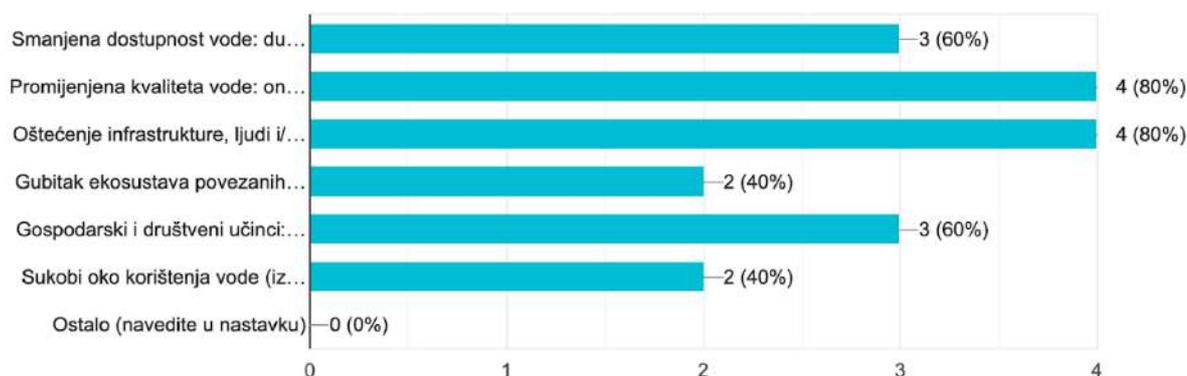


Figura 6



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Smanjena dostupnost vode: du... = **Reduced water availability: prolonged droughts and/or reduced river flow (60%)**

Promijenjena kvaliteta vode: on... = **Altered water quality: pollution of rivers, aquifers and/or saltwater intrusion (80%)**

Oštećenje infrastrukture, ljudi i/... = **Damage to infrastructure, people and/or the built environment due to extreme events (e.g., floods, flash floods) (80%)**

Gubitak ekosustava povezanih... = **Loss of water-related ecosystems: reduction of natural habitats and/or draining of wetlands (40%)**

Gospodarski i društveni učinci:... = **Economic and social impacts: damage to agriculture, tourism and high management costs (60%)**

Sukobi oko korištenja vode (iz... = **Conflicts over water use (between sectors and/or communities) (40%)**

Ostalo (navedite u nastavku) = **Other (0%)**

The main influences related to water resource management in the area include reduced water availability due to prolonged droughts and/or reduced river flow (60%), altered water quality from pollution and saltwater intrusion (80%), and damage to infrastructure and communities caused by extreme weather events such as floods and flash floods (80%). Other significant concerns are the loss of water-related ecosystems (40%), economic and social impacts on agriculture, tourism, and high management costs (60%), and conflicts over water use between sectors and communities (40%).

### **Economic sectors most affected by water-related impacts in Paklenica, Croatia:**

The economic sectors most affected by water-related impacts include Agriculture (mentioned by all respondents), Tourism (highlighted by all), and Public Services and Infrastructure (noted by most).



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These sectors are significantly impacted by water-related challenges such as droughts, floods, and pollution.

Na koje gospodarske sektore najviše utječu utjecaji povezani s vodom? (Odaberite sve relevantne opcije)

5 risposte



Figura 7

Poljoprivreda = **Agriculture (80%)**

Industrija = **Industry**

Turizam = **Tourism (80%)**

Javne usluge i infrastruktura = **Public Services and Infrastructure (80%)**

Ostalo (navedite u nastavku) = **Other**

### Elements or factors most vulnerable to water-related impacts in Paklenica, Croatia:

The primary vulnerabilities in the area related to water impacts are multifaceted. The general population is particularly vulnerable, especially regarding human health and economic well-being. During events such as heavy rainfall or floods, citizens face drinking water pollution and are forced to buy bottled water, adding financial strain. Moreover, areas like Zadar - Bili brig experience severe water shortages during summer months, affecting daily life. In addition to these personal challenges, the natural environment is at risk, especially critical habitats like wetlands, coastal areas, lagoons, and salt marshes. These habitats are disappearing or degrading due to inadequate infrastructure management, such as poor construction practices, improper waste disposal, and the impact of outfalls and cesspools. Furthermore, environmental conditions like reduced water flow, rising temperatures, and a growing presence of harmful microorganisms exacerbate these vulnerabilities, leading to broader ecological and public health concerns.



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### **Adaptation measures or solutions to be prioritized in Paklenica, Croatia:**

The responses suggest that adaptation measures should focus on aligning with nature rather than continuously modifying it. Key recommendations include protecting rivers from pollution and small hydropower plants, adapting buildings for rainwater collection, limiting construction and improving infrastructure, and fostering education and community involvement in water quality issues and the rational use of available water resources.

### **Adopted and Implemented Adaptation Policies and Measures in Paklenica, Croatia:**

The responses reveal a lack of specific adaptation policies or measures being adopted or implemented in the region. Many respondents, particularly those representing citizen associations or organizations without policy-making authority, noted that they do not have the mandate to adopt or implement public policies. Despite this, some individuals or organizations are focused on maintaining public health and water quality, suggesting that efforts to address water-related challenges, such as contamination and quality management, are a priority within their capacities. However, the lack of formal policy or strategic measures underscores a gap in the broader governance approach to adaptation in the area.

### **Relevant or Priority Nature-Based Solutions for Water Resource Management in Paklenica, Croatia:**

The responses emphasize the importance of several nature-based solutions for water resource management, with a strong focus on restoring river ecosystems, creating wetlands for water management, planting trees to improve water absorption and regulate climate, using green infrastructure to mitigate floods, and preserving biodiversity to enhance climate resilience. These



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solutions are widely recognized as priorities in the region, highlighting a comprehensive approach to managing water resources while strengthening environmental sustainability and resilience.

Koja rješenja koja se temelje na prirodi smatrate relevantnim ili prioritetnim za upravljanje vodnim resursima u vašem području? (Odaberite sve relevantne opcije)

5 risposte

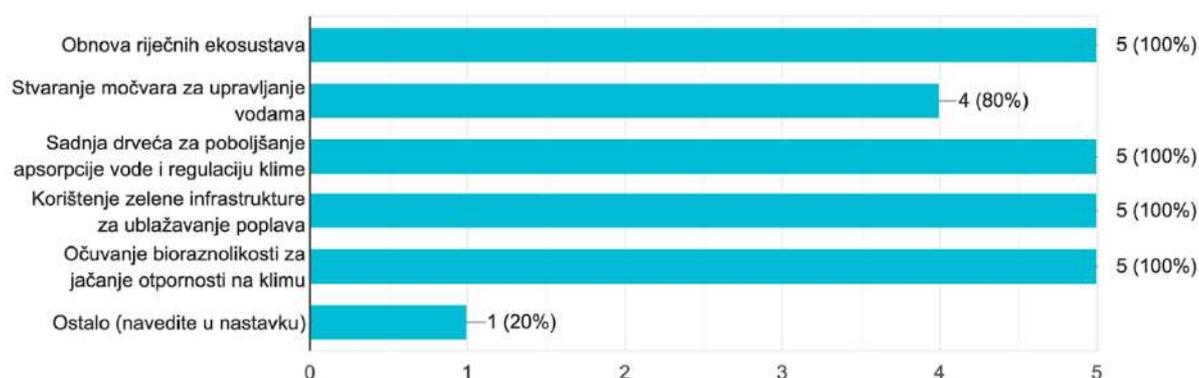


Figura 8

Obnova riječnih ekosustava = **River ecosystem restoration (100%)**

Stvaranje močvara za upravljanje vodama = **Creating wetlands for water management (80%)**

Sadnja drveća za poboljšanje apsorpcije vode i regulaciju klime = **Planting trees to improve water absorption and climate regulation (100%)**

Korištenje zelene infrastrukture za ublažavanje poplava = **Using green infrastructure for flood mitigation (100%)**

Očuvanje bioraznolikosti za jačanje otpornosti na klimu = **Preserving biodiversity to strengthen climate resilience (100%)**

Ostalo (navedite u nastavku) = **Other (20%)**

The priority nature-based solutions for water resource management in the area include river ecosystem restoration (100%), creating wetlands for water management (80%), planting trees to improve water absorption and climate regulation (100%), using green infrastructure for flood mitigation (100%), and preserving biodiversity to strengthen climate resilience (100%). Additionally, some respondents highlighted other measures (20%).

### Barriers to Implementing Nature-Based Solutions in Paklenica, Croatia:

The barriers to implementing nature-based solutions in the area are multi-faceted, reflecting both practical and systemic challenges. Social or cultural resistance is a significant concern, as some local communities may oppose new approaches due to traditional practices or lack of awareness. Policy



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conflicts also pose a barrier, with different policies often contradicting each other, leading to confusion and inefficiency. Furthermore, insufficient knowledge or technical support is seen as a critical obstacle, as there may be gaps in expertise or understanding regarding nature-based solutions, hindering their effective implementation. Management preferences and settings also play a role, as existing management structures may prioritize more conventional methods over innovative, nature-based approaches. Lack of resources, both financial and human, further limits the capacity to implement such solutions effectively. Lastly, some respondents mentioned other unspecified factors, indicating a range of additional, contextual challenges that may arise.

Koje prepreke predviđate u implementaciji rješenja temeljenih na prirodi na vašem području? (Odaberite sve relevantne opcije)

5 risposte

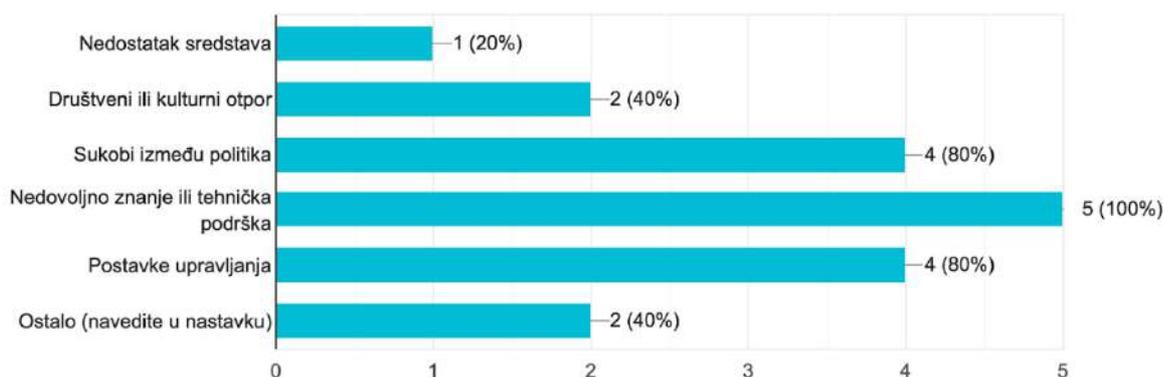


Figura 9

*Nedostatak sredstava* = **Lack of funds (20%)**

*Društveni ili kulturni otpor* = **Social or cultural resistance (40%)**

*Sukobi između politika* = **Conflicts between policies (80%)**

*Nedovoljno znanje ili tehnička podrška* = **Insufficient knowledge or technical support (100%)**

*Postavke upravljanja* = **Management settings (80%)**

*Ostalo (navedite u nastavku)* = **Other (40%)**

The main barriers foreseen in implementing nature-based solutions in the area include insufficient knowledge or technical support (100%), conflicts between policies (80%), and management settings (80%). Social or cultural resistance is also a notable barrier (40%), along with other unspecified challenges (40%). Lack of funds is seen as a smaller but still relevant concern (20%).

**Additional comments or suggestions regarding waterscape management or climate adaptation strategies:**



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### bePrepARed

The responses highlight significant challenges in water and marine landscape management in Zadar County, particularly in the Paklenica coastal area, where sensitive ecosystems such as posidonia, salt marshes, and coastal habitats are threatened by sea-level rise, coastal erosion, and human activities like urbanization, pollution, and anchoring. There is a need for active protection of these ecosystems, including measures like eco-mooring systems, enforcing environmental laws, and raising awareness within the local community. The importance of sustainable tourism practices and harmonizing development with nature conservation is stressed. The response emphasizes that climate change is deeply connected to marine ecosystems, which play a crucial role in regulating temperature, absorbing CO<sub>2</sub>, and mitigating climate change impacts, underscoring the need for sustainable practices for a resilient future.

### Interest in Receiving Key Results from the Questionnaire:

Želite li biti obaviješteni o ključnim rezultatima iz upitnika?

5 risposte

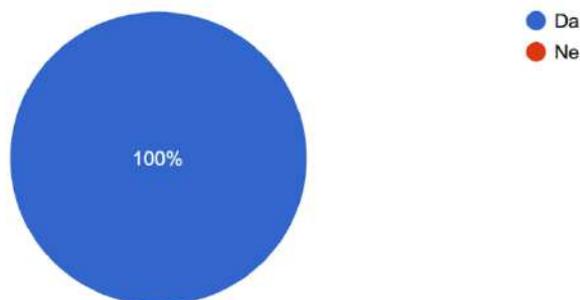


Figura 10

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# Preparing, Adapting, Reconstructing: actions to promote climate change adaptation and risk disaster resilience in Italian and Croatian sensitive ecosystems

Work Package 1 - Activity 1.3 - Deliverable 1.3

“Reports mapping the relevant local stakeholders’ needs”

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### Summary

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## INTRODUCTION

In the framework of impacts related to climate change, water stock management is crucial to address and mitigate extreme phenomena that determine an overabundance or scarcity of water resources, with impacts on local production systems, citizens well-being and land management. To tackle this challenge, bePrePARED project aims to coordinate and integrate risk management tools, systems and policies aimed at improving the resilience of vulnerable ecosystems and landscapes historically managed on both sides of the Adriatic Sea, with a focus on water management. This is to create new high competence skills and practices for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia targeted areas, adapting them to a sustainable use of water resources in rural-urban landscapes, raising awareness of institutions and civil society on the risks related to water scarcity and the need for water saving and adaptation policies.

Two of the main aims of the project are:

- Creating **new high competence skills and practices** for an ecosystem-based governance of water, transferring tools, system and policies in the Italy - Croatia areas, adapting them to a sustainable use of water resources in rural-urban landscapes.
- **Raising awareness of institutions and civil society** on the risks related to water scarcity and the need for water saving and adaptation policies.

In this framework, **activity 1.3** aimed at **identifying and networking all the institutional and social / economic stakeholders of the territorial communities** addressed by the project , to assess their current awareness state about the nature and seriousness of the challenge for water landscapes sustainable management and typify their needs for information, for recommendations for a change in behaviour in facing water and climate-related risks, for cultural and capacity building, towards a higher attentiveness to the implications of an ecosystem management more sound to the present, evolutionary, climate conditions.

The deliverable is made of 6 reports, one per each of the target areas of the project. The reports share a common introduction on the methodology used for stakeholders' mapping and for the preparation of the online questionnaires, while including different results specific for each of the 6 geographies.



## Neretva (river), CROATIA - HRV

### THE IMPORTANCE OF STAKEHOLDER MAPPING IN CLIMATE ADAPTATION

The stakeholder mapping process is essential to ensure that decisions related to climate change adaptation are inclusive, representative, and based on solid evidence. Engaging various actors, from citizens to institutions, enhances the relevance, effectiveness, and credibility of adaptation plans, building trust and a collective mandate for implementing the necessary actions. By integrating local insights and concerns, mapping helps complement top-down approaches, fostering a sense of shared ownership and clarifying common goals.

In the context of the project, a structure has been adopted that considers the need to accurately identify and categorize the involved stakeholders. This process is crucial for building a solid evidence base, gaining political support, establishing effective governance structures, and understanding the roles and responsibilities of each actor. The framework used for mapping stakeholders is based on an analytical methodology that ensures accurate identification, avoiding biases that could compromise the representativeness and effectiveness of the engagement.

By adopting a transparent and robust approach, the mapping process allows the collection of key information on the behaviors, intentions, connections, resources, and influence of stakeholders. This information is then used to guide political decisions, improve understanding of the social and political feasibility of proposed actions, and effectively guide future developments in adaptation policies.

### STAKEHOLDER MAPPING FRAMEWORK

The structure of the stakeholder mapping for the bePrepared project was carefully designed using the Tandem Guidance approach, which was also applied in the [Adaptation AGORA project](#). The



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Tandem framework serves as a valuable tool for fostering transdisciplinary collaboration and ensuring that stakeholder engagement is purposeful, systematic, and aligned with project objectives. It provides a structured set of elements and guiding questions, informed by empirical cases and prior frameworks, that enable stakeholders to engage meaningfully in collaborative learning processes, address shared challenges, and align on governance, risks, goals, and solutions. In the bePrepared project, the stakeholder mapping for the Neretva River Delta case study follows this framework, with the goal of identifying the key actors involved, understanding their roles and interests, and determining how their involvement can shape both the issues at hand and the solutions proposed. The mapping structure includes several key components:

1. **Stakeholder Identification:** Each stakeholder or target group is clearly identified, including their contact details, role, and organizational affiliation. This ensures that the right individuals are engaged and that their contributions can be tracked throughout the project.
2. **Stakeholder Roles and Interests:** The roles that each stakeholder plays (e.g., decision-maker, expert, community member) are identified, along with the key interests or issues they care about. This helps to ensure that the project considers the priorities of all relevant stakeholders and addresses their specific concerns.
3. **Key Issues and Solutions:** For each stakeholder, we assess the specific issues they are either affecting or affected by, and similarly, the solutions they can contribute to or benefit from. This provides a comprehensive understanding of each stakeholder's position and potential impact on the project.
4. **Interest and Type of Participation:** The mapping includes a clear assessment of the level of interest each stakeholder has in participating in the project. Stakeholders are categorized based on their interest (e.g., high, low, none) and the type of participation they are expected to contribute (e.g., awareness, information sharing, consultation, discussion, co-design, co-decision making). This helps ensure that stakeholders are engaged at the appropriate level, allowing for meaningful contributions without overwhelming less interested parties.
5. **Means of Engagement:** Various engagement methods are identified, ranging from emails and phone calls to more interactive forms of participation like workshops or co-design sessions. This ensures that each stakeholder is reached using the most appropriate and effective communication channels.
6. **Engagement Status:** The mapping also tracks the status of each stakeholder's engagement (e.g., contacted, not contacted), which helps to monitor progress and identify any gaps in stakeholder inclusion.

An example of how the stakeholder mapping file was sent to each case study is present in the following image.



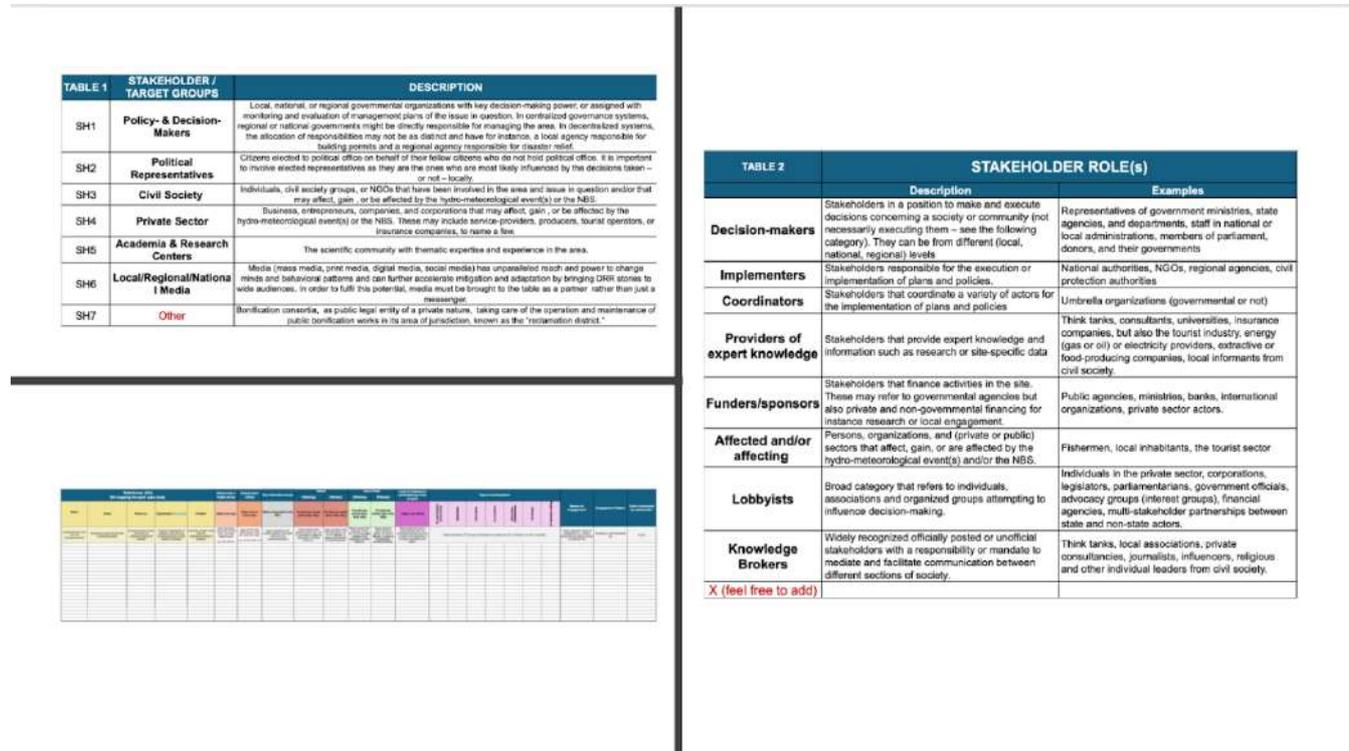


Figure 1

This structured approach to stakeholder mapping ensures that the bePrepared project captures a diverse range of perspectives and effectively integrates stakeholders into the decision-making process. By using the Tandem framework, the project establishes a transparent, inclusive, and participatory foundation for tackling climate change and water resource management challenges in the Neretva River Delta.

Number of identified stakeholders in the Stakeholder Mapping process for the Neretva River Delta case study: **123**.

## QUESTIONNAIRE ON NEEDS ASSESSMENT, STRUCTURE

The questionnaire has been structured to serve as a robust tool for gathering essential insights within the bePrepared project. Its design reflects the need to conduct a comprehensive needs assessment, ensuring that the perspectives of key stakeholders - identified in the previous phase based on the structure described above - are accurately captured and integrated into the project's strategic development. By addressing various dimensions of water resource management and climate change



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adaptation, the questionnaire aims to bridge knowledge gaps, identify local challenges, and highlight opportunities for more effective and sustainable solutions.

To achieve this, the questionnaire is divided into seven thematic sections, each focusing on a specific aspect of stakeholder engagement and expertise. The first two sections (1-2) gather contextual information, identifying the respondent's role and their organization's involvement in water management and adaptation efforts. This allows for a clear mapping of stakeholders and their influence within the system. The third section (3) delves into perceptions of climate change impacts and associated risks, providing valuable qualitative and quantitative insights into how different actors experience and interpret these challenges in their respective regions. The fourth (4) and fifth (5) sections explore water both as a resource—identifying key needs, priorities, and constraints in its management—and as a source of impacts, assessing how water-related issues, such as floods or droughts, affect communities, economies, and ecosystems. The sixth section (6) is dedicated to Nature-Based Solutions (NBS), evaluating the feasibility and relevance of these innovative approaches within the respondents' local contexts. Finally, the seventh section (7) offers an open space for additional input, ensuring that the questionnaire captures perspectives that may not have been explicitly addressed in the structured questions.

A mix of multiple-choice and open-ended questions has been employed to balance structured data collection with the flexibility needed to incorporate stakeholder-specific insights. This methodological approach allows us to extract both quantifiable trends and nuanced qualitative responses, enhancing the reliability and applicability of the findings.

Ultimately, this questionnaire is more than just a data-gathering tool—it is a collaborative effort to shape effective climate adaptation and water management strategies. By participating, stakeholders directly contribute to the development of evidence-based solutions that align with real-world needs, reinforcing the overarching objectives of the bePreparedproject.

## INSIGHTS FROM THE NEEDS ASSESSMENT QUESTIONNAIRE

**Number of Participants:** 20

**List of the organizations and institutions involved in the questionnaire on local stakeholders' perceptions of water-related risks, opportunities, and challenges in Neretva, Croatia:**

1. Mountaineering and Environmental Conservation Associations
  - Croatian Mountaineering Society "Grabovica Ploče"
  - OSMICA – Society for Mountaineering, Research and Preservation of Natural History Values
2. Museums and Ornithological Societies
  - Natural History Museum METKOVIĆ
  - Ornithological Society "Brkata sjenica"



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3. Non-Governmental Organizations (NGOs) and Local Groups
  - LAGUR Malo misto
  - NGO Čaplja
  - NGO Hyla
4. Agriculture and Fisheries Sector
  - Family Farm "Blažević"
  - Fishing Trade "Tratun"
5. Forestry and Natural Resource Management
  - Croatian Forests Ltd, Metković Forestry Department
6. Regional Development and Water Management
  - Regional Development Agency DUNEA
  - Croatian Waters
7. Public Authorities and Local Administration
  - Municipality of Zažablje
8. Academic and Research Institutions
  - University of Split, Faculty of Civil Engineering, Architecture and Geodesy
9. Private Companies and Enterprises
  - Vipera
  - Biota Ltd.
10. Educational Institutions
  - Primary School Opuzen
11. International Networks and Organizations
  - CEE Bankwatch Network

This list provides a comprehensive overview of the participants, highlighting the diversity of stakeholders involved, ranging from public institutions to NGOs, private sector entities, and academic research.

### **Role of the participants in their institution/organization:**

The respondents to the questionnaire held a diverse range of roles, reflecting the variety of organizations involved. They included high-level decision-makers such as presidents, directors, and owners, as well as key administrative figures like secretaries, managers, and grant managers. Additionally, several respondents were specialists in their fields, including senior expert associates for EU project implementation, researchers, and project managers. Public sector representation was also present, with roles such as mayor and head of a branch office for water management. This



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diverse mix of participants ensured a well-rounded perspective on water-related risks, opportunities, and challenges.

### **Geographical scale of reference of the respondents:**

The respondents to the questionnaire primarily operate at a regional scale, with a strong focus on the Neretva River area in Croatia. This indicates a shared geographical context, emphasizing the importance of water-related issues specific to this river basin. Additionally, one respondent referenced the Trogir area in the Split-Dalmatian region, suggesting some broader regional perspectives. Overall, the responses reflect a localized yet regionally significant focus on water management, environmental challenges, and development opportunities within the Neretva River basin.

### **Organization's role in the context of water resource management and/or climate change adaptation:**

The respondents represent a wide range of organizational roles and responsibilities in the context of water resource management and climate change adaptation, reflecting a diverse set of priorities and approaches. Many respondents are focused on promoting environmental protection policies, managing and protecting land and water resources, and fostering cooperation with local communities. Additionally, several respondents are involved in monitoring and assessing climate risks, as well as contributing to the economic and social development of the territories.

Some organizations have a more specialized focus, such as the removal of garbage from speleological facilities to reduce groundwater pollution or investigating speleological objects with underground water to monitor water conditions. Others emphasize community-led local development or the production of organic agricultural products, linking water management with sustainable agriculture and community resilience.

Flood protection, especially against sea floods and other harmful water impacts, is another key concern for some respondents. Additionally, certain organizations, like the CEE Bankwatch Network, focus on monitoring and preventing projects that may harm the environment, offering international support to national associations in advocating for better environmental practices. These diverse roles demonstrate a broad spectrum of involvement, ranging from local environmental management to



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international advocacy, highlighting the multi-faceted nature of water-related challenges and the need for integrated efforts across different scales and sectors.

### Perception related to the severity of climate change impacts in Neretva, Croatia:

Kako biste ocijenili ozbiljnost utjecaja klimatskih promjena na vašem području?  
20 risposte

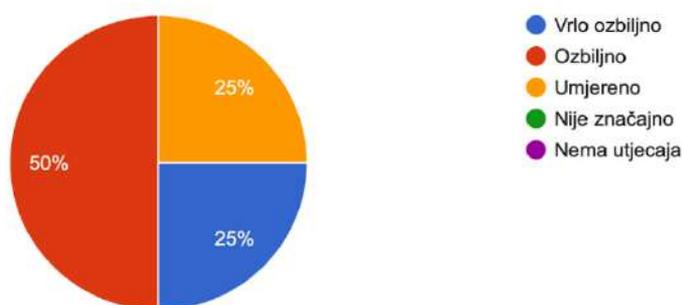


Figura 2

Vrlo ozbiljno = **Very serious (25%)**

Ozbiljno = **Serious (50%)**

Umjereno = **Moderate (25%)**

Nije značajno = **Not significant**

Nema utjecaja = **No impact**

Most of the respondents highlighted that their perception of the severity of the impacts of climate change in the area ranges from moderate (25%) to serious (50%), if not very serious (25%).

### Main climate risks that affect the Neretva area, Croatia:

The responses to the question "What are the main climate risks that affect your area?" provided a comprehensive view of the climate-related challenges faced by the respondents. A significant portion of the respondents (appearing in over half of the answers) highlighted **prolonged droughts** as a major climate risk, underscoring the concern for water scarcity and the long-term effects on agricultural and ecological systems. This was often coupled with **extreme weather events**, such as **floods and storms**, which were seen as increasingly frequent and intense. These events disrupt local infrastructure, agriculture, and communities, highlighting the unpredictable nature of climate impacts in the area.

The **increase in average temperatures** was another commonly identified risk, with respondents expressing concerns over the long-term warming trends and their effects on the local environment,



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agriculture, and biodiversity. This temperature rise was often tied to the **loss of biodiversity and natural habitats**, indicating that many respondents are seeing climate change as a driver of ecosystem degradation, with species loss and habitat destruction posing long-term threats to the area's natural resources.

In addition to these risks, **coastal and soil erosion** were mentioned by some respondents, particularly those in areas with coastal or vulnerable land, where rising temperatures and extreme weather conditions are accelerating the degradation of soil and coastal areas. This erosion threatens agricultural land, infrastructure, and even communities located near the coast. The **saltwater intrusion** into freshwater systems was also a significant concern, particularly in the Lower Neretva area, where rising sea levels and reduced freshwater inflow from the Neretva River basin are causing saltwater to penetrate deeper, salinizing both surface and groundwater. This saltwater intrusion is exacerbating the challenges posed by drought and changing hydrological cycles. Another key issue raised by several respondents was the **salinization of soil and water**, particularly due to the combination of **long-term droughts** and **reduced sediment inflow** from the Neretva River, which has been altered by regulation and damming, as well as from other tributaries in Bosnia and Herzegovina. This **soil and water salinization** is severely affecting local **biodiversity** and **habitat conditions**, as the changing salinity levels disrupt ecosystems and threaten agricultural productivity. Moreover, some respondents raised concerns over the **increasing frequency of invasive species**, which further complicates local environmental management. The appearance of invasive species is often a consequence of changing climatic conditions, such as rising temperatures and altered precipitation patterns, which allow non-native species to thrive at the expense of native ones. Finally, some respondents noted **other** climate risks, which may reflect more localized or specific concerns not fully captured in the most common responses. These varied perspectives highlight the diverse and interconnected nature of climate risks faced by different regions, with a clear emphasis on both **gradual, long-term environmental stresses** (such as droughts, temperature increases, and salinization) and **immediate, extreme weather events** (like floods and storms). The responses



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show a complex landscape where these multiple factors intertwine, creating a challenging environment for local adaptation and resilience strategies.

Koji su glavni klimatski rizici koji utječu na vaše područje? (Odaberite sve relevantne opcije)

20 risposte

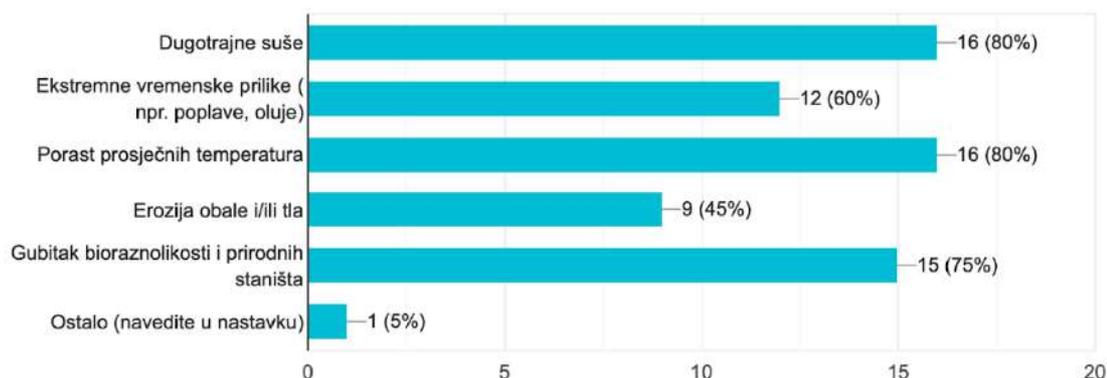


Figura 3

Dugotrajne suše = **Prolonged droughts (80%)**

Eks. vremenske prilike (poplave, oluje) = **Ext. weather events (e.g. floods, storms) (60%)**

Porast prosječnih temperatura = **Increase in average temperatures (80%)**

Erozija obale i/ili tla = **Coastal and/or soil erosion (45%)**

Gubitak bioraznolikosti i prirodnih staništa = **Loss of biodiversity and nat. habitats (75%)**

Ostalo (navedite u nastavku) = **Other (please specify below) (5%)**

Prolonged droughts and increase in average temperatures were identified as the most pressing issues, each with 80% of respondents highlighting them. Extreme weather events such as floods and storms followed closely at 60%. Additionally, loss of biodiversity and natural habitats was also a significant concern, with 75% of respondents noting it. Coastal and/or soil erosion was mentioned by 45%, while only 5% of respondents identified other needs.

### Primary Needs in Water Resource Management:

The responses highlighted a clear and widespread concern for the protection and sustainable use of water resources. The most frequently mentioned need was **preventing pollution of water resources**, with nearly all respondents recognizing the urgent need to safeguard water sources from contamination. Along with pollution prevention, many respondents stressed the importance of **promoting the sustainable use of water resources**, underscoring the need for responsible water management practices that balance human consumption with environmental preservation.



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An important focus was placed on **improving the efficiency of irrigation and distribution systems**, reflecting a broader recognition that optimizing water use, particularly in agriculture, is essential to minimize waste and enhance water availability. Additionally, several respondents highlighted the need to **ensure greater availability of drinking water**, emphasizing that equitable access to clean, safe drinking water remains a critical issue, particularly in areas facing increasing demand and climate-related challenges.

One key issue raised by a respondent was the **need to prevent the construction of projects** such as the Gornji Horizonti hydropower project in Bosnia and Herzegovina, which poses significant risks to the local biodiversity and the well-being of the surrounding communities. This project is seen as a direct threat not only to the biodiversity in the local area in BiH but also to the Neretva Delta in Croatia, where its negative environmental impacts would be felt in terms of the disruption to ecosystems, water quality, and local livelihoods. The inclusion of this concern highlights a broader, cross-border dimension to water management, with local environmental risks extending beyond national borders.

A few respondents also mentioned **other** specific needs that reflect localized concerns or innovative solutions to water resource management challenges, although these were less frequently raised compared to the more common themes of pollution prevention, sustainable use, and efficiency improvements.

Overall, the responses reveal a strong consensus on the critical need for **pollution prevention, sustainable water management, and improved water use efficiency**. These responses also demonstrate an awareness of the interconnectedness of local and regional ecosystems, with many participants recognizing the broader implications of water management projects, such as the Gornji Horizonti hydropower project, on shared water resources and ecosystems. The concerns raised point to the importance of collaborative, cross-border efforts in managing water resources and protecting the environment.



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Koje su primarne potrebe vezane uz upravljanje vodnim resursima u vašem području? (Odaberite sve relevantne opcije)

20 risposte

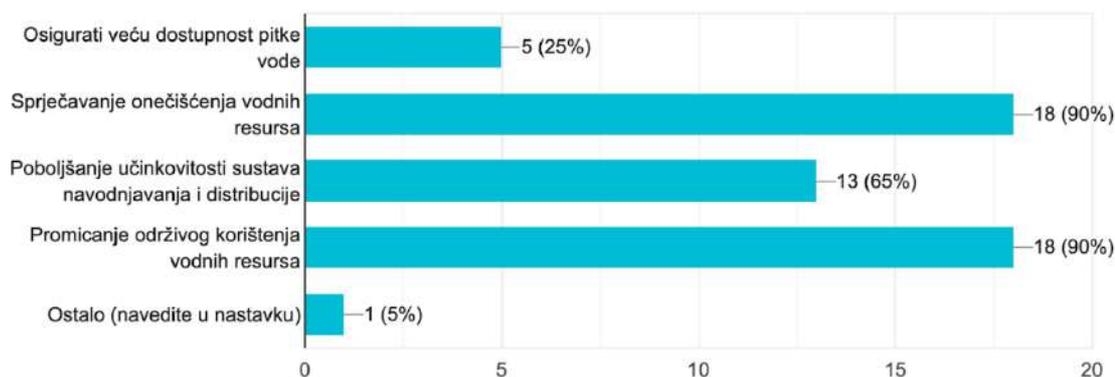


Figura 4

*Osigurati veću dostupnost pitke vode* = **Ensure greater availability of drinking water (25%)**

*Sprječavanje onečišćenja vodnih resursa* = **Preventing pollution of water resources (90%)**

*Poboljšanje učinkovitosti sustava navodnjavanja i distribucije* = **Improving the efficiency of irrigation and distribution systems (65%)**

*Promicanje održivog korištenja vodnih resursa* = **Promoting sustainable use of water resources (90%)**

*Ostalo (navedite u nastavku)* = **Other (5%)**

The responses to the question on primary needs in water resource management highlight a strong focus on preventing pollution of water resources and promoting sustainable use of water resources, both of which were selected by 90% of respondents. Additionally, improving the efficiency of irrigation and distribution systems was noted by 65%, while ensuring greater availability of drinking water was considered a priority by 25%. Only 5% of respondents referred to “other needs”..

### Main Challenges in Water Resource Management in the Neretva area, Croatia:

The responses highlighted several critical and complex issues, many of which point to both local and cross-border difficulties in managing water resources effectively. A significant concern raised by respondents was the **lack of adequate infrastructure**, with many pointing to outdated or insufficient systems for water distribution, irrigation, and overall resource management. This issue is particularly alarming, as it is seen as a direct contributor to the failure in maintaining water resources, with some respondents suggesting that current water management strategies have not been able to meet the growing demands of the region. This gap in infrastructure and management practices



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further exacerbates the vulnerability of water resources to climate change and increasing human activity.

The **conflicts between different water uses** (such as agriculture, industry, and tourism) were frequently noted. Many respondents acknowledged the ongoing struggle to balance these diverse needs, with water often being a limited resource in areas with competing interests. These conflicts are further intensified by demographic pressures and urbanization, which continue to put significant stress on both water resources and the existing infrastructure. As the population grows and urban areas expand, the competition for water resources intensifies, leading to potential conflicts and inefficiencies in distribution.

Moreover, the **lack of awareness and technical skills within local communities and institutions** was another common challenge highlighted. Respondents emphasized the need for better education, training, and expertise in water management to improve the region's ability to adapt to the growing complexities of resource management. Many noted that this gap in knowledge and capacity undermines efforts to implement more sustainable water practices and to address the region's evolving water challenges.

Additionally, **cross-border cooperation** emerged as a critical need, particularly in the context of issues such as the redirection of water flows from the Neretva basin to the Trebišnjica basin and the lack of consultation and impact assessments related to the Gornji Horizonti hydropower project. These cross-border concerns were seen as key barriers to effective water resource management, as actions taken in one country can have significant environmental and social impacts on neighboring regions. The Neretva Delta, in particular, is vulnerable to these cross-border issues, as changes in water flow can significantly affect ecosystems and local communities in both Bosnia and Herzegovina and Croatia.

Lastly, some respondents pointed to other challenges that are specific to their local contexts, suggesting that the complexities of water resource management are **not one-size-fits-all**, and there are **unique regional issues** that need to be addressed alongside more common challenges.

In summary, the responses paint a picture of a region grappling with multiple interconnected challenges in water management. The need for improved infrastructure, better management of



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competing water uses, enhanced public awareness and technical capacity, and cross-border cooperation is clear.

Koji su glavni izazovi vezani uz upravljanje vodama na vašem području? (Odaberite sve relevantne opcije)

20 risposte

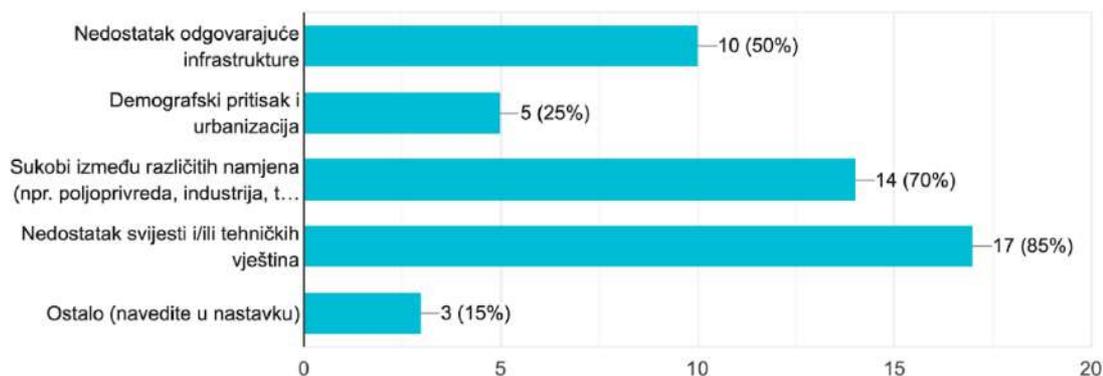


Figura 5

*Nedostatak odgovarajuće infrastrukture* = **Lack of adequate infrastructure (50%)**

*Demografski pritisak i urbanizacija* = **Demographic pressure and urbanization (25%)**

*Sukobi između različitih namjena (npr. poljoprivreda, industrija, turizam)* = **Conflicts between different uses (e.g. agriculture, industry, tourism) (70%)**

*Nedostatak svijesti i/ili tehničkih vještina* = **Lack of awareness and/or technical skills (85%)**

*Ostalo (navedite u nastavku)* = **Other (15%)**

Responses reveal a clear distribution of concerns, with 85% of respondents highlighting the lack of awareness and/or technical skills as a key issue. Additionally, 70% identified conflicts between different uses (e.g., agriculture, industry, tourism), while 50% pointed to the lack of adequate infrastructure as a significant challenge. 25% emphasized the impact of demographic pressure and urbanization, and 15% mentioned other challenges specific to their region.

### Priority Actions for Preserving Water Resources in the Neretva area, Croatia:

The responses reflected a diverse range of urgent and interconnected actions, all aimed at addressing the current and future challenges related to water management. A predominant theme across the responses was the **need to reduce water pollution**, particularly from plastics, agricultural chemicals, and waste. Several respondents emphasized that tackling water pollution from various sources, including illegal waste dumps, plastic waste, and pollution from speleological



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facilities, should be a primary focus. This aligns with the growing concern for preserving the ecological health of water bodies and the communities that depend on them.

Furthermore, many respondents highlighted the **importance of improving infrastructure**, specifically **wastewater drainage systems** and **irrigation networks**. This was seen as essential to managing water more efficiently, as many existing systems were described as outdated or insufficient for the needs of the region. Improving infrastructure would not only support better water distribution and waste management but also enhance the resilience of local communities to climate change impacts, such as droughts or floods.

**Cross-border cooperation** emerged as another critical action, with particular focus on **collaboration between Croatia and Bosnia and Herzegovina**. Several respondents emphasized the need for joint initiatives to reduce pollution, ensure equitable water distribution, and manage the shared water resources of the Neretva River and its delta. The salinization of the Neretva Delta, partly attributed to projects like the Upper Horizons hydropower project in Bosnia and Herzegovina, was highlighted as a major concern. Respondents called for **urgent political and institutional interventions** at both local and international levels to address these issues and protect water resources in the region.

In terms of ecosystem and biodiversity protection, there was a consensus on the need for **sustainable water management practices**. Many respondents stressed the importance of revitalizing wetlands, regulating irrigation, and promoting eco-friendly agricultural practices to prevent the depletion and degradation of water bodies. Raising awareness about the environmental sensitivity of aquatic ecosystems, coupled with education on regenerative agriculture and smart technologies, was frequently mentioned as an essential component of long-term water resource preservation.

**Addressing the threat of saltwater intrusion** into freshwater systems, particularly in the Neretva Delta, was also identified as a priority. This issue is being exacerbated by the lack of sufficient freshwater inflow, which could have severe consequences for local communities, agriculture, and biodiversity. Several respondents suggested focusing on measures to **increase freshwater inflow**, especially from areas like Eastern Herzegovina, which is connected underground to the Neretva River Delta. Other respondents pointed out the need for **improving water governance**, which includes creating appropriate infrastructure, enforcing stricter regulations on water usage, and ensuring the effective management of shared water resources. For instance, some responses indicated that there should be greater emphasis on monitoring and research to understand the spatial dynamics of water-related challenges and to develop more adaptive management strategies.

In addition, **tackling urbanization pressures and reducing the use of harmful chemicals** in agricultural practices were mentioned as part of broader efforts to ensure that water resources are used sustainably. The need to focus on **ecosystem restoration**, especially the removal of invasive



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species and the reduction of soil and water pollution, was seen as critical to enhancing both water quality and biodiversity in the region.

To further strengthen local actions, several respondents stressed the importance of **community education and engagement**. Specifically, they called for greater efforts to raise awareness among local populations about the importance of preserving water resources, with a particular focus on younger generations. Workshops, information campaigns, and hands-on eco-actions were seen as crucial tools in fostering a culture of sustainability.

Ultimately, the responses reflected the complexity and urgency of addressing multiple, interconnected priorities. Key actions such as reducing pollution, upgrading infrastructure, and enhancing cross-border cooperation emerged as fundamental to addressing current challenges.

### **Main Influences on Water Resource Management in the Neretva area, Croatia:**

The responses reveal a complex set of challenges, many of which are closely interlinked, highlighting the critical importance of effective and integrated water management strategies. **Reduced water availability** emerged as a central concern, particularly due to prolonged droughts and reduced river flow. These factors exacerbate the strain on water resources, reducing the overall supply for both human consumption and ecological systems. Many respondents noted that the reduction in available water has led to more frequent and severe water shortages, affecting agriculture, industry, and daily living, thus further highlighting the urgency of addressing this issue. A key consequence of reduced water availability is the altered **water quality**, with pollution of rivers and aquifers, alongside saltwater intrusion, becoming major influences. **Pollution**, often stemming from agricultural runoff and industrial waste, significantly degrades water quality, making it unsafe for consumption and harming aquatic ecosystems. **Saltwater intrusion**, in particular, was highlighted in areas near coastlines or estuaries, where rising sea levels or reduced freshwater inflow are pushing saltwater into freshwater reserves, compounding the water scarcity problem.

Another significant influence is the **loss of water-related ecosystems**, especially in regions where wetlands and natural habitats have been reduced or drained. The loss of these ecosystems not only impacts biodiversity but also diminishes natural water filtration systems, leading to poorer water quality and the disruption of local hydrological cycles. Wetlands, which traditionally act as natural buffers, are critical for maintaining water quality and regulating water flow, and their degradation contributes to a vicious cycle of further environmental damage.

Beyond environmental impacts, **economic and social consequences** were also frequently mentioned. The damage to agriculture, tourism, and high management costs due to poor water quality and availability were concerns for many respondents. **Agriculture**, which is highly dependent on reliable water sources, suffers from both water shortages and pollution, leading to reduced crop yields and increased costs for irrigation. **Tourism**, especially in regions relying on clean water bodies for recreational activities, also faces adverse effects from pollution and ecosystem degradation. The



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social implications are profound, as these challenges disproportionately affect vulnerable communities, leading to a decline in quality of life and livelihood security.

A crucial issue raised was the **role of interstate relations** between Croatia and Bosnia and Herzegovina. These tensions, particularly concerning water management in shared river systems, complicate cooperation efforts. Disagreements over **water allocation**, such as those related to the Neretva River, were noted as key obstacles. The Gornji Horizonti hydropower project in Bosnia and Herzegovina, which has reduced freshwater inflow into the Neretva and contributed to saltwater intrusion in the Neretva Delta, was cited as an example of how cross-border issues impact the water resources of both countries. These interstate relations require stronger communication, joint strategies, and legal mechanisms to address shared water resources and avoid further degradation of the ecosystem.

Finally, the issue of conflicts over water use emerged as another key influence. **Disputes between different sectors**—such as agriculture, industry, and tourism—over water allocation are exacerbated by the competing demands for limited resources. These conflicts are often intensified in periods of scarcity, making it difficult to implement cooperative and sustainable management practices. Furthermore, damage to infrastructure, particularly during extreme events like floods or flash floods, was noted as a serious challenge, as these events often disrupt water distribution systems and exacerbate the difficulty of managing water resources effectively.

In summary, the range of responses underscores the interconnectedness of these challenges. Effective water resource management must address both the immediate concerns of water scarcity and pollution, while also considering long-term impacts on ecosystems, economies, and social well-being. It is clear that coordinated efforts, from local to cross-border levels, are needed to mitigate these influences and ensure the sustainable management of water resources in the future. Addressing issues such as interstate relations, particularly between Croatia and Bosnia and



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Herzegovina, will be essential for resolving conflicts and creating long-term solutions for shared water management.

Koji su glavni utjecaji povezani s upravljanjem vodama na vašem području? (Odaberite sve relevantne opcije)

20 risposte

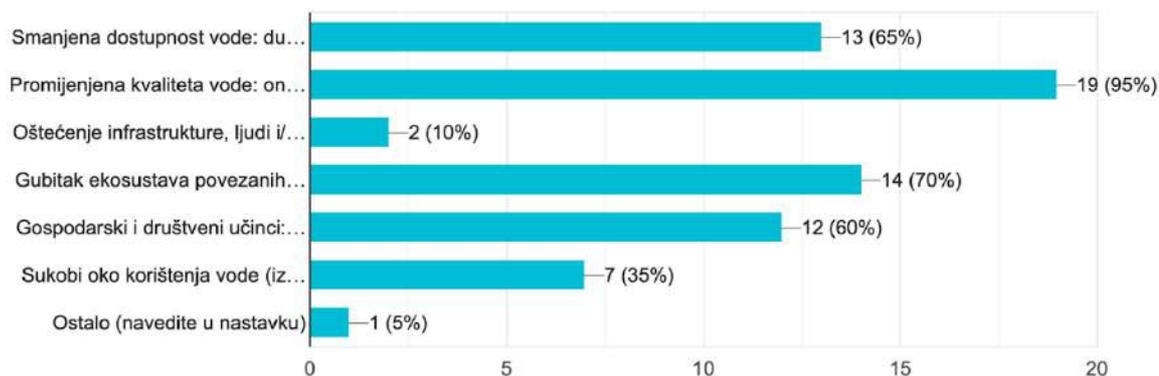


Figura 6

Smanjena dostupnost vode: du... = **Reduced water availability: prolonged droughts and/or reduced river flow (65%)**

Promijenjena kvaliteta vode: on... = **Altered water quality: pollution of rivers, aquifers and/or saltwater intrusion (95%)**

Oštećenje infrastrukture, ljudi i/... = **Damage to infrastructure, people and/or the built environment due to extreme events (e.g., floods, flash floods) (10%)**

Gubitak ekosustava povezanih... = **Loss of water-related ecosystems: reduction of natural habitats and/or draining of wetlands (70%)**

Gospodarski i društveni učinci:... = **Economic and social impacts: damage to agriculture, tourism and high management costs (60%)**

Sukobi oko korištenja vode (iz... = **Conflicts over water use (between sectors and/or communities) (35%)**

Ostalo (navedite u nastavku) = **Other (5%)**

Responses reveal a complex interplay of environmental and socio-economic factors. A significant concern is the **altered water quality**, with 95% of respondents highlighting issues such as pollution of rivers, aquifers, and saltwater intrusion. **Reduced water availability**, including prolonged droughts and reduced river flow, was also noted by 65% of participants. The **loss of water-related ecosystems**, such as the reduction of natural habitats and draining of wetlands, was cited by 70%, while **economic and social impacts**, including damage to agriculture, tourism, and high management costs, were emphasized by 60%. **Conflicts over water use** between different sectors

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and communities were identified by 35%, with 10% of respondents noting the impact of **damage to infrastructure** due to extreme events like floods. Only 5% mentioned other influences.

### Economic sectors most affected by water-related impacts in the Neretva area, Croatia:

Na koje gospodarske sektore najviše utječu utjecaji povezani s vodom? (Odaberite sve relevantne opcije)  
20 risposte

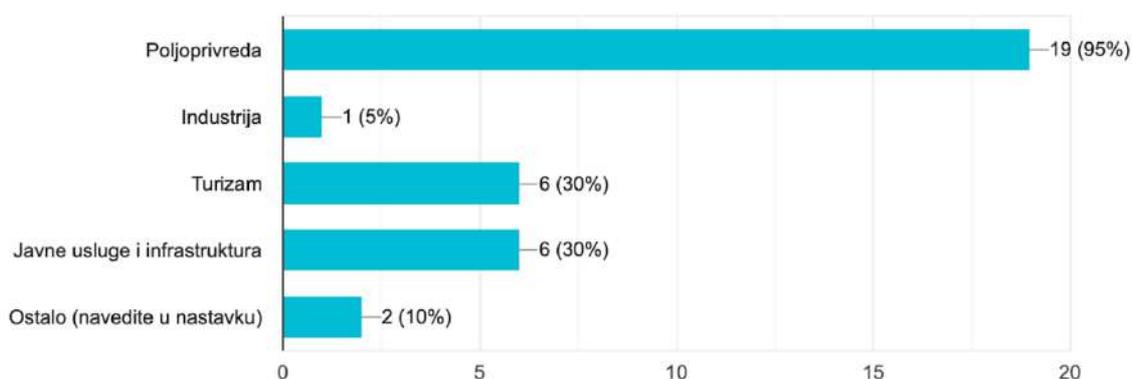


Figura 7

Poljoprivreda = **Agriculture**

Industrija = **Industry**

Turizam = **Tourism**

Javne usluge i infrastruktura = **Public Services and Infrastructure**

Ostalo (navedite u nastavku) = **Other**

Responses highlight that **agriculture** is the sector most frequently mentioned, with almost every response citing its significant dependence on water resources. Following agriculture, sectors like **public services and infrastructure**, **tourism**, and **industry** were also commonly identified as being affected by water-related challenges. A particularly concerning issue raised in the responses is the impact on the **reedbed area** and the **floodplains of the Neretva valley**. In certain areas, **water shortages** throughout the year have led to residents resorting to setting fires in dry conditions, creating an alarming situation. The situation in the Neretva is critical, and as one respondent



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emphasized, urgent action is required, stressing that measures should have been implemented **"yesterday"** to prevent further damage and to ensure the region's sustainability.

### **Elements or factors most vulnerable to water-related impacts in the Neretva area, Croatia:**

The range of responses highlights several **critical vulnerabilities**, particularly **in the context of water scarcity, quality, and ecosystem health**. **Agriculture** emerged as the most frequently mentioned sector, underscoring its susceptibility to disruptions caused by reduced water availability, salinity from seawater intrusion, and pollution. As agriculture is heavily dependent on stable water supplies, changes in water flow and quality directly impact crop yields and farming viability. **Biodiversity** was another key concern, with many respondents noting that both terrestrial and aquatic ecosystems are under threat from reduced water availability and pollution. The reduction in water flow, particularly in the Neretva River, coupled with the increasing salinity from seawater intrusion, has been identified as a primary cause of stress on both aquatic habitats and fish stocks. This, in turn, affects the broader ecosystem, including protected areas, wetlands, and endangered species.

The **tourism sector** was also highlighted as vulnerable, as it relies heavily on the health of natural water bodies and ecosystems. Water scarcity and pollution can deter tourists, especially in areas that depend on pristine natural environments. Similarly, the public water supply system is under pressure, as water shortages and contamination can affect the availability of clean drinking water for local populations.

**Wetlands**, essential for biodiversity and as natural water filters, were pointed out as being particularly vulnerable, with some responses stressing the importance of maintaining protected fish species and other wetland ecosystems. **Groundwater** was also flagged as at risk from both pollution and over-extraction, further complicating water management efforts.

Extreme weather events, including droughts and floods, were mentioned as growing threats that exacerbate vulnerabilities across sectors. These events can disrupt water availability, damage infrastructure, and lead to soil erosion, affecting both agricultural productivity and water quality. Lastly, the issue of **pollution, from various sources**, was repeatedly mentioned as a significant risk factor. This includes surface water pollution, soil contamination, and the impacts of industrial and agricultural runoff, all of which pose long-term risks to water resources and ecosystems in the region.

### **Adaptation measures or solutions to be prioritized in the Neretva area, Croatia:**

Responses to the question on necessary adaptation measures or solutions to reduce water-related risks in the Neretva area reflect a multifaceted approach to addressing the growing pressures on water resources. One of the most frequently mentioned solutions was the **improvement of infrastructure**, which includes a range of actions like constructing **wastewater treatment plants**, developing **irrigation systems**, and building **saltwater barriers** on the Neretva River. These infrastructure projects aim to prevent saltwater intrusion, maintain adequate freshwater inflow, and



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support sustainable water use in the face of changing environmental conditions, especially during low flow periods.

Another key response highlighted the importance of **better management of water resources** and ecosystems. For example, respondents stressed the need for the **regulation of irrigation systems** to prevent water wastage and ensure more efficient use of available water. Similarly, there was a strong emphasis on the **preservation of natural habitats**, particularly wetlands, which serve as vital water management resources and provide important ecological services. Respondents also noted the critical role of **monitoring seawater intrusion** into coastal ecosystems to assess the ongoing impact of saltwater on freshwater resources. **Pollution control** emerged as a significant priority, with multiple mentions of reducing **pesticide use**, **removing illegal waste dumps**, and improving **wastewater treatment systems**. The aim is not only to reduce harmful contaminants entering the water systems but also to create cleaner, safer water for both human and environmental health. The call for **sustainable agricultural practices** and **ecological production** underscores the importance of integrating environmentally friendly practices into farming and industry, thus minimizing the long-term negative impacts on water quality and availability. **Climate change adaptation** was also seen as an integral part of long-term water management strategies, with respondents advocating for the inclusion of **climate scenarios** in planning to better predict and address future water challenges. This aligns with the call for **sustainable urbanization**, where urban expansion is carefully managed to avoid overburdening water resources. In terms of **community involvement**, there was a clear consensus on the importance of **educating the local population** and encouraging **active participation** in water management practices. This includes raising awareness about water conservation, pollution reduction, and the value of maintaining healthy ecosystems.

Finally, some respondents raised concerns about specific projects, such as the **Gornji Horizonti hydropower project**, warning that such initiatives could exacerbate water scarcity and negatively affect local habitats by disrupting the natural water flow. As such, there was a call for greater scrutiny and regulation of projects that may harm the region's water resources. Overall, the responses indicate a recognition that **holistic water management** is essential for preserving both the natural environment and the livelihoods of the people in the Neretva area. This involves a combination of technological solutions, sustainable practices, policy adjustments, and community engagement to ensure a balanced and resilient water future.

### **Adopted and Implemented Adaptation Policies and Measures in the Neretva area, Croatia:**

Responses offer a snapshot of various approaches to addressing water resource management and climate change adaptation, revealing differing levels of engagement, from active policy implementation to advocacy and research.

Several respondents emphasized the **introduction of new legislation** aimed at strengthening water resource management and addressing climate challenges in both Croatia and Bosnia and Herzegovina. This included more frequent field inspections, with some authorities taking a strict



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stance on enforcement, including conscientious punishment of violators to improve compliance with environmental standards.

For many non-governmental organizations (NGOs), their influence is more indirect. They work within the **framework of guidelines and advocacy**, striving to raise awareness and push for systemic changes. One NGO mentioned its reliance on guidelines to guide its work, **influencing practices** rather than directly implementing policies or measures.

In terms of infrastructure measures, respondents pointed to **flood management strategies**, such as the construction of individual flood dams, to mitigate the impacts of extreme weather events, a crucial part of climate adaptation in vulnerable areas. A significant project planned for 2025 includes the construction of a dam on the Neretva River in Croatia, aimed at improving water regulation, as well as the development of an irrigation network for the Neretva River's melioration areas. These projects reflect efforts to enhance infrastructure resilience to climate pressures, though concerns about the environmental implications of such developments were also highlighted. On the conservation front, there was an emphasis on the importance of **preserving forest resources and combating soil erosion**, both critical for maintaining healthy watersheds and water quality. Some respondents also mentioned efforts to protect both aboveground and underground watercourses, an important measure to ensure water availability and ecosystem health.

Collaboration between countries was highlighted through the Interreg Italy-Croatia projects such as MoST and SeCure, which established a **monitoring system to track seawater intrusion** in the region, a growing concern for coastal and inland freshwater systems. Furthermore, DUNEA has actively engaged in various climate adaptation projects in the Neretva Valley, focusing on saltwater intrusion mitigation and broader climate change adaptation efforts, such as the MoWaCLIM project. A few respondents expressed a more limited scope of involvement, with mentions of **waste management efforts**, although these were not always directly tied to water resource management. Others were involved in scientific research to detect and monitor biosphere changes resulting from environmental pressures, providing valuable data for future policy-making. Some organizations acknowledged they had yet to take concrete action. For example, Bankwatch noted that as a civil society organization, it does not directly adopt or implement adaptation measures but may advocate for them. Similarly, some respondents indicated that environmentally friendly incentives or other minor actions were taken without significant direct involvement in major adaptation initiatives.

In summary, the responses reflect a range of strategies and measures aimed at adapting to climate change and addressing water resource management issues. While some actors are involved in



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proactive legislation, infrastructure projects, and conservation efforts, others are still in the early stages of involvement, focusing on advocacy, research, or awareness-raising.

### **Relevant or Priority Nature-Based Solutions for Water Resource Management in the Neretva Area:**

Responses indicate a strong consensus around several key strategies. Restoring river ecosystems emerged as the most frequently cited solution, reflecting a recognition of the vital role that healthy waterways play in maintaining water quality and supporting diverse ecosystems. Alongside this, preserving biodiversity was highlighted as essential for building climate resilience, suggesting that a diverse range of species can buffer ecosystems against climate stressors and contribute to long-term stability.

Respondents also emphasized creating wetlands as a critical measure for improving water management. Wetlands act as natural filters, help manage floodwaters, and support biodiversity. Similarly, the importance of planting trees was noted as a way to improve water absorption, mitigate soil erosion, and regulate local climates, ultimately contributing to both water conservation and broader environmental health.

Another commonly mentioned solution is the use of green infrastructure for flood mitigation. This includes measures like rain gardens, permeable pavements, and vegetated swales that not only reduce flood risks but also enhance water quality by filtering out pollutants. These approaches highlight a growing recognition of the benefits of working with nature to address water management challenges.

Together, these responses suggest a broad acceptance of nature-based solutions as essential tools for sustainable water resource management. By leveraging natural processes, these strategies aim



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to enhance ecosystem services, restore ecological balance, and build resilience to the impacts of climate change.

Koja rješenja koja se temelje na prirodi smatraju relevantnim ili prioritetnim za upravljanje vodnim resursima u vašem području? (Odaberite sve relevantne opcije)

20 risposte

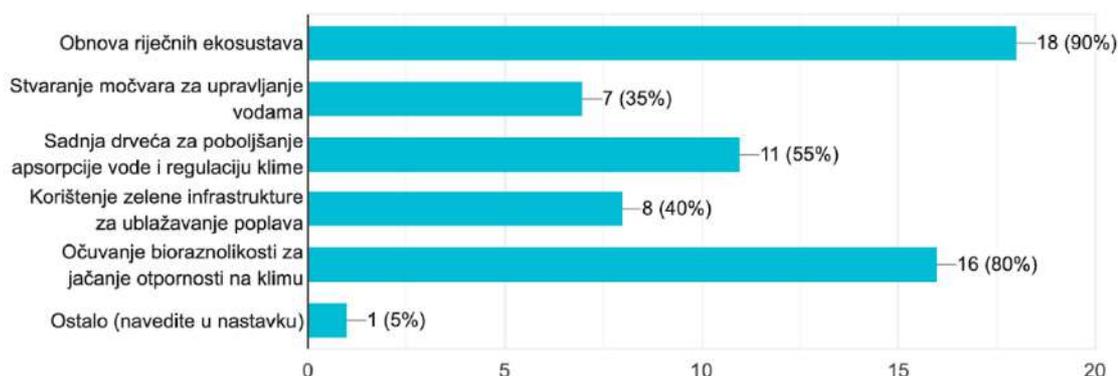


Figura 8

Obnova riječnih ekosustava = **River ecosystem restoration (90%)**

Stvaranje močvara za upravljanje vodama = **Creating wetlands for water management (35%)**

Sadnja drveća za poboljšanje apsorpcije vode i regulaciju klime = **Planting trees to improve water absorption and climate regulation (55%)**

Korištenje zelene infrastrukture za ublažavanje poplava = **Using green infrastructure for flood mitigation (40%)**

Očuvanje bioraznolikosti za jačanje otpornosti na klimu = **Preserving biodiversity to strengthen climate resilience (80%)**

Ostalo (navedite u nastavku) = **Other (5%)**

The restoration of river ecosystems emerges as the most prioritized solution, with 90% of respondents identifying it as essential. This reflects the urgent need to address the degradation of river systems, such as the Neretva River, which is facing significant environmental pressures. Following this, preserving biodiversity to strengthen climate resilience is another high priority, with 80% of respondents emphasizing its importance. This solution is seen as critical to ensuring long-term ecological balance and enhancing the capacity of ecosystems to withstand climate-related stressors. The creation of wetlands for water management was also recognized by 35% of respondents as a valuable approach, likely in response to the region's challenges with water storage and flood mitigation. Similarly, planting trees to improve water absorption and climate regulation is viewed as an effective measure by 55% of participants, linking natural processes to improved water retention and climate stabilization. Additionally, the use of green infrastructure for flood mitigation

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is favored by 40% of respondents, offering a more sustainable alternative to traditional engineering solutions.

### Barriers to Implementing Nature-Based Solutions in the Neretva Area:

The responses to the question "What barriers do you foresee in implementing nature-based solutions in your area?" reflect a diverse set of challenges, many of which are deeply rooted in local and political dynamics. One of the most pressing barriers mentioned is **social and cultural resistance**, particularly from local interest groups such as farmers and hunters. This resistance is often tied to a lack of **education** about ecological practices and a general reluctance to adopt new methods, with some perceiving them as threats to established ways of life. This resistance is compounded by **insufficient knowledge** about the benefits and practicalities of nature-based solutions, particularly in the context of **ecological production**. As one respondent pointed out, the **lack of education** on these topics is a significant hurdle, making it difficult to achieve local support and engagement.

The **political context** also plays a critical role, with the **conflicts between policies** at both local and national levels posing a major obstacle. In the case of the Neretva River, **unresolved communal problems** and political issues—such as the **change in the course of the Neretva River in Bosnia and Herzegovina**—are seen as key factors that influence the state of water resources in Croatia's Neretva Valley. The **jurisdictional complexity** of the Neretva Delta, which spans multiple levels of government and even countries, further complicates the implementation of nature-based solutions. **Coordination between the policies of multiple countries and jurisdictions** is essential for effective management but remains a challenge, particularly in light of the **Gornji Horizonti hydropower project**, which is expected to have **irreversible detrimental impacts** on the ecosystem and local communities. Another barrier is the **lack of funds**. Many respondents highlighted the **insufficient resources** for implementing nature-based solutions, with some pointing out that **EU project funding** is often difficult to obtain due to bureaucratic obstacles. This lack of funding exacerbates the challenges in the **nature protection sector**, where financial support is essential for long-term conservation efforts. Similarly, the **slow and demanding process of obtaining funds** further delays action and hampers the development of viable solutions.

The **lack of dialogue** between **policymakers, nature protection institutions, relevant stakeholders, and local communities** was also noted as a critical barrier. Without clear communication and collaboration, policies and strategies from different sectors often conflict, going in opposite directions and hindering integrated approaches to water resource management.

Additionally, there is significant concern regarding the **restoration of river ecosystems**, especially for the **Neretva River**, which is described as one of the most endangered rivers in Europe. The **pollution of the river** and the **draining of wetlands** are seen as urgent issues that require



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immediate attention. Restoration efforts are often stymied by the lack of local support and the slow pace of permitting processes, making it challenging to implement effective restoration measures. Overall, the responses suggest that overcoming these barriers requires a multifaceted approach: improving education, fostering political cooperation, securing funding, promoting dialogue across sectors, and tackling the specific political and social resistance that exists at the local level.

Koje prepreke predviđate u implementaciji rješenja temeljenih na prirodi na vašem području? (Odaberite sve relevantne opcije)

20 rispote

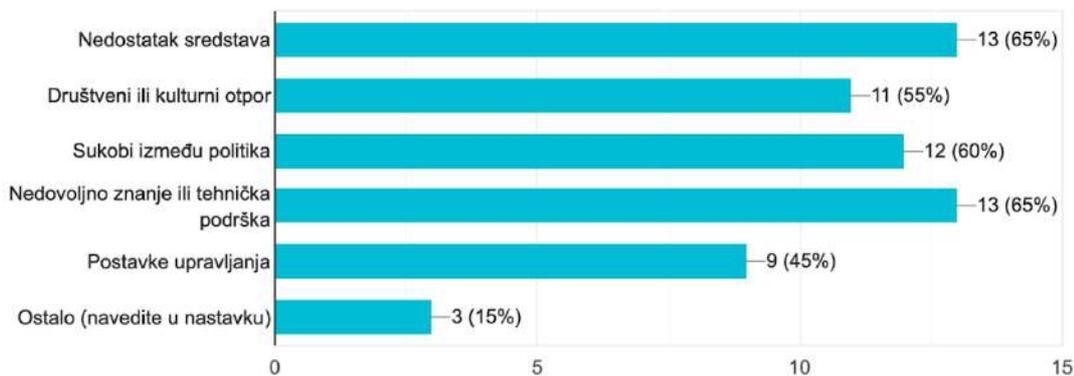


Figura 9

*Nedostatak sredstava* = **Lack of funds (13%)**

*Društveni ili kulturni otpor* = **Social or cultural resistance (55%)**

*Sukobi između politika* = **Conflicts between policies (60%)**

*Nedovoljno znanje ili tehnička podrška* = **Insufficient knowledge or technical support (65%)**

*Postavke upravljanja* = **Management settings (45%)**

*Ostalo (navedite u nastavku)* = **Other (25%)**

The implementation of nature-based solutions in the Neretva area faces several barriers, including insufficient knowledge and technical support (65%), conflicts between policies (60%), and social or cultural resistance (55%), particularly from local communities with traditional practices. The lack of funds (13%) and management settings (45%) also hinder progress, while other factors such as legal issues and slow administrative processes further complicate efforts. Overcoming these challenges requires better education, funding, and coordination between sectors and regions.



### Interest in Receiving Key Results from the Questionnaire:

Želite li biti obaviješteni o ključnim rezultatima iz upitnika?

19 risposte

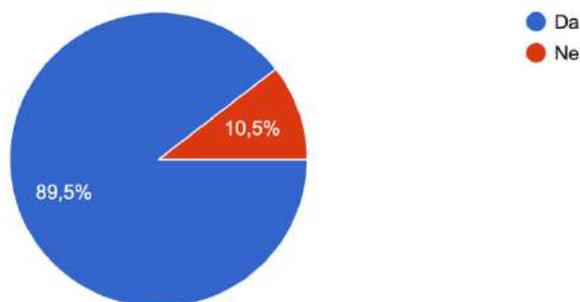


Figura 10

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