MONITORING land cover change for sustainable management of Mediterranean coastal zones

POLICY BRIEF

med PROGRAMME

2.1 Mediterranean Coastal Zones Climate Resilience Water Security and Habitat Protection

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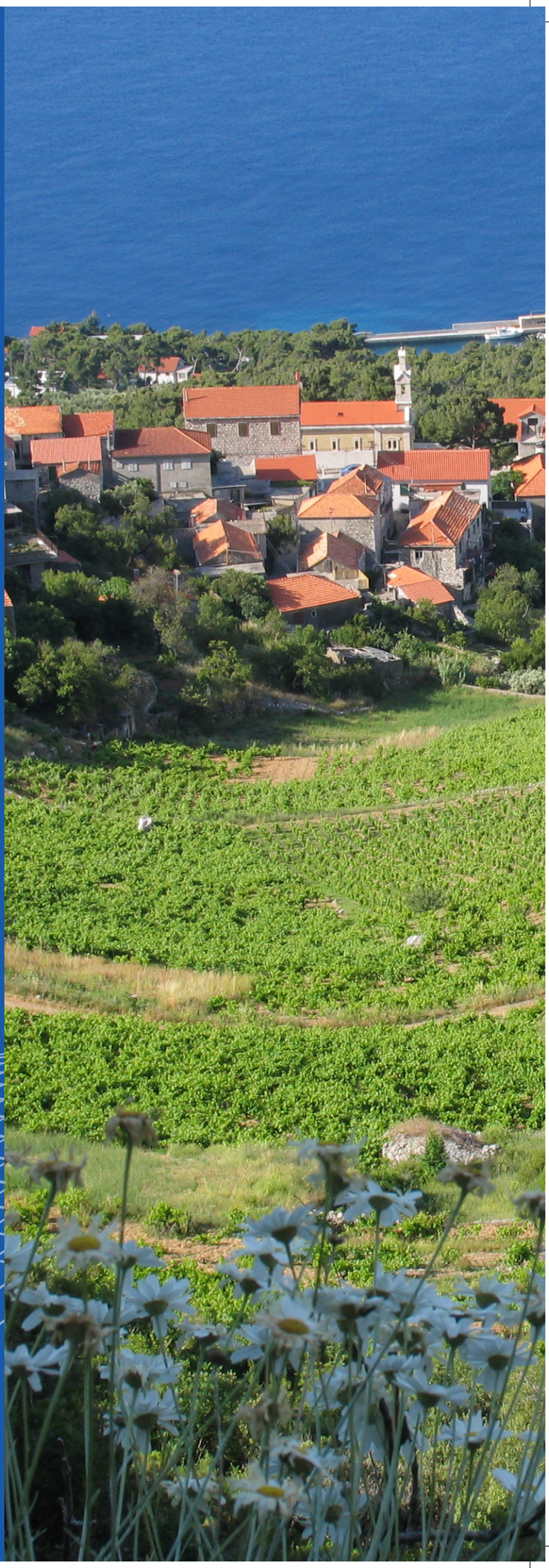


Photo: Marko Prem

1. Introduction

Mediterranean coastal zones are highly dynamic environments that support rich biodiversity, deliver important ecosystem services, and sustain key socio-economic activities such as tourism, fisheries, agriculture, and human settlements. At the same time, these areas are increasingly exposed to cumulative pressures from urbanization, infrastructure expansion, agricultural intensification, tourism development, and climate change. Together, these drivers accelerate land cover change, altering coastal landscapes, and increasing vulnerability to climate-related hazards, including sea-level rise, coastal flooding, and erosion.

Land cover change reflects the ways in which land is utilized and transformed by both human activities and natural processes. Beyond shaping landscapes and ecosystems, land cover also plays an important role in the global climate system: terrestrial and marine ecosystems together absorb more than half of anthropogenic CO2 emissions, helping regulate the global carbon cycle, while land-use change can reduce this capacity and release stored carbon into the atmosphere.In coastal zones, these dynamics are particularly significant, as ecosystems such as wetlands, coastal forests and seagrass meadows can store large amounts of carbon and their degradation may release long-accumulated carbon stocks. In addition,these changes directly influence ecological functioning, habitat connectivity, landscape diversity, and the capacity of ecosystems to provide essential services.

Monitoring land cover change therefore provides important evidence base for understanding pressures on coastal ecosystems, identifying emerging risks, and supporting informed spatial planning, conservation, and adaptation decisions.

Within the Mediterranean region, the Mediterranean Action Plan (MAP) and its Integrated Monitoring and Assessment Programme (IMAP) have identified Land Cover Change (listed as IMAP Common Indicator 25) as a key indicator for tracking pressures on coastal ecosystems

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and landscapes. The indicator enables a systematic assessment of land cover dynamics, supporting the identification of trends, the evaluation of human-induced and natural changes, and the prioritization of areas requiring policy intervention. Land cover change indicator hence provides information for preserving the natural dynamics of coastal areas and ensuring sustainable land use in balance with economic and social development.

Integrating land cover change monitoring into spatial planning processes strengthens the capacity of authorities to protect valuable habitats, maintain ecosystem integrity, and enhance climate resilience. The indicator directly supports the objectives of the Integrated Coastal Zone Management (ICZM) Protocol and contributes to the implementation of relevant EU directives, the Convention on Biological Diversity, and national biodiversity and climate adaptation strategies. As such, land cover change indicator serves as a strategic tool for national, regional, and local decision-makers to guide sustainable coastal development, conserve biodiversity, and respond effectively to current and future environmental pressures.

The latest Global Environment Outlook -7 highlights that the triple planetary crisis—climate change, biodiversity loss and pollution—is increasingly interconnected, with land degradation and desertification emerging as an additional dimension of this global challenge. The latest studies based on satellite data show that this topic is particularly relevant for Mediterranean coastal zones, where land degradation is primarily driven by unsustainable land management and the conversion of natural landscapes into urban development. Although coastal belts represent only a small share of national territory—about 0.55% within 1 km of the shoreline and 4.42% within 10 km—they contain a disproportionately large share of built-up areas. In many countries, 5–10% of all built-up land lies within 1 km of the coast and around 20% within 10 km, reflecting a persistent concentration of people and assets in narrow coastal zones (UNIGE/GRID and PAP/RAC. 2026). Coastal zones are, therefore, hotspots of human pressure.

This policy brief aims to highlight the needto monitorland cover changein Mediterranean coastal zones, presents the methodology on how to monitor it, stress out how to track key trends and pressures affecting coastal landscapes, and provide actionable recommendations for authorities at national, regional, and local levels. By promoting the integration of land cover change monitoring into spatial planning and coastal management processes, this brief aims to support sustainable development, biodiversity conservation, and climate resilience, and enhances the capacity of authorities to address current and emerging pressures on Mediterranean coastal ecosystems and landscapes.

2. Importance of monitoring land cover

Monitoring land cover change is essential for understanding and managing both ecological and societal impacts of land use in Mediterranean coastal zones. Changes in land cover influence biodiversity, ecosystem functions such as carbon sequestration, water regulation, soil protection, and the overall resilience of coastal areas to climate hazards like flooding, erosion, and sea-level rise. Without systematic monitoring, authorities risk responding to environmental degradation only after it occurs, rather than implementing proactive measures to safeguard ecosystems and communities.

Not all land cover changes are inherently negative. Positive transformations include reforestation, restoration of natural habitats, conversion of abandoned agricultural land to semi-natural landscapes, and controlled urban densification,where urban typology permits,that protects natural areas. In contrast, negative changes include uncontrolled urban sprawl, wetland degradation, and conversion of high-value natural or agricultural lands into built-up areas. Monitoring of land cover changeallows decision-makers to distinguish between desirable and harmful changes and implement timely interventions that balance development and environmental protection.

Box 1 – Positive vs Negative land cover changes

Positive changes	Negative changes
Conversion of abandoned agricultural land into semi-natural habitats or forests, restoring biodiversity, improving soil stability, and enhancing carbon sequestration	Urban expansion and land take in coastal zones, fragmenting habitats and reducing biodiversity
Maintenance or expansion of wetlands and protected areas, safeguarding critical habitats	Conversion of forests to agriculture or semi-natural lands under unfavourable conditions, causing soil degradation and loss of ecosystem services
Restoration of forests, wetlands, and semi-natural areas	Linear infrastructure development along coastlines, disrupting geomorphology, hydrology, and ecological connectivity
Controlled densification where urban typology permits, while protecting natural habitats.	Uncontrolled urban sprawl in low-lying coastal areas
Enhancement of landscape diversity in human-modified areas	Degradation of soils and ecosystems due to poorly managed agricultural expansion or land abandonment

Monitoring land cover allows authorities to distinguish desirable from harmful changes, prioritize conservation or restoration actions, and integrate thisevidence into sustainable spatial planning.

"Monitoring land cover allows authorities to distinguish desirable from harmful changes, prioritize conservation or restoration actions, and integrate thisevidence into sustainable spatial planning."

Monitoring of land cover change is a very useful tool for spatial planning. By tracking changes over time, authorities can evaluate the cumulative impacts of development on ecosystems, identify priority areas for protection or restoration, and integrate nature-based solutions into urban and coastal planning. The Land cover change indicator supports planning at multiple governance levels. At the national level, it informs strategic land-use objectives and harmonized monitoring frameworks; at the regional level, it guides infrastructure development and zoning to minimize habitat loss; and at the local level, it supports zoning decisions, redevelopment of brownfield sites, and the implementation of green infrastructure in urban design for instance.

Photo: Ja Kubislav, Unsplash

The land cover changeis fundamental for assessing and managing coastal ecosystem integrity. By understanding how land cover is altered by human activities, policymakers can address environmental degradation, protect biodiversity, and strengthen climate resilience. It contributes directly to achieving good environmental status, a framework that ensures coastal and marine ecosystems function sustainably, support biodiversity, and maintain resilience against anthropogenic and climatic stressors.

Good environmental status for land cover change aims to minimize linear and low-lying coastal development, maintain a balance between urban growth and ecosystem preservation, promote mixed land-use structures in human-made landscapes, and increase landscape diversity. Proposed targets should be adapted to national and local specific socio-economic, cultural and historical context. It should include avoiding new construction in setback zones and low-lying coastal areas, reversing urban dominance in coastal land use, and preserving or enhancing landscape diversity.

By linking land cover monitoring with spatial planning, authorities can move from reactive to strategic management of coastal and inland areas, aligning development decisions with climate adaptation, biodiversity conservation, and sustainable urban and coastal development goals. Integrating land-sea interactions into management, as guided by the ICZM Protocol and its recent asUNEP/MAP Decision on MSP in the Mediterranean as well as by other international legal instruments such as the EU Marine Spatial Planning Directive, ensures that coastal planning contributes to long-term ecological sustainability and human well-being.

Box 1– Role and importance of land cover change monitoring

- Tracks urbanization trends affecting ecosystem health.
- Identifies habitat loss, fragmentation, and areas under high pressure.
- Supports climate adaptation by enhancing coastal resilience.
- Guides sustainable spatial planning and land-use policies.
- Enables prioritization of areas for protection, restoration, or redevelopment.
- Supports goodenvironmental status by balancing urban growth, ecosystempreservation, and landscape diversity.

Box 2 – Role of land cover change in spatial planning

Land cover change acts as both a signal and a guide, helping authorities to:

- Assess cumulative impacts of development on ecosystems and landscapes.
- Identify priority areas for protection or restoration.
- Align planning decisions with climate adaptation, biodiversity conservation, and sustainable urban development.
- Integrate land-sea interactions into coastal management.

Box 3 – What is Good Environmental Status?

- Overall health and sustainability of coastal and marine ecosystems.
- Ensures ecosystems function sustainably, support biodiversity, and remain resilient to human and climate pressures.

Box 4 – Good Environmental Statusobjectives for land cover change

- Minimize linear and coastal development in low-lying terrain.
- Balance urban growth with ecosystem preservation.
- Promote mixed land-use structures in human-made landscapes.
- Increase and preserve landscape diversity.

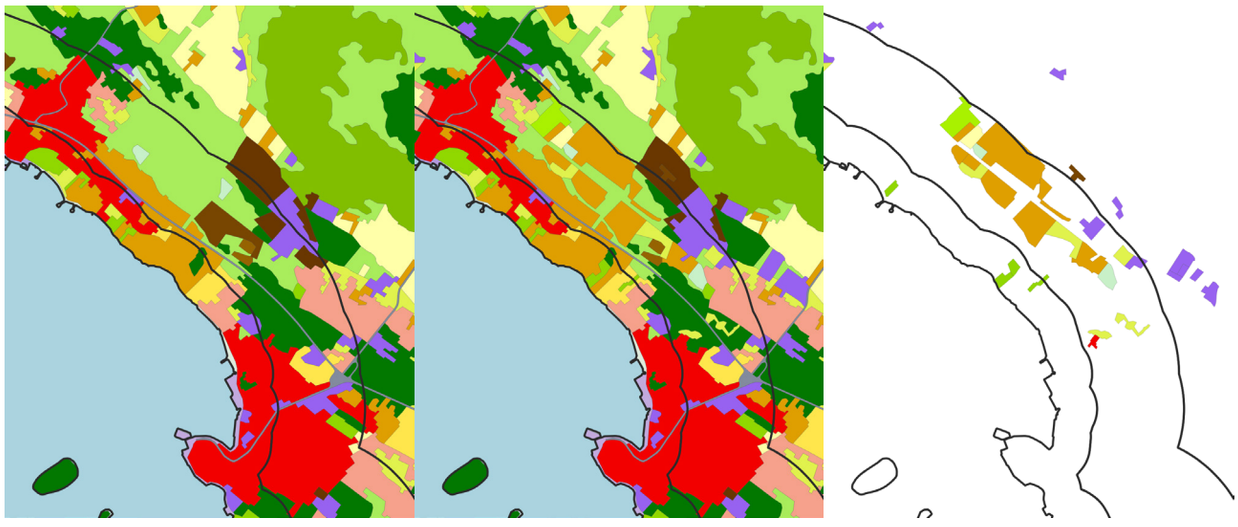

Figure 1 = Land cover in 2012 / Figure 2 = Land cover in 2018 / Figure 3 = Land cover change

3. Policy context and targets

The ICZM Protocol emphasizes the rational, balanced, and sustainable use of coastal zones, aiming to preserve landscapes, protect ecosystems and geomorphology, and integrate economic, social, and cultural development. EU directives, including the Habitats and Birds Directives, the Marine Spatial Planning Directive, the EU Adaptation Strategy, and the 8th Environment Action Programme, reinforce the need to integrate biodiversity conservation and climate resilience into land-use planning.

Policy targets for land cover management focus on minimizing urbanization in sensitive coastal areas, maintaining landscape diversity, preserving ecological connectivity, and promoting the restoration of degraded habitats. These targets are intended as general guidelines and should be interpreted and adapted based on local socio-economic, cultural, and geographical conditions, using local expertise to ensure relevance and feasibility.

Box 5 – Proposed targets (to be adapted locally/regionally)

- Avoiding construction within set back zones and mini mizing develop ment in low-lying coastal terrain.
- Reversing the dominance of urban land use in coastal zones and promoting mixed land-use structures.
- Preserving and increasing landscape diversity and maintaining ecological connectivity.

Indicator description and methodology

The Land cover change indicator measures the type, extent, and dynamics of land use in coastal areas, covering artificial/built-up areas, agriculture, forests and semi-natural lands, wetlands and water bodies. It provides a comprehensive view of areas under pressure, as well as regions where restoration or conservation efforts are having a positive impact. Monitoring land cover change enables authorities to detect trends, assess risks, and guide spatial planning and coastal management interventions.

Monitoring relies on a combination of remote sensing, GIS analysis, and field verification, following internationally recognized standards such as the UN Land Cover Classification System (UN-LCCS). Key data sources include satellite imagery (ESA WorldCover, Copernicus DEM, Sentinel-1/2), administrative reports, collaborative maps (OpenStreetMap), and global databases on protected areas such as the World Database on Protected Areas (WDPA). National datasets are incorporated where available to increase spatial resolution and improve accuracy.

The spatial scope focuses on Mediterranean coastal zones, subdivided into three coastal strips: 0–300 meters, 300 meters–1 kilometre, and 1–10 kilometres from the shoreline. Special attention is given to Low Elevation Coastal Zones (LECZs), defined as areas below five meters above sea level, which are highly vulnerable to flooding, erosion, salinization, and other climate-related hazards. Overlaying protected areas allows assessment of how human pressures affect biodiversity and ecosystem services. Monitoring is conducted at intervals of six years, enabling the detection of meaningful trends while supporting timely policy and planning interventions.

Key parameters of the indicator include:

- Proportion of built-up areas within coastal strips.
- Changes in forest, wetland, and semi-natural areas.
- Land take within LECZ.
- Changes in protected area coverage.

Data are processed on a standardized 1-hectare grid, integrating multiple layers including baseline land cover, land cover changes, coastal strips, LECZ, and protected areas. Statistical outputs, expressed as percentages and area measures, are visualized through maps, graphs, and tables. Detailed technical procedures, including cell-level calculations and land cover transitions, are provided in the technical manual and in the Guidance Factsheet.

Box 6: Priority considerations for LECZ

- Focus on areas below 5 m above sea level, highly vulnerable to flooding, erosion, and sea-level rise.
- Restrict new development to reduce habitat loss and economic risks.
- Implement nature-based solutions to protect coasts and increase resilience.
- Preserve and restore wetlands as natural buffers and carbon sinks.

Monitoring land cover change involves:

- Baseline assessments: Establishing initial land cover conditions.
- Change detection: Identifying changes in land cover over time.
- GIS and remote sensing: Utilizing high-resolution satellite imagery and geospatial analysis.
- Indicator metrics: % of built-up land in coastal strips and LECZ
  - Rate of land conversion (forest to agriculture, agriculture to urban, etc.)
  - % of protected areas affected by land use change
  - % of built-up areas within LECZ

Within the framework of the Global Environment Facility's (GEF) "MedProgramme", Priority Actions Programme Regional Activity Centre (PAP/RAC) developed a Manual for the Calculation of Land Cover Change. The Manual provides a clear, step-by-step methodology for monitoring land cover dynamics, ensuring consistency and comparability of results across different countries and coastal contexts.

The methodology was pilot-tested in several countries participating in the GEF MedProgramme, namely Albania, Bosnia and Herzegovina, Lebanon, Libya, Montenegro, Morocco and Tunisia, through a series of pilot applications. These pilot exercises relied on comparable datasets, enabling the methodology to be assessed across a range of environmental and institutional settings.

The testing process involved close cooperation with national experts and institutions, which applied the methodology in selected coastal areas. Feedback gathered during the pilot phase contributed to further refining the approach, enhancing its practical applicability, and strengthening its relevance for decision-making and reporting purposes throughout the Mediterranean region.

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4. Policy implications and recommendations

Monitoring land cover change provides a decision-support tool that allows authorities to anticipate risks, evaluate interventions, and guide sustainable spatial development, particularly in vulnerable coastal and low-lying areas. At the national level, authorities should set limits on urbanization in coastal and protected areas, integrate land cover change into national monitoring frameworks, and provide harmonized data and technical guidance to sub-national and local authorities. National policies should prioritize restoration initiatives in areas showing net loss of natural cover and ensure compliance with the ICZM Protocol and other related EU directives and other international legal requirements.

At the sub-national level, land cover change data can guide infrastructure development and urban expansion to reduce habitat fragmentation, identify priority areas for restoration or conservation, and inform regional climate adaptation plans targeting flood-prone coastal strips and low-elevation zones. Local authorities can use monitoring outputs to enforce zoning restrictions, promote redevelopment of brownfield sites rather than greenfield conversion, implement green infrastructure for climate resilience, and engage communities in participatory planning.

Cross-level measures include developing early-warning systems for rapid land take, reporting land cover change trends to assess progress toward ICZM and EU policy targets, evaluating intervention effectiveness, and integrating land-sea planning for coordinated management. Clear visualization of monitoring results using maps, diagrams, and simple statistics ensures decision-makers can quickly understand trends, identify areas at risk, and prioritize action.

The analysis of land cover trends provides evidence-based guidance for authorities at national, regional, and local levels. The following recommendations link observed changes to policy and planning measures:

1. Urbanization control

Authorities should strictly limit construction within setback zones and low-lying coastal areas. Zoning regulations should prioritize development in less sensitive areas while maintaining ecological corridors. Policies should include enforcement mechanisms and incentives for sustainable urban expansion, including green infrastructure and multi-functional land use.

2. Ecosystem restoration and conservation

Ecosystems that have been significantly degraded in the past should be progressively restored to recover ecological functions, strengthen climate resilience and maintain ecosystem services.Therefore, losses in forest, wetland, and semi-natural areas should trigger restoration programs. Reforestation using native species and rehabilitation of abandoned agricultural lands can improve biodiversity, soil stability, and carbon storage. Expanding or creating protected areas, particularly in LECZ and biodiversity hotspots, is essential to enhance ecosystem resilience.

3. Climate adaptation integration

Planning of land user should integrate climate projections, particularly for sea-level rise and flooding risks. Measures may include managed retreat, coastal habitat restoration, and incorporation of nature-based solutions such as wetlands and dune systems to buffer climate impacts and restore carbon sinks.

4. Spatial planning and cross-sectoral coordination

National and sub-national authorities should align land-use policies, ICZM strategies and plans, and marine spatial planning to prevent conflicting uses and promote coherence across land-sea interactions. Local authorities should use high-resolution land cover data to identify hotspots of pressure and prioritize interventions accordingly.

5. Monitoring, reporting, and capacity building

Continued monitoring using standardized methods is essential to track trends and assess the effectiveness of interventions. Authorities should invest in capacity building for GIS and remote sensing analysis, ensure data quality control, and engage stakeholders in decision-making.

6. Policy flexibility and local knowledge

Given the strong socio-economic, cultural, and geomorphological differences across countries, interpretation of land cover trends should leverage local knowledge. Policy responses should be adaptive, context-specific, and informed by participatory processes to ensure sustainable outcomes.

Box 7: Key policy recommendations

- Urbanization control: Limit construction in setback zones and low-lying coastal areas. Promote compact, green urban development.
- Ecosystem restoration: Implement refor estation, wetland restoration, and habitat rehabilitation programs. Expand protected areas to strengthen ecological networks.
- Climate adaptation: Incorporate climate projections and nature-based solutions into spatial planning to buffer flooding, erosion, and other hazards.
- Spatial planning coordination: Align national, regional, and local land-use policies with ICZM and marine spatial planning strategies. Use land cover change data to target interventions effectively.
- Monitoring and reporting: Conduct stan dardized, regular monitoring and transparent reporting to assess trends and policy effectiveness. Build local capacity for GIS and remote sensing analysis.
- Context-specific measures: Interpret land cover change trends considering socio-economic, cultural, and geographic contexts to ensure adaptive, locally relevant policy responses.

Box 8: Policy recommendations by governance level

National level

- Set strategic land-use objectives and lim its on urban expansion in coastal and protected zones.
- Integrate land cover indicators into national planning and monitoring frameworks.
- Ensure compliance with international and regional commitments, such as the Barcelona Convention, ICZM Protocol, EU directives and global conventions.

Sub-national

- Guide development, infrastructure, and zoning to minimize habitat loss and fragmentation.
- Protect ecological corridors and areas of high landscape diversity.
- Target climate adaptation measures in low-lying and flood-prone coastal zones.

Local / Municipal level

- Implement setback zones and land-use restrictions in vulnerable coastal strips.
- Promote brownfield redevelopment over greenfield expansion.
- Apply nature-based solutions, green infrastructure, and ecosystem-based adaptation in urban design.
- Use land cover monitoring data to support permitting decisions and identify areas for local restoration projects.

By integrating land cover change monitoring into policy and planning, authorities can make evidence-based decisions that preserve habitats, wetlands, and semi-natural areas, ensure sustainable urban and infrastructure development, and increase the resilience of coastal zones to climate change. Monitoring also supports transparency and stakeholder engagement, helping communities understand environmental trends and the impacts of coastal development.

Photo: Marko Prem

5. Conclusions

Land cover change is a key indicator for sustainable coastal management in the Mediterranean. Monitoring urban expansion, natural habitat loss, and land-use transformations provides crucial insights for decision-making. By integrating land cover monitoring into spatial planning and policy frameworks, authorities can balance development with ecosystem preservation, enhance resilience to climate change, and achieve the objectives outlined by UNEP/MAP and other global objectives and legal requirements.

The standardized methodology for calculating this indicator elaborated by PAP/RAC and UNEP/MAPprovides a clear, evidence-based foundation for targeted measures and interventions by policy makers.

Effective monitoring of land cover change is essential for preserving coastal ecosystems and ensuring climate resilience. Implementing strong policies based on indicator analysis will help maintain the ecological and socio-economic balance of Mediterranean coastal zones, supporting sustainable development for present and future generations.

6. Example from the Adriatic region

For the 2023 Mediterranean Quality Status Report (QSR), land cover change monitoring was applied to the Adriatic region as a pilot case. Several maps and graphs were produced to illustrate land cover change in the sub-region. These include:

- a map showing areas of significant land cover change between 2012 and 2018, highlighting regions with increased built-up areas;
- a graph illustrating the increase in built-up areas (land take) from 2012 to 2018 across different coastal strips (0–300 m, 300 m–1 km, 1–10 km);
- a map and graph presenting the distribution of land cover classes within the Low Elevation Coastal Zone (LECZ) of the Adriatic region.

Further details and specific figures, drawn from the 2023 Mediterranean Quality Status Report (QSR), adopted at COP23 (5–8 December 2023, Portorož, Slovenia), are presented below.

The 2023 QSR provides comprehensive assessments and visual representations of land cover change in the Adriatic sub-region. It serves as an example of how this indicator could be assessed for the entire Mediterranean coastal region once updated data become available for the next QSR cycle.

The land cover change for the Adriatic sub-region was assessed using open-source data from the Copernicus Land Monitoring – Coastal Zones service, OpenStreetMap, the World Database on Protected Areas, and the Forest and Buildings Removed Copernicus DEM (FABDEM) global elevation map for 2012 and 2018.

Coastal urbanization, or land take, is largely an irreversible process. Land cover change assessment therefore provides an inventory of urbanization pressures on coastal ecosystems and highlights changes between different land cover classes. By focusing specifically on theLECZ, defined as areas below 5 m above sea level, the indicator delivers key findings relevant to climate change adaptation and coastal planning.

Key messages for Land cover change in the Adriatic sub-region

The assessment of land cover change in the Adriatic sub-region (coastal zone, defined as 10 km width) indicates the following trends:

1. Built-up area expansion

- In 2018, built-up areas occupied 8.77% (≈2,500 km²) of the Adriatic coastal zone.
- Between 2012 and 2018, built-up area increased by 27 km², representing a land take of 1% over six years.
- The main land cover transitions contributing to this increase were:
  - forest and semi-natural land ⟶ built-up (24 km²)
  - water bodies ⟶ built-up (3 km²)
  - agricultural land ⟶ built-up (2 km²)
  - some conversion to wetlands also occurred (2 km²). (Figure 1)

2. Changes within coastal strips

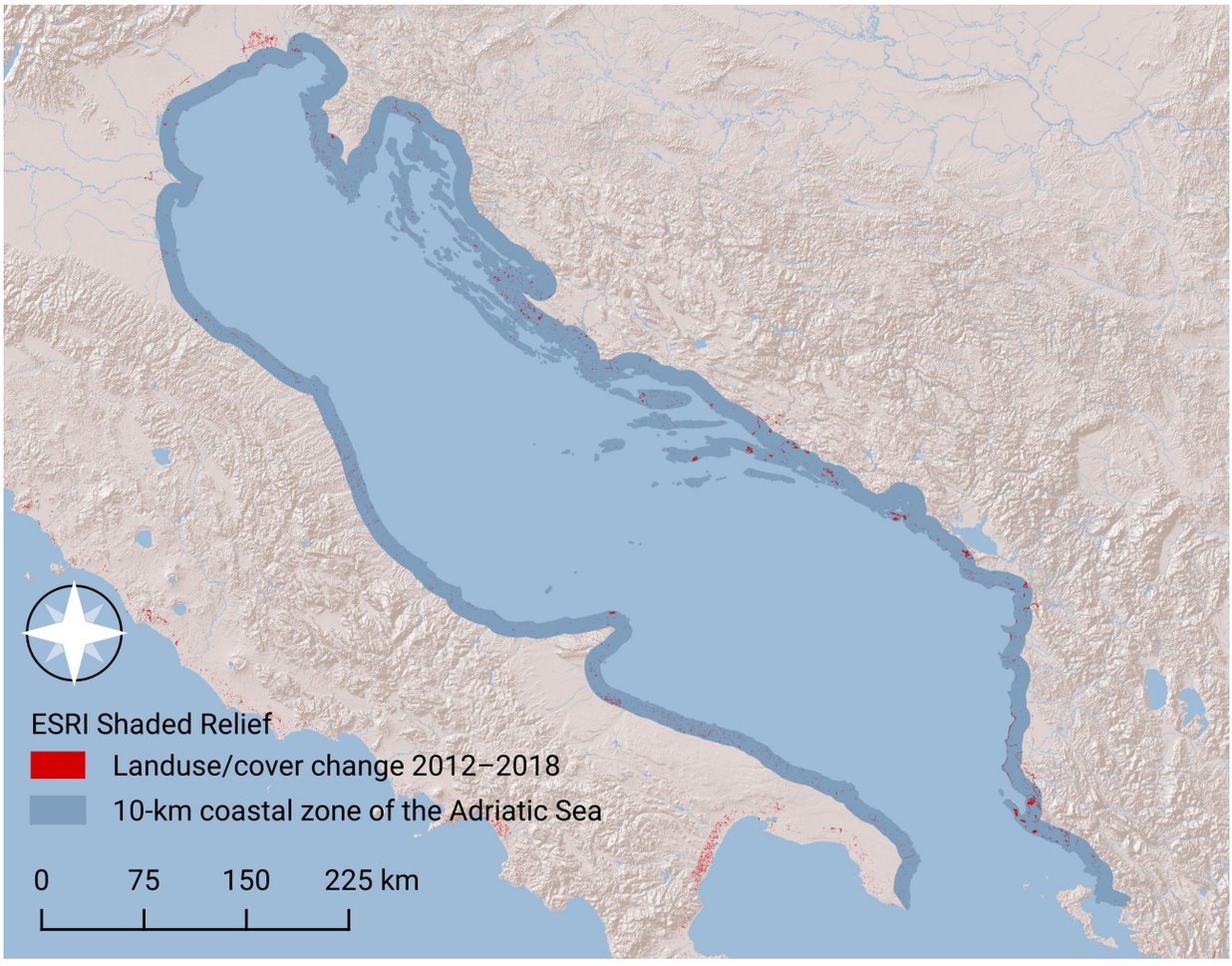
- The narrowest coastal strip (0–300 m from the shoreline) has the highest share of built-up area at 18%, more than double the share of the overall 10 km coastal zone.
- Between 2012 and 2018, built-up area in this strip increased by 4.4 km², while the 300 m –1 km strip saw an increase of 3.5 km².
- These increases occurred mainly at the expense of forests, semi-natural land, water bodies, and wetlands. (Figure 2)

3. Protected areas

- Protected areas expanded from covering 20% of the coastal zone in 2012 to 37% in 2018, reflecting enhanced conservation coverage.
- No Adriatic countries experienced a decrease in built-up area during the reporting period.

4. Low Elevation Coastal Zone (LECZ)

- The LECZ (≤5 m above sea level) covers 17% (≈4,955 km²) of the 10 km-wide coastal zone.
- Within the LECZ, built-up areas account for 10% (≈484 km²), highlighting concentrated urban pressures in areas most vulnerable to climate change impacts.



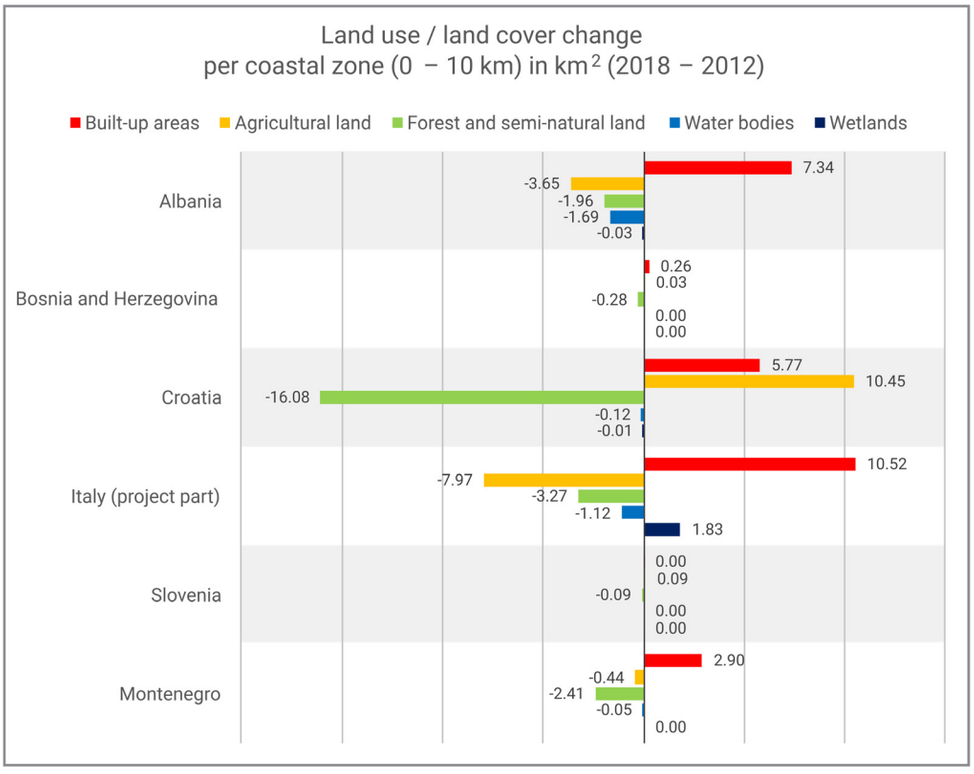


Figure 1: Adriatic sub-region Land cover change 2012 to 2018 for coastal zone (0 – 10 km)

Figure 2: Land cover change in km2 from year 2012 to 2018 on country level for coastal zone (0 –10 km)

Key land cover changeassessment findings

The assessment of the land cover change for the Adriatic sub-region indicates a clear increasing trend of coastal urbanization. Between 2012 and 2018, built-up areas increased by 27 km², accounting for most of the total land cover change (29 km²), primarily at the expense of natural areas.

At the same time, areas under protection have expanded, demonstrating good practice in preserving and improving good environmental status. However, a slight increase in built-up areas was observed within protected areas, highlighting ongoing pressures on sensitive zones.

The land cover change indicator parameters effectively identify linear coastal development, which is particularly pronounced in Croatia. These assessments provide valuable guidance for countries in designing measures and actions to maintain or achieve a good environmental status.

Spatial dynamics of land take

- Albania and Croatia: The narrowest coastal strip (0–300 m) experienced the largest absolute land-take, despite being the smallest strip by area. This indicates that urbaN sprawl is concentrated closest to the coastline, emphasizing the need to better enforce Article 8 of the ICZM Protocol on setback zones.

- Albania, Italy, and Montenegro: The 1–10 km coastal strips experienced the largest land-take, indicating that most urban expansion in these countries occurred farther from the immediate shoreline rather than in the narrow coastal strip.

Figure 3 illustrates land-take (km² of built-up area increase) from 2012 to 2018 per coastal strip at the country level, highlighting these spatial dynamics.

The LECZ reporting unit, representing areas most at risk from flooding, shows that substantial portions of the coastal zone are low-lying (Figure 4), and built-up areas in these zones continue to increase. This highlights the growing issue of coastal artificialization, which reduces the resilience of coastal areas to climate change impacts. A more detailed analysis at the municipal and city level could support targeted interventions and inform updated urban planning requirements, such as prohibiting new land-take within the LECZ.

The assessment also shows that, between 2012 and 2018, land cover change within the LECZ led to an increase in built-up areas across all countries in the Adriatic sub-region, with a total increase of 6 km², corresponding to 1% of the built-up area in 2012. Figure 5 illustrates land-take by country and coastal strip.

Spatial trends differ among countries

- Albania: The largest increase in built-up areas within the LECZ occurred primarily in the 1–10 km coastal strip.
- Croatia: Most land-take within the LECZ was concentrated in the narrowest coastal strip (0–300 m), indicating high urbanization pressure near the shoreline.

Measures and actions to achieve good environmental status for land cover in Adriatic sub-region

The geographic, socio-economic, cultural, and environmental diversity of coastal zones requires the application of targeted measures and actions to achieve GES.

Main targets under ecological objective for coastal ecosystems and landscapes may include:

- Avoid further construction within setback zones and flood-prone low-lying coastal areas.
- Prioritize the low-lying coastal zone when developing climate change adaptation plans.
- Maintain a diverse and balanced coastal land cover structure and reverse the dominance of urban land cover.
- Preserve and enhance landscape diversity.

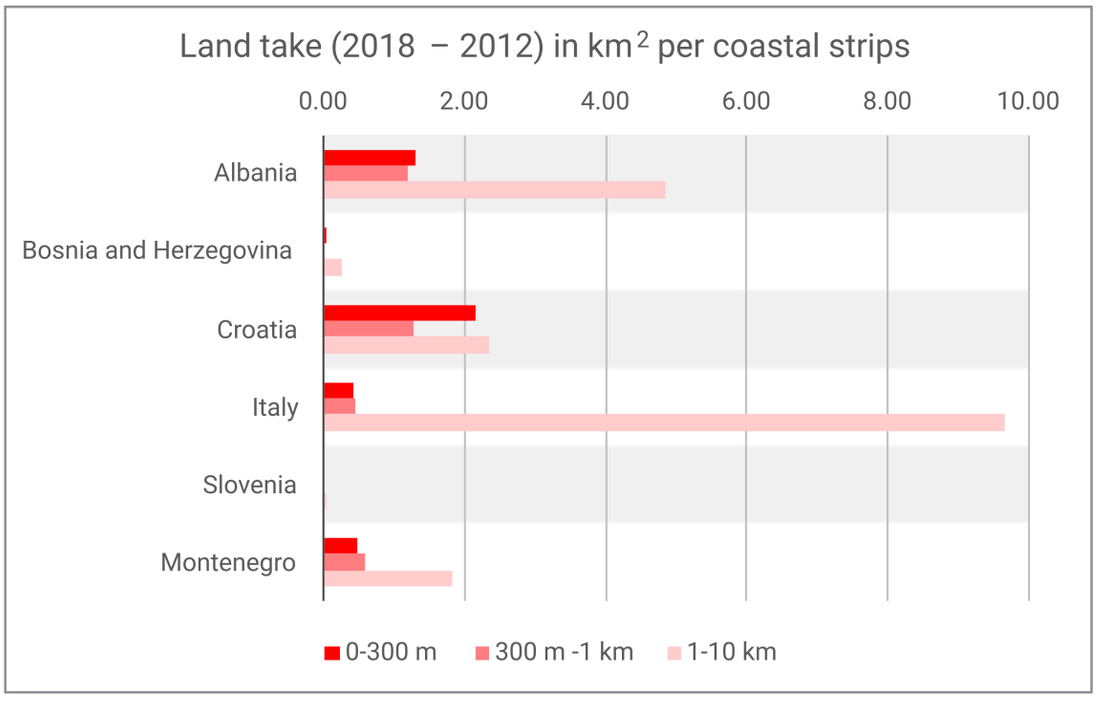


Figure 3: Land take (increase of built-up areas) from year 2012 to 2018 per coastal strip

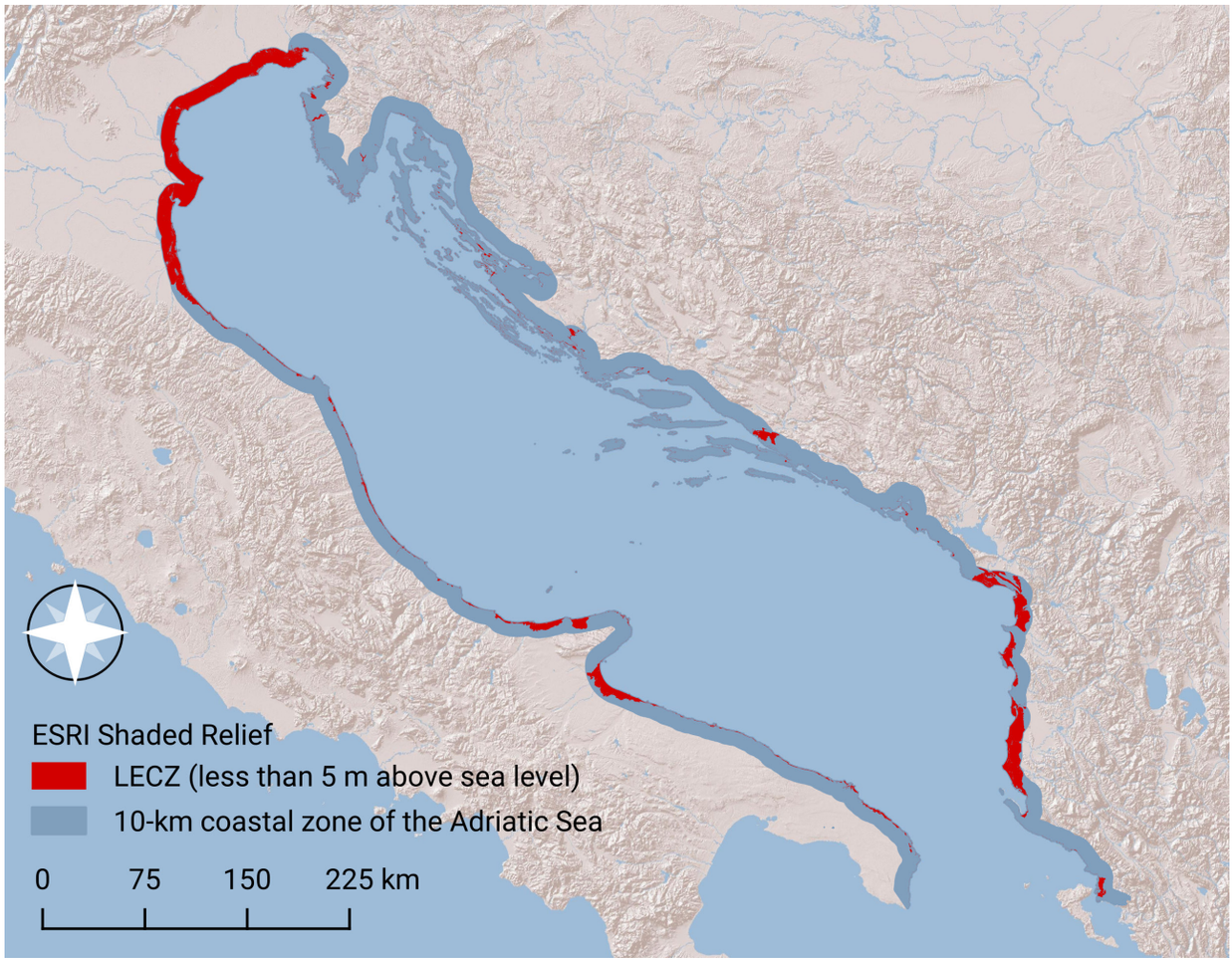


Figure 4: LECZ of the Adriatic sub-region

These general recommendations should be further adapted to the specific characteristics of each territory.

Measures and actions can generally be grouped into three types:

- Management actions to directly advance GES.
- Knowledge-building measures, including scientific research and pilot applications of innovative solutions.
- Knowledge dissemination and stakeholder engagement to ensure effective implementation and shared responsibility in achieving GES.

Specific management actions addressing land cover change may include:

- Analyse existing built-up areas and categorize them into those that are essential, those that can be reduced, and those that can be returned to nature (e.g., abandoned industrial zones).
- Prior to planning new built-up areas, assess whether human needs can be met through improved management or functional transformation of existing built-up areas.
- In existing built-up areas, enhance monitoring of environmental impacts and implement measures to mitigate negative effects, such as pollution, habitat fragmentation, noise, light pollution, and water cycle disruption.
- For new construction, integrate nature-based solutions and provide incentives for their implementation.
- Promote efficient land use to minimize spatial and natural resource consumption (e.g., restrict land take for secondary homes).
- Protect, restore, conserve, and enhance threatened coastal ecosystems and habitats, such as dunes, wetlands, and coastal forests.

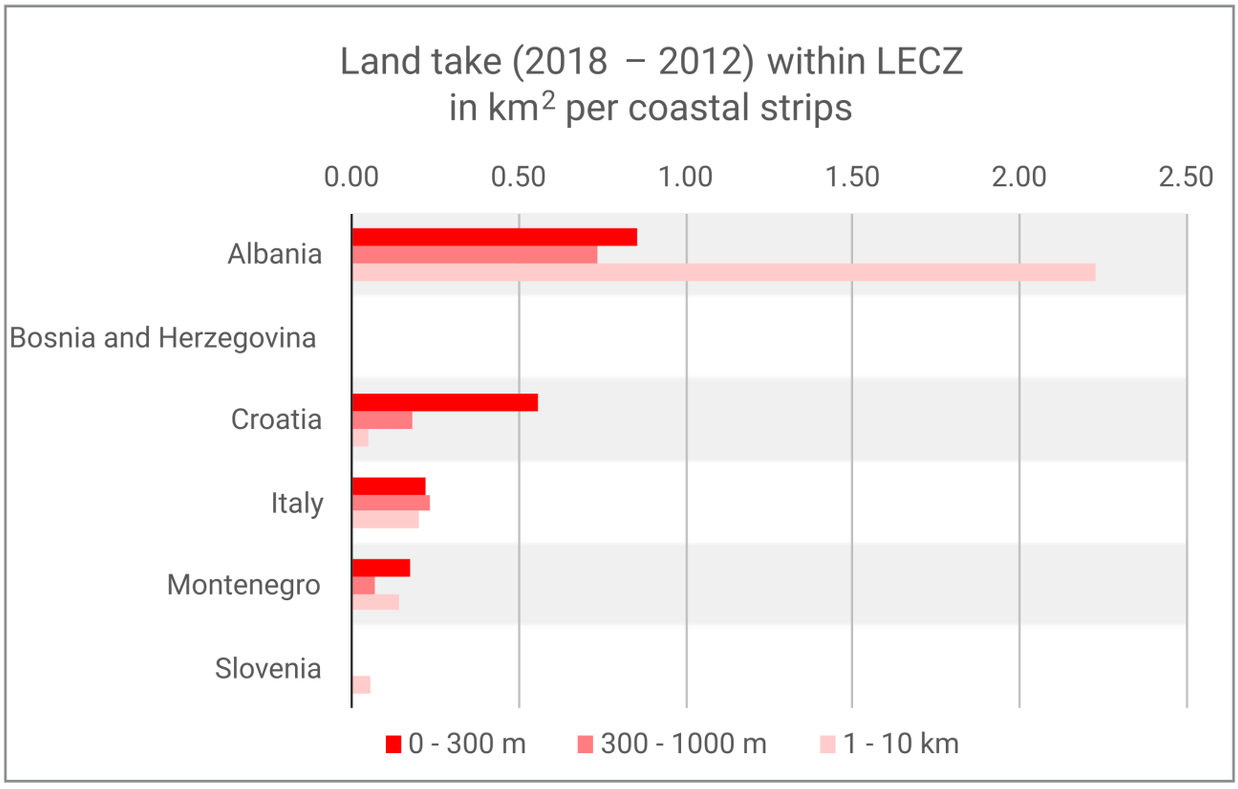


Figure 5: Land take in the LECZ per country per coastal strips in km2

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