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Promoting Coastal Climate Adaptation in the old historic town centre of Piran, Slovenia

Empowering communities to identify and improve traditional infrastructure with Nature-based Solutions for climate resilience

Restoring degraded landscapes and dry-stone walls enhance the historic city centre of Piran, contributing to climate adaptation and the preservation of cultural heritage.

Key Learnings

- **Stakeholder involvement improves adaptation:** Involving citizens and other stakeholders early on to share knowledge and experience through surveys and workshops boosted citizen engagement and facilitated the establishment of an active stakeholder community operating within the historic town, referred to as a coastal city living lab. The workshop participants, for example, evaluated the effectiveness of Nature-based Solutions for climate adaptation.
- **Improving terraced gardens:** A design plan for repairing the terraced gardens with dry-stone walls will help to implement the adaptation actions by following an organised approach. The design plan will facilitate collaboration between authorities, local community groups and Non-Governmental Organisations to repair damaged dry-stone walls and redesign two municipality-owned gardens with local, climate-resilient plants.
- **Restoring historic water systems:** Re-activating abandoned and degraded historic water collection systems preserves cultural heritage and contributes to climate adaptation by providing fresh water for gardening and communal cleaning.
- **Simultaneous adaptation and restoration measures:** The effectiveness of Nature-based Solutions and cultural heritage traditions/infrastructures as climate adaptation solutions depends also on the parallel implementation of renovating underground sewer and drainage systems, especially in old Mediterranean towns like Piran.

About the region

Piran is a coastal municipality in Slovenia, which covers about 44 km² and is home to approximately 18,000 people ([2023](#)). Piran's coastal location makes it an attractive tourist destination, but coastal flooding and storm surges, and sea-level rise threaten the municipality's historic urban infrastructure. Water scarcity becomes acute during summer tourist seasons.

Climate Hazards

Droughts, Extreme Heat, Flooding,

Water scarcity, Sea level rise

Sectors

Coastal Area, Cultural Heritage, Tourism,

Urban, Disaster Risk Reduction,

Water Management

Key systems

Ecosystem and Nature Based Solutions, Water Management



Climate Threats

Due to its coastal Mediterranean location, Piran faces a multitude of climate threats, like sea level rise, winter storm surges, inducing coastal flooding, heavy rain, summer heatwaves and droughts, and freshwater scarcity. In particular, over the past ten years, the availability of potable freshwater has decreased, a situation further aggravated by tourism, as Piran and the wider coastal area are popular summer destinations. Although state authorities are recognising the challenges the region is facing, municipalities themselves need to pursue adaptation actions on the ground. In response, citizen-driven initiatives, involving local knowledge and expertise, can empower local communities by enhancing climate literacy and driving nature and cultural heritage protection while adapting to climate change. Since Slovenia's coastal tourism relies on natural and cultural assets, the adaptation measures also directly contribute to local and national economic prosperity.

"The challenge for a historic town like Piran and for all Slovenian coastal communities is to recognise and connect innovative adaptation solutions, such as historic rainwater collection systems, and dry-stone walls supporting terraced landscapes, with renewing the outdated historic sewer and drainage systems. Only in combination, these measures enable adaptation to warmer temperatures and floods, while preserving cultural heritage."

Dr. Cécil Meulenberg

Collaborative design and interdisciplinarity support effective climate change adaptation

The coastal municipality of Piran's success relies on interdisciplinarity and community empowerment. Citizens, action groups, and Non-Governmental Organisations work together with the municipal administration, the municipal waste and environmental management company, the civil protection service, and the regional branch of the Institute for the Protection of Cultural Heritage. The latter authority plays a crucial role in a monumental site such as Piran's historic centre, defining the maintenance and renovation of historic buildings, façades, pavements, and the overall urban layout. To ensure coherence and effectiveness, politicians, citizens, and non-governmental organisations should collaborate closely to implement the measures defined by the Institute for the Protection of Cultural Heritage.



Figure 1: Potential for green space upgrading: Small publicly accessible park with a dislocated wellhead. Image Credit: Erik Kralj.

Acting as an interdisciplinary community, participants were invited to engage in an open dialogue on climate challenges, focusing on how to make better use of the historic town centre's limited space. They began by re-examining long-established infrastructure and landscapes to identify new opportunities for adaptation. This collaborative process could later extend to the wider municipality, including surrounding areas. Such a collaboration reflects strong community values, while also highlighting the ongoing challenge of communicating local priorities effectively to regional and national decision-makers.

Multi-criteria analysis to prioritise Nature-based Solutions

As a project partner in the EU-funded SCORE project, the Science and Research Centre Koper (ZRS Koper) moderated the stakeholder dialogue and facilitated workshops to discuss adaptation activities. Among other workshop actions, a multi-criteria analysis facilitated prioritising Nature-based Solutions for better climate change adaptation in the municipality. A series of workshops informed stakeholders about Nature-based Solutions, their benefits and ways of implementing them. Consecutive voting rounds, which were based on general and specific criteria, revealed a preference to plant trees, renovate historic rainwater collectors, and establish multi-purpose green infrastructure sites (e.g., small parks and terraced

gardens) to reduce temperatures in the old town and collect fresh water, while providing enhanced biodiversity and more recreation surface.

Cultural heritage as climate adaptation

The study site, defined as Piran's historic centre, identified traditional building techniques, such as water-permeable stone pavements and dry-stone walls. These structures support the terraced coastal landscape with private and community gardens, including olive groves and vineyards, while also retaining soil moisture and preventing landslides. Building on citizen knowledge and a 2017 catalogue (Through squares and courtyards in search of water: catalogue of cisterns and fountains in Piran yesterday and today by Daniela Paliaga Janković), the site also recognised historic rainwater collectors as valuable Nature-based Solutions. Citizens were invited to use an application to georeference and pinpoint locations of water fountains, degraded green areas, and historic pavement by providing photos and comments. As such, they contributed to mapping and documenting the ownership, capacity, and location of these collectors.

Scientists then carried out initial cost-benefit analyses, showing that renovating rainwater collectors and maintaining publicly accessible green spaces deliver significant climate benefits, even though there is only a slight increase in freshwater capacity. By marking and including the identified culturally important infrastructures in tourist routes and having them maintained properly as publicly accessible sites, tourism revenue can further help finance these expensive renovations.

To prioritise these culturally significant methods, the researchers of ZRS Koper commissioned the digitisation of a historic 1889 town map displaying public and private water sources as well as pavements.



Figure 2: Proposed renovation of terraced landscape: Dry stone wall with vegetation (Capparis spinosa) supporting the sloped terraces. Image Credit: Cécil Meulenberg.

Now permanently exhibited in the Maritime Museum and available digitally, the map illustrates Piran's monument status as enacted by cultural heritage legislation in modern-day and provides a foundation for guiding archaeological excavations and the knowledge on the historic urban environment, as well as modern construction.

The effectiveness of Nature-based Solutions and cultural heritage traditions/infrastructures as climate adaptation solutions also depends on simultaneously renovating underground sewer and drainage

systems, especially in old Mediterranean towns like Piran. By recognising and revaluating traditional methodologies and landscapes, the study site contributes to understanding the combination of cultural heritage preservation and climate adaptation within historical urban settings. This combined approach is highly relevant not only for Piran's historic centre but also for other Slovenian coastal towns and the wider Mediterranean region. A working group, ViTA (Valorisation and Innovations of Traditional Architecture and Landscape in Piran), emerged from the [SCORE](#) project activities to carry this work forward.

Summary

Piran, one of Slovenia's coastal municipalities on the Northern Adriatic, faces major climate challenges, including winter coastal flooding from storm surges and summer droughts and heatwaves that cause freshwater scarcity. To respond, the local community, led and supported by the Science and Research Centre Koper, worked with citizens, local organisations, and municipal authorities to identify and prioritise Nature-based Solutions through a series of workshops. Together they agreed on actions such as planting trees to provide shade and cooling, renovating historic rainwater collectors to improve water retention, and creating multi-purpose green spaces that combine biodiversity, water storage, and recreation – an approach particularly important in the limited urban space of Mediterranean towns. The stakeholders also recognised the value of traditional methods such as water-permeable pavements, dry-stone walls, and terraced gardens, which potentially can contribute to both climate resilience and cultural heritage preservation. A dedicated working group is now continuing this effort, advancing Nature-based and traditional solutions to strengthen resilience while protecting Piran's unique architecture and landscape.

Further information

The work presented in this adaptation story is part of the [SCORE](#) project.

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- Piran CCLL SCORE blog: <https://platform.score-eu-project.eu/catalogue/#/geostory/5729>

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