

SHARING AND ASSESING SCENARIOS REPORT

Pilot area name: Special ornithological reserve Palud - Palù

Partner Name: Public Institution Natura Histrica

Deliverable 1.2.4 - English summary

Draft vers. 1.0 date: 17/04/2026

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INTRODUCTION

This document has been developed within the framework of the project *GREW - Governance of Wetlands* in the Italy–Croatia Cross-Border Region, a cross-border initiative aimed at improving the governance and long-term management of coastal wetlands under increasing climate change pressures.

Coastal wetlands in the Italy–Croatia cross-border area represent ecosystems of high ecological value, providing important habitats for biodiversity and delivering essential ecosystem services to local communities and visitors. However, these areas are increasingly exposed to multiple and interacting pressures, particularly those related to climate change, such as rising temperatures, altered precipitation patterns and increasing variability in hydrological regimes. Additional challenges, including habitat degradation, pressures from human activities and insufficiently coordinated management approaches, further affect their ecological stability and resilience.

The preferred scenario reflects the outcomes of participatory processes carried out within the project, incorporating contributions from stakeholders and local actors. It combines realistic development conditions with shared visions and priorities for the future management of the Palud reserve.

The scenario identifies key priority areas for action and outlines a set of measures aimed at strengthening conservation, improving management effectiveness and enhancing ecosystem resilience. These measures are designed to address current pressures while supporting adaptation to future environmental and climate-related changes.

The proposed actions represent a basis for further discussion and refinement within the Wetland Contract process, ensuring alignment between stakeholder expectations, practical feasibility and long-term conservation objectives.

PREFERRED SCENARIO

The preferred scenario is developed based on the participation activities of the **Territorial Labs** open to the public. It combines aspects of the trend scenario and expectations/visions/ideas considered as most important to the members of the community and engaged stakeholders. It will balance the potential reality of the future while on one side providing opportunities to adjust to changing development patterns, and the other side addressing the desired objectives of environmental protection and economic development.

The scenario reflects the shared vision of stakeholders to strengthen the protection and management of the Palud reserve while addressing concrete pressures identified during the participatory process, particularly those related to visitor management, biodiversity knowledge gaps and increasing climate variability.

Priority elements of preferred scenario are listed below:

- Improvement and regulation of access infrastructure (unclassified roads, pathways, parking) to reduce pressure on sensitive habitats and ensure safer and more controlled visitor movement under changing climate conditions.
- Strengthening of supervision and on-site control to address increasing pressures from tourism, waste and inappropriate behavior.
- Development of a stronger knowledge base through targeted research on biodiversity, including assessment of wild boar population and its impact on habitat conditions.
- Analysis and promotion of ecological agriculture as a sustainable activity compatible with wetland conservation and climate resilience.
- Improvement of awareness and communication through targeted promotional and educational materials addressing key local pressures and appropriate behavior.

The actions presented in this scenario reflect the overall ambition of the local community, while their prioritisation and implementation will be further defined through the Wetland Contract process.

PREFERRED SCENARIO				
Strategic area	Objectives	Measure	Action/Initiatives	Risks
G. GOVERNANCE	OG1. Access, traffic and visitor movement within the Palud reserve are spatially regulated and aligned with conservation and climate change adaptation needs	Regulation and improvement of unclassified roads, pathways and parking system.	Gradual organization of the existing network of unclassified roads and informal paths, including their classification, rehabilitation, or closure where necessary; establishment of a clearly defined parking system outside sensitive zones; prevention of uncontrolled vehicle access and ad hoc parking; alignment of access solutions with increasing climate risks (e.g. drought-sensitive areas, flood-prone zones).	Administrative and permitting delays; limited funding; resistance to restricting existing access practices.

	OG2. On-site supervision and management capacity are strengthened to respond to increasing pressures on the reserve.	Improvement of supervision, monitoring and enforcement mechanisms.	Increase in field presence (ranger service), especially during peak seasons; introduction of basic surveillance and monitoring tools; strengthening cooperation with local services (e.g. communal wardens); more consistent enforcement of rules related to movement, parking and waste disposal; gradual integration of monitoring data into management decisions in the context of increasing climate-related pressures.	Limited human resources; operational costs; difficulty ensuring continuous presence; enforcement challenges.
E. ENVIRONMENT	OE1. Reliable knowledge based on biodiversity and ecological pressures is established to	Implementation of targeted research and monitoring activities.	Definition and implementation of priority research activities for assessing the state of biodiversity in	Insufficient long-term funding; dependence on external experts;

	support adaptive management under climate change conditions.		the Palud reserve; establishment of a more continuous monitoring system (beyond project-based activities); collaboration with scientific institutions; use of collected data to inform management measures and climate adaptation planning.	discontinuity of research activities.
	OE2. Impacts of key species on habitat conditions are understood and managed, with a focus on wild boar population dynamics.	Research and data collection on wildlife populations.	Targeted research to determine the size, distribution, and impacts of wild boar population (including consultation with local hunting associations and existing data sources); assessment of their influence on soil, vegetation, and habitat structure; use of results to define	Lack of reliable baseline data; coordination challenges with external stakeholders; limited implementation capacity of follow-up measures.

			possible management responses where needed to maintain ecosystem resilience under changing climate conditions.	
D. ECONOMIC AND SOCIAL DEVELOPMENT	OD1. Potential for environmentally sustainable agricultural practices in the surrounding area is assessed and promoted.	Analysis and knowledge-sharing on ecological agriculture.	Preparation of an analysis of the potential for development of ecological agriculture in the wider Palud area; identification of suitable practices compatible with wetland conservation and climate adaptation; organization of workshops or meetings with local stakeholders to present opportunities and constraints.	Limited interest from local producers; economic constraints; complexity of agricultural policies.
	OD2. Awareness of the value of the	Development and implementation of	Design and implementation of	Limited outreach; low engagement

	Palud reserve and appropriate behavior within the area is increased through targeted communication.	educational programmes and guided visits, supported by promotional and educational materials	locally adapted educational programmes, including guided visits, workshops and interpretative activities within the reserve, aimed at different target groups (e.g. schools, local community, visitors). These activities focus on the ecological value of the reserve, key environmental pressures and appropriate behavior within the area, encouraging direct experience and stronger engagement with the site. Educational actions are complemented by the preparation and distribution of promotional and	of target groups; insufficient continuity of communication activities.
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			educational materials (printed and digital), ensuring broader outreach beyond organized activities. Materials are disseminated through local institutions and events, and communication efforts are linked with concrete management measures.	
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ANNEX – INTEGRATED SCENARIO DOCUMENT

As part of the GREW project deliverables, a comprehensive document has been prepared containing the full scenario analysis, including both the trend scenario and the preferred scenario developed through the participatory process.

For reference and completeness, the full scenario document is included as an annex to this report.

STRATEGIC SCENARIO REPORT

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Coastal wetlands in the Italy–Croatia cross-border area represent ecosystems of high ecological value, providing important habitats for biodiversity and delivering essential ecosystem services to local communities and visitors. However, these areas are increasingly exposed to multiple and interacting pressures, particularly those related to climate change, such as rising temperatures, altered precipitation patterns and increasing variability in hydrological regimes. Additional challenges, including habitat degradation, pressures from human activities and insufficiently coordinated management approaches, further affect their ecological stability and resilience.

In response to these challenges, this document applies a scenario-based approach to explore possible future developments of the Palud reserve under different conditions. The scenarios aim to support a better understanding of key pressures, identify potential risks and guide the definition of appropriate management responses.

Two scenarios are presented. The trend scenario reflects the continuation of current practices and existing limitations, providing a baseline for understanding how the system may evolve without significant intervention. The preferred scenario, developed through participatory processes involving local stakeholders, outlines a more desirable development pathway that combines realistic conditions with shared priorities for improved management, biodiversity protection and sustainable use of the area.

Together, these scenarios provide a structured basis for supporting decision-making and guiding future actions within the Wetland Contract process.

A. TREND SCENARIO

This scenario aims to replicate the continuity of current trends across three strategic pillars: governance, environment, and economic and social development. In this context, citizen engagement remains limited, and management and conservation policies do not effectively encourage the participation of all territorial stakeholders. As a result, the scenario reflects a continuation of the existing development pattern and is not considered an optimal framework for achieving objectives related to preventing the degradation of natural areas. For each pillar, the main problems affecting the pilot wetland area their related impacts, and the likely trends under this scenario are identified.

Scenarios are developed to explore possible future developments of the wetland under different conditions and management approaches. They help to better understand how ongoing pressures, such as increasing climate variability, changes in hydrological regimes, and the growing influence of certain wildlife species, may affect the ecosystem over time. By comparing different scenarios, it becomes possible to identify risks, anticipate challenges, and support more informed and strategic decision-making for the sustainable management and conservation of the wetland.

TREND SCENARIO			
Strategic pillar	Problem	Effects	Trends and critical issues
G. GOVERNANCE	PG1. Increasing climate variability creates operational challenges for wetland management, while existing governance tools remain insufficiently adapted to these changes	Recent climate patterns are characterized by longer dry periods, higher frequency of heat waves and increasingly irregular rainfall distribution, including short but intense precipitation events. These changes directly affect the water regime of the wetland, causing fluctuations in water levels, seasonal drying of certain zones and occasional sudden inflows that alter sediment distribution and habitat conditions. Such variability creates practical challenges for day-to-	Under the trend scenario, climate variability continues to increase, amplifying pressures on the wetland system and making management conditions more unpredictable. At the same time, governance practices evolve slowly, without the introduction of specific operational tools, guidelines, or decision-support mechanisms tailored to changing climate conditions. As a result, management responses remain largely improvised and short-term,

		day management, including difficulties in planning maintenance activities, regulating access and ensuring the stability of key habitats. However, existing management tools, operational protocols and planning practices are not sufficiently adapted to these dynamic conditions. Climate-related parameters are not consistently monitored or translated into concrete management actions, limiting the ability to adjust interventions in a timely and coordinated manner.	focusing on immediate issues rather than long-term adaptation. The lack of structured procedures for dealing with extreme events and gradual changes leads to repeated disruptions in management effectiveness and contributes to the progressive instability of the wetland ecosystem.
	PG2. Limited operational capacity for monitoring, supervision and enforcement within the wetland area	Current monitoring and supervision activities are constrained by limited human resources, absence of continuous field presence and insufficient use of technological solutions (e.g. automated monitoring, surveillance tools). As a result, large parts of the wetland remain only intermittently controlled, reducing the ability to detect and prevent inappropriate activities in real time. This creates conditions in which behaviors such as uncontrolled vehicle access, informal parking, movement	Under the trend scenario, the need for increased supervision and improved monitoring remains only partially addressed. Investments in monitoring technologies, digital tools and enforcement capacity are limited, while human resources remain insufficient. As a result, pressures on the wetland ecosystem persist or increase, while governance continues to rely on reactive and incomplete control mechanisms. This reinforces a pattern of insufficient oversight and contributes to the gradual degradation of natural values.

		outside designated paths and occasional illegal disposal of waste can occur without timely intervention. In addition, the lack of systematic and continuous data collection limits the understanding of ongoing environmental pressures and reduces the capacity to link observed changes in the field with management responses.	
	PG3. Unregulated access and insufficiently structured management of roads, pathways and parking areas	The current system of access to the wetland is characterized by the presence of unclassified roads, informal pathways and a lack of clearly designated and managed parking areas. This results in dispersed and uncontrolled entry points, making it difficult to guide visitors' movement and concentrate on activities in less sensitive zones. Consequently, certain parts of the wetland are exposed to repeated physical disturbance, including soil compaction, damage to vegetation and disruption of fauna. During periods of increased visitation, the absence of an organized parking system leads to spontaneous parking in ecologically sensitive areas, further intensifying localized pressures and creating conflicts between	Under the trend scenario, the need to regulate access infrastructure remains only partially addressed. Interventions related to the improvement of roads, pathways and parking management are implemented sporadically and without a comprehensive spatial or operational framework. As a result, access remains largely uncontrolled and visitor pressure continues to be unevenly distributed across the wetland. Without clear zoning, physical guidance measures and consistent supervision, the cumulative impact of these pressures increases over time, contributing to habitat degradation and reducing the capacity of governance

		conservation objectives and recreational use.	structures to manage visitor use in a sustainable way.
E. ENVIRONMENT	PE1. Climate variability affecting hydrological stability and ecological conditions of the wetland	Increasing variability in precipitation patterns, combined with longer dry periods and higher temperatures, directly affects the hydrological balance of the Palud wetland. Fluctuations in water levels, including seasonal drying and irregular inflows, alter habitat conditions for aquatic and semi-aquatic species. In addition, prolonged dry periods and reduced freshwater input can contribute to increased salinity levels in the wetland, leading to excessive salinization that further stresses freshwater-dependent habitats and species. Changes in temperature and water availability influence vegetation dynamics, including shifts in species composition and accelerated succession processes in certain zones. Variability in hydrological conditions also affects the timing and availability of key habitats for fauna, particularly birds and other water-dependent species. Elevated salinity may additionally favor	Under the trend scenario, climate variability continues to intensify, leading to increasingly unstable hydrological conditions and reduced predictability of ecological processes. Periods of low water availability are likely to further increase salinity levels, exacerbating stress on sensitive habitats and contributing to long-term ecological changes. While technical solutions such as the planned water regulation infrastructure (e.g. flow control structures) exist, their role in broader ecosystem adaptation remains limited without a comprehensive management framework. As a result, fluctuations in water regime and salinity progressively affect habitat quality and availability, weakening ecosystem stability and increasing sensitivity to additional environmental pressures.

		salt-tolerant species, potentially alter ecological balance and reduce overall biodiversity. Although certain activities, such as monitoring water quality, sediment conditions and hydrological dynamics, are already being carried out, their results are not always fully integrated into adaptive ecosystem management.	
	PE2. Insufficient knowledge based on key ecological pressures and species dynamics	Despite ongoing efforts in monitoring water and sediment quality, significant knowledge gaps remain regarding the status and trends of biodiversity within the wetland. In particular, the lack of systematic research on certain species and ecological interactions limits the understanding of ecosystem dynamics. This is especially relevant in the case of species such as wild boar, whose population size and spatial behavior are not sufficiently assessed, despite their potential impact on habitat structure, soil conditions and vegetation. The absence of coordinated data collection, including the use of external sources such as local hunting associations, reduces the ability to evaluate	Under the trend scenario, research activities remain fragmented and project-dependent, without the establishment of a continuous and comprehensive biodiversity monitoring system. Key ecological pressures are only partially understood, and management decisions continue to be made with limited empirical evidence. As a result, the impacts of certain species and ecological processes may remain underestimated or unaddressed, leading to gradual habitat degradation and reduced effectiveness of conservation measures.

		pressures and design appropriate management responses.	
	PE3. Increasing pressure of wildlife (e.g. wild boar) on habitat structure and vegetation	The presence and potential increase of certain wildlife populations, particularly wild boar, can significantly affect wetland habitats through rooting, soil disturbance and alteration of vegetation cover. These activities may lead to changes in microhabitats, increased erosion, and degradation of sensitive areas, especially in zones already affected by hydrological stress. In the absence of reliable population data and coordinated management approaches, these impacts are difficult to quantify and control. The interaction between wildlife pressure and other environmental factors, such as fluctuating water levels and vegetation changes, can further amplify ecosystem disturbance.	Under the trend scenario, the lack of systematic monitoring and management of wildlife populations persists, while environmental conditions become more variable due to climate influences. Without coordinated action and data exchange (e.g. with hunting stakeholders), pressures related to wildlife may increase or remain unbalanced. This contributes to ongoing habitat disturbance and reduces the capacity of the ecosystem to recover from other stressors, reinforcing negative trends in habitat quality.
D. ECONOMIC AND SOCIAL DEVELOPMENT	PD1. Limited awareness and understanding of the ecological value of the wetland	Insufficient information and educational activities related to the ecological importance of the Palud reserve reduce public understanding of its role in biodiversity conservation and ecosystem functioning. This limits the capacity of local	Under the trend scenario, educational and awareness-raising activities remain sporadic and dependent on individual initiatives rather than being systematically integrated into local frameworks.

	among the local population	communities to recognize the benefits provided by the wetland and to actively support its protection. The lack of structured and continuous educational initiatives results in weak social engagement and reduces the potential for developing local stewardship and long-term support for conservation and sustainable management practices.	As a result, the level of public awareness remains relatively low and the connection between the local community and the wetland does not significantly strengthen over time. This limits the potential for building social resilience and collective responsibility in the context of increasing environmental pressures.
	PD2. Underutilized potential for the development of sustainable and ecological agricultural practices	The potential for developing ecological and environmentally friendly agricultural practices in the surrounding area remains insufficiently explored and supported. Limited analysis of opportunities, lack of targeted guidance and weak incentives reduce the motivation of local producers to transition toward more sustainable production models. This limits the contribution of agriculture to biodiversity conservation and reduces the potential for creating added value linked to environmentally responsible practices. At the same time, conventional practices may continue to exert pressure on natural resources, particularly	Under the trend scenario, the transition toward ecological agriculture remains slow and fragmented, without a clear strategic framework or coordinated support mechanisms. Climate variability further challenges agricultural stability, while opportunities to align production practices with conservation and climate adaptation objectives remain underused. As a result, the role of agriculture as a positive driver of ecosystem resilience is not fully realized and economic opportunities linked to sustainable land use remain limited.

		under changing climate conditions.	
	PD3. Potential impacts of including the wetland in the tourism offer without a strategic plan	Tourist presence can disturb wildlife, trample vegetation and generate waste or noise that affects sensitive habitats. Without clear guidelines and management strategies, the ecological integrity of the wetland could be compromised and opportunities for aligning tourism with conservation objectives would remain underdeveloped. The lack of a strategic framework increases the risk that any future tourism activities would inadvertently conflict with the wetland's primary role as a protected natural area.	Under the trend scenario, initiatives to integrate the wetland into tourism could arise sporadically, but without a coordinated plan, their potential impacts on biodiversity and ecosystem functions would not be adequately addressed. The absence of proactive planning or regulatory frameworks may lead to incremental pressures on the wetland over time, reducing habitat quality and resilience.

B. PREFERRED SCENARIO

The preferred scenario is developed basing on the participation activities of the **Territorial Labs** open to the public. It combines aspects of the trend scenario and expectations/visions/ideas considered as most important to the members of the community and engaged stakeholders. It will balance the potential reality of the future while on one side providing opportunities to adjust to changing development patterns, and the other side addressing the desired objectives of environmental protection and economic development.

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G. GOVERNANCE	OG1. Access, traffic and visitor movement within the Palud reserve are spatially regulated and aligned with conservation and climate change adaptation needs	Regulation and improvement of unclassified roads, pathways and parking system.	Gradual organization of the existing network of unclassified roads and informal paths, including their classification, rehabilitation, or closure where necessary; establishment of a clearly defined parking system	Administrative and permitting delays; limited funding; resistance to restricting existing access practices.

			outside sensitive zones; prevention of uncontrolled vehicle access and ad hoc parking; alignment of access solutions with increasing climate risks (e.g. drought-sensitive areas, flood-prone zones).	
	OG2. On-site supervision and management capacity are strengthened to respond to increasing pressures on the reserve.	Improvement of supervision, monitoring and enforcement mechanisms.	Increase in field presence (ranger service), especially during peak seasons; introduction of basic surveillance and monitoring tools; strengthening cooperation with local services (e.g. communal wardens); more consistent enforcement of rules related to movement, parking and waste disposal; gradual integration of	Limited human resources; operational costs; difficulty ensuring continuous presence; enforcement challenges.

			monitoring data into management decisions in the context of increasing climate-related pressures.	
E. ENVIRONMENT	OE1. Reliable knowledge base on biodiversity and ecological pressures is established to support adaptive management under climate change conditions.	Implementation of targeted research and monitoring activities.	Definition and implementation of priority research activities for assessing the state of biodiversity in the Palud reserve; establishment of a more continuous monitoring system (beyond project-based activities); collaboration with scientific institutions; use of collected data to inform management measures and climate adaptation planning.	Insufficient long-term funding; dependence on external experts; discontinuity of research activities.
	OE2. Impacts of key species on habitat conditions are understood and managed, with	Research and data collection on wildlife populations.	Targeted research to determine the size, distribution, and impacts of wild boar	Lack of reliable baseline data; coordination challenges with external

	a focus on wild boar population dynamics.		population (including consultation with local hunting associations and existing data sources); assessment of their influence on soil, vegetation, and habitat structure; use of results to define possible management responses where needed in order to maintain ecosystem resilience under changing climate conditions.	stakeholders; limited implementation capacity of follow-up measures.
D. ECONOMIC AND SOCIAL DEVELOPMENT	OD1. Potential for environmentally sustainable agricultural practices in the surrounding area is assessed and promoted.	Analysis and knowledge-sharing on ecological agriculture.	Preparation of an analysis of the potential for development of ecological agriculture in the wider Palud area; identification of suitable practices compatible with wetland	Limited interest from local producers; economic constraints; complexity of agricultural policies.

			conservation and climate adaptation; organization of workshops or meetings with local stakeholders to present opportunities and constraints.	
	OD2. Awareness of the value of the Palud reserve and appropriate behavior within the area is increased through targeted communication.	Development and implementation of educational programmes and guided visits, supported by promotional and educational materials	Design and implementation of locally adapted educational programmes, including guided visits, workshops and interpretative activities within the reserve, aimed at different target groups (e.g. schools, local community, visitors). These activities focus on the ecological value of the reserve, key environmental pressures and appropriate behavior within	Limited outreach; low engagement of target groups; insufficient continuity of communication activities.

			the area, encouraging direct experience and stronger engagement with the site. Educational actions are complemented by the preparation and distribution of promotional and educational materials (printed and digital), ensuring broader outreach beyond organized activities. Materials are disseminated through local institutions and events, and communication efforts are linked with concrete management measures.	
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