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Agenda item 5: The Guiding Factsheet for the Candidate CI 25 "Land cover change"

A test of the application of the NEAT assessment tool for GES for the coast and hydrography EOs in the Adriatic

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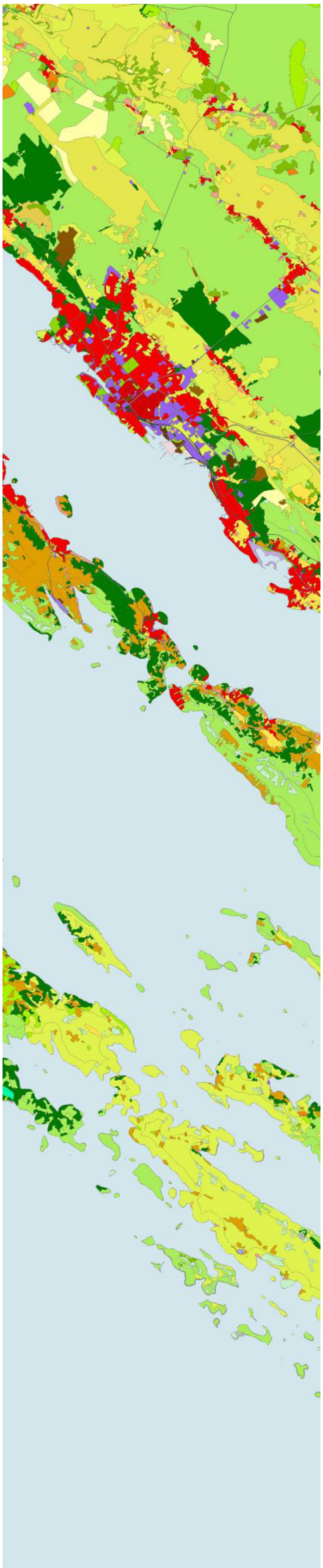

A TEST OF THE APPLICABILITY OF THE NEAT ASSESSMENT TOOL FOR GES FOR THE COAST AND HYDROGRAPHY EOS IN THE ADRIATIC

November 2022

A test of the applicability of the NEAT assessment tool for GES for the Coast and hydrography EOs in the Adriatic

Deliverable: Report on testing the NEAT tool applicability and GES assessment findings for CIs 15 & 16 (pros and cons) with recommendations for the integrated assessment as appropriate

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Place and date: **Split, November 2022**

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1. Introduction

This report elaborates the implementation of the Integrated Monitoring and Assessment Programme (IMAP) in the Adriatic Sea Sub-region in order to provide an integrated assessment of the Good Environmental Status (GES) based on IMAP Common Indicators: Ecological Objective7 and 8 Coast and Hydrography Common Indicators 15 and 16 and Candidate Common Indicator 25. As one of the activities of the project "Towards integrated ecosystem assessment and ecosystems management approach in the Adriatic", this task should contribute to the quantitative assessment of GES status as requested by adoption of the 2017 Mediterranean quality status report; that corresponds to UNEP Regional Seas integration tools/ assessment approaches.

Common Indicators 15, 16, and Candidate Common Indicator 25 are elaborated for the Adriatic Sea Sub-region of the Mediterranean. Common Indicator 15 (CI15) "Location and extent of the habitats potentially impacted by hydrographic alterations" is elaborated in chapter 2 based on data provided by Ocean Mercator, national reports of some countries on the baseline situation and other data. Difficulties in assessing this indicator lie in the lack of data as well as the complexity and even lack of scientific methods for modelling complex processes in the sea. Countries, however, do not report following the requirements of the agreed Guidance Factsheet. Common Indicator 16 (CI16) "Length of coastline subject to physical disturbance due to the influence of human-made structures" is elaborated in chapter 3 based on data provided by countries. The first sets of monitoring data are provided for the entire Adriatic coastline except for some parts of Croatia. This allows the analysis of the baseline status of CI16. Only for the Italian part of the Adriatic sub-region it is calculated for two time periods, so that first monitoring results showing trends are available. CI16 relation to other assessments data, particularly Candidate Common Indicator 25, is further discussed. Candidate Common Indicator 25 (CCCI25) "Land cover change" is elaborated in chapter 4. Based on open- source data, CCCI25 is calculated within this task for the entire Adriatic Sea sub-region. The results are discussed and detailed data is given in Annexes. GIS database, digital maps and excel sheets are provided as auxiliary files supporting this report.

Chapter 5 provides an inside into the assessment and relevance of NEAT tool application for GES for these three indicators. Chapter 6 concludes the report and drafts prospects for the improvements of GES integrated assessment based on IMAP Common Indicators.

2. Common indicator 15 “Location and extent of the habitats potentially impacted by hydrographic alterations”

Ecological Objective 7 („Alteration of hydrographic conditions“) addresses potential permanent alterations in the hydrographical regime of currents, waves and sediments due to new large-scale developments. An agreed common indicator - 'Location and extent of habitats impacted directly by hydrographic alterations' considers marine habitats which may be affected or disturbed by changes in hydrographic conditions (currents, waves, suspended sediment loads) due to such developments. At the same time, it is particularly important to point out that the indicator itself, in accordance with the current definition from the Guidance Factsheet, does not take into account other spatial factors that also have a significant impact on marine habitats. Among many other factors, one of the most prominent are certainly climate changes, which have a global character.

Related operational **objective** of the indicator refers to alterations caused by permanent constructions on the coast and watersheds, marine installations and seafloor anchored structures are minimised.

Proposed targets of the indicator are directed to process of planning new structures within which all possible mitigation measures will be taken into account in order to minimize the impact on coastal and marine ecosystem, the integrity of its services and cultural/historic assets. Where is possible, it will promote ecosystem health.

About 28% of Europe’s coastline is affected by permanent hydrographical changes, including from seawater movement, salinity and sea temperature changes, as a result of human activities such as dredging, infrastructure development, sand extraction or desalination (*Report on the Implementation of the Marine Strategy Framework Directive, 2020*).

2.1. Methodology

The CI15 reflects the location and extent of habitats potentially impacted by alterations and/or circulation changes induced by them. It concerns area/habitat and the proportion of the total area/habitat where alterations of hydrographical conditions are expected to occur (estimations by modelling or semi-quantitative estimation).

The methodology proposed for indicator measurement encompasses:

i. Mapping of areas where human activities may cause permanent alterations of hydrographical conditions (using i.e. existing EIA, SEA and Maritime Spatial Planning -MSP);
ii. Mapping of habitats of interest in these areas; and
iii. Intersection of spatial maps of the areas of hydrographical changes with spatial maps of habitats to determine areas of individual habitat types that are impacted by hydrographical changes (Figure 2.1).

The following hydrographical conditions should be considered according to the Guidance Factsheet:

- At least, **changes in waves and currents** (can be used to assess changes in bottom shear stress, turbulence and alike).
- For sandy sites or sites with natural sediment dynamic, changes in **sediment transport processes** and **turbidity**, and induced changes in **morphology of the coast**.
- If the new structure involves water discharge, water extraction or changes in fresh water movements: assessment of **salinity** and/or **temperature changes**.

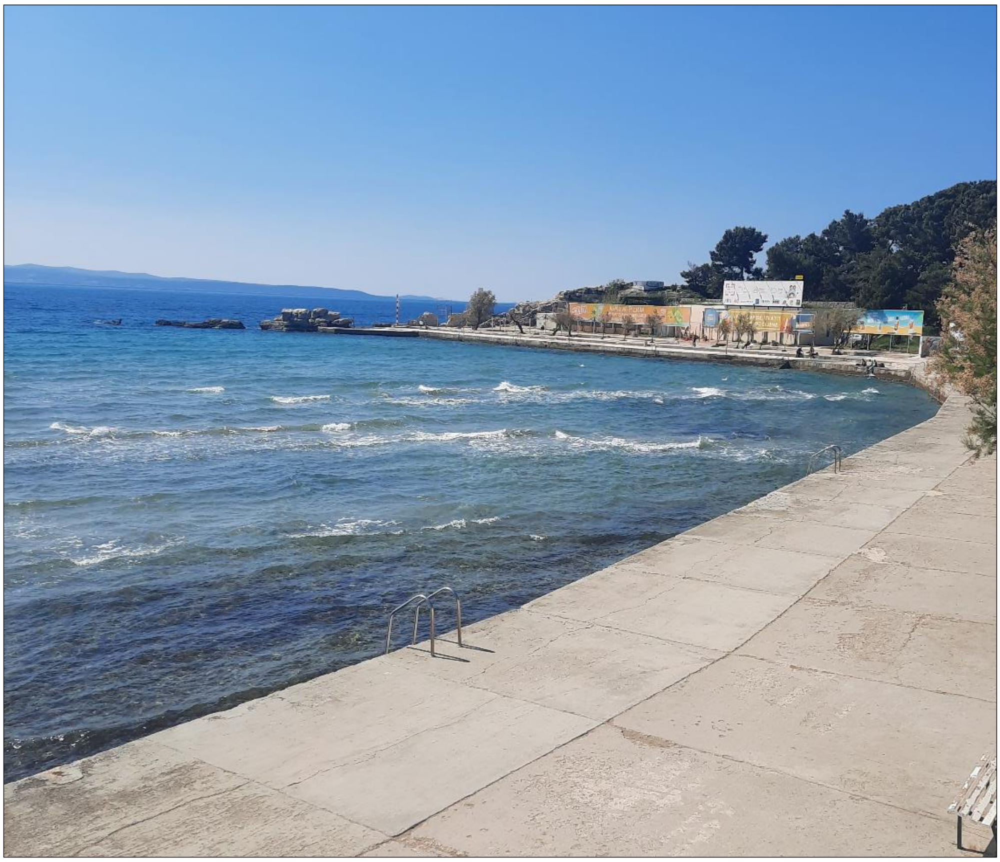


Figure 2.1: Hydrographic alterations - wave changes (Bačvice beach, Croatia)
Source: Antonio Morić-Španić

Due to the difficulties with the implementation of monitoring of CI15 according to the adopted Guidance Factsheet a number of Contracting Parties at several meetings requested to prepare a more simplified methodology. This was also in line with the decision on MSFD (Decision 2017/048/UE, May 2017). As a result, an alternative, i.e., a more simplified approach proposes to assess first the hydrographical alterations as a result of physical loss (permanent changes of the seabed in terms of bathymetry, morphology or nature substrate) induced by the structure itself or by human activities in its surroundings.

Such an approach aims to focus on:

1. The hold of the **structure (location and extend** on the sea floor). In this area, the presence of the structure will definitively alter the existing habitats (**physical loss**) (Figure 2.2).

2. **Permanent changes to the seabed** related to both the structure itself and human activities. For instance, the creation of a port often requires digging of basins and dumping of materials at sea. These diggings, discharges, leading to permanent bathymetric, eventually substrate changes, modifying waves, **and currents propagation**, will also definitively alter the existing habitats.

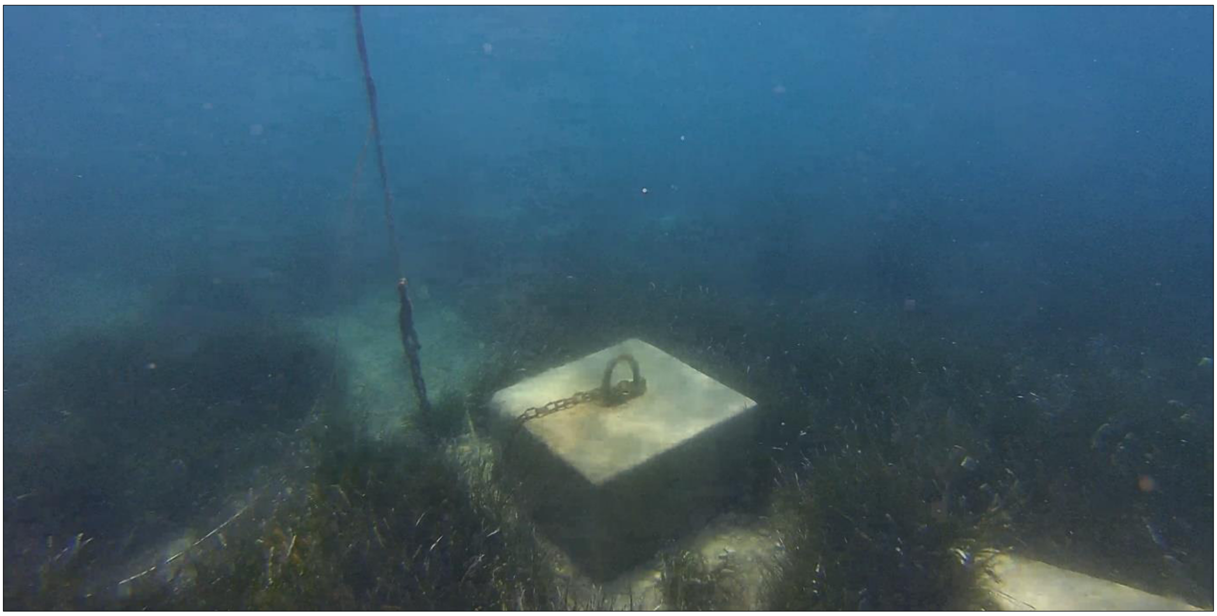


Figure 2.2: Concrete anchoring block surrounded by Posidonia oceanica – Hvar (Croatia)
Source: Antonio Morić-Španić

3. Effects of the structure on hydrographical conditions in its surroundings. The existence of the structure will **modify the regime of currents** and agitation and also the coastal transit with creation of erosion and deposition zones. For instance, in a harbour, the presence of dikes attenuates the currents and the swell inside the basins and leads to decantation of suspended material (vases, organic matter, debris plants) inducing changes in benthic settlements.

2.2. Reports on the baseline situation – country overview

This chapter will analyse the results of five Adriatic countries - Albania, Bosnia and Herzegovina, Croatia, Montenegro, and Slovenia. These countries provided brief reports based on the questionnaire prepared in the framework of the EcAp MED III project and in close cooperation with the IMAP MPA project, in order to provide general information on the baseline situation. Data for Italy are not available.

It should be noted, as said earlier, that none of the countries have reported monitoring results according to the requirements of the Guidance Factsheet. Therefore, other sources, including the ones referred above, as well as data provided by the scientific partner Mercator Ocean and other sources have been utilised.

The answers from the questionnaire are divided into four components and sub-questions:

2.2.1. General characterization of the coastal area and marine environment

Albania

Data for Albania are not available.

Bosnia and Herzegovina

In Bosnia and Herzegovina there are mainly rocky, cobble/gravel and artificial coasts, but the data on the proportion of the different types of coasts are not available at the moment.

According to the data provided there are no areas of erosion and/or accretion in Bosnia and Herzegovina. Data and/or studies on the coast, its length, spatial position and its evolution/change are not available for this country.

Croatia

In Croatia rocky coasts prevail (approximate 90% or a bit less). Other types of coastlines are only sporadically represented:

- gravel beach (approx. <5%)
- mixed sand and gravel (approx. <3%)
- rocky shore with gravel beach (approx. <3%)
- rocky shore with sand beach (approx. <3%)

Share of artificial coastline in the total length of the coast of Croatia is approximately 10%.

Some of natural and artificial beaches are under erosion, together with the Neretva river mouth (Neretva Delta). There is a detailed ongoing study of types and length of coastal types in Croatia with their spatial position. Several studies of coastal changes exist as well (Duilovo cliff, Sakarun beach, Ploče beach, Vrgada island, Lojišće beach). Maps of marine habitats are still largely unavailable; there is an ongoing project of marine habitat (*Posidonia oceanica*) mapping in Croatia.

Slovenia

The predominant type of seabed in Slovenia is silt-covered seabed, which covers 77% of the coastal zone. This is followed by a combination of silt and grass covering 13% of the wider sea zone. Follow stone bottom covering about 6%; the least represented are the types of sand with 2% and the areas of individual rocks and rocks, which also represent 2% of the seabed (Kolega, 2009).

Slovenian coast is situated in the Eastern part of the Gulf of Trieste (Northern part of the Adriatic Sea), and is wide open toward West. The Slovenian Sea is mainly influenced by meteorological events and river fresh water inputs, which result in a short-term spatial stratification change (temperature and salinity) and on impact circulation as well. The circulation is influenced mainly by tide (range of ± 1 m) and wind, in particular the easterly wind (Bora) (Malačič et al., 2014). The marine environment is particularly rich in biota and great variety of habitats (Lipej et al. 2006).

Most of the Slovenian coast represents the abrasive type of coast with steep and crumbling cliffs of marl and sandstone in different phases of development, and with 3 different erosion driving forces prevailing. Majority of cliffs are in mature form having shingle beaches at toe. The main erosion factor there is weathering with occasional landslides and toppling, wave erosion being limited only to occasional extreme storm events. Minority of almost vertical cliffs is under constant erosion action of waves, rock falls and toppling being main failure modes there. The accumulative type of coast is formed by large quantities of fine sediments, deposited by rivers: mainly by Soča and to a smaller extent by Rižana, Badaševica and Dragonja. The sediment deposition resulted in coastal plains facing a shallow sea with muddy gently shelving sea bottom (Šantl et al., 2019).

Data and/or studies on the coast, its length, spatial position and its evolution/change available for Slovenia:

- ✓ Single and Multi-Beam sonar (SBES and MBES) datasets
- ✓ Sub-Bottom sonar profiler (SBP) datasets
- ✓ Light Detection and Ranging (LIDAR) datasets
- ✓ aerial photography

The entire Slovenian sea was surveyed with a MBES; the data was used mainly to update the national navigation charts. These extensive surveys were conducted in the period 2016-2018. The meta data for MBES and coastline are available in the EMODnet Bathymetry data base. Recent changes in the coastal side are ongoing mainly in the Koper Bay due to the port area extension and new marina and beach building.

MBES and LIDAR data used for morphological analysis of the Slovenian coast are studied by Kolega and Poklar (2012). The study of coastal changes on the Slovenian coast between 1954 and 2010 was based on an aerial photography analysis (Kolega, 2015) and short-term changes in the area of cliffs of Fiesa and Pacug with LIDAR data analysis (Kolega and Prelc, 2016).

An overview of the habitats in Slovenian Sea is included in the publication Endangered species and habitat types in the Slovenian Sea by Lipej et al. 2006. Recent mapping with MBES, field methods, aerial photography (drone) were conducted and studied by various researchers (Lipej et al., 2018; Poklar and Brečko Grubar, 2018).

2.2.2. Anthropogenic Activities Present in marine environment

Albania

Human activities undertaken in Albanian waters with the potential to permanently change hydrographic conditions mainly near the coast include several port structures, which are protective of the coastline in the area of Shëngjin, Durrës and Vlora, as well as the presence of some breakwater.

Approximately 60% of the Albanian population is living in the coastal areas. While beach tourism and other coastal activities have seen significant developments in recent years, areas such marine tourism, boating, yachting industry, diving, recreational fisheries, and other water sports still have potential to grow. Construction of large marinas, in general, but very much dependent on the local geomorphological characteristics, might have significant impacts on the coastal local circulation and waves, and therefore on erosion, sediment transport and sedimentation rates. A local circulation change may also influence the spreading from the local river runoffs, and their influence on temperature and salinity of the coastal waters. A senseful planning and construction must consider the local coastal conditions, in order to minimise permanent changes, which in turn, would create as small as possible hydrographical and ecological impact on the local environment. A careful evaluation of development alternatives using Environmental Impacts Assessment and cost-benefit analysis of marina development would reduce the risk of building overcapacity (World Bank, 2020).

A large problem is the lack of an adequate, integrated waste management system in the inland areas as well. An environmental impact studies involving measurements of thermohaline conditions, currents and hydrodynamic modelling should be performed for all new planned wastewater discharges.

Bosnia and Herzegovina

The main human activity present in coastal and marine environment of Bosnia and Herzegovina is tourism. According to the data provided, there is no any new installation of structures nor dredging and dumping activities in the marine/coastal environment. In Bosnia and Herzegovina there is no data on anthropogenic activities that are subject to authorization requests, impact studies, environmental monitoring, etc.

Croatia

The main human activities present in coastal and marine environment of Croatia are activities related to tourism and marinas, marine ports and aquaculture facilities and rare industrial facilities. The main impact is due to tourism and related activities (traffic, urbanization and artificialization of the coast). There is an increasing number of artificial beaches, groins and other associated protective structures built along the coast. A large number of new marinas emerged and some marinas have been enlarged.

There is also presence of dumping activities in the marine environment, mostly illegal dumping of constructional waste, sometimes dumped on beaches. Inadequate quarried material is placed along the coast when artificial beaches are being constructed. Dredging is rare, mostly along the sandy beaches. Dredging is used for beach replenishment. There is occasional port dredging in the Ploče town due to the Neretva River sediment input.

Large scale anthropogenic activities have to be approved in terms of an official environmental impact assessment. Documents are usually accessible, but not gathered at one place.

Montenegro

Human activities undertaken in Montenegrin waters with the potential to permanently change hydrographic conditions mainly near the coast include construction or expansion of ports, marinas, and construction of wastewater treatment plants and sewers. At the present, the situation in the coastal area is quite burdened by unplanned construction, marinas and sewers outflow. For the example, in the Boka Kotorska Bay some parts of its coastal areas are of reduced circulations and hydro-morphological quality which has led to deterioration in ecological quality. Cumulative impacts of these modified areas largely represent locations where substantial coastal infrastructure activity has taken place, resulting in major modifications of the coastline and/or adjacent marine waters. In the open water, there are currently no planned activities that could lead to permanent hydrographical alterations.

Due to the significant impact of urbanization through unplanned construction, increasing the capacity of sewage and increasing the number of berths in marinas (construction or extension), special care should be taken to achieve or maintain good environmental status. The current situation is already worrying. The main discharges must be positioned in a such way that the stratification (summer thermocline position) prevents the upwelling of pollution to the surface. An environmental impact study involving measurements thermohaline conditions, currents and hydrodynamic modelling should be performed for all newly planned waste water discharges. After construction, monitoring should be carried out for each wastewater discharge. Out of 6 municipal centers in the coastal area, only four regional centers have wastewater treatment plants: for the municipality of Herceg Novi in Meljine in the Bay of Kotor, for Kotor and Tivat on a joint device in Đuraševići, with the discharge of treated water in the bay of Trašte into the open sea, and for Budva with the surrounding settlements PPOV "Vještica" in the hinterland of Bečići and Rafailovića, which discharges purified water into the open sea through the existing waste water treatment plant on Zavala into Budva Bay (Figure 2.3a and 2.3b). Ulcinj and Bar do not yet have treatment plants, so wastewater is discharged into the open sea only with primary treatment, with long sewage outlets.

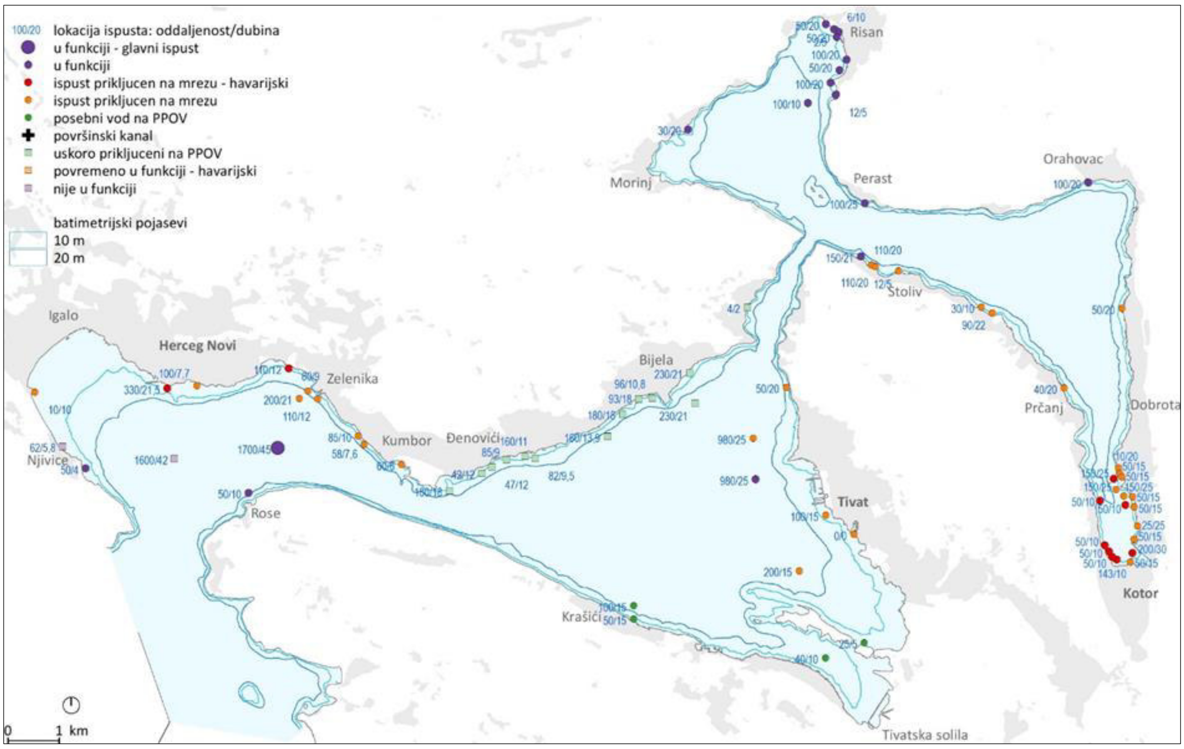


Figure 2.3a: Map of discharge locations in Boka Kotorska Bay
Source: Grbec, B., 2021: Assessment of Good Environmental Status of marine areas of Montenegro regarding Hydrography, in the frame of the GEF Adriatic Project

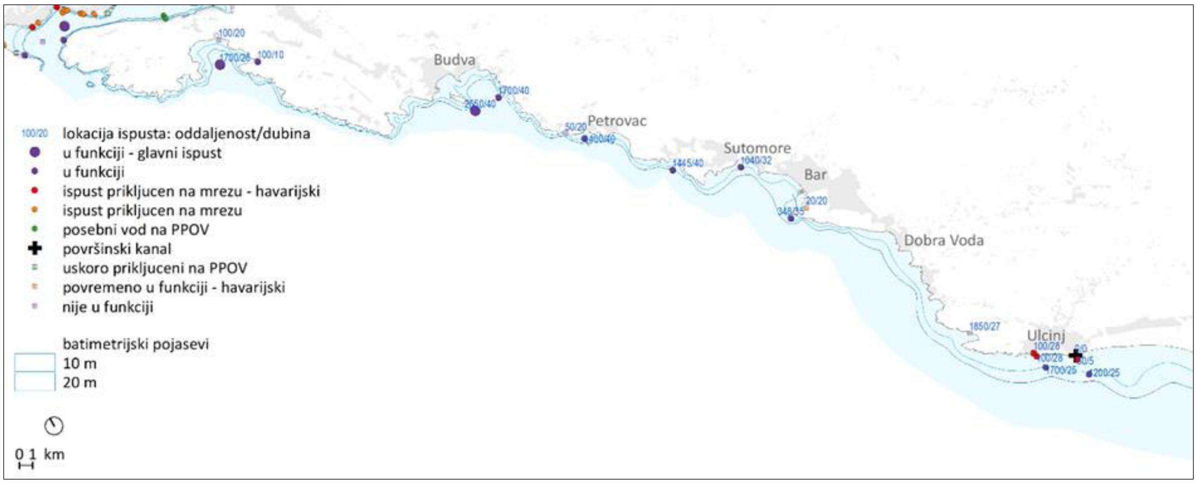


Figure 2.3b: Map of discharge locations in Montenegrin coast
Source: Grbec, B., 2021: Assessment of Good Environmental Status of marine areas of Montenegro regarding Hydrography, in the frame of the GEF Adriatic Project

<u>*Slovenia*</u>

The Slovenian coast is highly impacted by anthropogenic activities. The most industrialized part of the coast is the Koper Bay area, with a vast port area and marinas. In the inland there are extended industrial facilities and land use (agriculture and other activities). The main human activities are maritime traffic (due to the Port of Koper activities) and tourism. Those include touristic marinas and higher maritime traffic during the touristic period.

New installation project is ongoing in the Bay of Koper. The larger project is the extension of the Port of Koper, which results in new facilities on the northern part of the port area towards Ankaran and the prolongation of the two piers toward east (Figure 2.4). The project includes dredging and pillar installation.

Figure 2.4: Port of Koper (DOF) with visible prolongation activities in the first pier and planed new pier in the northern part of the port
Source: GURS, 2020

After more than a decade of planning, the Koper municipality has started a project of a touristic marina in the Semedela bay (Figure 2.5). The construction started along the southern part of the coast (between Semendela and Žusterna).

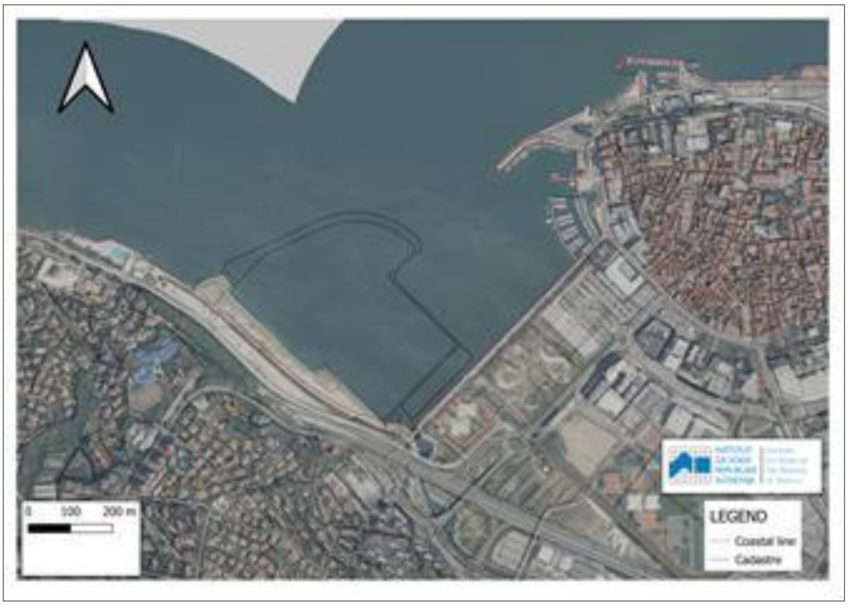


Figure 2.5: The touristic marina project in the Semedela Bay
Source: GURS, 2020

The main dragged areas are in the Koper port zone, mainly in the internal basins and in the port canals. Probably, some dragging or dumping is ongoing within the construction of the prolongation of the first port pier zone. In the past, limited dredging was executed in the Koper Bay marinas and coastal parts due to maintenance.

Obligations for elaboration of environment impact studies have taken place in recent past, e.g., first Slovenian Law on protection of Environment from 1993.

These documents (permits, impact studies, environmental monitoring) are not freely accessible, but decisions, rules, obligations are part of national and municipal spatial plans. E.g., spatial plans on the territory of municipality of Koper Town can be seen at https://geoportal.3-port.si/mok/ with linkage to the corresponding national or municipal decrees. About actual Maritime Spatial Planning in Slovenia a comprehensive information is available in https://www.msp-platform.eu/sites/default/files/download/slovenia.pdf.

2.2.3. Hydrodynamic conditions

Albania

Data for Albania are not available.

Bosnia and Herzegovina

According to the answers from the questionnaire, there are no available cartographic data on bathymetry for Bosnia and Herzegovina.

The data on temperature of the sea is available for 4 stations in Neum and are available over link: http://wqdss.jadran.ba/wqdss/index.aspx. Data of salinity on station "More Neum" has been recorded, but still not posted on the website of Adriatic sea watershed agency. In situ measurements are available for temperature with frequency from 4- 12 times per year and from this year data on salinity will be available as well. Data can be check over link: http://wqdss.jadran.ba/wqdss/ShowStation.aspx StationId=102.

Croatia

Hydrographic Institute of the Republic of Croatia produces various bathymetric maps, but these are commercial (not freely available).

There is National monitoring programme in the frame of MSFD but it is not stated whether there is a possibility of free access to the same. HF radars for surface currents measurement were active until 2019 in the middle Adriatic (area bee-twin island of Vis and island of Brač). Currently, five buoys are planned by DHMZ (Croatian Hydro-meteorological Service), and they should be active in 2022.

Montenegro

In the Montenegrin waters there is no systematic long-term thermohaline measurement. In October 2019 a three-day measurement of temperature, salinity and transparency (and also chemical and biological parameters) was performed during the field survey (cruise) in order to gain insight into the hydrographic characteristic of the area. The measurement was conducted at a total of 17 stations distributed along five transects from the Boka-Kotorska Bay to the mouth of the river Bojana. The depth at the measuring stations varied from the shallowest station P11 with a depth of 15 m in the mouth of the river Bojana to the deepest station P3 with a depth of 217 m. Changes in salinity along the eastern Adriatic coast have recently shown a positive trend in the entire water column (http://baltazar.izor.hr/azo/azoindex).

Slovenia

In order to update the national navigation charts, an extensive MBES survey campaign was conducted in the period from 2016 to 2018 . The survey was divided in three years and there were three survey zones (https://www.emodnet-bathymetry.eu/search). The equipment of the survey was an Reson SeaBat8125 and R2Sonic 2022 each mounted on a small survey vessel equipped with various Javad GPS sistem (models Delta, Triumph-1 in TRG3T) – real time kinetic RTK GNSS (±2 cm). The data grid (cell size 0.5 m) covers the entire Slovenian Sea. The bathymetry datasets are not publicly available, while nautical charts are available upon agreement at National Maritime authorities (URSP) and Geodetic authorities (GURS).

Hydrodynamic condition was studied at the National Institute of Biology – Marine Biology Station of Piran (NIB - MBS) and Slovenian Environmental Agency (ARSO). The collection of data is available on the internet site and in published studies (available on the agencies internet sites). ARSO and NIB – MBS are cooperating with EMODnet, part of the datasets is available in the EMODnet data base, as well.

All mentioned measurements sites are measuring temperature (T) and conductivity - salinity (S). The three buoys (Vida –OB Piran, Zarja and Zora) are also measuring the wave characteristics and currents along the water column (with different ADCP orientation). The location of the continuous (buoys and mareographic stations) and periodic in-situ measurements is available at WFS service of ARSO. However, there are more known measurement site in the entire Slovenian Sea (NIB – MBS), which are measured on a monthly basis and spatially processed.

A constant measurement of T, S, turbidity, O2, pH and surface current measurement is in the Port of Koper (website).

With an HF Radar system NIB – MBS, ARSO and Italian partners OGS provides a near real time surface current in the Gulf of Trieste. HF radar represents a new tool for waves and surficial currents assessment as well as a potential resource for monitoring the impact of wave energy on the marine environment (NIB – MBS, web site).

Websites:

SAE: http://www.arso.gov.si/en/water/data/ and http://www.arso.gov.si/vode/morje/

NIB – MBS: https://www.nib.si/mbp/en/oceanographic-data-and-measurements

Port of Koper buoy: https://www.zivetispristaniscem.si/opremljeni-s-sodobno-opremo-za-kakovostno-ciscenje-morja/

NIB – MBS HF Radar: https://www.nib.si/mbp/en/oceanographic-data-and-measurements/other-oceanographic-data/hf-radar-2

Data and analysis of afore mentioned parameters are available in the EMODnet data bases and at the providers (ARSO and NIB – MBS) of the service websites. The frequency of the buoys measurements is on hour period, and in-situ periodical measurements spatial distribution.

2.2.4. Planning of new installations in coastal or marine environment

Albania

There are several institutional structures dealing with environment and in particular with marine and coastal waters: the Ministry of Tourism and Environment, the National Agency of Protected Areas, the National Environmental Agency (the main institution responsible for monitoring and reporting on the environment), the National Coastal Agency, the National Territorial Planning Agency, the National Water Council. The efficient management of the coastal and marine environments is an outcome of improving and organizing a high-level coordination among them.

Several activities (aquaculture, transport, tourism, fishery, etc) ongoing simultaneously in the same area need spatial planing in the frame of a National maritime spatial planning. For example, the Vlora bay is an area where plans are to further develop aquaculture, maritime transport, coastal infrastructure, coastal and marine tourism, recreational and leisure craft, and fishery co-exist. At present, however, there is no shared overall vision for the harmonization of all these activities.

Bosnia and Herzegovina

In Bosnia and Herzegovina, Federal Ministry of Physical Planning is responsible for authorizing construction in coastal/marine environment such as:

- seaport of special (international) economic interest for the Federation, according to a special regulation,
- nautical tourism port and sports port,
- water structure for navigation (waterway with associated facilities and water structures), except for floating facilities connected to the shore in the function of service activities.
- regulatory and protective water structure

According to the information that are available now, new structures are not planned in the near future.

Croatia

In Croatia, Ministry of Economy and Sustainable Development is responsible for authorizing construction in coastal/marine environment.

It is expected that coastal and marine structure will be built within the next 5-10 years and existing structures may be enlarged. Maps and lists of planned structures are not gathered in one place and not known exactly.

It is likely that environmental impact assessment will be done for various constructional projects. General hydrographic monitoring is planned. Individual projects may or may not include pre-operational hydrographic measurements/monitoring.

Montenegro

Data for Montenegro are not available.

Slovenia

In the case of the state procedure, the procedure is led by the Ministry of the Environment and Spatial Planning – alongside with the Spatial Planning, Construction and Housing Directorate, and the final act is adopted by the Government of the Republic of Slovenia. The entire process is complicate and involves numerous National authorities and different technical bodies of decision making such: spatial development, resident areas, environment protection, forestry, agriculture, traffic, energy, marine traffic, nature protection, railways, culture, defence, hazards protection etc. Moreover, coordination between various ministries is required, with additional collaboration with civil society: local authorities, parties, land owners, public participation and parties with interests or rights, etc. However, is worth a mention, the strong interests for exploit coastal resources and the holistic approach to coastal monitoring and management.

A new installation project is ongoing in the Bay of Koper (the Port of Koper and Touristic marina). In the case of the Port of Koper, there are various reports (Malačič, 2007, 2014 and 2018) available that address the potential impact on circulation and environment in the Bay of Koper. The maps (model results and in-situ measurements) are not available on the internet, but are included in the reports.

There are no available maps, data or reports in the case of the touristic marina. However, there is a high possibility of a major habitat (Association with Zostera marina) loss in this area. This habitat is particular due to largest coverage zone in a polluted area. The seagrass meadows of Z. marina in this part of the Koper Bay is threatened by different anthropogenic activities, such as sewage outfall, physical degradation (ongoing) and the planned building of the new marina (Lipej et al. 2006).

The general conclusion of chapter is reflected in several key determinants. Provided reports based on the questionnaire for five Adriatic countries (Albania, Bosnia and Herzegovina, Croatia, Montenegro, and

Slovenia) primarily indicate an incomplete and insufficient level of availability of spatial data, except for Slovenia. Due to planning of new installations in coastal or marine environment, the most pronounced construction of new installations is planned in almost all countries, except Bosnia and Herzegovina. It will mainly manifest through the expansion and upgrading of seaports (Slovenia and Croatia), and marinas in Slovenia and Albania. The highest anthropogenic pressure in all countries is manifested in the tourist burden of the sea and coastal areas. Finally, one of the most notable problems is the lack of suitable wastewater treatment plants and sewers, especially in Montenegro and Albania.

2.3. Data collecting

Data used for the monitoring are in agreement with Shared Environmental Information System (SEIS) principles, in accordance with the Integrated Monitoring and Assessment Guidance (*UNEP/MAP, 2016*).

Available marine data source at the scale of the Adriatic Sea in Indicator guidance factsheets for EO7 Coast and Hydrography Common Indicator 15 are listed as follows:

- EMODnet Central Portal (http://www.emodnet.eu/)
- Mediterranean Marine Data[1] (http://www.mediterranean-marinedata.eu/)
- Copernicus, Marine environment monitoring service (http://marine.copernicus.eu/)

In accordance with the sources stated, a detailed analysis of spatial data is made, which is explained and inventory in thematic areas (hydrographic alteration, habitats and SEA / EIA data). In conclusion, clear inventory of existing and available data for Adriatic Sea has been made.

2.3.1. Hydrographical alterations data

In accordance with the key guidelines of the *Mediterranean Quality State Report, Mercator Ocean contribution - Preliminary report (15/01/2022)* and the latest Copernicus Marine Service (CMEMS) products, an insight into the available spatial data for monitoring hydrographic alterations in the Adriatic Sea will be presented below.

Waves

Mercator Ocean can provide wave information from data computed in the frame of the Copernicus Marine Service. Data come from satellite observations and from models. Instantaneous information of significant wave height computed from model over the period 1993-2022 for the whole Adriatic Sea are available at a horizontal resolution of about 4 km (Figure 2.6).

MEDSEA_MULTIYEAR_WAV_006_012 is the multi-year wave product of the Mediterranean Sea Waves forecasting system (Med-waves). It contains a Reanalysis dataset and an Interim dataset which covers the

[1] The database from the website stated is not available, since the website is no longer active.

period after the reanalysis until 1 month before present. The Reanalysis dataset is a multi-year wave reanalysis starting from January 1993, composed by hourly wave parameters at 1/24° horizontal resolution, covering the Mediterranean Sea and extending up to 18.125W into the Atlantic Ocean. The modelling system resolves the prognostic part of the wave spectrum with 24 directional and 32 logarithmically distributed frequency bins. The wave system also includes an optimal interpolation assimilation scheme assimilating significant wave height along track satellite observations available through CMEMS and it is forced with daily averaged currents from Med-Physics and with 1-h, 0.25° horizontal-resolution ERA5 reanalysis 10m-above-sea-surface winds from ECMWF.

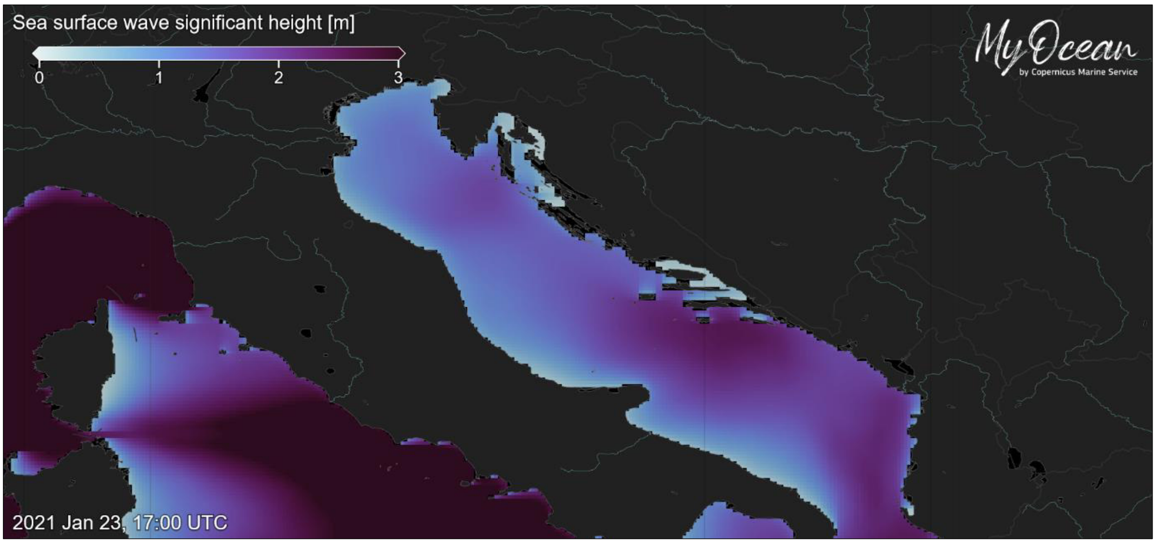


Figure 2.6: Sea surface wave significant height in Adriatic Sea (23 January 2021)
Source: https://doi.org/10.25423/cmcc/medsea_multiyear_wav_006_012

The Adriatic Sea is a semi-enclosed sea, characterized by intense cyclonic activity (especially in the winter), over which winds of different directions and intensities blow. The most common surface waves on the Adriatic are caused by bora and southerly winds in the winter, and northwesterly winds in the summer.

The characteristics of surface waves generally depend on the direction, speed and duration of prevailing winds, the size of the area over which these winds blow (airport) and the topography of the seabed (sea depth). Therefore, in the area of the Adriatic Sea, the southeast wind (jugo) causes significantly higher wave heights than the northeast wind (bora) at the same wind speed and duration.

The Croatian Hydrographic Institute measured on November 12, 2019. year at 4 p.m., a record wave on the Adriatic. This wave was recorded in the waters of the city of Dubrovnik near the island of Sv. Andrew. The maximum height of the wave was H_{max} = 10.87m with the associated significant wave height = 4.75m (sea state 6) and period = 10s. The wave came from the direction Dirp = 167.1°. For storm situations, the maximum registered wave height in the northern Adriatic is H_{max} = 7.2 m (significant wave height = 3.9 m, mean period = 5.7 s, mean wavelength = 51 m). From instrumental measurements, the return value of the highest wave in the Adriatic was estimated at 13.5 m. All these values are given for the open Adriatic, while significantly smaller waves occur in the coastal area, depending on the topographical characteristics and the openness of the water area according to the dominant wind directions (*Mala Internet škola oceanografije*, 2022).

Sea water velocity

The Med MFC physical reanalysis product is generated by a numerical system composed of an hydrodynamic model, supplied by the Nucleous for European Modelling of the Ocean (NEMO) and a variational data assimilation scheme (OceanVAR) for temperature and salinity vertical profiles and satellite Sea Level Anomaly along track data. Temporal extent of dataset range from 1 January 1987 to now (Figure 2.7). The model horizontal grid resolution is 1/24° (ca. 4-5 km) and the unevenly spaced vertical levels are 141.

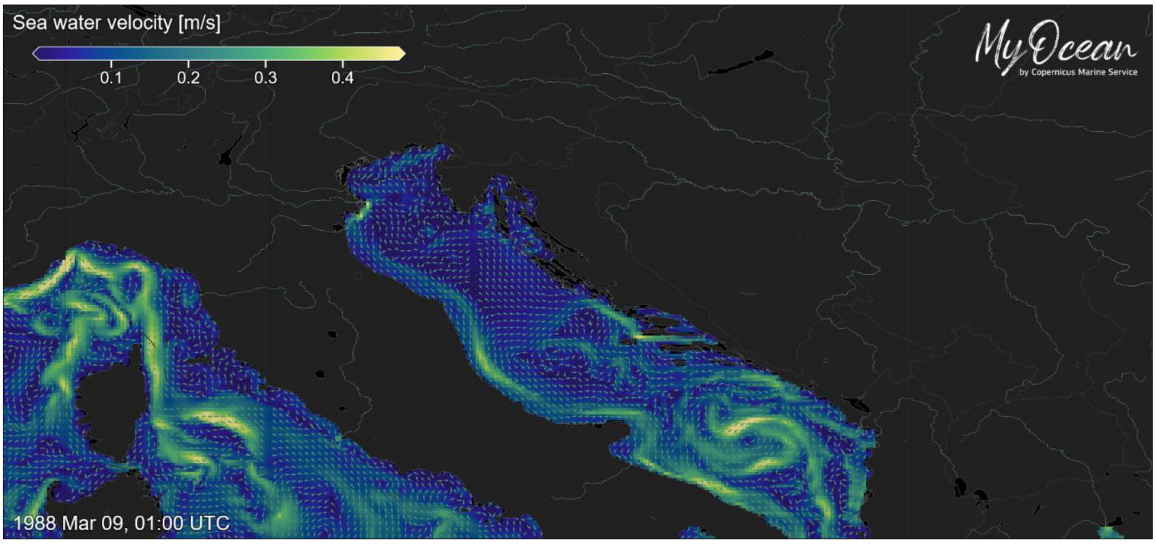


Figure 2.7: Sea water velocity in Adriatic Sea (9 March 1988)
Source: https://doi.org/10.25423/CMCC/MEDSEA_MULTIYEAR_PHY_006_004_E3R1

Sea water velocity on the Adriatic surface is counter clockwise: the water flows along the Albanian, Montenegrin and Croatian coast, flows out on the Italian side, with several transverse flows. Deviations from this simple scheme have also been noted, so that, for example, in the warm part of the year, smaller circular flows are observed in a clockwise direction, and the output current is more developed than the input branch. Even at greater depths, the current prevails counter clockwise, with the input current predominating in the intermediate layer and the output current in the bottom layer. The speeds of these currents are not high, between 10 and 20 cm / s. Their origin has not yet been fully explained, but the prevailing opinion is that they are associated with surface and coastal flows of moisture and heat and the consequent changes in salinity and temperature. Wind currents in the Adriatic are well developed: in winter, under the influence of the bora and the south, their speeds can exceed 50 cm / s. Wind causes other processes, which are manifested in changes in the current field: internal waves with a period of about 1 hour, inertial oscillations with a period of about 17 hours and Kelvin waves with a period of several days (*Hrvatska enciklopedija, 2022*). Finally, tidal-related currents are observed in the Adriatic, but their velocities are generally low (about 10 cm/s).

Temperature and salinity

The Operational Mercator global ocean analysis and forecast system at 1/12 degree (6 km at midlatitudes) is providing 10 days of 3D global ocean forecasts updated daily. The time series start on January 1st, 2016 and are aggregated in time in order to reach a two full year's time series sliding window (Figure 2.8). This product includes daily and monthly mean files of temperature, salinity, currents, sea level, mixed layer depth and ice parameters from the top to the bottom over the global ocean.

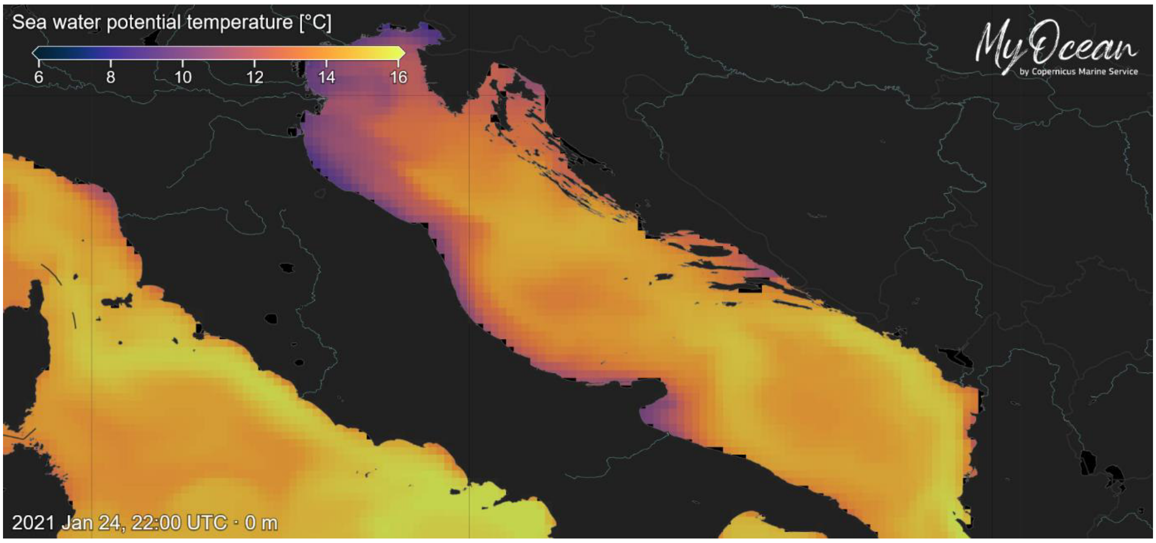


Figure 2.8: Sea water potential temperature in Adriatic Sea (24 January 2021)
Source: https://doi.org/10.48670/moi-00016

It also includes hourly mean surface fields for sea level height, temperature and currents. The global ocean output files are displayed with a 1/12 degree horizontal resolution with regular longitude/latitude equirectangular projection. 50 vertical levels are ranging from 0 to 5500 meters. This product also delivers a special dataset for surface current, which also includes wave and tidal drift called SMOC (Surface merged Ocean Current).

The sea temperature primarily depends on the surface heat flow, which leads to the warming of the Adriatic in the warm part of the year and its cooling in the cold half of the year. Collectively, the Adriatic transfers heat to the atmosphere, which means that heat is introduced through the Straits of Otranto. The surface temperature is the lowest in February and March, and the highest in August, when daily temperature fluctuations are observed in protected coastal areas. In winter it is temp. in most of the basin it is uniform along the vertical and decreases from more than 13 ° C in the southern and eastern part of the basin to less than 8 ° C in its northern and western parts. In summer, the surface temperature is more even and ranges between 24 and 25 ° C; at a depth of 10 to 30 m, the temperature drops sharply with depth (the so-called thermocline layer), and at greater depths it takes on a value between 12 and 14 ° C. Satellite images of the Adriatic show that both winter and summer temperature fields are characterized by many small formations such as vortices, filaments, etc. Year-on-year temperature variability is very pronounced, so in some winters values up to 4 ° C, and in some summers higher from 28 ° C (*Hrvatska enciklopedija, 2022*).

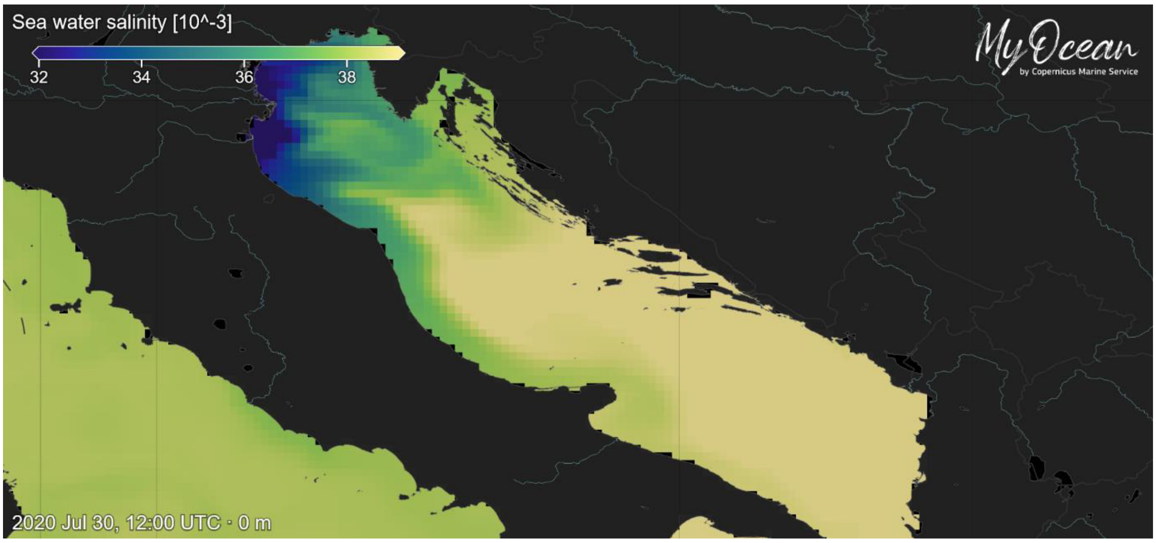


Figure 2.9: Sea water salinity in Adriatic Sea (30 July 2020)
Source: https://doi.org/10.48670/moi-00016

The surface salinity values decrease from the south to the north of the Adriatic (Figure 2.9). Fresh waters of the Po River and other rivers reduce salinity in the northern Adriatic and in a narrow strip along the Italian coast (salinity 33-37), while salty water from the Ionian and Mediterranean Seas is advected along the Croatian coast (salinity 38-39). The seasonal course of salinity is observed in the northern Adriatic, which is a consequence of the seasonal course of the Po River, which has the largest inflow in the autumn (highest precipitation) and spring (snowmelt) periods, and in that area a halocline is formed in the surface layer of 5-20 m (*Mala Internet škola oceanografije,* 2022).

In the deeper layers of the Adriatic, temperatures range from 11°C in the area of the northern Adriatic and the Jabuka basin, to 14°C in the South Adriatic basin and the Otranto Gate. Salinity also increases from the northern Adriatic (37.5 - 38.5) to the southeast (38.5 - 39.0). The seasonal movement is weakly expressed, while the interannual variability is conditioned by the creation and advection of deep water masses.

Turbidity and Suspended Matter

The High-Resolution Ocean Colour (HR-OC) Consortium (Brockmann Consult, Royal Belgian Institute of Natural Sciences, Flemish Institute for Technological Research) distributes Remote Sensing Reflectances (RRS, expressed in sr-1), Turbidity (TUR, expressed in FNU), Solid Particulate Matter Concentration (SPM, expressed in mg/l), spectral particulate backscattering (BBP, expressed in m-1) and chlorophyll-a concentration (CHL, expressed in µg/l) for the Sentinel 2/MSI sensor at 100m resolution for a 20km coastal zone (Figure 2.10). The products are delivered on a geographic lat-lon grid (EPSG:4326). To limit file size the products are provided in tiles of 600x800 km^2. RRS and BBP are delivered at nominal central bands of 443, 492, 560, 665, 704, 740, 783, 865 nm. The primary variable from which it is virtually possible to derive all the geophysical and transparency products is the spectral RRS. This, together with the spectral BBP, constitute the category of the 'optics' products. The spectral BBP product is generated from the RRS products using a quasi-analytical algorithm (Lee et al. 2002). The 'transparency' products include TUR and SPM).

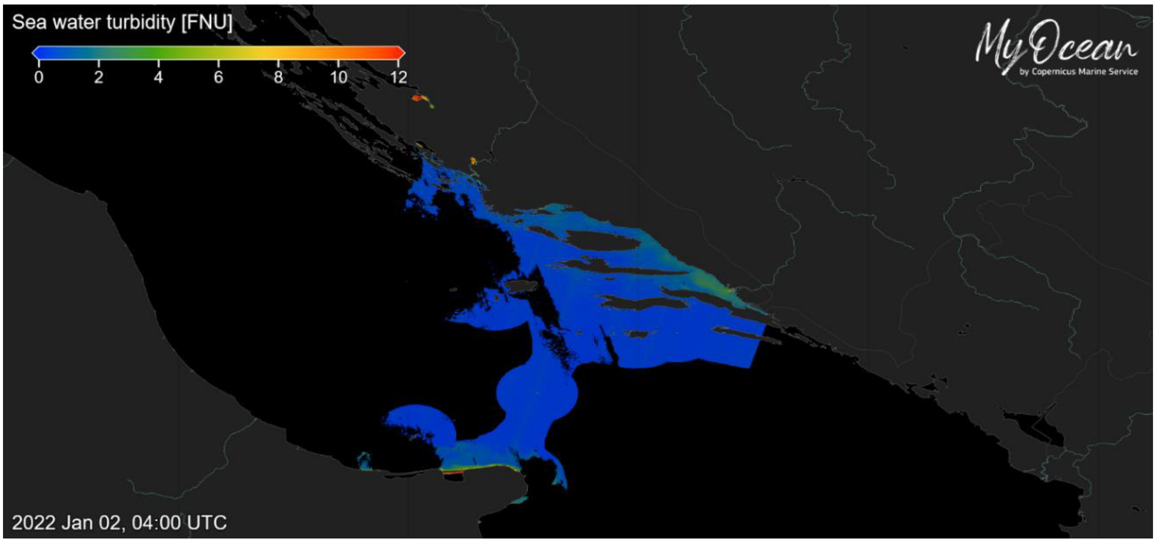


Figure 2.10: Sea water turbidity in Adriatic Sea (2 Jan 2022)
Source: https://doi.org/10.48670/moi-00109

They are retrieved through the application of automated switching algorithms to the RRS spectra adapted to varying water conditions (Novoa et al. 2017). The GEOPHYSICAL product consists of the Chlorophyll-a concentration (CHL) retrieved via a multi-algorithm approach with optimized quality flagging (O'Reilly et al. 2019, Gons et al. 2005, Lavigne et al. 2021). The NRT products are generally provided withing 24 hours after end of the day. The RRS product is accompanied by a relative uncertainty estimate (unitless) derived by direct comparison of the products to corresponding fiducial reference measurements provided through the AERONET-OC network. The current day data temporal consistency is evaluated as Quality Index (QI) for TUR, SPM and CHL: QI = (CurrentDataPixel-ClimatologyDataPixel) / STDDataPixel where QI is the difference between current data and the relevant climatological field as a signed multiple of climatological standard deviations (STDDataPixel).

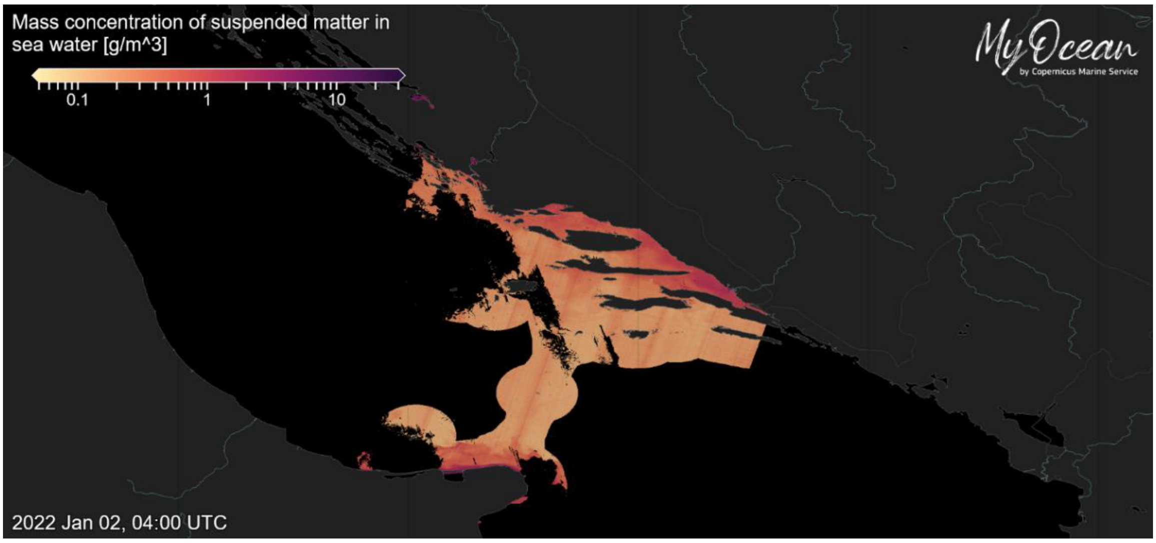


Figure 2.11: Mass concentration of suspended matter in Adriatic Sea (2 Jan 2022)
Source: https://doi.org/10.48670/moi-00109

The turbidity of the water is increasing from the south to the north and from the open sea to the Adriatic coast. The trend is similar with suspended organic matter, with the highest concentration of it being characteristic of the northernmost part of the Adriatic. Higher concentrations are also characteristic along the mouths of larger Adriatic rivers (Vjose, Seman, Neretva, Krka, Cetina, etc.) (Figure 2.11).

Bathymetry data

A harmonised EMODnet Digital Terrain Model (DTM) has been generated for European sea regions (36W,15N; 43E,90N) from selected bathymetric survey data sets, composite DTMs, Satellite Derive Bathymetry (SDB) data products, while gaps with no data coverage are completed by integrating the GEBCO Digital Bathymetry. The DTM with its information layers is made freely available for browsing and downloading through the Bathymetry Viewing and Download service[2] (Figure 2.12).

On October 2016 a version of the EMODnet DTM had been released with a grid resolution of 1/8 * 1/8 arc minutes. In the meantime, more survey data sets have been gathered from an increasing number of data providers and activities have been undertaken for correcting identified anomalies, where possible. This has resulted mid September 2018 in the release of a new DTM, now with an increased grid resolution of 1/16 * 1/16 arc minutes (circa 115 * 115 meters).

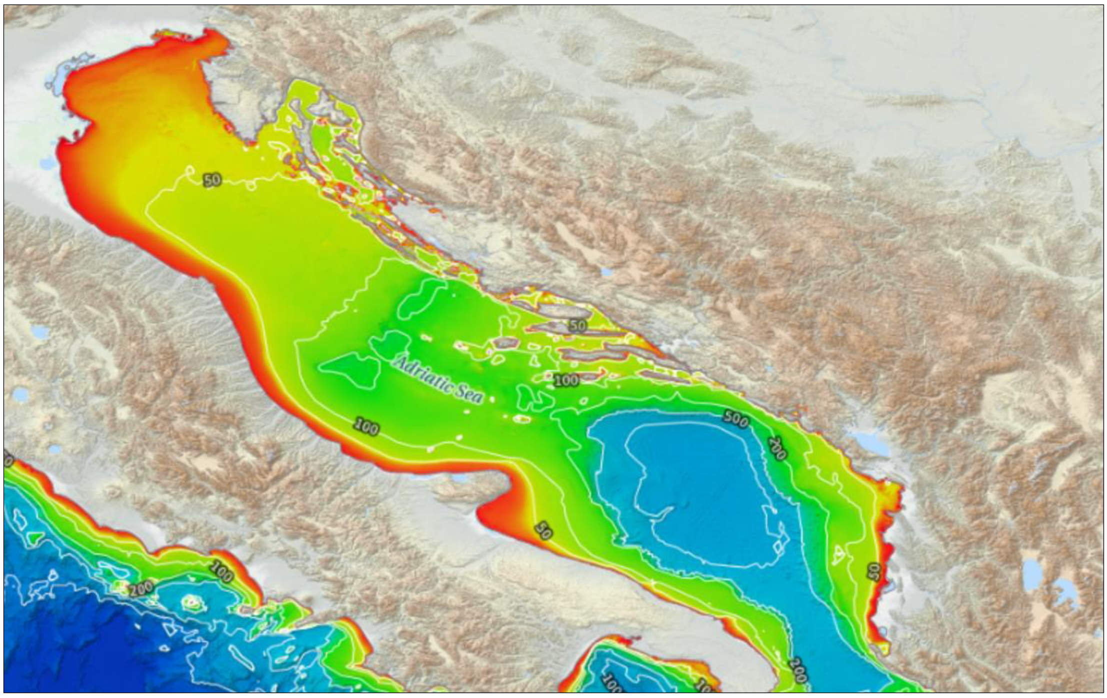


Figure 2.12: Adriatic Sea bathymetry
Source: https://portal.emodnet-bathymetry.eu/

End 2020 further progress has resulted in the latest 2020 DTM release, continued with a grid resolution of 1/16 * 1/16 arc minutes, while the number of underlying bathymetric surveys and composite DTMs

[2] https://www.emodnet-bathymetry.eu/data-products

has been expanded from circa 9400 in the 2018 edition to circa 16360 in the latest 2020 edition. The 2020 DTM data product is freely available to users as GIS layers for viewing, while the DTM versions from 2016, 2018, and 2020 are also available for sharing as OGC web services (WMS, WFS, WMTS, WCS) and downloading as DTM tiles in several output formats.

A detailed survey of the bathymetric features of the western (Italian) part of the Adriatic Sea was conducted by the Istituto di Scienze Marine (ISMAR-CNR) which resulted in creating a bathymetric map of the western side of the Adriatic Sea compiled by at basin scale (1:750,000) (Figure 2.13).

Bathymetric map is based on heterogeneous data with uneven spatial distribution of Single-Beam echo-sounding, which revealed very detail underwater morphology features. These new instruments are adding substantial informations on the continental margins, their main sediment pathways (submarine canyons) and the increasingly recognised mass-transport deposits (Trincardi et al., 2014).

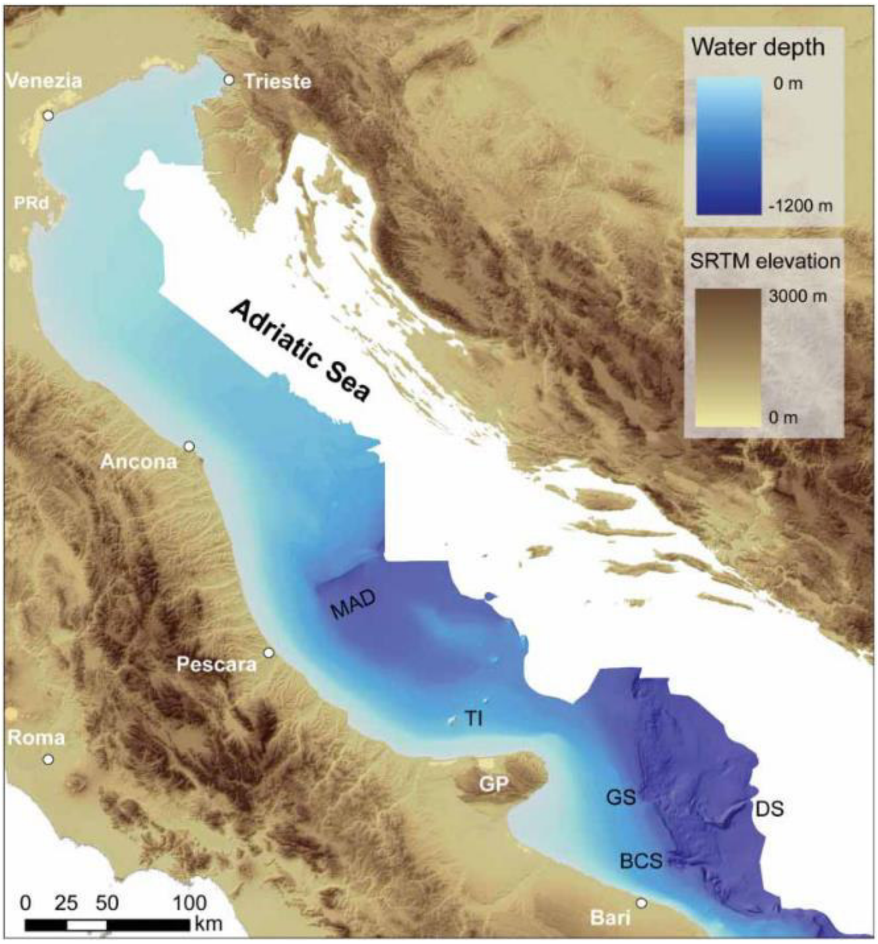


Figure 2.13: Bathymetry of western part of Adriatic Sea
Source: Trincardi, F., Campiani, E., Correggiari, A., Foglini, F., Maselli, V., Remia, A., 2014: Bathymetry of the Adriatic Sea: The legacy of the last eustatic cycle and the impact of modern sediment dispersal, Journal of Maps 10 (1), 151-158, http://dx.doi.org/10.1080/17445647.2013.864844

The Adriatic Sea is a long syncline, the northwestern end of which is filled with sediments of the Po river and other alpine rivers and the extreme southeastern part became inland by folding in the Neogene. This process created the Straits of Otranto, which connects the Adriatic and Ionian Sea. The Adriatic Sea is the shallowest in the extreme northwestern part (Gulf of Trieste, 24 to 26 m). About 380 km wide shelf in the northern Adriatic stretches from north to south; its greatest depth is about 90 m (at the edge of 190 m). Along the Apennine Peninsula, the shelf occurs in the Gulf of Manfredonia. From the island of Žirje near Šibenik to Ortona on the coast of the Apennine Peninsula, there is a transverse valley up to 268 m deep, which is called Jabučka kotlina after the island of Jabuka. About 150 km long and up to 130 m deep submarine Palagruža threshold (named after the island of Palagruža) stretches from the island of Lastovo to the Gargano peninsula on the east coast of the Apennine Peninsula. To the southeast, the bottom of the Palagruža threshold descends into the South Adriatic valley, where the greatest depth is 1228 meters (*Hrvatska enciklopedija, 2022*).

2.3.2. Habitats data

EMODnet Seabed Habitats[3] provides a single access point to European seabed habitat data and products to aid marine spatial planning and marine habitat assessments. The project has brought together a European consortium of specialists in benthic ecology and seabed habitat mapping. The EMODnet Seabed Habitat map viewer displays and gives access to broad scale predictive habitat maps and collated seabed habitat maps from surveys within Europe's marine waters. In addition, habitat models, composite products, protected habitats and point data have also been collated. Users can build a query based on specific criteria such as geographic area, data layer or specific habitat. Data can be downloaded in GIS format or exported using the Web Map Service (WMS) to personal desktop GIS applications or to other web mapping portals (Figure 2.14).

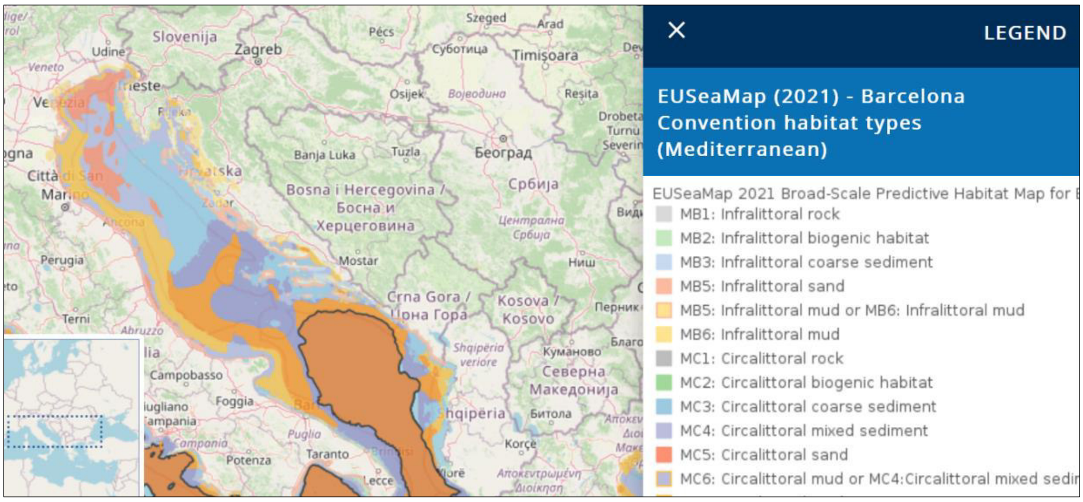


Figure 2.14: Habitat types in Adriatic Sea – EMODnet Seabed Habitats viewer
Source: https://www.emodnet-seabedhabitats.eu/access-data/launch-map-viewer/

Principal drivers for seabed habitat distributions include seabed substrate, depth, light availability and the energy of water movements. Salinity and oxygen levels are considered to be fundamental for habitat

[3] https://www.emodnet-seabedhabitats.eu/

mapping in enclosed sea basins. In the absence of substrate data, it is possible to produce a 'predictive map' of expected seabed habitat types by combining a series of proxy measurements, such as water depth and light levels amongst others, using statistical analysis and GIS modelling. EMODnet bathymetry and Copernicus Marine Environment Monitoring Service (CMEMS) are key data providers.

There are two systems of marine habitats in the Adriatic Sea: the coastal or littoral system and the deep or profundal system. The first reaches a depth of approximately 200 m, and is divided into stairs characterized by specific animals: supralitoral, mediolittoral, infralitoral and circalitoral. The profundal system is divided into bathyal, abyssal and hadal steps, and extends from a depth of 200 m to the greatest depths. The abyssal and hadal steps are not located in the Adriatic Sea, due to its insufficient depth.

Supralitoral

The height of the supralittoral step additionally depends on the slope of the coast and its exposure to waves and wind. It begins with a belt of gray limestone, due to the presence of supralittoral lithophytic blue-green algae. Supralitoral settlements of hard ground are permanently out of direct contact with the sea. In addition to lithophytic blue-green algae, more algae and some animals live on this stage. The most common blue-green alga there is *Rivularia atra*, in the form of small black balls, and of the higher algae, *Catenella opuntia* is common. A special habitat of the supralittoral staircase (as well as mediolittoral) are supralittoral puddles. There are very variable ecological conditions, for example the salinity varies from almost fresh water to that in which the salt crystallizes.

Mediolitoral

The mediolittoral step is located in the tidal zone. Due to the greater difference between tides, in the northern Adriatic it is higher than in the central and southern Adriatic. The upper limit of the mediolittoral step in the Adriatic is 0.5 to 3 m above the mean sea level, and the lower limit coincides with the lower limit of the normal low tide. In this step, on a hard surface, a distinction is made between the upper horizon, which is in contact with the sea due to flooding, and the lower horizon, which is submerged at high tide. These two horizons are clearly separated in the central and southern Adriatic, while they are not in the northern, due to the higher amplitude of tides. The upper horizon of the mediolittoral staircase is inhabited by the species *Patella rustica* and *Chthamalus stellatus*, colonies of which often cover large areas. Some types of algae grow in the mediolittoral step and form real meadows there. To the north. The brown alga *Fucus virsoides* is common in the Adriatic, and the red alga *Catenella opuntia* grows in shaded crevices along the sea surface. The polluted sea is dominated by green algae *Enteromorpha compressa* and sea lettuce (*Ulva lactuca*), which often take up habitat for other algae and animals. *Hymeniacydon sanguinea*, red mulberry (*Actinia equina*), chiton *Acanthochiton fascicularis*, and snails from the genus *Monodonta* are often found in rock crevices and overhangs. Some parts of the rocks are completely overgrown with mussel settlements, and are common in areas with a large influx of organic matter and there mark the upper edge of the infralittoral staircase. In the clear sea, on the very border between the mediolittoral and infralittoral steps, the brown alga *Cystoseira spicata* grows (*Hrvatska enciklopedija, 2022*).

<u>Infralittoral</u>

Below the lower tide, an infralittoral step begins, the first land belt independent of land. This is the area of most suitable conditions for most benthic organisms. Due to good lighting, plant biomass is higher than animal biomass. The infralittoral borders the lowest ebb on the upper side and the marginal depth of seagrass growth on the lower side. The lower limit of the infralittoral staircase in the Adriatic is variable, due to differences in sea transparency and consequently reduced light penetration. In the northern Adriatic it reaches approximately 20 m, in the middle and south between 30 and 40 m, and around some islands in the open Adriatic up to 50 m. The upper part of the infralittoral in the Adriatic Sea is inhabited by brown algae *Cystoseira spicata*. Upper settlements of the infralittoral staircase angle. are constantly submerged and exposed to strong shock waves. In large waves, these influences reach up to 15 m, exceptionally up to 30 m in depth. On the sandy bottom of the upper infralittoral, the biocenosis of photophilous algae is replaced by the biocenosis of seagrass meadows, "seagrass". In the Adriatic Sea, four species usually grow as separate meadows: feathers (*Zostera marina*), small feathers (*Zostera nana*), silkworms (*Cymodocea nodosa*) and posidonia (*Posidonia oceanica*). The peak of the biocenosis of seagrass meadows are the largest seaweeds, *Posidonia*. They inhabit large areas in the southern and central, and to a lesser extent in the northern Adriatic, where meadows of other mentioned species predominate. *Posidonia* is mostly inhabited by silty sand to a depth of approximately 40 m. Its meadows are dense in areas with clean sea water. Where there is little sediment and where there is a lack of humic substances, resistant silk is the first to settle, primarily in areas 3 to 5 m deep. Feathers grow in sparse meadows and predominate in the northern area. Adriatic. In some places it is replaced by a related species of feathers a little. Many sessile (attached) and vaginal (mobile) benthic species and many epibionts live in the biocenosis of *Posidonia* meadows. Organisms characteristic of the coralligenous biocenosis inhabit the heavily shaded part, at the bottom of the posidonia stems.

<u>Circalitoral</u>

This step occupies most of the bottom, given that the Adriatic is a relatively shallow sea. It begins at the lower limit of seagrass growth and continues to a depth of approximately 200 m, where the lower limit of growth is scyaphilous algae. It is important for her that animal biomass predominates over plant biomass. Changes in salinity and temperature are smaller, as is the movement of seawater, except for the flow of constant deep water masses. The main feature of circalitorals is low light, so the life of most plant species is not possible.

Beneath the circalitoral staircase begins the aphital system, which is divided into bathyal, abisal, and hadal. In the Adriatic Sea, only the southern Adriatic basin is deep enough to be added to the upper part of the bathyal staircase. There is complete darkness, and the temperature and salinity do not change. Biocenoses and species of the Adriatic bathyal are poorly studied, and the number of species and their density is probably very modest.

Human impacts are a constant threat to living communities in shallow coastal areas. This mostly refers to construction works on the coast, backfilling and consequent silting of parts of the water area, disposal of solid waste and especially to pollution by untreated wastewater of urban and industrial origin. These factors endanger the living communities of supralitorals and mediolittorals, and of the infralittoral communities, seagrass meadows are particularly endangered.

2.3.3. SEA / EIA data

Georeferenced data from SEA / EIA for six countries that have a coast on the Adriatic Sea (Italy, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro and Albania) do not exist or if they are not publicly available. The list of EIA studies, for example, the Republic of Croatia is available on the official website of the Ministry of Economy and Sustainable Development (MINGOR), but the data also don't have a geospatial component, which prevents their spatial comparison and overlap with other data layers (hydrographical alterations and habitat data). From the register of the EIA study database, several examples from the Republic of Croatia were selected where EIA studies analyzed and considered the conditions of construction and interventions in space and, among other things, explained the impact of future anthropogenic structures on hydrographic alterations and marine habitats. The main problem of these spatial examples is the unavailability of data in geospatial format, which prevents their further comparison, analysis and modeling. For example, three environmental impact studies were singled out and selected:

- Environmental impact study - Luka Novalja, Lika-Senj County (2020)

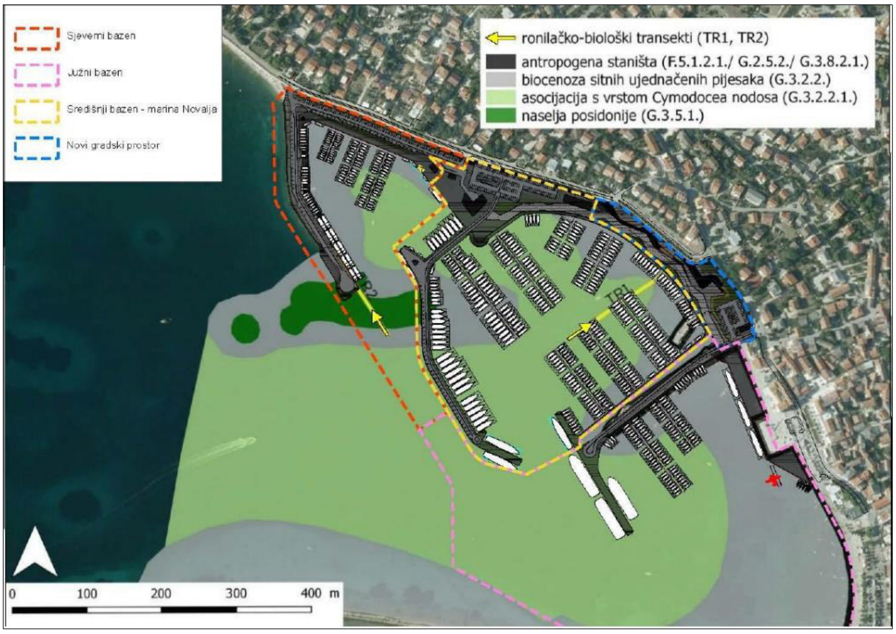


Figure 2.15: Environmental impact study - Luka Novalja, Lika-Senj County
Source: Adriatic Croatia International Club d.d., Urbanistički institut Hrvatske d.o.o., 2020: Studija utjecaja na okoliš - Luka Novalja, Zagreb.

– Landscaping of Dumići beach - environmental impact study, Primorje-Gorski Kotar County (2020)

Figure 2.16: Landscaping of Dumići beach - environmental impact study, Primorje-Gorski Kotar County Source: Grad Rab, Rijekaprojekt d.o.o., 2020: Uređenje plaže Dumići – studija utjecaja na okoliš, Rijeka.

– Environmental impact study of the nautical tourism port Pašman with access road and promenade, Zadar County (2019)

Figure 2.17: Environmental impact study of the nautical tourism port Pašman with access road and promenade, Zadar County Source: Općina Pašman, Institut IGH d.d., 2019: Studija o utjecaju na okoliš luke nautičkog turizma Pašman s pristupnom cestom i šetnicom, Zagreb.

Partial and incomplete data of human / antropogenic structures in Adriatic Sea are available throught EMODnet Human Activities database portal[4] (e.g.):

[4] https://www.emodnet-humanactivities.eu/view-data.php

I. Telecommunication cables - schematic routes

There are several telecommunication cable routes in Adriatic Sea (*Submarine Cable Map*, 2022). The northern one is between Italy and Croatia, with total lenght of 230 km. The installation of the cable was completed in 1994. The landing points of cable are Umag (Croatia) and Mestre (Italy). Cable Adria-1 is connecting Dubrovnik (Croatia), Durres (Albania) and Corfu (Greece). It's total lenght is 440 km and the installation of the cable was completed in September 1996 (Figure 2.18). Italy and Albania are connected via underwater telecommunication cable since 1997. The landing points of cable are Bari (Italy) and Durres (Albania) with total cable lenght of 240 km. At the beginning of 2023, the installation of the 106 km long Trans Adriatic Express underwater cable, which will connect Italy (San Foca) and Albania (Seman), is planned. Since 2004, cable OTEGLOBE Kokkini-Bari, with total lenght of 700 km, is connecting Greece and Italy. Apart from it, there is also Italy-Greece 1 cable route with total lenght of 169 km. The landing points of cable are Aethos (Greece) and Otranto (Italy). The installation of the cable was completed in 1995.

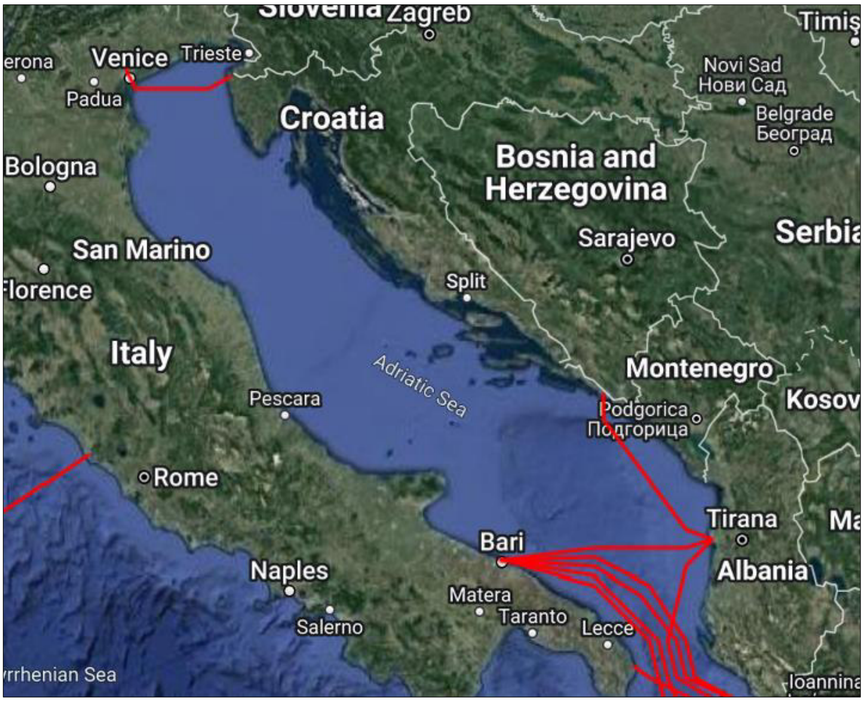


Figure 2.18: Telecommunication cables in Adriatic Sea
Source: https://www.emodnet-humanactivities.eu/view-data.php

Except regional cables, there are also two intercontinetal cables which have their starting point in Bari:

1. Asia Africa Europe-1 (AAE-1), built in 2017, with total lenght od 25.000 km
2. Jonah (Italy – Israel), built in 2012, with total lenght of 2.297 km

II. Dredging sites

According to data from EMODnet (June 2022), dredging in the Adriatic Sea is present mainly along the Italian coast. The official database lists 22 dredging locations, mostly in the coastal zone between Pescara and Venice (Figure 2.19).

In the coastal sea of the Republic of Croatia, dredging is carried out during the construction of the Privlački gaz waterway (near the island of Vir) and as part of the expansion and deepening of the waterway corridor Puntarska draga (island of Krk). Occasional dredging activities are also present at the mouths of larger rivers (Neretva).

Figure 2.19: Dredging sites in Adriatic Sea
Source: https://www.emodnet-humanactivities.eu/view-data.php

III. Oil and gas boreholes and installations' sites

In the northern Adriatic in the Republic of Croatia, 22 gas deposits were discovered with a total estimated reserves of about 1.3 trillion cubic feet (Figure 2.20). The Republic of Croatia currently has 19 gas production platforms and one compressor platform, which are connected to 51 exploitation (production) wells within 3 exploitation fields, from which around 1.2 billion m3 of gas are produced annually.

In Italy, around 130 deposits with estimated reserves of around 23 trillion cubic feet have been discovered in the Adriatic Sea area, and of the 130, 45 fields are currently in the production phase. The Republic of Italy currently has 107 gas platforms to which almost 600 exploitation gas wells are connected, from which approximately 5 billion m3 of gas are produced annually (data taken from the official website of the Italian Ministry of Economy).

In Italy, there have been a total of 24 oil discoveries with estimated reserves of 550 million barrels, and 7 fields are currently in production (Figure 2.21). The Republic of Italy currently has 7 oil platforms to which 39 exploitation oil wells are connected, from which 1.8 million barrels of oil are produced annually (data taken from the official website of the Italian Ministry of Economy).

According to the available data, there is no oil extraction from the seas of the Republic of Croatia, Slovenia, Bosnia and Herzegovina, Montenegro and Albania.

Figure 2.20: Gas boreholes and instalations sites in Adriatic Sea
Source: https://www.emodnet-humanactivities.eu/view-data.php

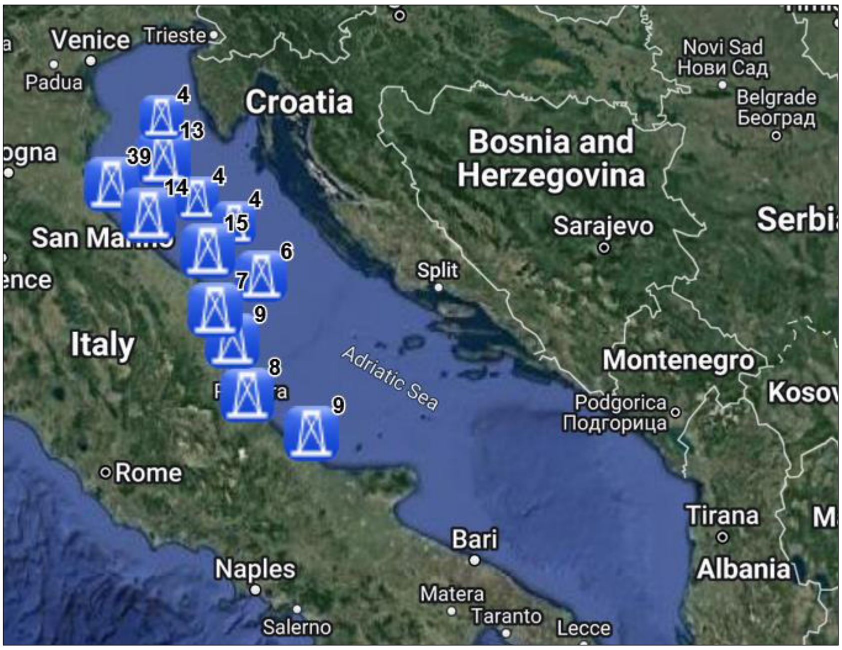


Figure 2.21: Oil boreholes and instalations sites in Adriatic Sea
Source: https://www.emodnet-humanactivities.eu/view-data.php

IV. Pipelines routes

According to the available data from EMODnet's database, the majority of pipeline routes are located in the area of the Northern Adriatic and connect gas installation sites to each other, while the main branch towards the Croatian mainland originates in the city of Pula (Figure 2.22).

Although it is not in EMODnet's database, part of Trans Adriatic Pipeline (TAP), natural gas pipeline constructed in 2016 and operational since 2020, passes through part of the Adriatic Sea. The length of the gas pipeline under the sea is 105 km, and it stretches between the Italian city of San Foca and the Albanian city of Fier.

Figure 2.22: Pipelines routes in Adriatic Sea
Source: https://www.emodnet-humanactivities.eu/view-data.php

V. Dredge spoil dumping sites

According to the available data from EMODnet's database there are 20 dredge spoil dumping sites in the Adriatic Sea. They are all located along the Italian coast, and their highest concentration is, as expected, downstream from the mouth of the Po River.

Figure 2.23: Dredge spoil dumping sites in Adriatic Sea
Source: https://www.emodnet-humanactivities.eu/view-data.php

VI. Dumped munitions areas

The area of the Adriatic Sea abounds in locations for the disposal of munition. Most of the locations are located in distant offshore areas, but some coastal areas of Italy and Croatia and almost the whole of Albania, are intended for the disposal of munition (Figure 2.24).

Figure 2.24: Dumped munitions areas in Adriatic Sea
Source: https://www.emodnet-humanactivities.eu/view-data.php

2.4. Mapping/calculation of CI15

Due to non-reporting of monitoring data according to the Guidance Factsheet by the CPs it is not possible to get an overall area of habitats impacted by the hydrographic alterations. Such information would be very site specific, potentially extracted from the SEA / EIA data for the projects that would cause the hydrographic alterations and the loss/impact of habitats. In addition to scientific gaps and uncertainties, such studies have incomplete input data, lack of geospatial database, and lack of uniformity between Adriatic countries. Therefore, an implementation of hydrodynamic modelling and related calculation of the CI15 for Adriatic Sea according to the agreed Guidance Factsheet methodology **is not feasible.**

An alternative, more general approach has been applied for the assessment by using other sources of data such as national reports and contributions by the scientific partners. The process of estimation of hydrographic changes can be greatly supported by the products of satellite images, whereby the Copernicus Marine Service can be highlighted as an excellent source of data. However, given the insufficient spatial resolution of recent data and the difficulty (almost impossibility) of extracting historical satellite data to calculate the indicator it is difficult to make any conclusions according to the Guidance Factsheet that require very site specific information on habitats impacted by hydrographic alterations. for the Adriatic Sea.

2.5. Hydrographic alterations caused by climate change

As a result of increasingly pronounced hydrographic alterations **the marine habitats** in the Adriatic Sea, **are increasingly endangered**, and some of them are threatened with complete extinction. Current climatological and oceanographic research (Bonacci and Vrsalović, 2022; Mihanović et al., 2021; Pastor et al., 2018; Šepić et al., 2021; Vilibić et al., 2013; Vilibić et al., 2019; Vilibić et al., 2022) indicates that the Adriatic Sea is already experiencing significant changes in hydrographic alterations, and their intensity will become more and more pronounced, while the occurrence of climatological extremes will increase.

With a brief review of existing trends of **sea temperature** in the last twenty years, the sea temperature in the Adriatic has increased by more than 1.5^{0}C. Scientific research indicates that the process of sea warming is unstoppable and irreversible and can only be mitigated a little. The increase in sea temperature in the Adriatic is recorded at all measuring stations. This increase is most pronounced on the surface of the sea and in the summer time of the year, therefore, along the eastern coast of the Adriatic, the sea temperature has increased by 1.2^{o}C, and the summer temperature by more than 2.0^{o}C. The largest trend derived from satellites (1982–2016; Pastor et al., 2018) is observed in June, with the rate of 0.43^{o}C over 10 years over the whole Mediterranean and ca. 0.55^{o}C over 10 years over the northern Adriatic. Overall, both satellite-derived and in situ-derived sea surface temperature trends reach their maximum values in summer (June–July), while they are lowest in October and January–February.

Regarding the rest of the Adriatic, the literature implies that sea surface temperature had a negative trend in the coastal eastern Adriatic between 1960 and 1975, while this trend was strongly positive between 1979 and 2015 (0.23–0.32 ∘C over 10 years; Grbec et al., 2018). For that reason, in situ sea surface temperature trends obtained over the middle Adriatic transversal transect between 1952 and 2010 (Vilibić et al., 2013) were found to be much lower, about 0.1 ∘C over 10 years along the northern section of the transect. It is important to emphasize how marine heat waves and cold spells are the strongest during spring and summer months (Vilibić et al., 2022).

Climatological and oceanographic research indicates increasingly pronounced heat waves in the future, which will be characterized by a longer duration. Therefore, in the future, **stronger storms and flooding of coastal cities** due to strong cyclones and southerlies can be expected on the Adriatic (Dunić, N., 2022).

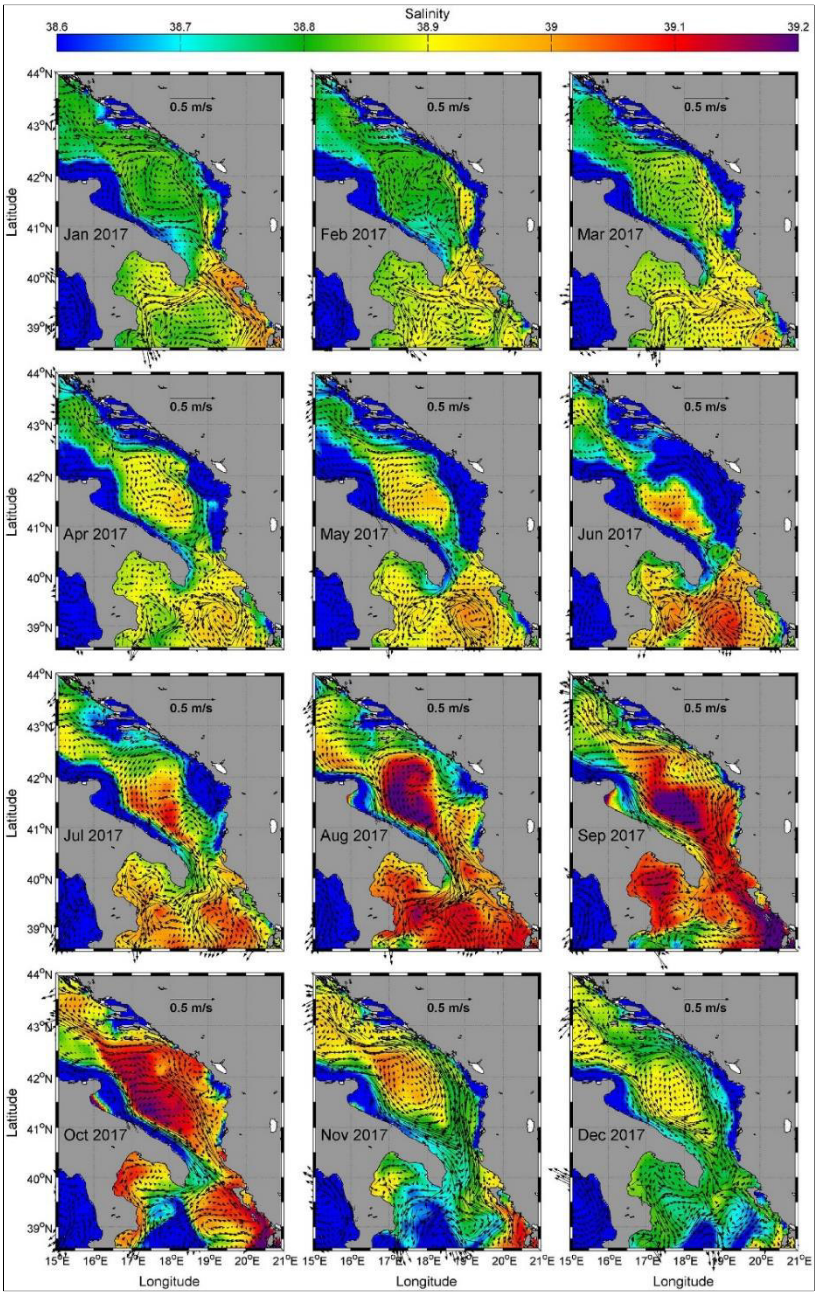


Figure 2.25: Sea currents and salinity in Adriatic Sea (January – December 2017)
Source: Mihanović, H., Vilibić ,I., Šepić, J., Matić, F., Ljubešić, Z., Mauri, E., Gerin, R., Notarstefano, G., Poulain, P-M., 2021: Observation, Preconditioning and Recurrence of Exceptionally High Salinities in the Adriatic Sea, Frontiers in Marine Science 8, DOI:10.3389/fmars.2021.672210

The northern and the eastern coast of the Adriatic Sea are occasionally affected by **extreme sea-levels** known to cause substantial material damage. These extremes appear due to the superposition of several ocean processes that occur at different periods, have different spatial extents, and are caused by distinct forcing mechanisms. Sea-level time series from six tide-gauge stations located along the northern and the eastern Adriatic coast (Venice, Trieste, Rovinj, Bakar, Split, Dubrovnik) were analysed for the period of 1956 to 2015 (1984 to 2015 for Venice). It was shown that positive (negative) extremes are up to 50-100% higher (lower) in the northern than in the south-eastern Adriatic (Šepić et al., 2021).

The Adriatic Sea is also becoming **increasingly salty**, especially its southern part (Figure 2.25). The maximum recorded salinity was 39.26, as measured by the Argo float in the Southern Adriatic. Surface salinity maximum events, but with much lower intensity, have been documented in the past (Mihanović et al., 2021). Salinity in the Middle Adriatic in March 2017 was high, between 38.8 and 38.93 at the transect stations, except close to the eastern (entire water column) and western (near the surface) Adriatic coast. Salinity values near the bottom, at the core of the NAdDW flow, were around 38.8, which is much higher than the average of ~38.6 in the period 1952–2010 (Vilibić et al., 2013).

The aforementioned hydrographic changes and climatological extremes already have a **significant impact** on certain **marine habitats** in the Adriatic, and in the future the aforementioned trend will be even more negative. For example, the habitats of corals, sponges and fish species that live in the biocenosis are the most affected by recent hydrographic changes. At a depth of fifty meters in the Adriatic Sea, the sea temperature can reach up to +24°C. As a result of such conditions, fish species die out or leave such habitats. The most endangered habitats that are dying out in the Adriatic are the habitats of red coral, dolphins and loggerhead turtles. Due to changes in hydrographic conditions, larger and denser habitats of *Caulerpe Chylindracea* are recorded (Kružić, P., 2022).

Both deep ocean circulation and surface thermohaline cells have weakened, resulting in lower ventilation of deep waters and lowering of the intermediate and deep water dissolved oxygen concentrations. Deep pelagic and benthic organisms can be affected by these changes, especially in the biodiversity of niches such as found in the nearby Jabuka Pit, which serves as a collector for dense water from the northern Adriatic Sea (Vilibić, et al., 2013).

following the above, long-term sea surface temperature warming trend in the Adriatic Sea has already had on marine fauna and the implications of climate change on the population and development of the Adriatic islands (Bonacci and Vrsalović, 2022).

2.6 Discussion

The Common Indicator 15 (CI15) is defined as the "Location and extent of the habitats potentially impacted by hydrographic alterations". As stated in the Guidance Factsheet, this indicator assesses marine habitats, which may be affected or disturbed by changes in hydrographic conditions due to new developments. It was concluded that the assessment according to the Factsheet and based on data provided by the Contracting Parties is not possible. Therefore, an alternative and more general overview of hydrographic changes was provided.

Taking into account analysed hydrographic trends, technical and technological circumstances, the **main limitations, gaps** and **uncertainties** that have been recognized and identified **for calculation of the CI15 in Adriatic Sea** are:

- there are insufficient surveys and monitoring of this indicator on Adriatic and local levels, and lack of sound assessment methodologies. Assessments that estimate the extent of hydrographic alterations (knowing conditions before and after construction) and its intersection with marine habitats are rare at the moment);
- georeferenced data from SEA/EIA for six countries that have a coast on the Adriatic Sea (Italy, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro and Albania) do not exist or these are not publicly available;
- some countries have list of EIA studies, but the data don't have a geospatial component, which prevents their spatial comparison and overlap with other data layers (hydrographical alterations and habitat data);
- more active international engagement and cooperation is needed in terms of digitization of spatial data from environmental impact studies (**creation of a single digital spatial database of all data from SEA/EIA** for interventions carried out in the marine / coastal area). An example of good practice can be the EIA portal set up by the Republic of Ireland. Digital spatial database of all data from SEA/EIA would contain all geospatial components of environmental impact studies, available from the databases of amenable state bodies (ministries). Its form and structure can be constructed as a webGIS browser with appropriate layers of spatial data at the level of the country, the year of the study and the administrative area level (county, city, settlement). The main (vector) layers of spatial data would include data on the **spatial coverage and location of the intervention, existing and planned spatial infrastructure** and **the use and purpose of the space in accordance with spatial planning regulations**. According to the need and availability of data, it is possible to integrate data on the bathymetric and geological properties of the area into the browser. In accordance with the modern possibilities of geospatial solutions, the data from the digital spatial database can be easily connected and integrated with the Copernicus Marine services, the EMODnet service and the spatial planning information system of individual countries (via WMS or WFS layers);
- the link to EO1 Biodiversity is essential for this indicator, as map of benthic habitats in the zone of interest (broad habitat types and/or particular sensitive habitats) is required. Therefore, identifying the priority benthic habitats for consideration in EO7 together with assessment of impacts, including cumulative impacts, is a cross-cutting issue of high priority for EO1 and EO7. Efforts need to be given to detect the cause-consequence relationship between hydrographic alterations due to new structures and habitat deterioration;

- spatial resolution and temporal scope of open / available spatial data on the state of hydrographic alterations (CMEMS products) is not sufficient;
- applying the given methodology in the subject area is not possible due to the unavailability of spatial data
- an assessment of the magnitude and scale of the hydrographic alterations due to climate change vis a vis the alterations caused by construction of new structures would need further considerations and detailed assessment. Changing of hydrographic parameters due to climate change such as salinity, temperature, waves and currents will greatly impact the calculation and assessment of other Cis (for example, trajectories of floating marine litter due to changes in currents, presence of invasive species due to increase of temperature etc.). It should be noted that CC still has many scientific gaps and uncertainties that will impact the estimation of GES
- the impact of climate change on cumulative impacts should be further studied. This is important for the integrated assessment within individual EO and between the EOs.

3. Common indicator 16 "Length of coastline subject to physical disturbance due to the influence of human-made structures"

The aim of this task is collecting and integrating national inputs of the assessment of Ecological Objective 8, Common Indicator 16 (CI16) "Length of coastline subject to physical disturbance due to the influence of human-made structures". The first sets of monitoring data are provided for the entire Adriatic coastline except for some parts of Croatia. This allows the analysis of the baseline status of CI16. Only for the Italian part of the Adriatic sub-region it is calculated for two periods, 2006 and 2012, so that first monitoring results showing trends are available. CI16 relation to other assessments data, particularly CCI25, is further discussed.

The following chapters describe methodology used for the CI16 parameters aggregation for the Adriatic sub-region, data processing and analysis. Aggregate views on the CI16 parameters are presented in the chapter 3.2. and detailed data is given in GIS database and excel sheets provided as auxiliary files supporting this Report.

3.1. Data collecting and processing

National assessments of CI16 are collected in forms of written reports and geographic digital data. The status of data regarding validation from the competent national bodies is unknown. Thus, the data were taken as provided and further processed.

Geographic data is harmonized in terms of coordinate systems as national assessments are provided in various ones (Table 3.1). Coastline lengths are recalculated as WGS84 ellipsoidal distances in meters and provided in new attribute column "L_wgs84_m". Data has various reference years as given in Table 3.1.

Attribute data is exported in excel and further aggregated. QGIS project file is prepared for the purpose of data and thematic maps viewing and further use.

Table 3.1: Geographic data coordinate systems and reference years for CI16

Country	**Coordinate system used for CI16**	**Reference year**
Albania	EPSG 4326 (WGS84)	2020
Croatia, Istra County	EPSG 3765 (HTRS96 / Croatia TM)	2016 till 2018
Croatia, Primorje-Gorski Kotar County	EPSG 3857 (WGS84 / Pseude-Mercator)	2018
Croatia, Šibenik-Knin County	EPSG 3765 (HTRS96 / Croatia TM)	2020
Bosnia and Herzegovina	EPSG 4326 (WGS84)	2009
Italy	EPSG 32633 (WGS84 / UTM zone 33N)	2006 and 2012

Country	Coordinate system used for CI16	Reference year
Montenegro	EPSG 32634 (WGS84 / UTM zone 34N)	2018
Slovenia	EPSG 3794 (1996 Slovenian National Grid)	2019

Further processing included selection of the Adriatic Sea coastlines from other seas coastlines in case of Italian and Albanian data. According to The International Hydrographic Organization, the boundary between the Adriatic and the Ionian seas is a line running from the Butrinto River's mouth (latitude 39°44'N) in Albania to the Karagol Cape in Corfu, through this island to the Kephali Cape (these two capes are in latitude 39°45'N), and on to the Santa Maria di Leuca Cape (latitude 39°48'N). Thus, for Italian coast, Santa Maria di Leuca Cape was a point from which Adriatic coastline was selected. For Albania, all coastline is taken into account, as only 18 km of natural coast at the south belongs to the Ionian Sea.

As methods for coastline mapping and classification vary among the reports, a brief description of used methods by the Adriatic sub-region countries follows. Use of various methods by countries results in semantic differences of assessed CI16 and thus must be taken into account while interpreting aggregate data for Adriatic sub-region.

Albania

The national assessment of CI16 for Albania includes report and GIS layers with all attributes as defined in the Indicator guidance factsheet. Regarding the classification of artificial structures, there are 1.6 km of structures that are not classified under the CI16 categories. Reference scale is 1:1500 (named as working scale in the national report).

Bosnia and Herzegovina

The national assessment of CI16 for Bosnia and Herzegovina includes report and GIS layers with all attributes as defined in the Indicator guidance factsheet. Reference scale is 1:1500 (named as working scale in the national report).

Croatia

For Croatia, only three of seven coastal countries have assessed CI16: Istria County, Primorje-Gorski Kotar County and Šibenik-Knin County. To provide better inside to the data and enable comparison with other Adriatic countries, an estimation of total Croatian Adriatic coast is made for the same level of details as provided by coastal data in the assessments for the three counties. Based on that, length of unknown CI16 is given in Table 3.5. Assesment of CI16 for Šibenik-Knin County does not include classification of artificial structures.

Italy

Assessment of CI16 for Italy is made by mapping reference coastline for years 2006 and 2012 with classification to natural and artificial coast (Figures 3.1. and 3.2, red and green lines). In addition, complex artificial objects such as coastal defence structures, ports and marinas are mapped with all details in separate geospatial layer (Figures 3.1. and 3.2, black lines), also for years 2006 and 2012. In the national assessment, the length of artificial coastline was calculated as the sum of segments on the reference coastline identified as the intersection of polylines representing manmade structures with the reference coastline, ignoring polylines representing manmade structures with no intersection with reference coastline.

For this Report, coastline lengths for Italian Adriatic sub-region are calculated from GIS layers separately for reference coastline data and for data showing coastline defence structures, ports and marinas (Table 3.4. and Table 3.5).

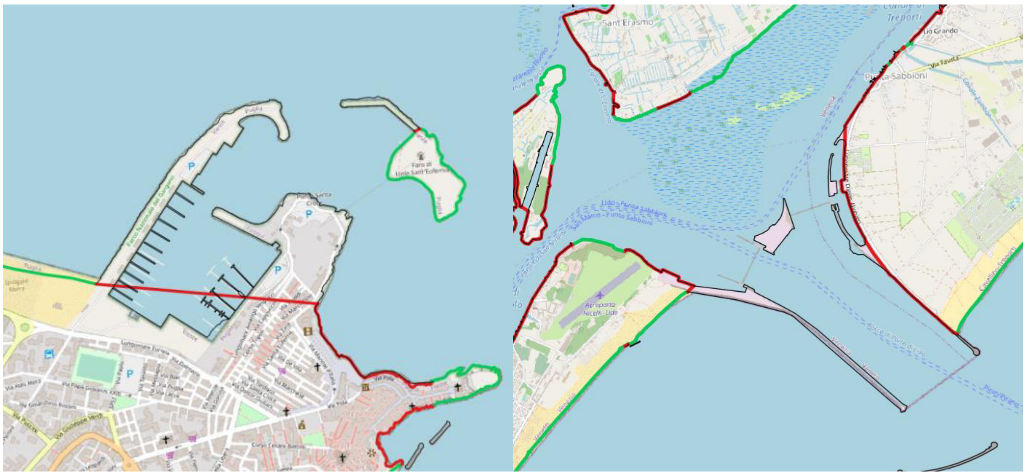


Figure 3.1: Ports features (coastal defence structures, black lines) are simplified to red line in reference coast and classified as artificial coast (left picture, red line) or not mapped as artificial coast (right picture)

Figure 3.2: Coastal defence man made features in front of the Italian coast (black lines); reference coastline is artificial (red lines)

Montenegro

The national assessment of CI16 for Montenegro includes report and GIS layers with all attributes as defined in the Indicator guidance factsheet.

Slovenia

The national assessment of CI16 for Slovenia includes report and GIS layers. As data from report and GIS layers does not completely correspond, data from the report is taken as relevant one and used for further aggregation of CI16 data for the Adriatic sub-region. Official data on the length of the Slovenian coast declares 46 km, while the CI16 assessments report declares 59 km. This is due to the use of geospatial data on a larger scale (more "precise" data), and the inclusion of the protected area Škocjanski zatok in the length of the coastline.

3.2. Mapping/calculation of CI 16

CI16 parameters per countries and aggregate values for Adriatic sub-region are presented in Table 3.5 and further illustrated by graphs on Figures 3.3-3.7.

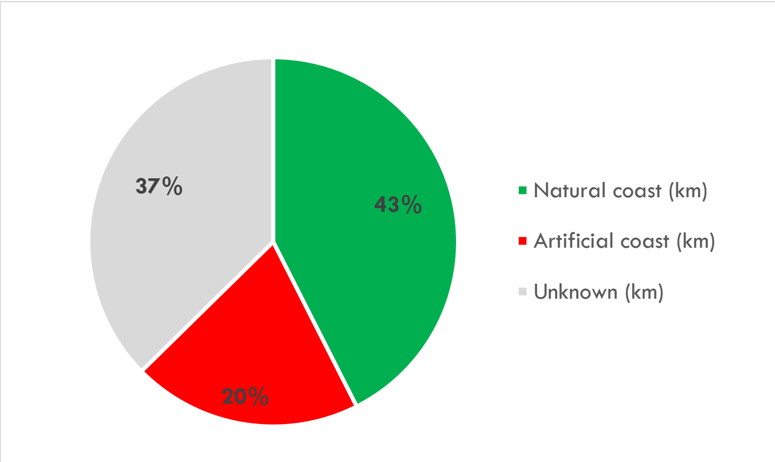


Figure 3.3: Chart with calculated percentage of CI16 for the Adriatic sub-region taking into account length of coastline without assessment

Chart on Figure 3.3 illustrates calculated percentages of CI16 for the Adriatic sub-region taking into account length of coastline without assessment. Percentages in Table 3.2 for the Adriatic sub-region shows percentages for assessed coastlines: 67.91% or 4929 km is natural and 34.98%or 2330 km is artificial coast. Albania has the largest share of natural coast of 85% while Slovenia has the smallest of 25%.

Table 3.2: Calculated CI16 for the Adriatic Sea

	Natural coast (km)	Artificial coast (km)	Without assessment (km)	Year
Albania	462.75	79.97		2020
	85.26 %	14.74 %		
Bosnia and Herzegovina	21.2	4.94		2009
	81.10 %	18.90 %		
Croatia	2346.81	417.7	4329.49	2016-2020
(% only for part of Croatia)	84.89 %	15.11 %		
Italy (Adriatic part)	1860.85*	1675.03**		2012
	52.63 %	47.37%		
Montenegro	223	107.46		2018
	67.48 %	32.52 %		
Slovenia	14.54	44.56		2016-2019
	24.60 %	75.40 %		
Adriatic sea	4929.15	2329.66	4329.49	
	67.91 %	34.98 %		

*Length of natural coast from reference coastline GIS layers
** Length of artificial coast from coastline defence structures GIS layers

Figure 3.4 and 3.5 illustrates lengths in km and percentages of natural and artificial coasts per countries, and Figure 3.6 provides an overview map of Adriatic sub-region.

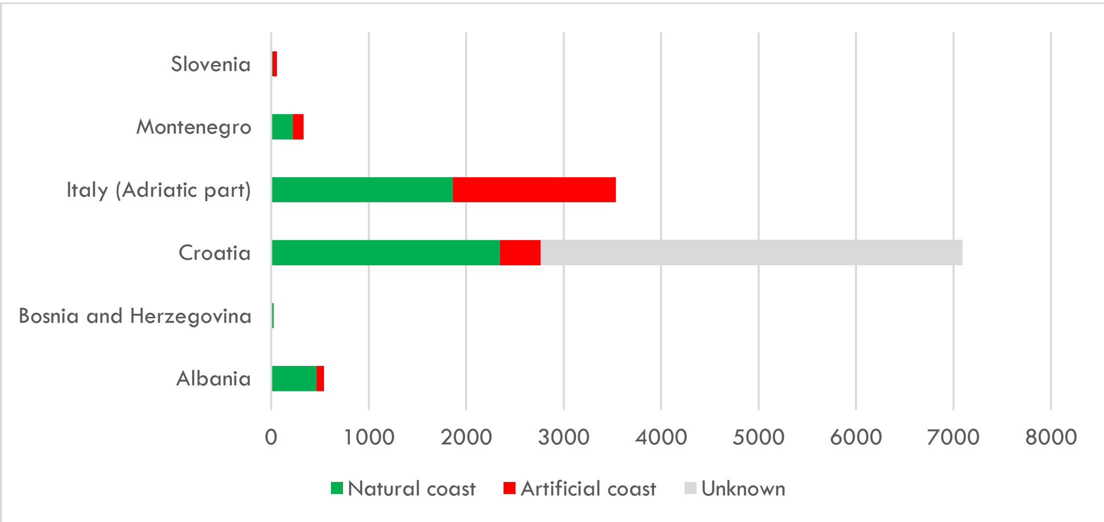


Figure 3.4: Coastline length of CI16 per countries in km

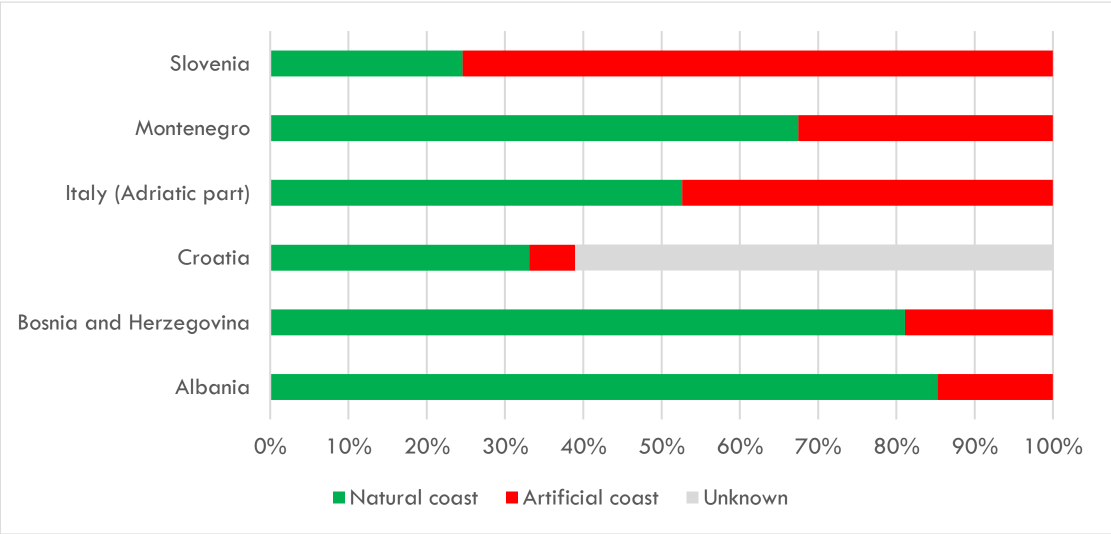


Figure 3.5: Coastline length of CI16 per countries in percentage

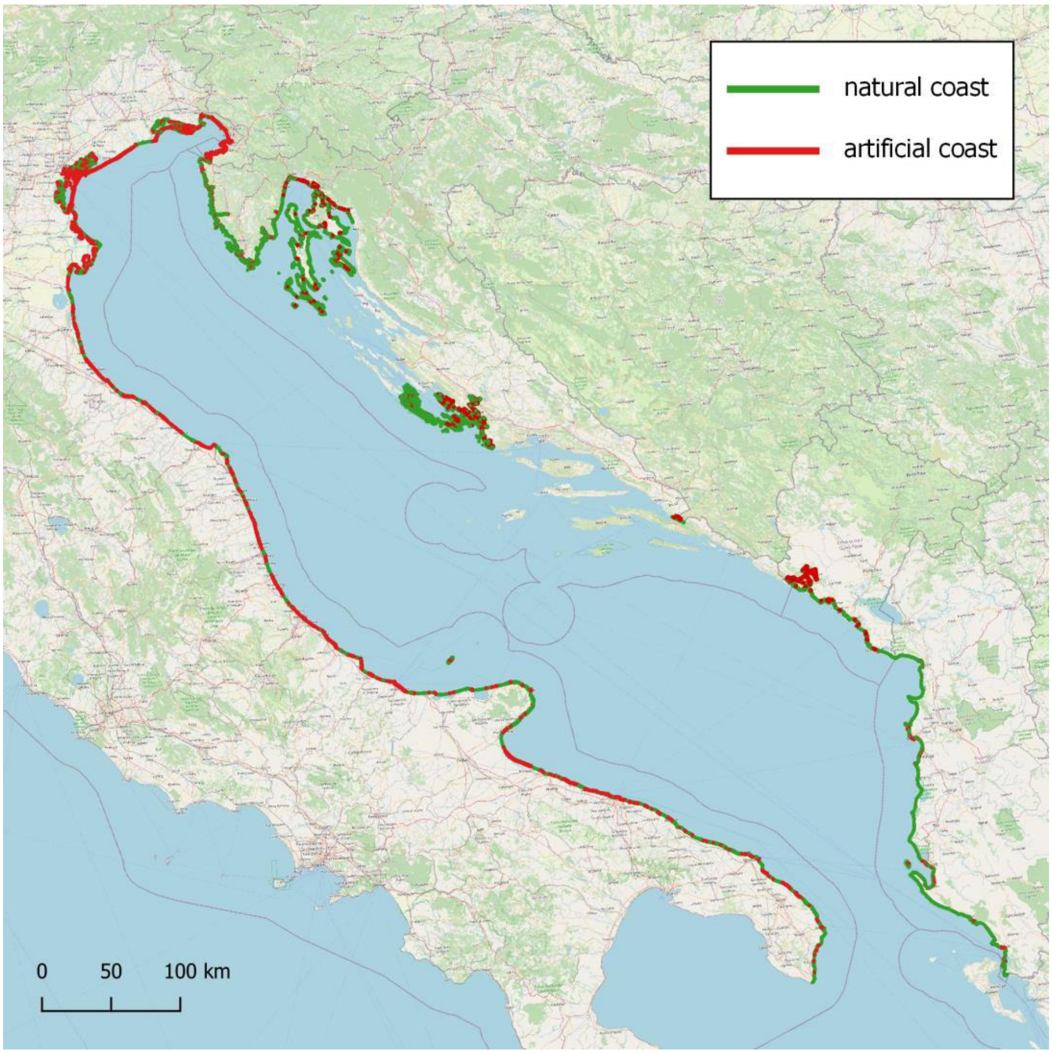


Figure 3.6: Map with calculated CI16 for Adriatic sub-region

Artificial infrastructure types

Data on type of artificial infrastructure is described by the following codes (ASCODES): 1 – Breakwaters, 2 – Seawaters/Revetments/Sea dike, 3- Groins, 4 – Jetties, 5 – River mouth structures, 12 – Port and marinas. Table 3.3. shows data from national reports. For Italy, data on artificial infrastructure types are summarized from GIS layer showing coastal defence structures, ports and marinas with all details (Figures 3.1. and 3.2, black lines) and not from reference coastline.

Table 3.3: Artifical structures in % of total artificial coastline and in km

Country	Breakwaters	Seawaters/ Revetments /Sea dike	Groins	Jetties	River mouth structures	Port and marinas	Unclassified
Albania	3.07 %	17.34 %	18.45 %	1.84 %	1.92 %	55.4 %	1.95 %
	2.5 km	13.9 km	14.8 km	1.5 km	1.5 km	44.3 km	1.6 km
Croatia, Istra County	20.53 %	12.21 %				67.26 %	
	17.77 km	10.57 km				58.20 km	
Croatia, Primorje-Gorski Kotar County	1.3 %	46.3 %			1.3%	51 %	
	2.67 km	94.40 km			2.71 km	103.91 km	
Croatia, Šibenik-Knin County	no data on artificial infrastructure type						
Bosnia and Herzegovina		85.2 %		14.8 %			
		4.18 km		0.73 km			
Italy*	25.78 %	28.75 %	5.86 %	8.81 %	2.69 %	28.03 %	0.09 %**
	431.78 km	481.54 km	98.14 km	147.53 km	45.02 km	469.54 km	1.49 km**
Montenegro		50.78 %			0.11 %	15.14 %	33.97 %
		54.57 km			0.12 km	16.27 km	36.50 km
Slovenia***	1.2 %	55.2 %		4.4 %		39.2 %	
	0.53 km	24.60 km		1.96 km		17.47 km	

*data calculated from GIS layer coastal defence structures, ports and marinas

**land reclamation

***km calculated from the shares of total coastline provided in national assessment report

Italian coastline - monitoring results

Only Italy provided two sets of monitoring data for this CI. Therefore, the assessment of changes in the coastline is given only for Italian Adriatic coastline.

Table 3.4. provides data for Italian Adriatic sub-region based on reference coastline GIS layer for years 2006 and 2012. Total length of coastline increased from 2.624 km to 2.635 km, but with drop of natural coastline of 4 km. Table 3.5. provides data for Italian Adriatic sub-region based on coastal defence structures, ports and marinas GIS layer for years 2006 and 2012. Total length of coastal defence structures, ports and marinas increased for 68.8 km or 4.29%. Table 3.6. provides data on classification

of coastal defence structures according to CI16 categories for years 2006 and 2012 and there are no significant changes.

There are almost twice as many kilometers of coastal defence structures, ports and marines as artificial ones in reference coastline GIS layer. The reason is in very detailed representation of coastal defence structures in GIS layer as shown on Figures 3.1. and 3.2. (black lines).

Table 3.4: Reference coastline data for Italian Adriatic sub-region classified to natural and artificial coast for years 2006 and 2012

Italy	**2006**		**2012**		**2012-2006**
Reference coastline data	**km**	%	**km**	%	%
Natural coast (km)	1864.83	71.08%	1860.85	70.62%	-0.46%
Artificial coast (km)	758.83	28.92%	774.27	29.38%	+0.46%
Total	2623.66		2635.12		

Table 3.5: Coastal defence structures for Italian Adriatic sub-region for years 2006 and 2012

	2006	**2012**	**2012-2006**	**(2012-2006)/2006**
Coastal defence structures, ports and marinas	1606.19km	1675.03km	68.84km	4.29%

Table 3.6: Coastal defence structures for Italian Adriatic sub-region classified by CI16 types for years 2006 and 2012

2006 - Coastal defence structures, ports and marinas (km)						
Breakwaters	Seawaters/ Revetments/Sea dike	Groins	Jetties	River mouth structures	Port and marinas	Unclassified
421km	460.25km	89.79km	148.98km	38.46km	447.95km	0.00
26.20%	28.66%	5.59%	9.28%	2.39%	27.89%	0.00%
2012 - Coastal defence structures, ports and marinas (km)						
Breakwaters	Seawaters/ Revetments/Sea dike	Groins	Jetties	River mouth structures	Port and marinas	Unclassified (land reclamation)
431.78km	481.54km	98.14km	147.53km	45.02km	469.54km	1.49km
25.78%	28.75%	5.86%	8.81%	2.69%	28.03%	0.09%

3.3. Discussion

Aggregation of national assessments for CI16 parameters for the Adriatic sub-region reported here provides first set of monitoring data for the region. Even though, the national assessments were made for different reference years and with slightly different mapping techniques, caused by different national data sets and geographic specifics. On this basis, countries could specify good environmental status (GES), the related operational objective and proposed targets for their coastline. The GES in the

Guidance Factsheet is defined in a descriptive manner as minimized physical disturbance (negative impacts) to coastal areas induced by human activities. Definitions that are more objective should be proposed, which is country specific. Future sets of monitoring data will allow assessments of coastline status: whether is further developed or it has stayed within GES. Such assessment results form the basis for the Quality Status Report (QSR) of the Mediterranean Sea and its coastal areas.

Analysing and aggregating the CI16 data received from the countries of the Adriatic sub-region, several challenges in the mapping and interpretation of CI16 were observed. As coastline is dynamic feature due to coastal erosion, sea level rise and morphological modifications, the important issue is to define country starting/reference line in relation to which the changes will be monitored. In general, coastline length depends on reference scale used. When the coast is measured on larger-scale maps, the length of the coast increases, more so on more indented coasts. Thus, it is important for monitoring coastline length to use coastline representations (level of details) made for the selected reference scale. Two national reports (Albania and Bosnia & Hercegovina declared it as 1:1500, by Guidance Factsheet it is 1:2000). Regarding artificial coastal structures and their categorization to CI16 classification, some typical coastal structure as concrete beaches and sea promenades are coded under "Seawaters/ Revetments/Sea dike", as reported in Slovenian and Montenegrin reports. In addition, field survey was performed for unclear segments. Thus, there are two main issues of performing CI16 classification for artificial coastline types:

- classification of specific objects into the same categories regardless of monitoring time or country, and
- credible recognition of types of objects regardless the used method (visual inspection of aerial images or field survey).

Further issues are coming from country specifics that could significantly affect the interpretation of calculated CI16. For example, Croatia includes significant length of coastline on uninhabited islands, islets and rocks. Small percentage of artificial coast in Croatia should not be interpreted as a very good condition, while in fact there is a lot of construction on the mainland part of the coast. Another issue is the total length of the coastline per country. If country has small coastline then it is expected that percentage of artificial coastline will be larger to provide facilities for all human coastal and maritime activities.

Additional question arises of the correlation between the coastal land use and the type of coast, particularly between land used by human activities and artificial coastline in front. Figures 3.7-3.9 illustrates typical situations that are find along Adriatic coast. Figure 3.7 illustrates situation where coastal land use and coast type has strong correlation: in front of settlement is artificial coast; in front of forest, shrubs and agricultural land is natural coast. Figure 3.8. presents situation with no correlation: in front of settlement is natural beach. Also, Figure 3.9. shows a situation where in front of mixed use but with vegetation and agricultural is an artificial coast. As a conclusion, there is no firm correlation between land use and coast type.

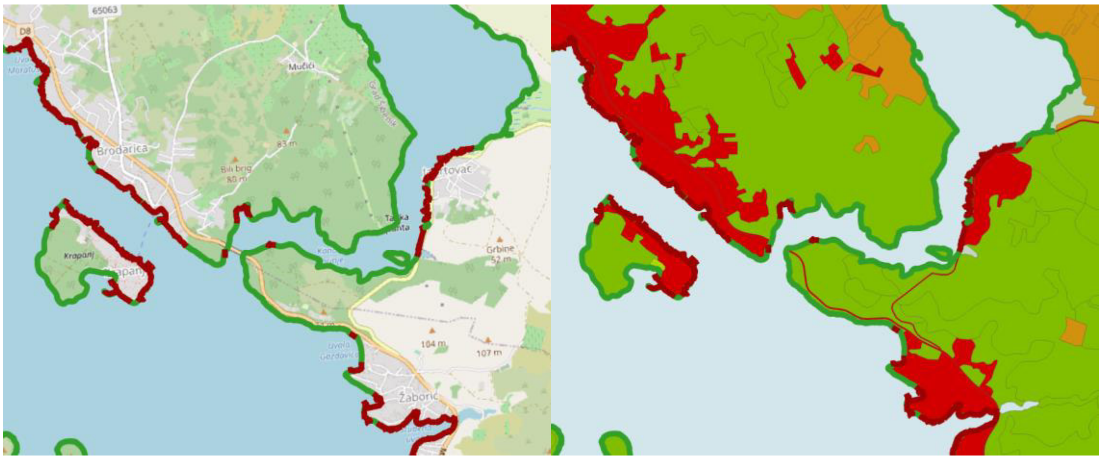


Figure 3.7: Coastal land use and coast type with strong correlation (area in Croatia, settlement and artificial coast; forest, shrubs, agriculture and natural coast)

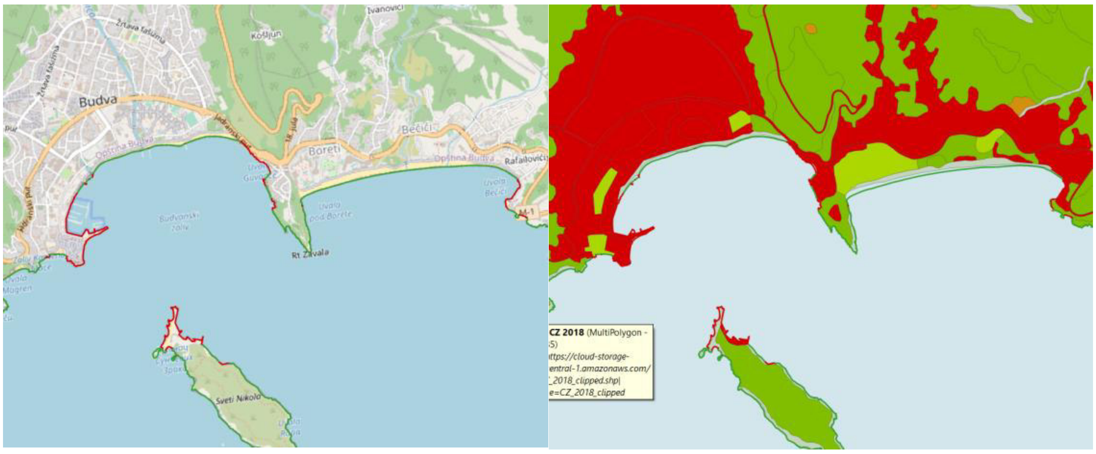


Figure 3.8: Coastal land use and coast type with no correlation (area in Montenegro, in front of settlement is long natural beach)

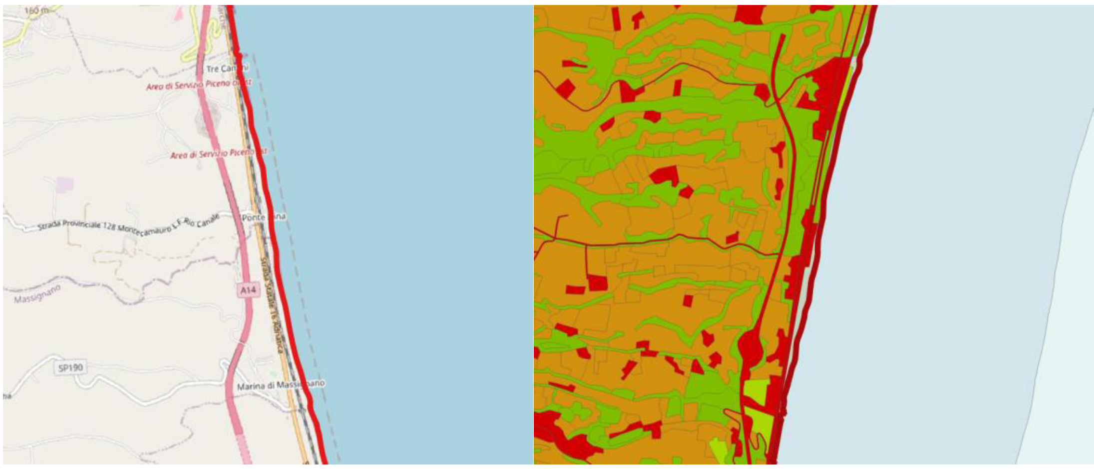


Figure 3.9: Coastal land use and coast type with no correlation (area in Italy, in front of mixed use but with agriculture and forests is an artificial coast)

4. Candidate Common Indicator 25 “Land cover change”

Candidate Common Indicator 25 “Land cover change” (CCI25) aims to maintain the natural dynamics of coastal areas and to preserve coastal ecosystems and landscapes as defined by the Ecological objective 8 (EO8). The urbanization of coastal zones is the most dramatic and irreversible process that results in habitat loss and fragmentation and thus has impact to ecosystems functions and habitats viability. Other changes in coastal zones of importance to the EO8 are conversion from forest and semi-naturalto agricultural land having negative impact and opposite, from agricultural to semi-natural and forest land having positive impact (UNEP/MAP, 2019).

CCI25 evaluates the processes of land use/land cover changes in coastal areas by quantifying them with indicator units. For the first monitoring, the calculated indicator units represent the base line from which changes will be calculated. First monitoring indicator units are the following:

1. km2 of built-up area in coastal zone;
2. %of built-up area in coastal zone;
3. %of other land cover classes in coastal zone;
4. % of built up area within coastal strips of different width compared to wider coastal units;
5. % of other land cover classes within coastal strips of different width compared to widercoastal units;
6. km2 of protected areas within coastal strips of different width.

For the second monitoring, in addition to the indicator units defined for the first monitoring, the following units are to be calculated:

1. % of increase of built-up area, or land take;
2. % of change of other land cover classes;
3. % of change of protected areas.

Reporting units are coastal zones as defined by country and three coastal strips: the first strip 0 m to 300 m, the second strip 300 m to 1 km, and the third strip 1 km to 10 km from coastline. Coastal zonesand coastal strips are split with administrative units of NUTS3 level and hence the CCI25 parameters are calculated for units that combine coastal zones, coastal strips and administrative units, herein after reporting units. The expected outputs are digital maps and spreadsheet files with calculated parameters.

The following chapters describe methodology used for the CCI25 parameters calculation, data sourcesand data pre-processing. Aggregate views on the calculated CCI25 parameters are presented in the chapter 4.3. “Candidate Common Indicator 25 parameters” and more detailed data is given in Annexes. GIS database, digital maps and excel sheets are provided as auxiliary files supporting this Report.

4.1. Methodology

Following methodology provided in the Indicator guidance factsheet for CCI25 (UNEP/MAP, 2019), the several steps are performed as briefly explained below.

The first step is selection of the data sources. The required data includes land use/land cover data fortwo years, protected areas for two years, coastline for construction of costal strips/zone and administrative units. Requirements over data from the Indicator guidance factsheet for CCI25 are summarized in the Table 4.1. A comprehensive elaboration of adequate open data sources for the CCI25 calculation is given in "The Report and GIS database with calculation of the LCC indicator for thepilot areas" (Baučić et al, 2022). Thus, open data sources for the project area are selected in line with the findings ofthat report. Open data is accessed via several Internet services and downloaded, details are explainedin the following chapter.

Table 4.1: Requirements from the indicator guidance factsheet (modified from (Baučić et al, 2022)

	Requirements from the indicator guidance factsheet
Spatial extent	Data should cover coastal strip of 10 km width in the Mediterranean region
Spatial resolution	1 ha (grid data) Minimum mapping unit of 25 ha and 100 m of linear elements
Change detection	Minimum change detection of 5 ha
Temporal scale	5 years
Land use/land cover classification	Artificial surfaces (built-up areas)Agricultural land Forest and semi-natural land Wetlands Water bodies
Protected areas	Surface with any of the protection status
Coastal zone/strips	To be constructed from coastline: 300m, 1 km and 10 km width.
Administrative units	Level NUTS3 or equivalent

Next step is data pre-processing. It included data clipping and/or merging to the project area extent, transformation to the selected reference coordinate system, creation of costal strips, creation of reporting units by overlaying costal strips with administrative units, attribute data harmonization andarea calculation, land use/cover classes reclassification to CCI25 classes and some other technical stepssuch as dissolving geometry or creation of spatial indices for faster data processing. As all source datais originally vector data and data volume does not require significantly strong computing power, thereis no need to convert vector data to raster data. All the pre-processing and further overlays are doneover vector data and hence, the spatial resolution of source vector data is preserved. Data pre- processing is done via open QGIS software and formats used are Shape (SHP) and GeoPackage (GPKG)files.

After preparation of the source data, three data overlays are performed: the first one is overlay of theland use/cover data for 2012 year over the reporting units, the second one is overlay of the land use/cover data for 2018 year over the reporting units and the third one is overlay of the protected areas over the reporting units. Three resulting GIS layers includes calculation of areas for the combination of reporting units with land use/cover classes and combination of reporting units with protected areas. Overlays are done via open QGIS software and resulting GIS layers are stored as GPKGfiles.

For the CCI25's parameters calculation, various aggregation and functions are performed over table data from the three overlays specified above. Table data is converted to excel files and all the processing is done via Excel software such as pivot tables and charts visualizing the results. The resultsare prepared as a set of Excel files accompanying this Report.

For the cartographic visualization of the results, various thematic maps are prepared via open QGIS software and presented in this Report. The resulting GIS database is prepared as a set of GPKG files. AQGIS project file is prepared for the purpose of data and thematic maps viewing and further use.

4.2. Data

4.2.1. Project area

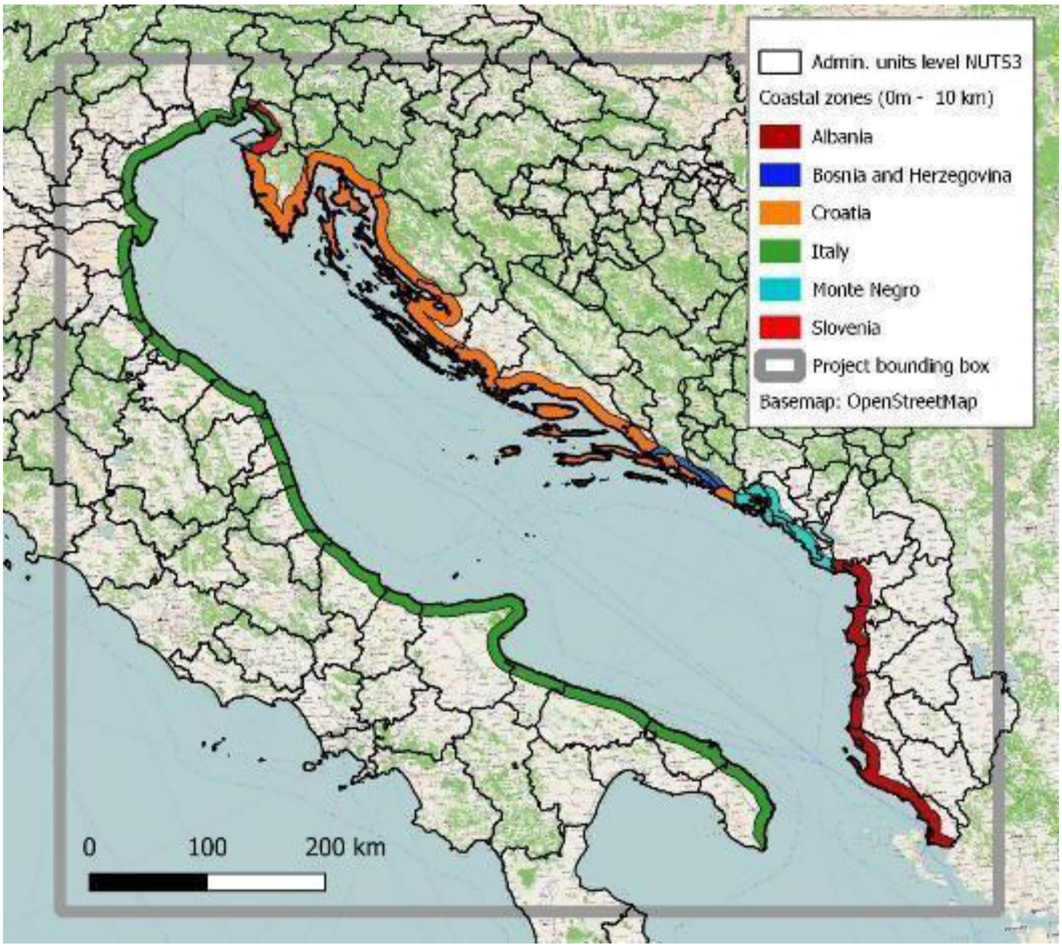
Project area covers Adriatic sub-region of the Mediterranean, namely the coastal zones of Albania, Bosnia and Herzegovina, Croatia, Montenegro, , Slovenia and Adriatic sea part of the Italian coastal zone. As defined by the Indicator guidance factsheet for CCI25 (UNEP/MAP, 2019), the CCI25 is calculated for the coastalzones as defined by the country and also three coastal strips: 0 to 300 m, 300 m to 1 km, and 1 km to10 km. In this project, **CCI25 is calculated for the costal strips. The coastal zone defined by the countryis omitted, but the word "coastal zone" is used for the total area of all three coastal strips, i.e. the coastal zone from 0 m to 1 km.** Map 4.1 visualize project area countries and their costal zones.

Table 4.2: Costal strips and zones areas in km 2 per project countries

	Coastal strips and zones areas in km2			
Country	**0-300 m**	**300 m - 1 km**	**1 km - 10 km**	**Coastal zone**
Albania	137.75	272.43	2,991.77	3,401.96
Bosnia and Herzegovina	6.13	7.26	412.55	425.93
Croatia	1 413.36	1 927.57	8 072.63	11 413.56
Italy (project area part)	394.05	844.94	10 131.09	11 370.08
Slovenia	12.44	20.68	409.86	442.98
Montenegro	72.77	142.85	1,257.11	1,472.73
Total	2 036.50	3 215.73	23 275.01	28,527.24

Table 4.2 provides areas in km 2 of costal strips and zones per each country. Total area of costal zonesfor all countries (from 0 to 10 km from the coastline) covers 28.527 km2. Significantly the largest costalzones are in

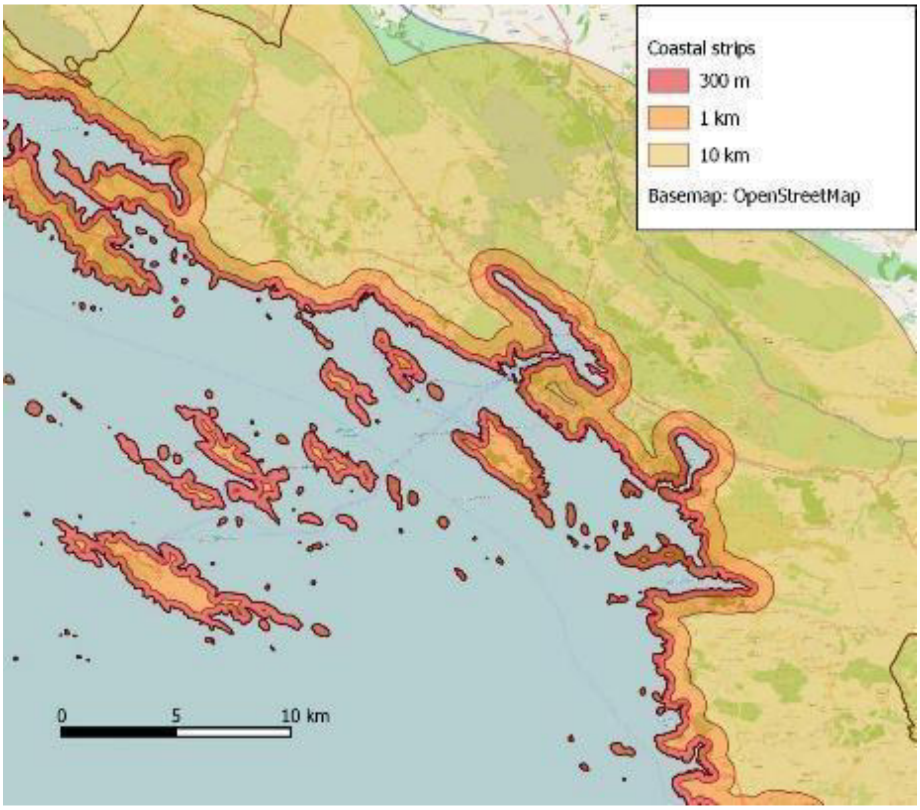
Italy and Croatia and the smallest ones in Slovenia and Bosnia and Herzegovina. Considering the narrower strip till 300 m from the coastline, significantly the largest one is in Croatia due to the large number of small islands that are completely inside the narrower costal strips (Map 4.2). Total area of coastal strips and their shares within the country are visualized on the Figure 4.1.



Map 4.1: Countries coastal zones (0 m to 10 km from the coastline) and administrative units level NUTS3

Table 4.3. provides areas in km 2 of coastal zone per each administrative unit in each country. In Albania coastal zone is located in seven administrative units, the Vlorë County has significantly the largest costal area. In Bosnia and Hercegovina coastal zone is located mainly in Herzegovina-Neretva Canton. Montenegro has seven coastal administrative units with Bar Municipality having the largest coastal area and Tivat Municipality with the smallest one. Italy has 24 costal administrative units. Foggia and Venezia have the largest coastal areas. In Slovenia coastal zone is located in two administrative units, the Coastal-Karst Statistical Region has significantly the largest costal area.

Annex 1 provides detailed table with areas by reporting units: the combination of administrative units and costal strips. Auxiliary Excel file contains data, pivot tables and charts.



Map 4.2: Croatian coast with many small islands covered by the narrowest costal strips

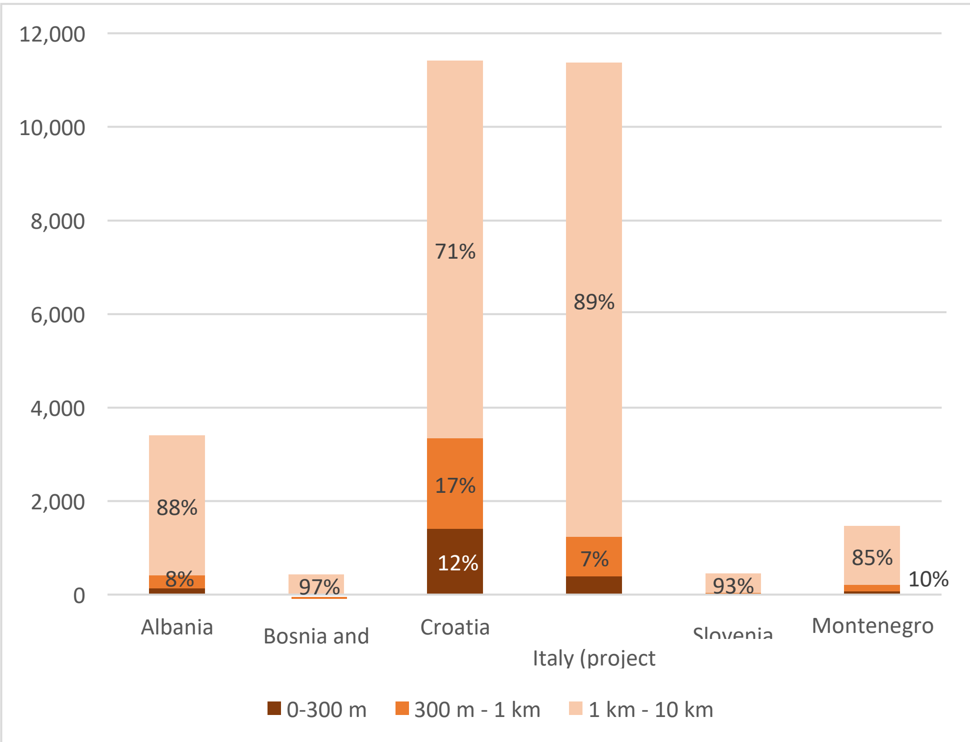


Figure 4.1: Total area of coastal strips and costal strips shares within the countries coastal zones

Table 4.3: Costal zone areas (0 m - 10 km) in km 2 per project countries and NUTS3 level administrative units

Country	NUTS3 equivalent	Coastal zone areain km2
Albania		3,401.96
	Durrës County	432.86
	Fier County	478.83
	Gjirokastër County	8.89
	Lezhë County	455.13
	Shkodër County	136.44
	Tirana County	275.22
	Vlorë County	1,614.59
Bosnia and Herzegovina		425.93
	City of Trebinje	96.39
	Herzegovina-Neretva Canton	329.54
Croatia		11,413.56
	Dubrovnik-Neretva County	1,680.26
	Istria County	1,629.61
	Lika-Senj County	1,028.08
	Primorje-Gorski Kotar County	1,923.50
	Split-Dalmatia County	2,285.18
	Šibenik-Knin County	798.09
	Zadar County	2,068.85
Montenegro		1,472.73
	Bar Municipality	350.54
	Budva Municipality	122.40
	Herceg Novi Municipality	208.28
	Kotor Municipality	297.53
	Old Royal CapitalCetinje	265.25
	Tivat Municipality	46.26
	Ulcinj Municipality	182.47

Country	NUTS3 equivalent	Coastal zone area in km2
Italy (project part)		11,370.08
	Ancona	549.71
	Ascoli Piceno	210.71
	Bari	822.49
	Barletta-Andria-Trani	492.66
	Brindisi	796.90
	Campobasso	358.30
	Chieti	671.59
	Fermo	252.16
	Ferrara	401.48
	Foggia	1,563.22
	Forlì-Cesena	152.15
	Gorizia	291.22
	Lecce	884.58
	Macerata	189.37
	Padova	14.24
	Pesaro eUrbino	383.30
	Pescara	168.13
	Ravenna	438.74
	Rimini	324.69
	Rovigo	477.01
	Teramo	425.03
	Trieste	212.09
	Udine	278.89
	Venezia	1,011.44
Slovenia		442.98
	Coastal-Karst Statistical Region	398.12
	Gorizia Statistical Region	44.86
Total		28,527.24

4.2.2. Data sources and pre-processing

Two pre-processing steps are necessary for all data. First step is to select reference coordinate system for calculating CCI25 and to transform all data to the selected one. As suggested by (Joint Research Centre, 2003), for purposes where area calculations is to be performed and data has extent over European regions, the Lambert Azimuthal Equal Area (LAEA) projection for Europe should be used, having reference number EPSG:3035. Hence, downloaded data is transformed to the coordinate system of the LAEA projection except land use/land cover data that was originally in LAEA projection. The second step is to clip data to the project area extent. The project area bounding box is constructed as shown on Map 4.1 with the following coordinates:

- Upper Left (EPSG:3035): 4.440.000 m, 2.570.000 m;
- Bottom Right (EPSG:3035): 5.240.000 m, 1.843.200 m.

and the corresponding GPKG file is created named AOI (a commonly used abbreviation for AreaOfInterest) to serve as clipping box for data.

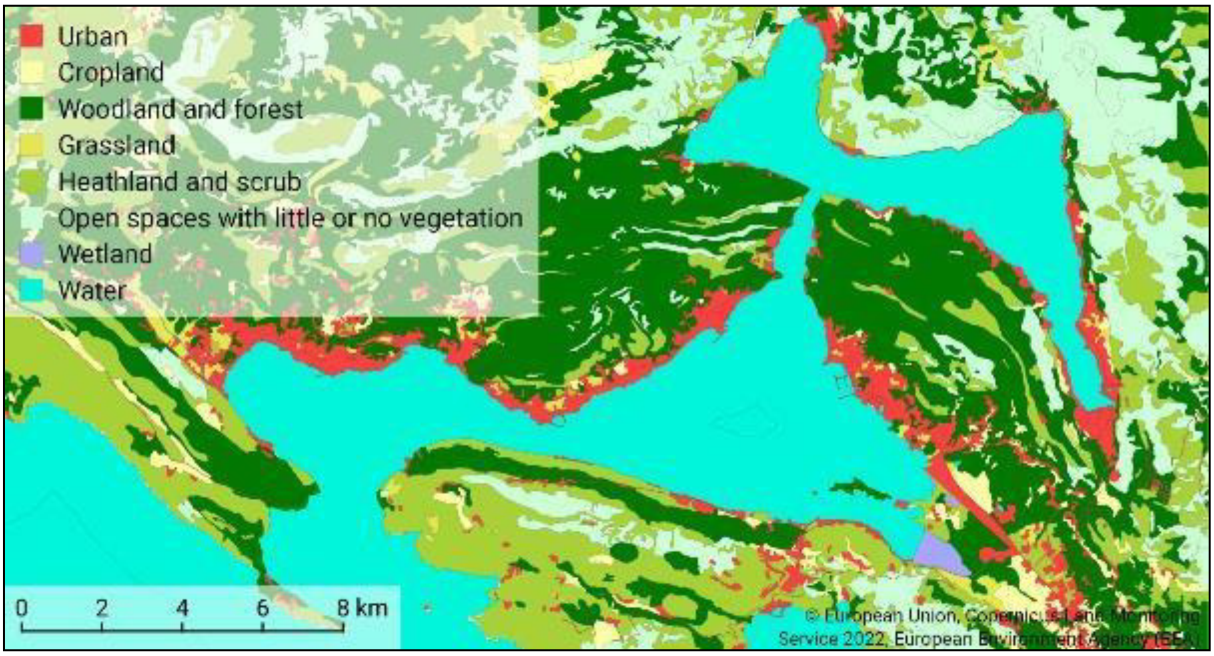
Four data sources are selected for the creation of GIS layers necessary for CCI25 calculation, details are given in the paragraphs that follows.

4.2.3. Land use/land cover data

Copernicus Coastal zones (CLMS-CZ) (https://land.copernicus.eu/local/coastal-zones) is selected data source for land use/land cover data. It is a part of the Copernicus Land Monitoring Service and it covers coastal area of EEA39[1] countries that is within 10 km of the coastline (partly modified EU-Hydro coastline). Currently, CLMS-CZ is available for 2012 and 2018, and it is planned to produce a new dataset every six years. Land use/land cover (LU/LC) classes are classified into 71 classes, based on satellite image classification, extensive visual interpretation from satellite images, and additional data sources such as national ortho-photo, Urban Atlas, Sentinel-2 images, and others (EEA, 2021). The minimum mapping unit is 0,5 ha and the minimum mapping width is 10 m (EEA, 2021). Data is stored in vector format (ESRI Geodatabase or GPKG), georeferenced in Lambert Equal Area Projection (LAEA, EPSG:3035). Land use /land cover classes are hierarchically organized into five levels, with level 1 consisting of eight classes (Map 4.3), and an overall 71 classes on the lowest hierarchical levels (EEA, 2021).

[1] Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kosovo, Latvia, Liechtenstein, Lithuania, Luxemburg, Malta, Montenegro,

Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the Former Yugoslav Republic of Macedonia



Map 4.3: Level 1 classification of CLMS-CZ data (Urban, Cropland, Woodland and forest, Grassland,Heathland and scrub, Open spaces with little or ni vegetation, Wetland and Water)

Table 4.4 summarizes required data characteristics from the Indicator guidance sheet and compares them with the characteristics of CLMS-CZ data. All the requirements are met, some even multiple times such as minimum mapping unit: CLMS-CZ data minimum mapping unit is 0,5 ha while the required is 25 ha. For now, the temporal scale is a bit larger for CLMS -CZ data (6 years).

Table 4.4: Comparison of data requirements and characteristics of CLMS-CZ data

	Requirements from the indicator guidancefactsheet	**Copernicus Coastal zones (CLMS-CZ) data**
Spatial extent	Coastal strip 10 km width Project area: Adriatic sub-region	Coastal strip: 10 km inland buffer zone Coverage: EEA39 countries
Spatial resolution	Minimum mapping unit (MMU): 25 ha Min.mapping width: 100 m of linear elements 1 ha (grid data for indicator calculation)	MMU: 0,5 ha Min. mapping width: 10 m Min. mapping length (no applicable) Reference scale: 1:10.000
Change detection	Minimum change detection: 5 ha	MMU for change: >= 0,5 ha Min. mapping width for change: >= 10 m
Temporal scale	5 years	6 years, planned to be 3 years Current available data is for year 2012 and 2018.
Used coastline	Coastal national zones and coastal strips –use of national coastlines data	EU-Hydro coastline

A specific matter is the semantic matching of the land use/land cover classes, which is shown in Table 4.5. The first level of CLMS-CZ data corresponds to the required classification given by Indicator guidance sheet except the class number 4 where second level classification should be used. CLMS-CZclass 4.1. Managed grassland is mapped to the indicator's class Agriculture, and CLMS-CZ class 4.2. Natural and semi-natural grassland is mapped to the indicator's class Forest and semi-natural land.

Table 4.5: Semantic matching of the land use/land cover classification required by Indicator guidance sheet and classification of CLMS-CZ data

LU/LC class and its definition from the Indicator guidance factsheet		**LU/LC class from Copernicus Coastal zones (CLMS-CZ) data**
Artificial surfaces(also referred as built-up areas)	Surfaces with dominant human influence but without agricultural land use. These areas include all artificial structures and their associated non-sealed and vegetated surfaces. Artificial structures are defined as buildings, roads, all constructions of infrastructure and other artificially sealed or paved areas. Associated non-sealed and vegetated surfaces are areas functionally related to human activities, except agriculture. Also, the areas where the natural surface is replaced by extraction and / or deposition or designed landscapes (such as urban parks or leisure parks) are mapped in this class. The land use is dominated by permanently populated areas and / or traffic, exploration, non-agricultural production, sports, recreation and leisure.	1 Urban
Agricultural	It includes: arable land, permanent crops, pastures and heterogeneous agricultural areas (complex cultivation patterns, land principally occupied by agriculture, with significant areas of natural vegetation).	2 Cropland (includes greenhauses) 4.1. Managed grassland
Forest and semi-natural land	It includes: forests, scrub and/or herbaceous vegetation associations, open spaces with little or no vegetation	3 Woodland and forest 4.2 Natural grassland 5. Heathland and scrub* 6. Open spaces with little or no vegetation*
Wetlands	Inland marshes, peatbogs, salt marshes, salinas, intertidal flats	7 Wetlands
Water bodies	Water courses, water bodies, coastal lagoons, estuaries, sea and ocean.	8 Water

Declared thematic accuracy is defined to be greater than 80 % for user and producer accuracies, and greater than 85 % for overall accuracy (EEA, 2021). These accuracies have been exceeded in the final product: overall accuracy is around 98 %, producer accuracies are greater than 87 % for all level 1 classes, and user accuracies are greater than 98 % for those classes (Planetek Italia S.r.l. 2021).

CLMS Coastal Zones data, namely Coastal zones 2012, Coastal zones 2018 and Coastal zones changes, are downloaded in GPKG format and in projected coordinate system EPSG:3035 from the following links:

- https://land.copernicus.eu/local/coastal-zones/coastal-zones-2012?tab=download
- https://land.copernicus.eu/local/coastal-zones/coastal-zones-2018?tab=download
- https://land.copernicus.eu/local/coastal-zones/coastal-zones-change-2012-2018?tab=download

When used, CLMS-CZ data has to be cited as: © European Union, Copernicus Land Monitoring Service <2022>, European Environment Agency (EEA).

Pre-processing of CLMS-CZ data included clipping by the project bounding box, conversion to SHP file format and creation of spatial indices for faster processing.

4.2.4. Coastline data

OpenStreetMap is a crowdsourced dataset but is nevertheless a valuable and reliable data source for certain geographic features. In the (Baučić et al, 2022) several open source data for coastlines are studied and final recommendation is to use official national data, and if those data are not available, coastline extracted from OpenStreetMap. Map 4.4 visualize variation of coastlines provided by different data sources.

Open Street Map coastline is used for construction of coastal strips and furthermore for construction of reporting units. Data is downloaded in SHP format and in geographic coordinate system WGS84 (EPSG: 4326) from the link:

- https://osmdata.openstreetmap.de/data/coastlines.html

This data is Copyright 2022 OpenStreetMap contributors. It is available under the Open Database License (ODbL).

Date of the data used is March 2022. Pre-processing of coastline data included clipping by the project bounding box and coordinate transformation to Lambert Azimuthal Equal Area (LAEA) projection EPSG:3035. Coastline GIS layer is used as a baseline for construction of coastal strips by open QGIS software.

Map 4.4: Variation of coastline data provided by different data sources.

4.2.5. Administrative units

In the (Baučić et al, 2022) recommendation for administrative units data is to use official national data, and if those data are not available, administrative boundaries extracted from OpenStreetMap. OpenStreetMap administrative data of NUTS3 level is used for construction of reporting units: a combination of coastal strips and administrative units. Data is downloaded in GeoJSON format and in geographic coordinate system WGS84 (EPSG: 4326) from the service:

- https://osm-boundaries.com/Map

This data is Copyright 2022 OpenStreetMap contributors. It is available under the Open Database License (ODbL).

Nomenclature of territorial units for statistics (NUTS) is a hierarchical system that divides territory of the EU, the UK, the EFTA countries, and some other countries in three levels: NUTS 1 (major socio- economic regions, with population between 3 and 7 million), NUTS 2 (basic regions for the application of regional policies, with population between 800 000 and 3 million), NUTS 3 (small regions for specific diagnoses, with population between 150 000 and 800 000) (https://ec.europa.eu/eurostat/web/nuts/background1). The Eurostat published the current NUTS 2021 classification that is valid from 1 January 2021 (https://ec.europa.eu/eurostat/web/nuts/background1). For the European union countries, the following units represent NUTS3 level: Croatia – counties, Italy – provinces; and for Slovenia – statistical regions. As candidate countries, it is agreed that NUTS3 level corresponds to counties for Albania and to whole country for Montenegro. However, municipalities are taken as the first level below the country level of Montenegro, because the data can later be easily aggregated to the country level. For Bosnia and Herzegovina there is no decision yet. According to NUTS3 definition, the cantonsof Federation of Bosnia and Hercegovina correspond to NUTS3 level. Republic of Srpska is directly divided into municipalities and thus the municipalities are taken as NUTS3 level units although havingsmaller population then 150.000.

Date of the data used is March 2022. Pre-processing of administrative data included clipping by the project bounding box and coordinate transformation to Lambert Azimuthal Equal Area (LAEA) projection EPSG:3035. Administrative units of NUTS3 level are extracted and GIS layer Administrativeunits in SHP format is produced (Map 4.1).

Overlay operation of Coastal strips and Administrative units is done by open source QGIS software andfinal GIS layer with Reporting units is produced in GPKG format.

4.2.6. Protected areas data

World Database on Protected Areas (WDPA) is the most exhaustive global database on terrestrial andmarine protected areas (https://www.protectedplanet.net/en/thematic-areas/wdpa?tab=WDPA). It is made in collaboration between UN Environment Program (UNEP) and the International Union for Conservation of Nature (IUCN) on one side and governments, non- governmental organizations, academia, and industries on other side (https://www.protectedplanet.net/en/thematic-areas/wdpa?tab=WDPA). WDPA is managed by UNEP World Conservation Monitoring Centre (UNEP-WCMC) and is being updated on a monthly basis. It includes comprehensive attribute data as name, area in km2, management category, status, type of designation, status year, country and location, governance type, managing authorities, management plan etc. (Map 4.5).

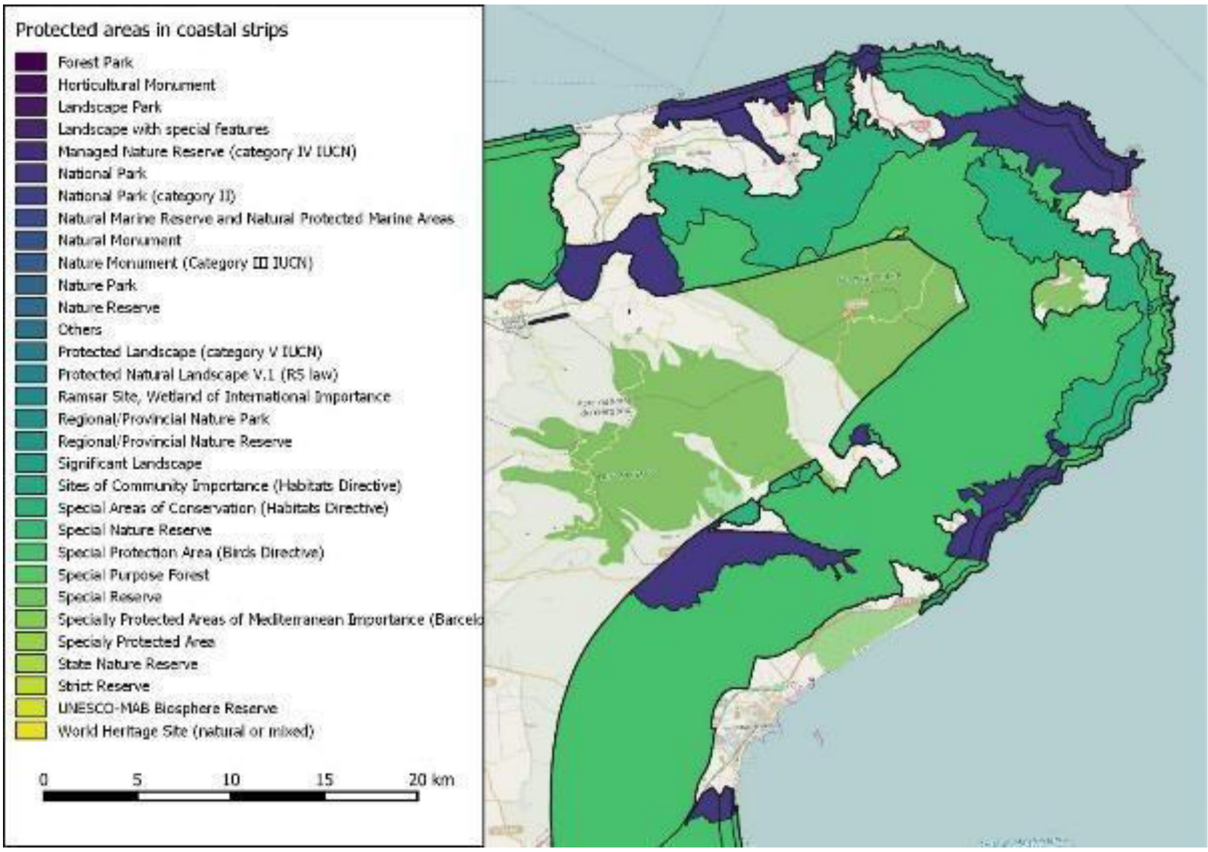
Map 4.5: Protected areas in WDPA database (https://www.protectedplanet.net/region/EU)

Data is downloaded in SHP format and in geographic coordinate system WGS84 (EPSG: 4326) from the service:

– https://www.protectedplanet.net

When used, data has to be cited as: UNEP-WCMC and IUCN (2022), Protected Planet: The World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures (WD-OECM) [Online], May 2022, Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net.

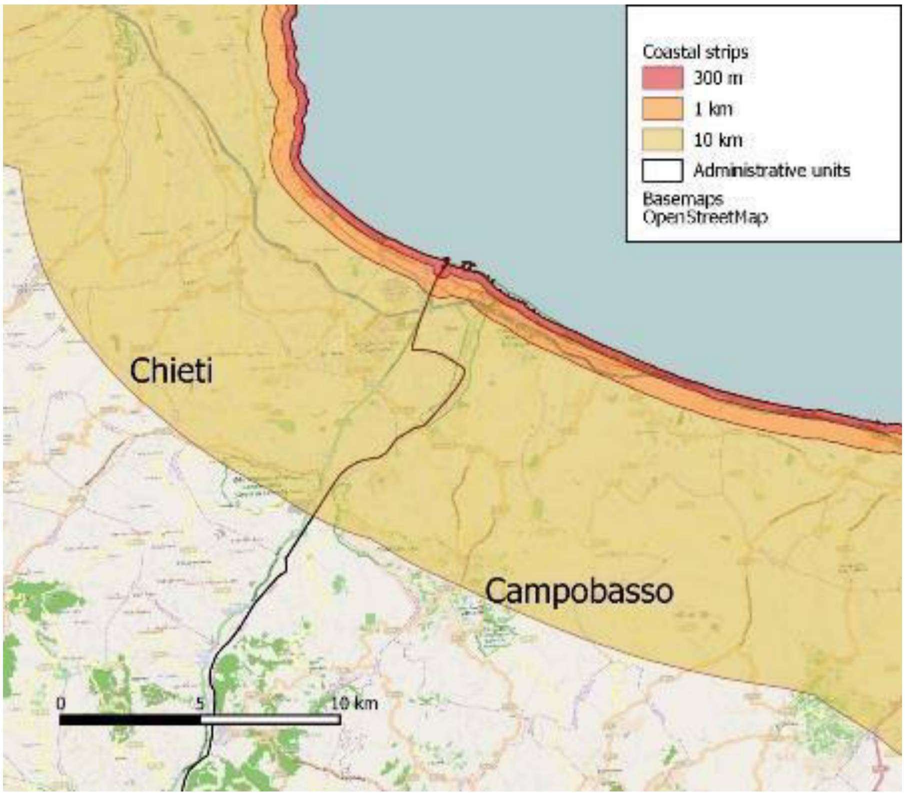
Data on protected areas are extracted for years 2012 and 2018. Pre-processing of protected areas data included clipping by the project bounding box and coordinate transformation to Lambert Azimuthal Equal Area (LAEA) projection EPSG:3035. Additional clipping is done with reporting units and final GIS layer with Protected areas is produced in GPKG format (Map 4.6).



Map 4.6: Protected areas extracted from WDPA database and clipped with reporting units

4.2.7. Construction of Reporting units and CCI25 parameters calculation

Reporting units are constructed as a combination of administrative units and coastal strips. A baselineused for construction of costal strips is coastline from OpenStreetMap database. Final GIS layer with Reporting units is produced in GPKG format (Map 4.7).



Map 4.7: Reporting units layer (combination of coastal strips and administrative units NUTS3 level)

During GIS overlay processing, the mismatching between Reporting units borders and CLMS CZ data is discovered. There is mismatching along the coastlines and along the coastal zone border lines showing 10 km distance from the coastline. The reason for the differences is that CLMS-CZ data is using modified EU-Hydro coastline and Reporting units is using OpenStreetMap coastline, as well as the possibility that different algorithms construct zones differently. Along the coastline, there are areas of Reporting units that are not covered by the CLMS-CZ data as well as areas where CLMS-CZ data covers areas on sea (Table 4.6, part a). The similar differences are along the coastal zone borderline. There are areas where CLMS-CZ data covers areas further then line of 10 km distance constructed from OpenStreetMap data (Table 4.6, part c) or areas of Reporting units that are not covered by the CLMS-CZ data (Table 4.6, part e and f). For CCI25 parameters calculation, CLMS-CZ data is cut by Reporting units. CLMS-CZ data exceeding area of Reporting units is omitted (Table 4.6, part b and d). Along the coastline, some areas got land use/cover class Water (Table 4. part b). Along the coastal zone border of 10 km distance from the coastline, some areas got null values (Table 4.6, part e and f).

The differences in areas on country level are given in Table 4.7. Differences on the Reporting units level are given in the Annex 2.

Table 4.6: Mismatching of coastal strips borders between Reporting units and CLMS-CZ data

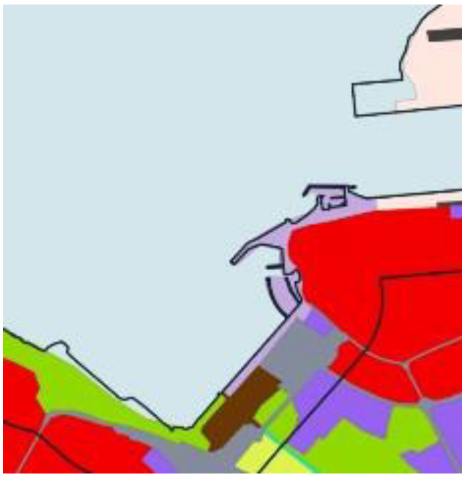
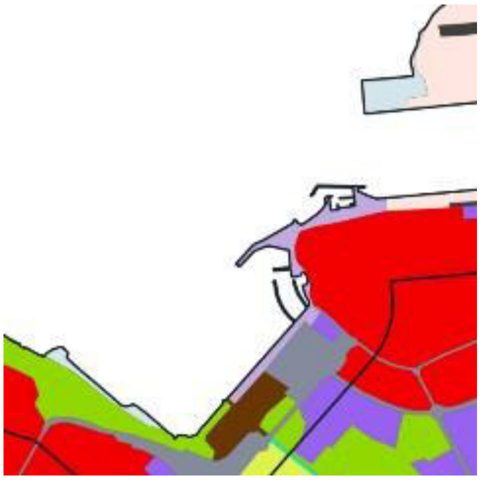
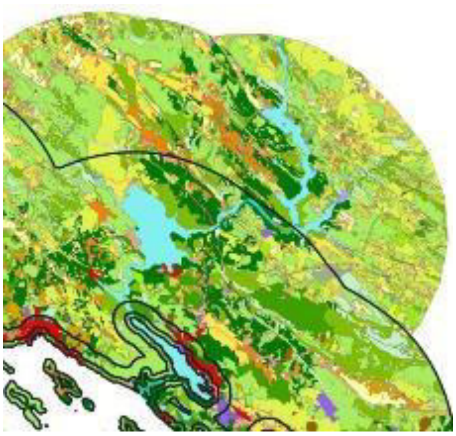
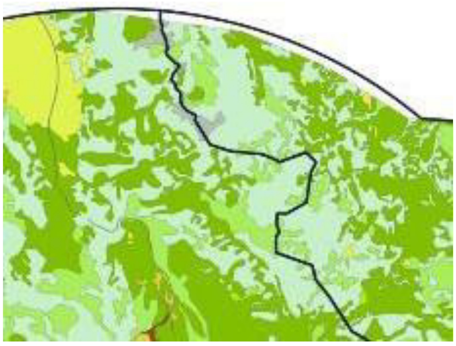
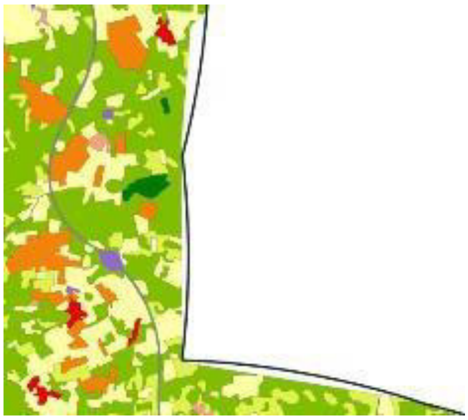
 a) Koper area – mismatching of coastlines	 b) Koper area – CLMS-CZ data after cliping with Reporting units
 c) Šibenik area (Krka river estuary) – mismatching of 10 km border of costal zone	 d) Šibenik area (Krka river estuary) – CLMS-CZ data after cliping with Reporting units
 e) Cetinje area - mismatching of 10 km border of costal zone	 f) Istra area - mismatching of 10 km border of costal zone

Table 4.7: Difference of reporting units areas in km2 (Reporting units - CLMS-CZ data)

Country	Areas in km2 defined by the reporting units		Areas in km2 defined by Copernicus Coastal zones (CLMS-CZ) LC / LU data 2012/2018		Difference of areas in km2 (Reporting units - CLMS-CZ data)			
	1 km - 10 km	Total	1 km - 10 km	Total	0-300 m	300 m - 1 km	1 km - 10 km	Total
	1	2	3	4	5	6	7	8
Albania	2,991.77	3,401.96	2,989.56	3,399.75	0.00	0.00	-2.21	-2.21
Bosnia and Herzegovina	412.55	425.93	410.45	423.84	0.00	0.00	-2.10	-2.10
Croatia	8,072.63	11,413.56	8,057.34	11,398.27	0.00	0.00	-15.29	-15.29
Italy	10,131.09	11 370.08	10,121.39	11,360.38	0.00	0.00	-9.70	-9.70
Slovenia	409.86	442.98	408.43	441.55	0.00	0.00	-1.43	-1.43
Montenegro	1,257.11	1,472.73	1,251.87	1,467.49	0.00	0.00	-5.24	-5.24
Grand Total	23,275.01	28,527.24	23,239.04	28,491.27	0.00	0.00	-35.97	-35.97

Total of 37 km^2 is size of area of Reporting units not covered by CLMS-CZ data. The CCI25 indicator parameters for land use/land cover classes are calculated based on areas covered by CLMS-CZ data, thus areas for the third coastal strips (1 km – 10 km) correspond to areas given in Table 4.7, column number 4. The CCI25 indicator parameters for protected areas are calculated based on areas defined by the Reporting units, thus areas for the third coastal strips (1 km – 10 km) correspond to areas givenin Table 4.7, column number 2.

4.3. Candidate Common Indicator 25 parameters

Based on the GIS overlays performed, as described in the chapter 4.1, resulting GIS layers include calculation of areas for the combination of reporting units with land use/cover classes and combination of reporting units with protected areas. For land use/land cover data the first monitoring year is 2012, and the second one is 2018, as well as for protected data. Data is further aggregated and CCI25 parameters are calculated. Aggregate results and their illustrations by graphs and thematic maps are given in the following paragraphs. The complete geodatabase and tabular data are provided as auxiliary files.

4.3.1. CCI25 parameters on country level year 2012

Calculated CCI25 parameters for year 2012 summarized on the level of the countries are given in the following tables and graphs. A detailed presentation by countries is given in the separate chapters.

Table 4.8: Areas of CCI25 land use classes in the coastal zone 0-10 km and their percentage, year 2012

2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Albania	Area in km 2	216.59	1,219.79	1,670.18	186.44	106.75	3,399.75
	% in coastal zone	6.37%	35.88%	49.13%	5.48%	3.14%	100.00%
Bosnia and Herzegovina	Area in km 2	4.38	9.68	409.73	0.04	0.00	423.84
	% in coastal zone	1.03%	2.28%	96.67%	0.01%	0.00%	100.00%
Croatia	Area in km 2	611.68	1,330.23	9,322.26	96.06	38.04	11,398.27
	% in coastal zone	5.37%	11.67%	81.79%	0.84%	0.33%	100.00%
Italy (project part)	Area in km 2	1 557.66	6 805.37	1 708.74	1 034.97	253.65	11 360.38
	% in coastal zone	13.71%	59.90%	15.04%	9.11%	2.23%	100.00%
Slovenia	Area in km 2	39.13	108.97	285.01	1.17	7.27	441.55
	% in coastal zone	8.86%	24.68%	64.55%	0.26%	1.65%	100.00%
Montenegro	Area in km 2	70.37	100.46	1,267.55	6.95	22.16	1,467.49
	% in coastal zone	4.80%	6.85%	86.38%	0.47%	1.51%	100.00%
Grand Total	Area in km 2	2 499.81	9 574.50	14 663.47	1 325.62	427.87	28 491.27
	% in coastal zone	8.77%	33.61%	51.47%	4.65%	1.50%	100.00%

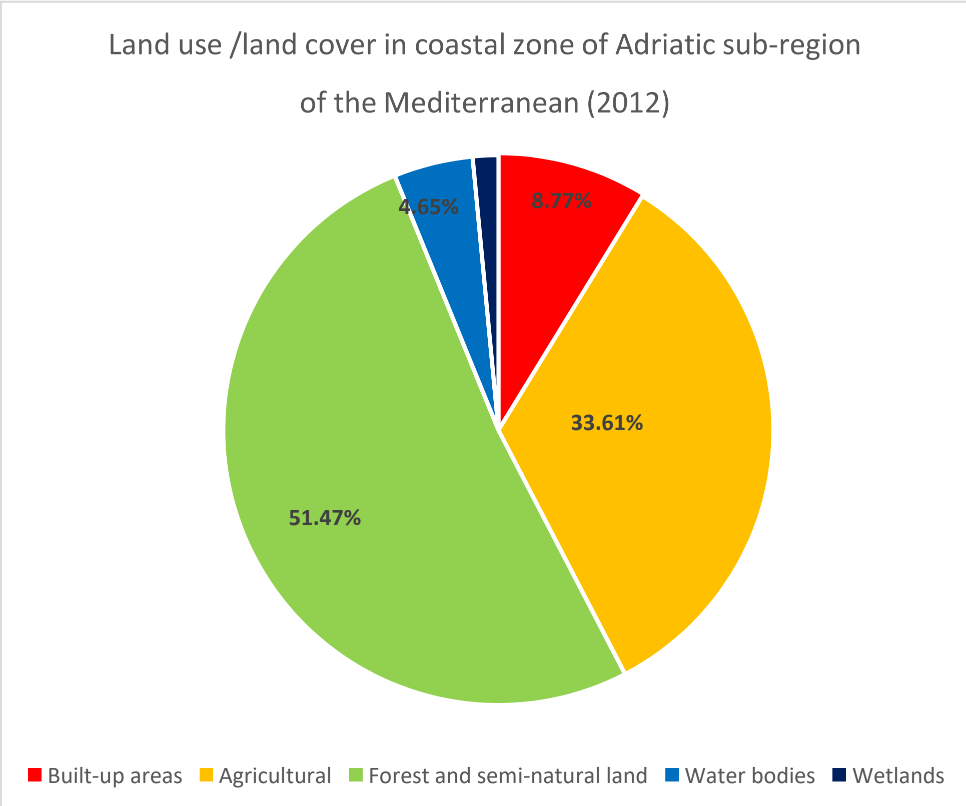


Figure 4.2: CCI25 land use classes in the coastal zone of Adriatic sub-region, year 2012

In the Adriatic sub-region, forest and semi-natural land dominates in the coastal zone with 51% followed with agriculture with 34%. Built up areas occupy 9% of the coastal zone in year 2012 (Figure 4.2).

Studying absolute values in year 2012, the most forest and semi-natural land is located in Croatia (9.322km2), agriculture land in Italy (6.805 km2) and built up land in Italy (1.557 km2), Figure 4.3 and Table 4.9.

Studying relative values per country in year 2012 (Figure 4.4, Table 4.8), the largest share of forest and semi-natural land is located in Bosnia and Herzegovina (97 %), of agriculture land in Italy (60 %) and built up land in Italy (14 %).

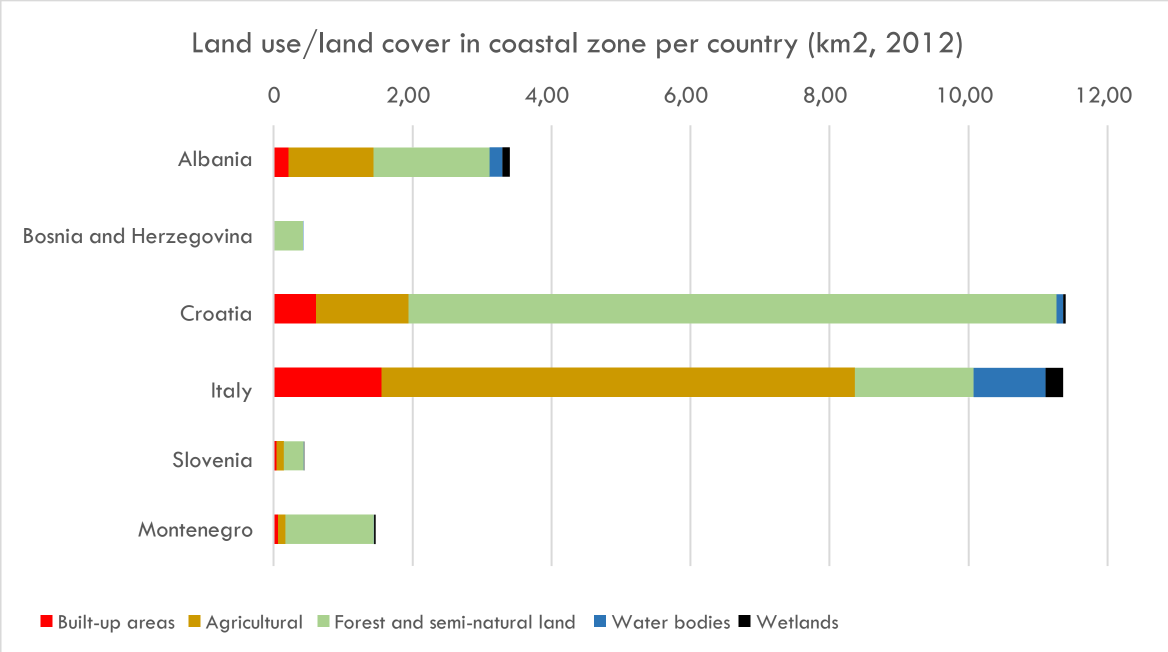


Figure 4.3: CCI25 land use classes in the coastal zone per country in km 2, year 2012

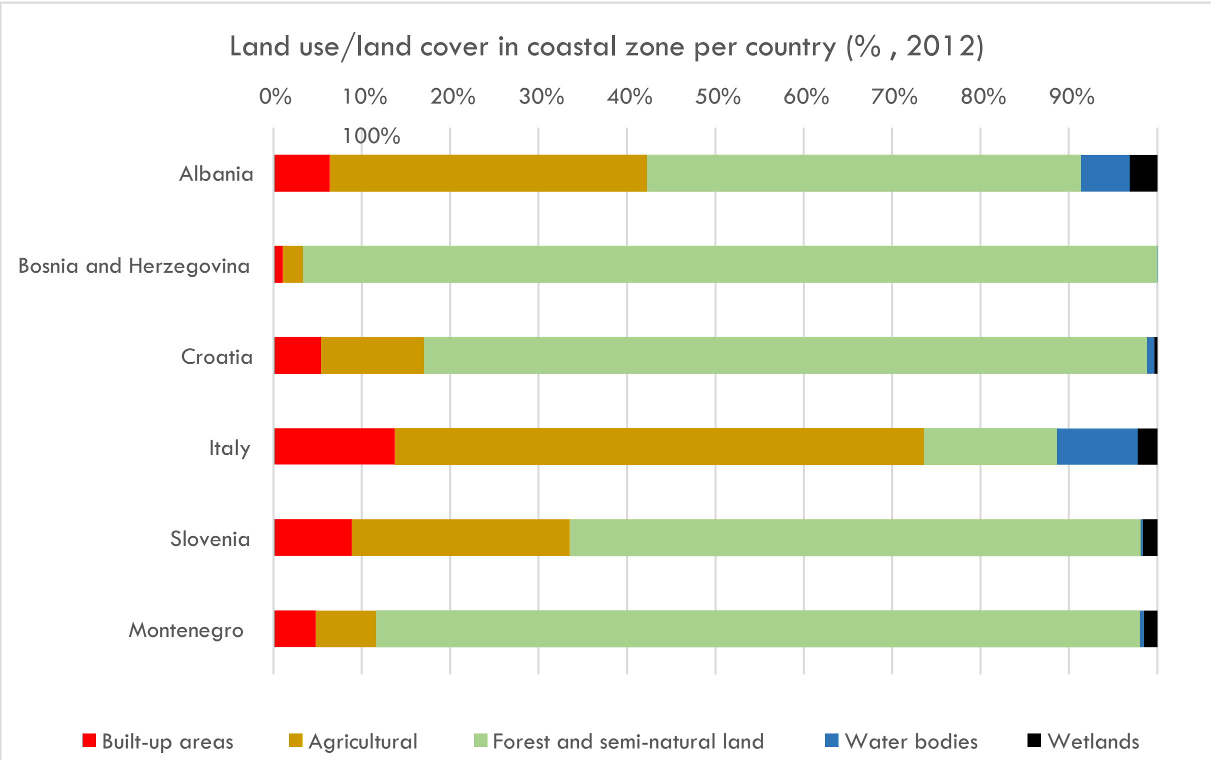


Figure 4.4: CCI25 land use classes in the coastal zone per country in percentage, year 2012

Table 4.9. provides detailed data per countries per costal strips for the main CCI25 land use classes. Regarding built up areas, the most are located in the coastal strip 1-10 km. The largest share in the narrowest coastal strip of 300 m are located in Croatia (29 %, Map 4.8) and Montenegro (26%, Map 4.9). Figure 4.5: illustrates built up areas in km2 per costal strips per country in year 2012. Although Croatia has

the largest built up area in the narrower coastal strip of 300 m (cca 178 km 2), it should betaken into account that Croatia has a very indented coastline with a longer length.

Table 4.9: Areas of CC125 land use classes and their percentage in the coastal zone, year 2012

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	**0-300 m**	**300 m -1 km**	**1-10 km**	**0 m -10 km**	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**
Built-up areas	Areas in km2				Percentage of coastal strips within coastal zone (0m-1km)			
Albania	14.36	24.71	177.52	216.59	6.63%	11.41%	81.96%	100.00%
Bosnia and Herzegovina	0.77	0.53	3.08	4.38	17.66%	12.10%	70.24%	100.00%
Croatia	178.41	132.15	301.13	611.68	29.17%	21.60%	49.23%	100.00%
Italy (project part)	150.49	264.13	1 143.04	1 557.66	9.66%	16.96%	73.38%	100.00%
Slovenia	6.39	7.63	25.11	39.13	16.33%	19.50%	64.16%	100.00%
Montenegro	18.57	19.49	32.31	70.37	26.38%	27.70%	45.91%	100.00%
Total	368.98	448.65	1 682.18	2 499.81	14.76%	17.95%	67.29%	100.00%
Agricultural land	Areas in km2				Percentage of coastal strips within coastal zone (0m-1km)			
Albania	6.87	37.92	1 175.00	1 219.79	0.56%	3.11%	96.33%	100.00%
Bosnia and Herzegovina	0.04	0.16	9.49	9.68	0.37%	1.60%	98.03%	100.00%
Croatia	73.17	194.98	1 062.07	1 330.23	5.50%	14.66%	79.84%	100.00%
Italy (project part)	56.36	315.91	6 433.10	6 805.37	0.83%	4.64%	94.53%	100.00%
Slovenia	2.17	6.92	99.88	108.97	1.99%	6.35%	91.66%	100.00%
Montenegro	1.17	8.78	90.51	100.46	1.17%	8.74%	90.10%	100.00%
Total	139.78	564.65	8 870.06	9 574.50	1.46%	5.90%	92.64%	100.00%
Forest and semi-natural land	Areas in km2				Percentage of coastal strips within coastal zone (0m-1km)			
Albania	87.64	152.39	1 430.15	1 670.18	5.25%	9.12%	85.63%	100.00%
Bosnia and Herzegovina	5.28	6.57	397.88	409.73	1.29%	1.60%	97.11%	100.00%
Croatia	1 131.48	1 592.73	6 598.05	9 322.26	12.14%	17.09%	70.78%	100.00%

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	0-300 m	300 m -1 km	1-10 km	0 m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Italy (project part)	139.95	153.81	1 414.98	1 708.74	8.19%	9.00%	82.81%	100.00%
Slovenia	2.05	3.53	279.43	285.01	0.72%	1.24%	98.04%	100.00%
Montenegro	50.79	111.49	1 105.27	1 267.55	4.01%	8.80%	87.20%	100.00%
Total	1 417.20	2 020.53	11 225.75	14 663.47	9.66%	13.78%	76.56%	100.00%
Water bodies	Areas in km2				Percentage of coastal strips within coastal zone (0m-1km)			
Albania	16.16	26.76	143.52	186.44	8.67%	14.35%	76.98%	100.00%
Bosnia and Herzegovina	0.04	0.00	0.00	0.04	100.00%	0.00%	0.00%	100.00%
Croatia	26.44	3.75	65.86	96.06	27.53%	3.91%	68.57%	100.00%
Italy (project part)	31.76	79.70	923.51	1 034.97	3.07%	7.70%	89.23%	100.00%
Slovenia	0.22	0.06	0.88	1.17	19.00%	5.49%	75.51%	100.00%
Montenegro	1.35	0.32	5.27	6.95	19.47%	4.59%	75.94%	100.00%
Total	75.98	110.60	1 139.05	1 325.62	5.73%	8.34%	85.93%	100.00%
Wetlands	Areas in km2				Percentage of coastal strips within coastal zone (0m-1km)			
Albania	12.72	30.67	63.36	106.75	11.92%	28.73%	59.36%	100.00%
Bosnia and Herzegovina	0.00	0.00	0.00	0.00	-	-	-	-
Croatia	3.85	3.96	30.23	38.04	10.13%	10.40%	79.47%	100.00%
Italy (project part)	15.50	31.38	206.77	253.65	6.11%	12.37%	81.52%	100.00%
Slovenia	1.60	2.53	3.14	7.27	22.05%	34.80%	43.15%	100.00%
Montenegro	0.89	2.77	18.50	22.16	4.01%	12.52%	83.48%	100.00%
Total	34.56	71.31	322.00	427.87	8.08%	16.67%	75.26%	100.00%

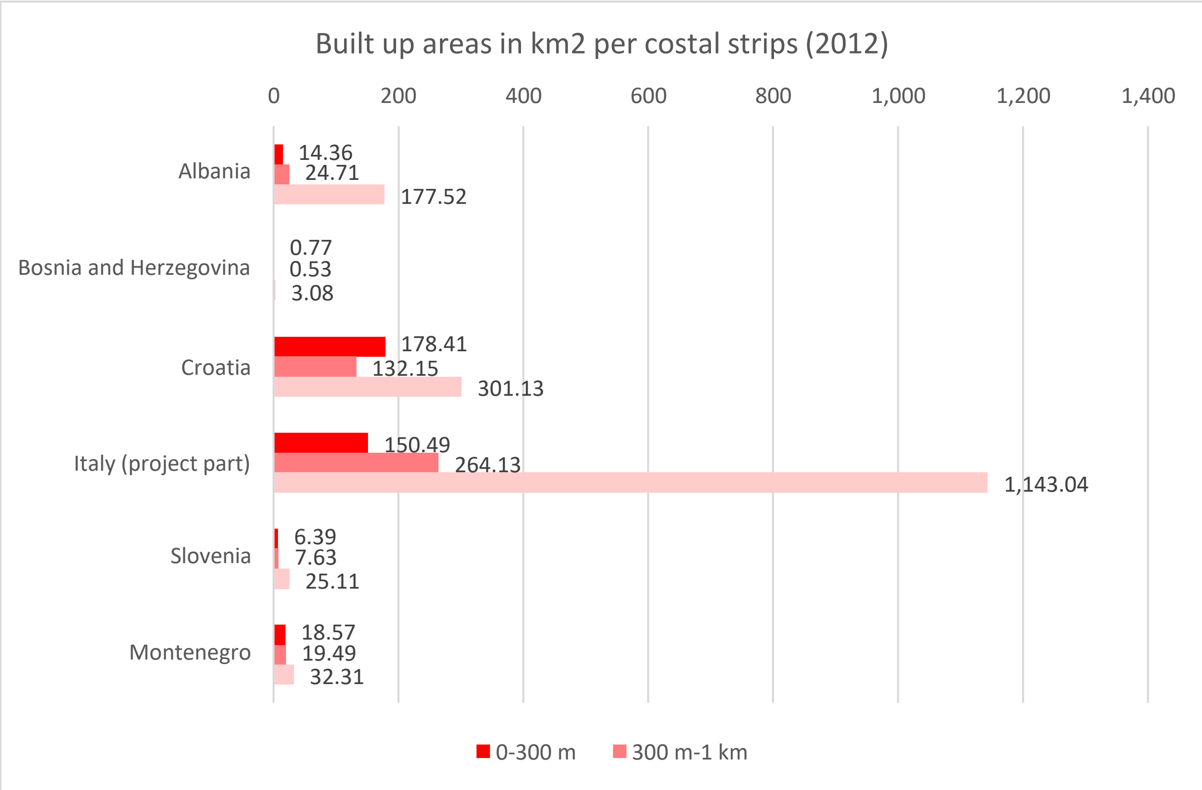
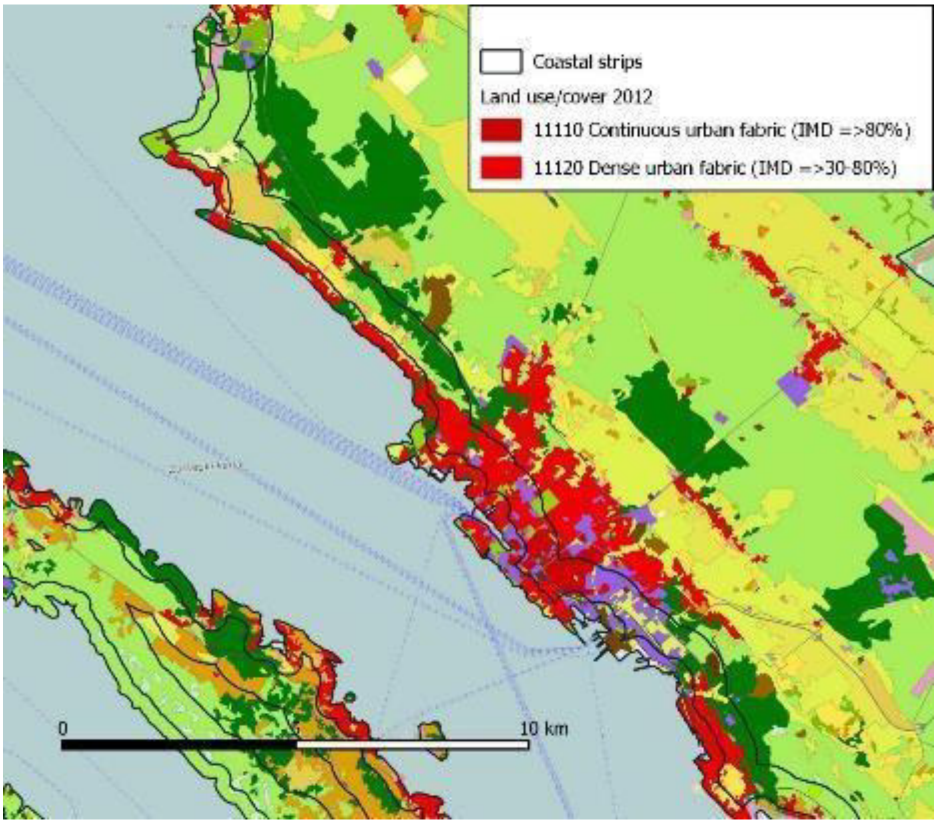
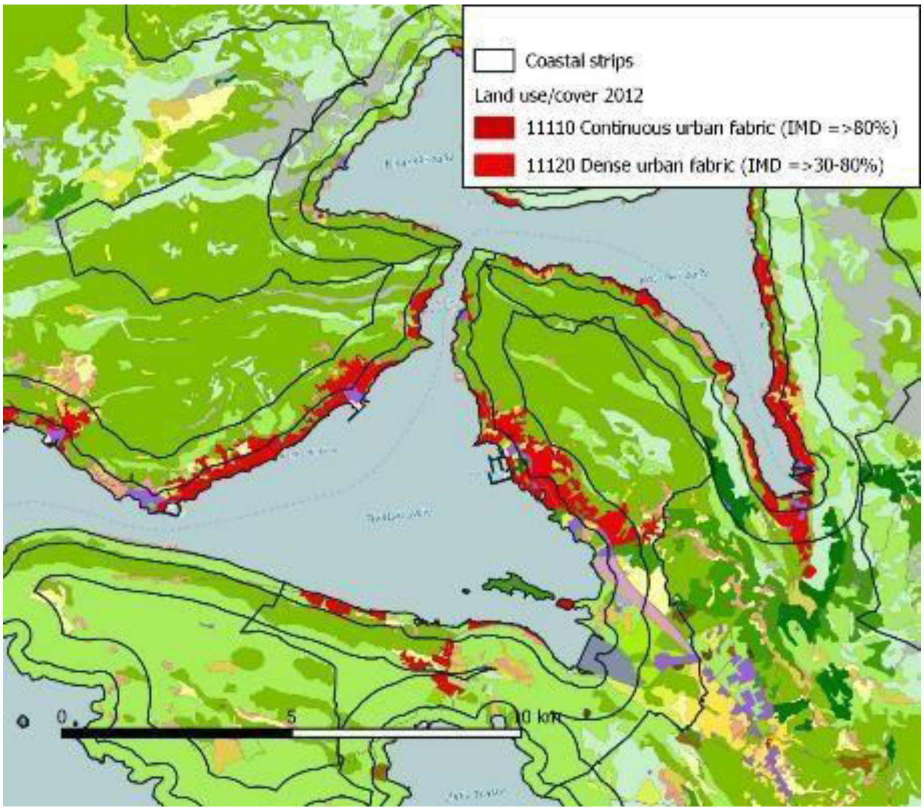


Figure 4.5: Built up area in km2 per costal strips per country in year 2012



Map 4.8: Built up areas along the narrower coastal strip in Croatia (areas around the city of Zadar)



Map 4.9: Built up areas along the narrower coastal strip in Montenegro (areas in Boka Kotorska bay)

4.3.2. CCI25 parameters on country level year 2018

Calculated CCI25 parameters for year 2018 summarized on the level of the countries are given in the following tables and graphs. A detailed presentation by countries is given in the separate chapters.

Table 4.10: Areas of CCI25 land use classes in the coastal zones and their percentage, year 2018

2018		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Albania	Area in km 2	223.93	1 216.14	1 668.21	184.75	106.72	3 399.75
	% in coastal zone	6.59%	35.77%	49.07%	5.43%	3.14%	100.00%
Bosnia and Herzegovina	Area in km 2	4.64	9.71	409.45	0.04	0.00	423.84
	% in coastal zone	1.09%	2.29%	96.60%	0.01%	0.00%	100.00%
Croatia	Area in km 2	617.46	1 340.67	9 306.18	95.94	38.02	11 398.27
	% in coastal zone	5.42%	11.76%	81.65%	0.84%	0.33%	100.00%
Italy (project part)	Area in km 2	1 568.18	6 797.40	1 705.47	1 033.85	255.48	11 360.38
	% in coastal zone	13.80%	59.83%	15.01%	9.10%	2.25%	100.00%

2018		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Slovenia	Area in km 2	39.13	109.05	284.92	1.17	7.27	441.55
	% in coastal zone	8.86%	24.70%	64.53%	0.26%	1.65%	100.00%
Montenegro	Area in km 2	73.27	100.02	1 265.14	6.89	22.16	1 467.49
	% in coastal zone	4.99%	6.82%	86.21%	0.47%	1.51%	100.00%
Grand Total	Area in km 2	2 526.60	9 573.00	14 639.37	1 322.64	429.66	28 491.27
	% in coastal zone	8.87%	33.60%	51.38%	4.64%	1.51%	100.00%

On the level of Adriatic Sub-region in year 2018, the land use/cover classes in the coastal zone occupy almost the same shares as in year 2012.

The absolute values in year 2018 show that the most forest and semi-natural land is located in Croatia (9.306 km2), agriculture land in Italy (6.797 km2) and built-up land in Italy (1.568 km2), Figure 4.6 and Table 4.10.

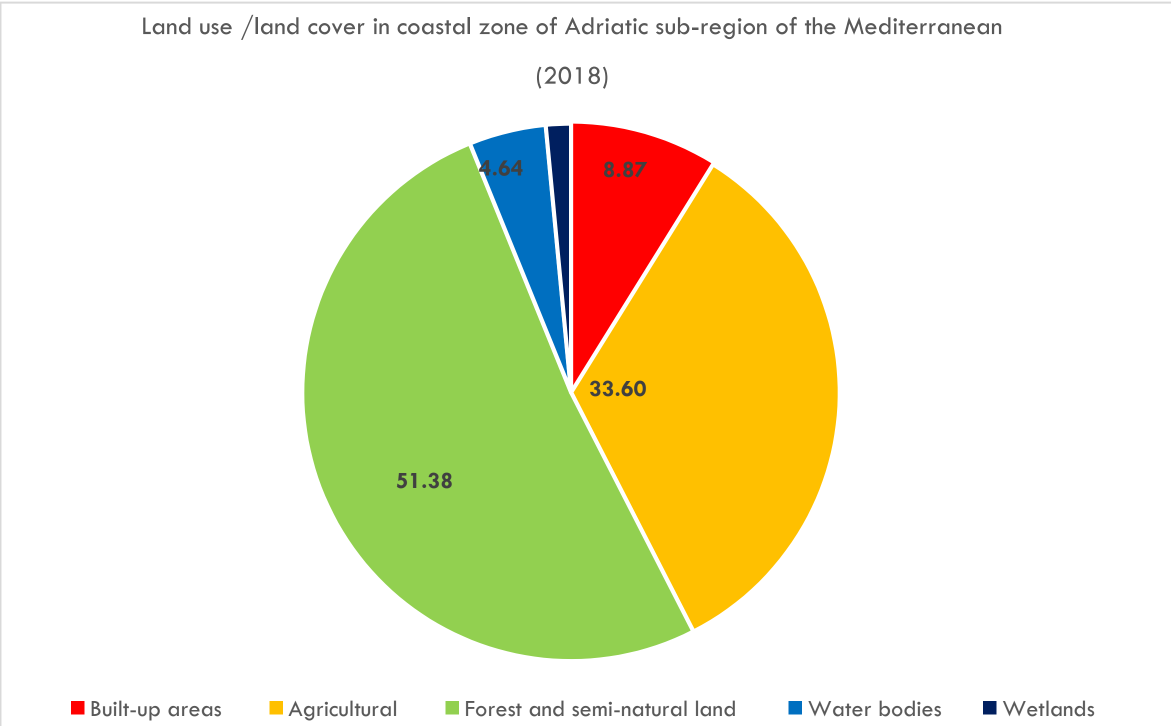


Figure 4.6: CCI25 land use classes in the coastal zone of Adriatic sub-region, year 2018

Studying relative values per country in year 2018 (Figure 4.6, Table 4.10), the largest share of forest and semi-natural land is located in Bosnia and Herzegovina (97%), of agriculture land in Italy (60%) and built-up land in Italy (14 %).

Table 4.11. provides detailed data per countries per costal strips for the main CCI25 land use classes. Regarding built up areas, the most are located in the coastal strip 1-10 km. The largest share in the narrowest coastal strip of 300 m are located in Croatia (29 %) and Montenegro (26%). Figure 4.9. illustrates built up areas in km2 per costal strips per country in year 2018.

Detailed analysis of land use/cover changes between years 2012 and 2018 is elaborated in the nextchapter.

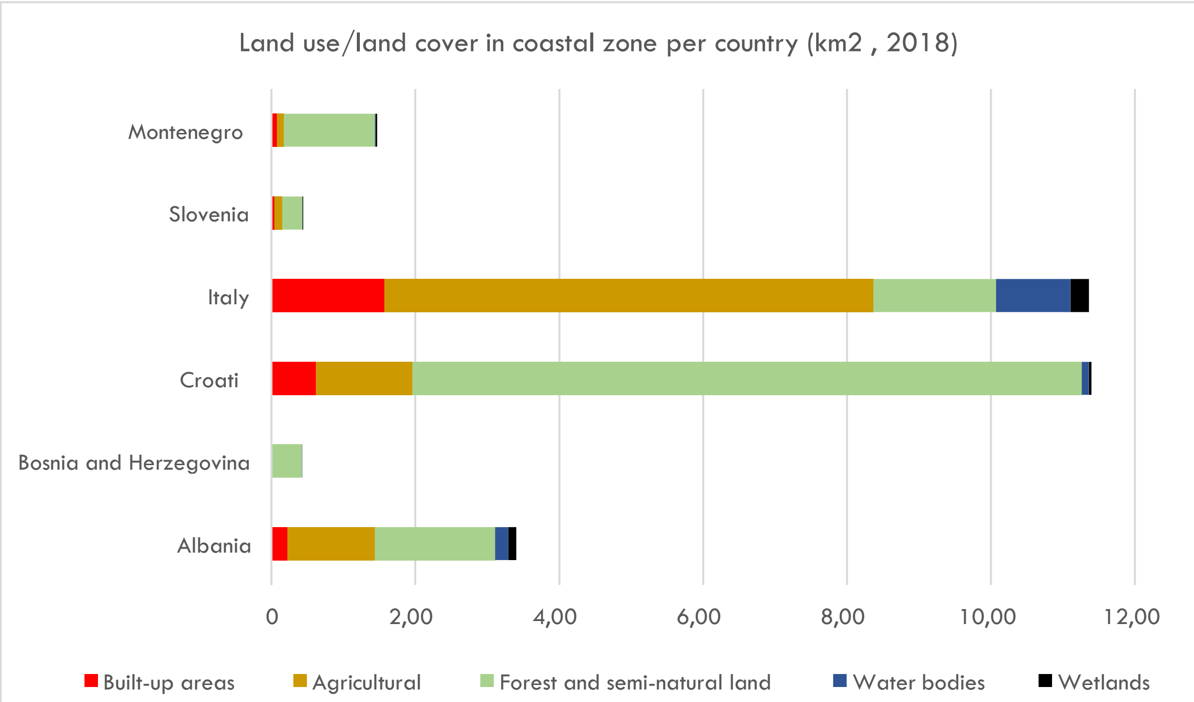


Figure 4.7: CCI25 land use classes in the coastal zone per country in km 2, year 2018

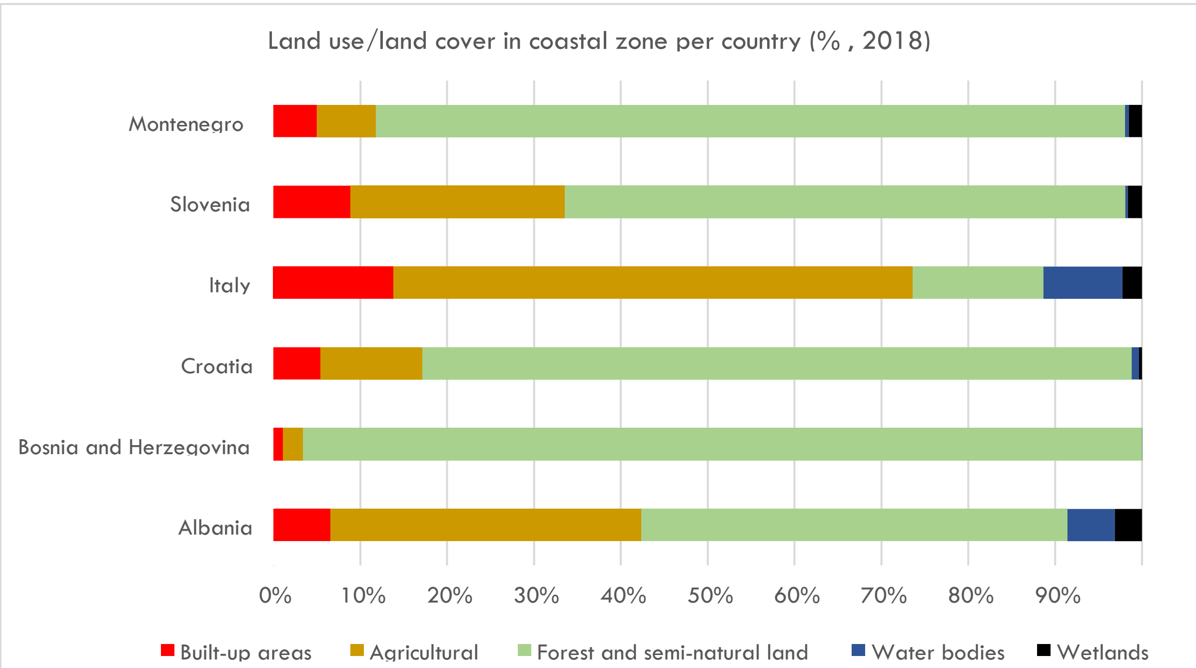


Figure 4.8: CCI25 land use classes in the coastal zone per country in percentage, year 2018

Table 4.11: Areas of CCI25 land use classes and their percentage in the coastal zone, year 2018

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2018	**0-300 m**	**300 m - 1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m - 1 km**	**1-10 km**	**0m -10 km (control**
Built-up areas	Areas in km2				% of c. strips within c. zone (0m-1km)			
Albania	15.67	25.89	182.36	223.93	7.00%	11.56%	81.44%	100.00%
Bosnia and Herzegovina	0.78	0.53	3.33	4.64	16.84%	11.43%	71.73%	100.00%
Croatia	180.57	133.42	303.47	617.46	29.24%	21.61%	49.15%	100.00%
Italy (project part)	150.90	264.58	1 152.70	1 568.18	9.62%	16.87%	73.51%	100.00%
Slovenia	6.39	7.63	25.11	39.13	16.33%	19.50%	64.17%	100.00%
Montenegro	19.05	20.09	34.14	73.27	25.99%	27.42%	46.59%	100.00%
Total	373.36	452.14	1 701.11	2 526.60	14.78%	17.90%	67.33%	100.00%
Agricultural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
Albania	6.58	37.69	1 171.86	1 216.14	0.54%	3.10%	96.36%	100.00%
Bosnia and Herzegovina	0.04	0.16	9.52	9.71	0.37%	1.60%	98.04%	100.00%
Croatia	73.86	196.38	1 070.44	1 340.67	5.51%	14.65%	79.84%	100.00%
Italy (project part)	56.06	315.31	6 426.03	6 797.40	0.82%	4.64%	94.54%	100.00%
Slovenia	2.17	6.92	99.97	109.05	1.99%	6.34%	91.67%	100.00%
Montenegro	1.17	8.70	90.15	100.02	1.17%	8.70%	90.12%	100.00%
Total	139.88	565.15	8 867.97	9 573.00	1.46%	5.90%	92.64%	100.00%
Forest and semi-natural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
Albania	88.83	151.50	1 427.89	1 668.21	5.32%	9.08%	85.59%	100.00%
Bosnia and Herzegovina	5.27	6.57	397.60	409.45	1.29%	1.61%	97.11%	100.00%
Croatia	1 128.90	1 590.09	6 587.19	9 306.18	12.13%	17.09%	70.78%	100.00%
Italy (project part)	139.64	153.92	1 411.91	1 705.47	8.19%	9.03%	82.79%	100.00%

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2018	**0-300 m**	**300 m - 1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m - 1 km**	**1-10 km**	**0m -10 km (control**
Slovenia	2.05	3.53	279.34	284.92	0.72%	1.24%	98.04%	100.00%
Montenegro	50.36	110.97	1 103.81	1 265.14	3.98%	8.77%	87.25%	100.00%
Total	1 415.05	2 016.58	11 207.74	14 639.37	9.67%	13.78%	76.56%	100.00%
Water bodies	Areas in km2				% of c. strips within c. zone (0m-1km)			
Albania	14.06	26.77	143.93	184.75	7.61%	14.49%	77.90%	100.00%
Bosnia and Herzegovina	0.04	0.00	0.00	0.04	100.00%	0.00%	0.00%	100.00%
Croatia	26.18	3.75	66.01	95.94	27.29%	3.91%	68.80%	100.00%
Italy (project part)	32.01	79.74	922.10	1 033.85	3.10%	7.71%	89.19%	100.00%
Slovenia	0.22	0.06	0.88	1.17	19.00%	5.49%	75.51%	100.00%
Montenegro	1.30	0.32	5.27	6.89	18.84%	4.62%	76.53%	100.00%
Total	73.81	110.64	1 138.20	1 322.64	5.58%	8.37%	86.05%	100.00%
Wetlands	Areas in km2				% of c. strips within c. zone (0m-1km)			
Albania	12.62	30.59	63.51	106.72	11.82%	28.66%	59.52%	100.00%
Bosnia and Herzegovina	0.00	0.00	0.00	0.00	-	-	-	-
Croatia	3.85	3.94	30.23	38.02	10.14%	10.37%	79.50%	100.00%
Italy (project part)	15.44	31.38	208.65	255.48	6.04%	12.28%	81.67%	100.00%
Slovenia	1.60	2.53	3.14	7.27	22.05%	34.80%	43.15%	100.00%
Montenegro	0.89	2.77	18.50	22.16	4.01%	12.52%	83.48%	100.00%
Total	34.41	71.22	324.03	429.66	8.01%	16.58%	75.42%	100.00%

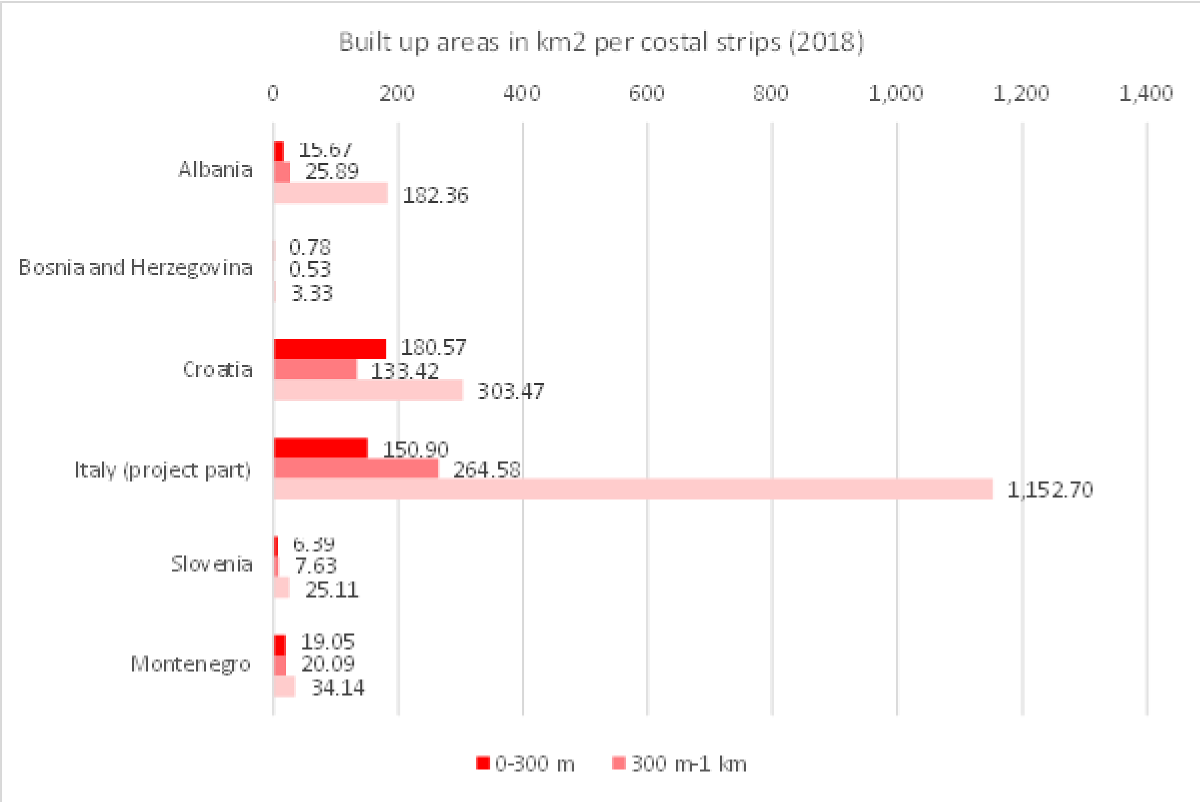


Figure 4.9: Built up area in km2 per costal strips per country in year 2018

4.3.3. CCI25 parameters on country level –land use/cover change from year 2012 to 2018

Based on data calculated for year 2012 and 2018, the change of land use/cover classes is calculated. The change in areas is calculated so that the area for 2012 was subtracted from the area from 2018 (Table 4.12 and 4.13). The resulting negative values mean that these areas decreased and the positive vales mean that these areas increased. The percentage of change was calculated by dividing the above difference with the areas from 2012 (the so-called baseline data). Thus, the resulting percentage has the meaning of percentage change with respect to the baseline data (Table 4.12 and 4.13).

Calculated changes in areas and in percentage on the level of the countries are given in the following tables and graphs. A detailed presentation by countries is given in the Annexes 3-7.

Table 4.12: Land use/cover change in km2 and percentage from year 2012 to 2018 on country level for coastal zone (0 – 10 km)

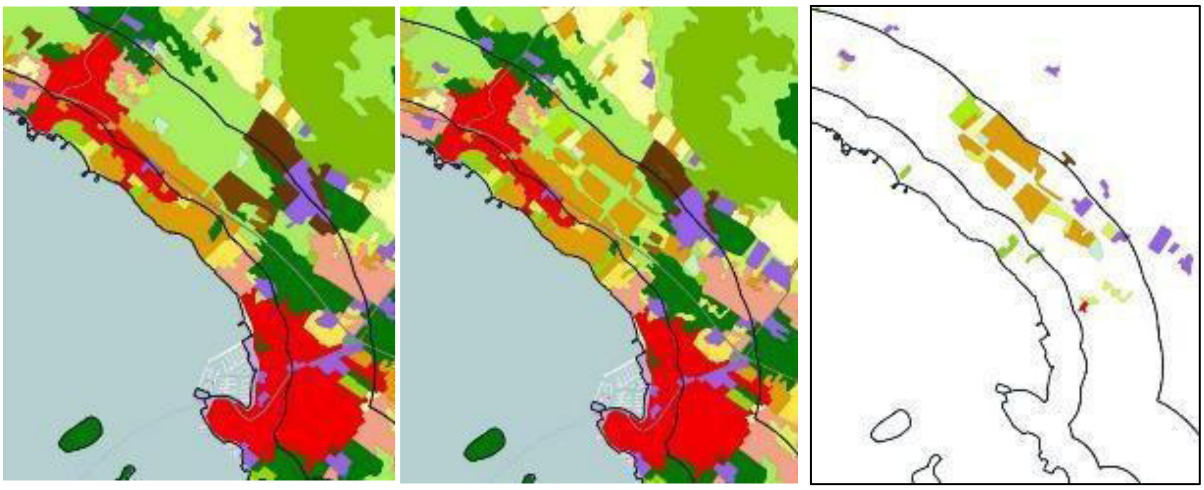
2018-2012		**Built-up areas**	**Agricultural land**	**Forest and semi-natural land**	**Water bodies**	**Wetlands**
Albania	Area in km 2	7.34	-3.65	-1.96	-1.69	-0.03
	% in coastal zone	3.39%	-0.30%	-0.12%	-0.91%	-0.03%
Bosnia and Herz.	Area in km 2	0.26	0.03	-0.28	0.00	0.00
	% in coastal zone	5.83%	0.30%	-0.07%	0.00%	0.00%
Croatia	Area in km 2	5.77	10.45	-16.08	-0.12	-0.01
	% in coastal zone	0.94%	0.79%	-0.17%	-0.12%	-0.04%

2018-2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands
Italy (project part)	Area in km 2	10.52	-7.97	-3.27	-1.12	1.83
	% in coastal zone	0.68%	-0.12%	-0.19%	-0.11%	0.72%
Slovenia	Area in km 2	0.00	0.09	-0.09	0.00	0.00
	% in coastal zone	0.00%	0.08%	-0.03%	0.00%	0.00%
Montenegro	Area in km 2	2.90	-0.44	-2.41	-0.05	0.00
	% in coastal zone	4.13%	-0.44%	-0.19%	-0.77%	0.00%
Grand Total	**Area in km 2**	**26.79**	**-1.50**	**-24.10**	**-2.98**	**1.79**
	% in coastal zone	**1.07%**	**-0.02%**	**-0.16%**	**-0.22%**	**0.42%**

In the Adriatic sub-region, the largest change occurred in the increase of the built-up area by 27 km2 and in the decrease of the forest and semi-natural land by 24 km2 (Table 4.12). In absolute values, the largest increase of built-up area occurred in Italy in amount of 10.5 km2, and the smallest in Slovenia of 0 km2 or without change. There are no countries with decrease of built-up areas. In relative values, the largest increase of built-up areas comparing with year 2012 occurred in Bosnia and Herzegovina (6%) and Montenegro (4%).

Figure 4.10. illustrates land use/cover change in km2 from year 2012 to 2018 on country level for coastal zone (0 – 10 km). In Croatia, there is an increase of agricultural land for 10 km2 in the coastal zone what is additionally illustrated on Map 4.10.

Table 4.13. provides detailed data and Figures 4.11-13 illustrate land use / cover changes per countries per costal strips for the main CCI25 land use classes. The largest changes are marked in orange color. Figures 4.11, 4.12, and 4.13 illustrates land use changes per coastal strips.



a) 2012 b) 2018 c) Change 2012 -2018

Map 4.10: Change in land use/cover classes (area of Biograd na moru in Croatia)

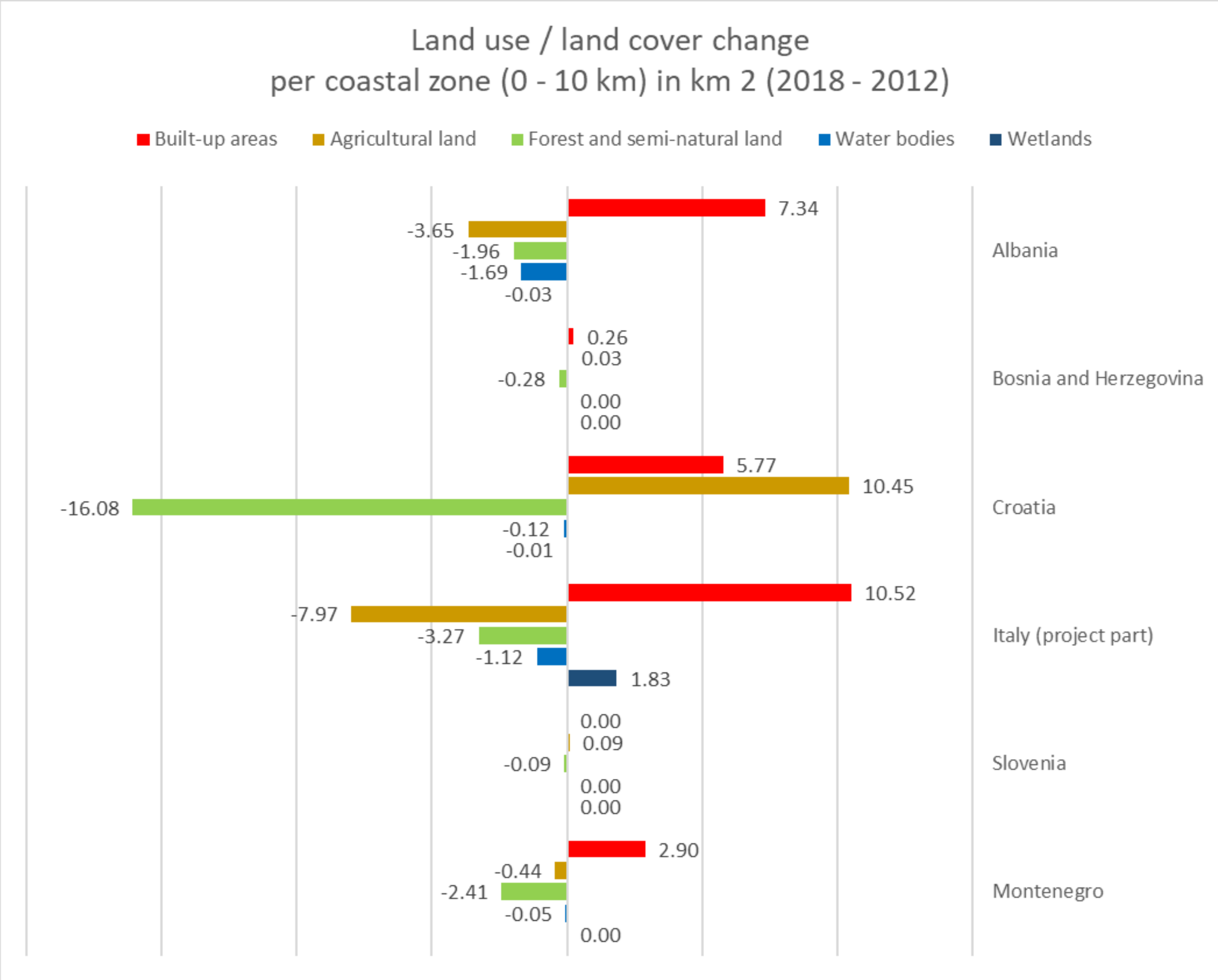


Figure 4.10: Land use/cover change in km2 from year 2012 to 2018 on country level for coastal zone (0 – 10 km)

Table 4.13: Land use/cover change from year 2012 to 2018 in km2 and percentage for coastal strips

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2018-2012	**0-300 m**	**300 m - 1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m - 1 km**	**1-10 km**	**0m -10 km**
Built-up areas				Change in km2	Change in percentage (2018 - 2012)/2012			
Albania	1.32	1.19	4.84	7.34	9.16%	4.80%	2.72%	3.39%
Bosnia and Herz.	0.01	0.00	0.25	0.26	0.89%	0.00%	8.07%	5.83%
Croatia	2.16	1.26	2.35	5.77	1.21%	0.96%	0.78%	0.94%
Italy (project part)	0.41	0.45	9.66	10.52	0.27%	0.17%	0.85%	0.68%
Slovenia	0.00	0.00	0.00	0.00	0.00%	0.00%	0.01%	0.00%
Montenegro	0.48	0.59	1.83	2.90	2.58%	3.05%	5.66%	4.13%
Total	4.37	3.49	18.92	26.79	1.19%	0.78%	1.12%	1.07%

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2018-2012	**0-300 m**	**300 m - 1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m - 1 km**	**1-10 km**	**0m -10 km**
Agricultural land	Change in km2				Change in percentage (2018 - 2012)/2012			
Albania	-0.29	-0.22	-3.14	-3.65	-4.22%	-0.59%	-0.27%	-0.30%
Bosnia and Herz.	0.00	0.00	0.03	0.03	0.00%	0.00%	0.31%	0.30%
Croatia	0.69	1.39	8.37	10.45	0.94%	0.71%	0.79%	0.79%
Italy (project part)	-0.30	-0.60	-7.07	-7.97	-0.53%	-0.19%	-0.11%	-0.12%
Slovenia	0.00	0.00	0.09	0.09	0.00%	0.00%	0.09%	0.08%
Montenegro	0.00	-0.07	-0.37	-0.44	0.00%	-0.81%	-0.40%	-0.44%
Total	0.10	0.50	-2.09	-1.50	0.07%	0.09%	-0.02%	-0.02%
Forest and semi-natural land	Change in km2				Change in percentage (2018 - 2012)/2012			
Albania	1.18	-0.89	-2.26	-1.96	1.35%	-0.58%	-0.16%	-0.12%
Bosnia and Herz.	-0.01	0.00	-0.28	-0.28	-0.13%	0.00%	-0.07%	-0.07%
Croatia	-2.58	-2.64	-10.86	-16.08	-0.23%	-0.17%	-0.16%	-0.17%
Italy (project part)	-0.31	0.11	-3.07	-3.27	-0.22%	0.07%	-0.22%	-0.19%
Slovenia	0.00	0.00	-0.09	-0.09	0.00%	0.00%	-0.03%	-0.03%
Montenegro	-0.43	-0.52	-1.46	-2.41	-0.84%	-0.47%	-0.13%	-0.19%
Total	-2.15	-3.94	-18.01	-24.10	-0.15%	-0.20%	-0.16%	-0.16%
Water bodies	Change in km2				Change in percentage (2018 - 2012)/2012			
Albania	-2.11	0.01	0.41	-1.69	-13.04%	0.03%	0.28%	-0.91%
Bosnia and Herz.	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Croatia	-0.26	0.00	0.14	-0.12	-1.00%	0.00%	0.22%	-0.12%
Italy (project part)	0.25	0.04	-1.41	-1.12	0.79%	0.05%	-0.15%	-0.11%
Slovenia	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Montenegro	-0.05	0.00	0.00	-0.05	-3.96%	0.00%	0.00%	-0.77%
Total	-2.17	0.05	-0.85	-2.98	-2.86%	0.04%	-0.07%	-0.22%
Wetlands	Change in km2				Change in percentage (2018 - 2012)/2012			
Albania	-0.10	-0.08	0.15	-0.03	-0.80%	-0.26%	0.24%	-0.03%
Bosnia and Herz.	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Croatia	0.00	-0.01	0.00	-0.01	0.00%	-0.37%	0.00%	-0.04%
Italy (project part)	-0.05	0.00	1.88	1.83	-0.34%	0.00%	0.91%	0.72%
Slovenia	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Montenegro	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Total	-0.15	-0.09	2.03	1.79	-0.45%	-0.13%	0.63%	0.42%

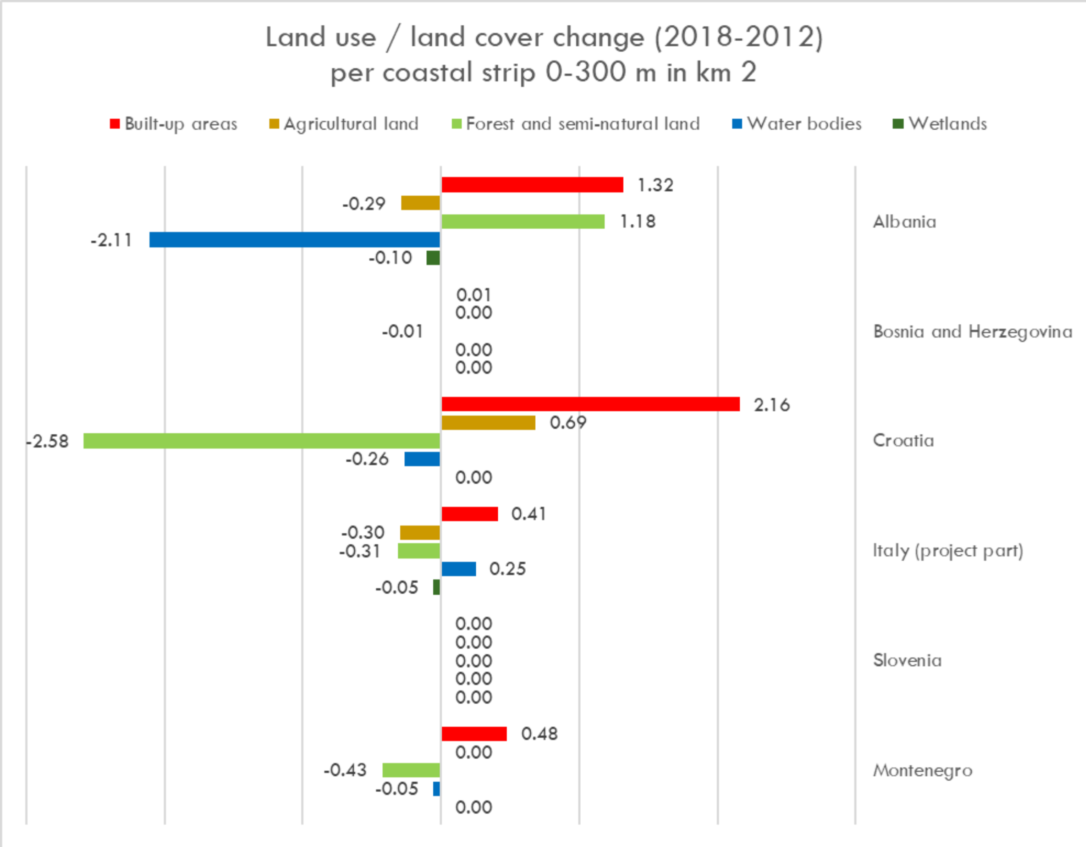


Figure 4.11: Land use/cover change in km2 from year 2012 to 2018 on country level for coastal strip 0-300 m

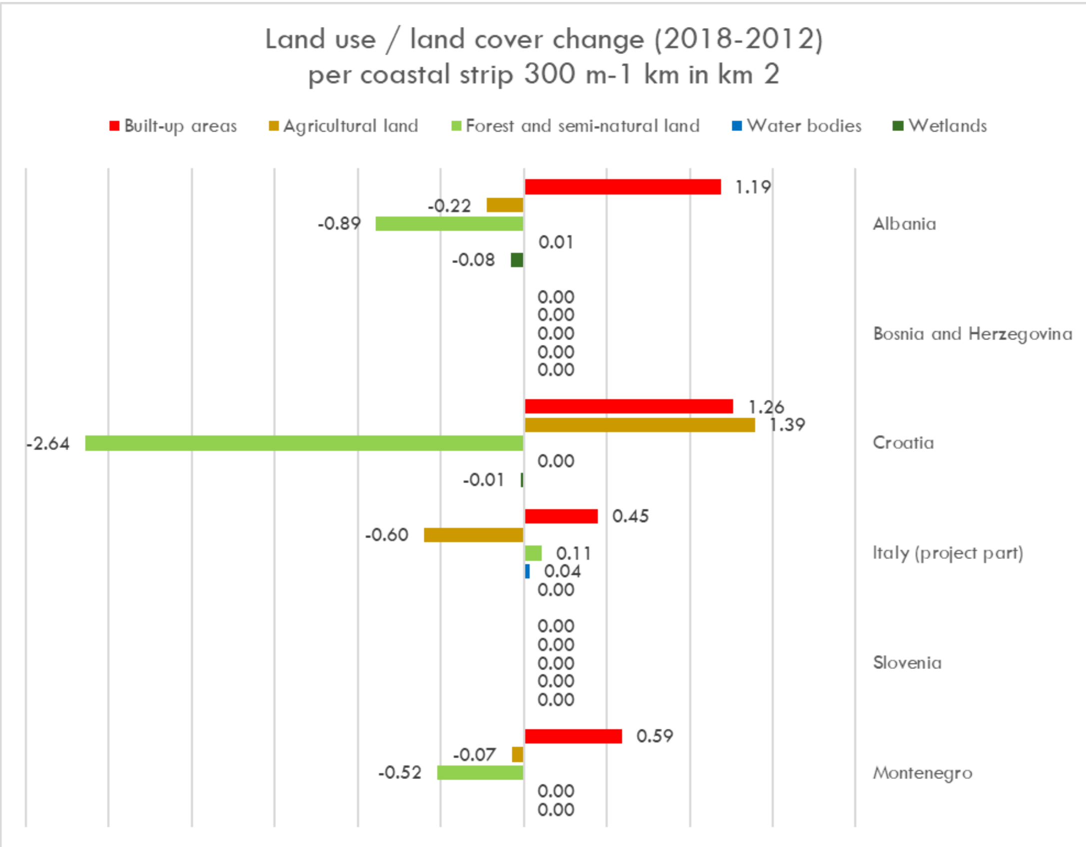


Figure 4.12: Land use/cover change in km2 from year 2012 to 2018 on country level for coastal strip 300 m-1 km

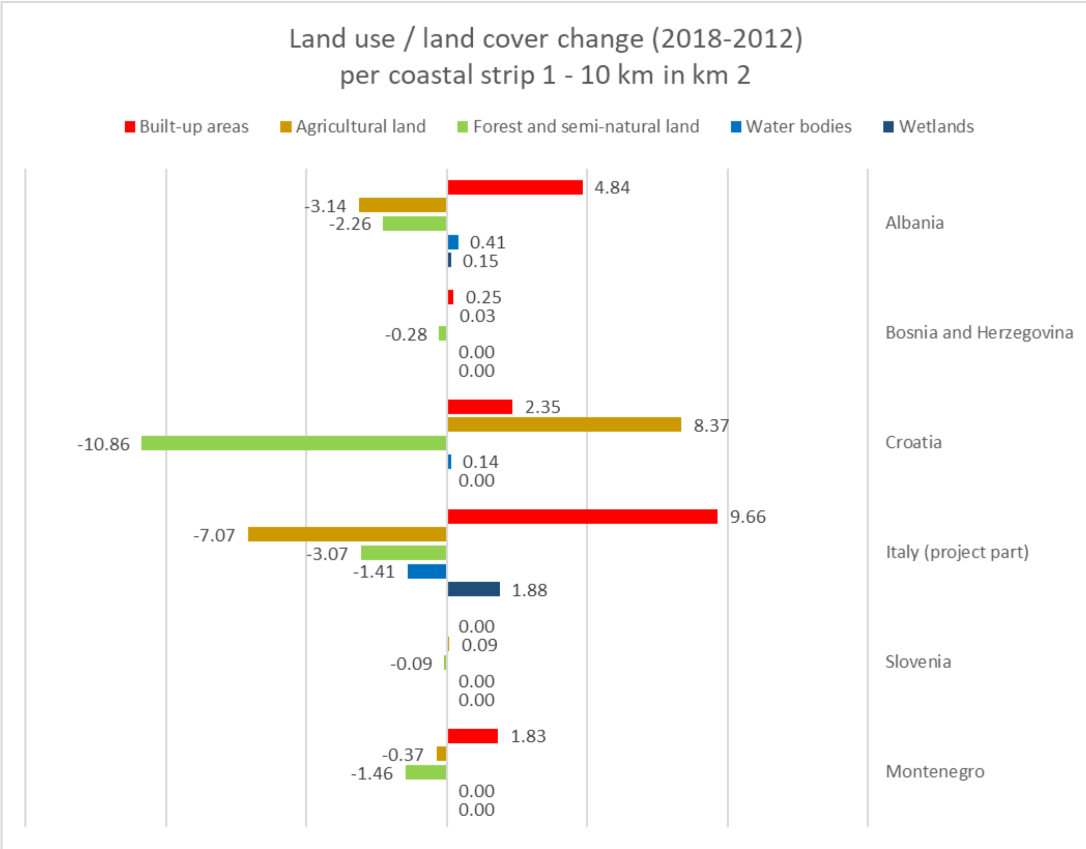


Figure 4.13: Land use/cover change in km2 from year 2012 to 2018 on country level for coastal strip 1-10 km

For built-up areas, the largest increase of absolute values in km2 occurred in Italy, in the coastal strip from 1-10 km (10.5 km2). In terms of relative increase to year 2012, the largest increase of built–up occurred in Albania in the narrower strip to 300m (9%), and in total coastal zone in Bosnia and Hercegovina (6%).

For agricultural land, the largest change is increase of absolute area of 10 km2 in Croatia, of which 8 km2 are in coastal strip 1-10 km. There is the largest decrease as in Italy in the amount of 8 km2 , of which 7 km2 are in coastal strip 1-10 km. In terms of relative decrease to year 2012, the largest amount occurred in Albania in the narrower strip to 300m (-4%).

For forest and semi-natural land, the largest decrease of absolute values in km2 occurred in Croatia in the coastal strip from 1 -10 km (-11 km2) and also in Croatia for total coastal zone (-16 km2). In terms of relative decrease to year 2012, the largest amount occurred in Albania in the narrower strip to 300m (-1%).

In Albania, along the coastline due to the very low and sandy soil, parts of the marshy coasts become sea water and lagoons and vice versa. All together there is a small decrease of water bodies.

Figure 4.14. illustrates land take in km2 (increase of built-up areas) from year 2012 to 2018 per coastal strips on country level. Looking at the distribution of land take among the costal strips, in Croatia the narrower coastal strip (by absolute area the smallest among the other coastal strips), has the largest amount of land

take what clearly identifies that urban sprawl is located at the nearest vicinity of coastline e.g. till 300 m. In Albania, Italy and Montenegro, the costal strips 1-10 km have the largest land take.

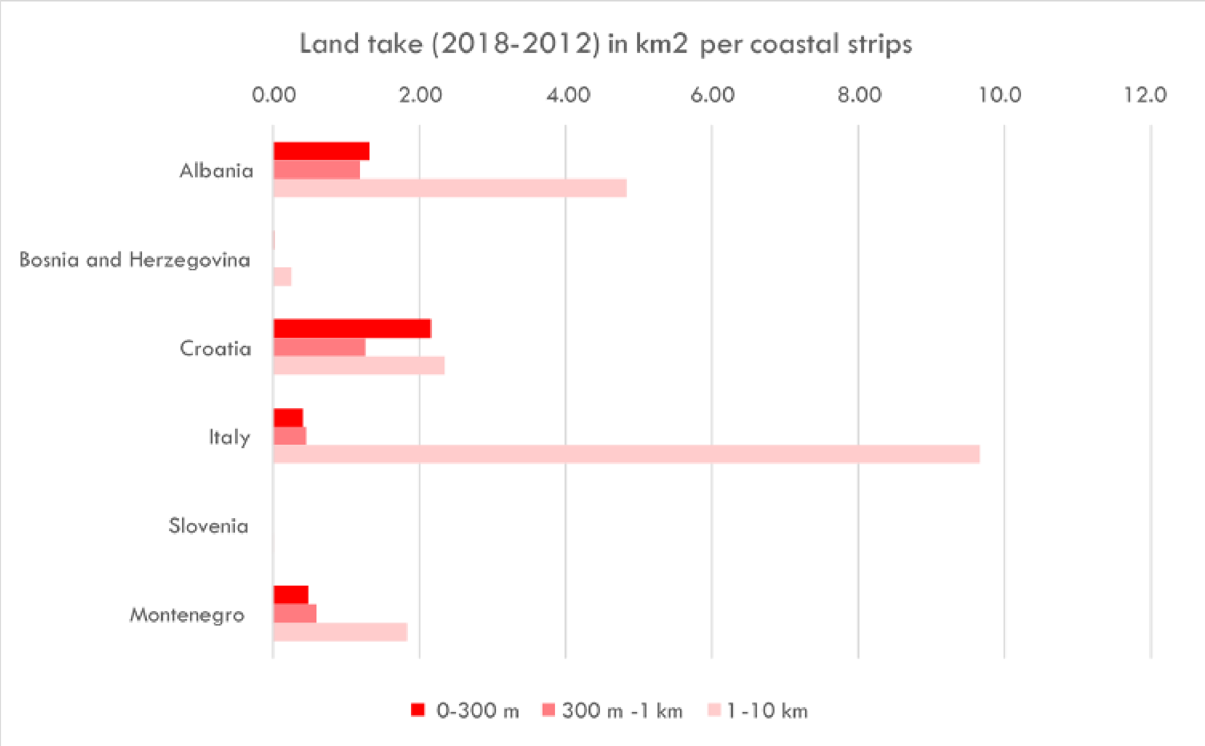


Figure 4.14: Land take (increase of built-up areas) from year 2012 to 2018 on country level per coastalstrips

4.3.4. Protected areas

Table 4.14 shows detail data per country per coastal strip in km2 for the protected areas. Croatia has the largest protected area in the narrowest coastal strip of 300m (252 km2), more than all the other countries combined. Regarding the widest coastal strip 1-10 km, the most areas are located in Italy (2.122 km2).

Figure 4.15 illustrates protected areas in % per coastal strips per country in baseline year 2012. Although the most of protected areas, based on their coverage in km2, are located in Italy and Croatia, the country with the largest share of protected areas relative to their size is Slovenia (63% in coastal strip 1-10 km, Table 4.15). Also, protected areas in Albania in the middle coastal strip 300m – 1km take almost half of the area.

Table 4.14: Protected areas in km2 in the coastal strips per country in year 2012

	Protected areas in km2 (2012)			
	Coastal strips			Coastal zone
	0-300 m	300 m - 1 km	1-10 km	0 m – 10 km
Albania	52.55	119.59	644.37	816.51
Durrës County	1.92	4.00	1.56	7.49
Fier County	5.78	22.49	193.46	221.72
Gjirokastër County	*	*	0.00	0.00
Lezhë County	13.71	23.86	72.74	110.31
Shkodër County	3.77	9.44	93.57	106.78
Tirana County	1.32	2.95	3.75	8.03
Vlorë County	26.05	56.85	279.28	362.19
Bosnia and Herzegovina	0.00	0.00	5.96	5.96
Herzegovina-Neretva Canton	0.00	0.00	5.96	5.96
City of Trebinje	*	*	0.00	0.00
Croatia	252.33	245.51	1 599.02	2 096.87
Dubrovnik-Neretva County	69.57	73.85	134.81	278.23
Istria County	29.15	12.16	71.28	112.59
Lika-Senj County	34.32	62.47	718.93	815.72
Primorje-Gorski Kotar County	18.02	22.91	93.66	134.59
Split-Dalmatia County	16.08	7.86	261.39	285.33
Šibenik-Knin County	53.29	27.82	46.43	127.54
Zadar County	31.91	38.43	272.53	342.87
Italy (project part)	127.46	272.29	2 122.09	2 521.83
Ancona	6.19	12.82	40.01	59.03
Ascoli Piceno	0.50	1.09	0.12	1.71
Bari	0.01	0.20	6.13	6.34
Barletta-Andria-Trani	4.21	14.98	88.23	107.43
Brindisi	6.32	11.99	39.46	57.77
Campobasso	2.61	4.01	3.23	9.85
Chieti	3.15	4.09	7.12	14.35
Fermo	0.00	0.00	0.00	0.00
Ferrara	8.72	17.40	155.71	181.83

	Protected areas in km2 (2012)			
	Coastal strips			Coastal zone
	0-300 m	300 m - 1 km	1-10 km	0 m – 10 km
Foggia	41.21	79.15	714.82	835.18
Forlì-Cesena	0.00	0.00	0.00	0.00
Gorizia	7.28	14.25	102.65	124.18
Lecce	8.24	13.86	15.42	37.51
Macerata	0.00	0.00	0.00	0.00
Padova	*	*	14.05	14.05
Pesaro e Urbino	6.12	13.12	20.20	39.44
Pescara	0.32	0.44	0.00	0.75
Ravenna	7.04	13.91	102.66	123.61
Rimini	0.00	0.00	0.00	0.00
Rovigo	12.99	33.22	175.54	221.75
Teramo	0.90	2.27	11.37	14.54
Trieste	2.23	6.94	88.11	97.28
Udine	2.88	6.50	77.54	86.93
Venezia	6.55	22.05	459.70	488.30
Montenegro	0.58	1.06	63.38	65.02
Bar Municipality	0.00	0.00	1.28	1.28
Budva Municipality	0.00	0.00	4.29	4.29
Herceg Novi Municipality	0.13	0.24	0.00	0.37
Kotor Municipality	0.00	0.00	0.00	0.00
Old Royal Capital Cetinje	*	*	57.48	57.48
Tivat Municipality	0.44	0.81	0.18	1.44
Ulcinj Municipality	0.01	0.00	0.16	0.16
Slovenia	3.36	4.33	257.83	265.52
Coastal-Karst Statistical Region	3.36	4.33	212.97	220.66
Gorizia Statistical Region	*	*	44.86	44.86
Grand Total	**436.28**	**642.78**	**4 692.65**	**5 771.71**

* Administrative unit is located in coastal zone of 10 km but not by the sea and thus coastal strips of 300 m and/or 1 km has no areas

Table 4.15: Protected areas in % per country and coastal strips in year 2012

	Protected areas in % (2012)			
	Coastal strips			Coastal zone
	0-300 m	300 m - 1 km	1-10 km	0 m – 10 km
Albania	38.15%	43.90%	21.54%	24.00%
Bosnia and Herzegovina	0.01%	0.05%	1.44%	1.40%
Croatia	17.85%	12.74%	19.81%	18.37%
Italy (project part)	32.35%	32.23%	20.95%	22.18%
Montenegro	0.80%	0.74%	5.04%	4.41%
Slovenia	27.00%	20.96%	62.91%	59.94%
Total	**21.42%**	**19.99%**	**20.16%**	**20.23%**

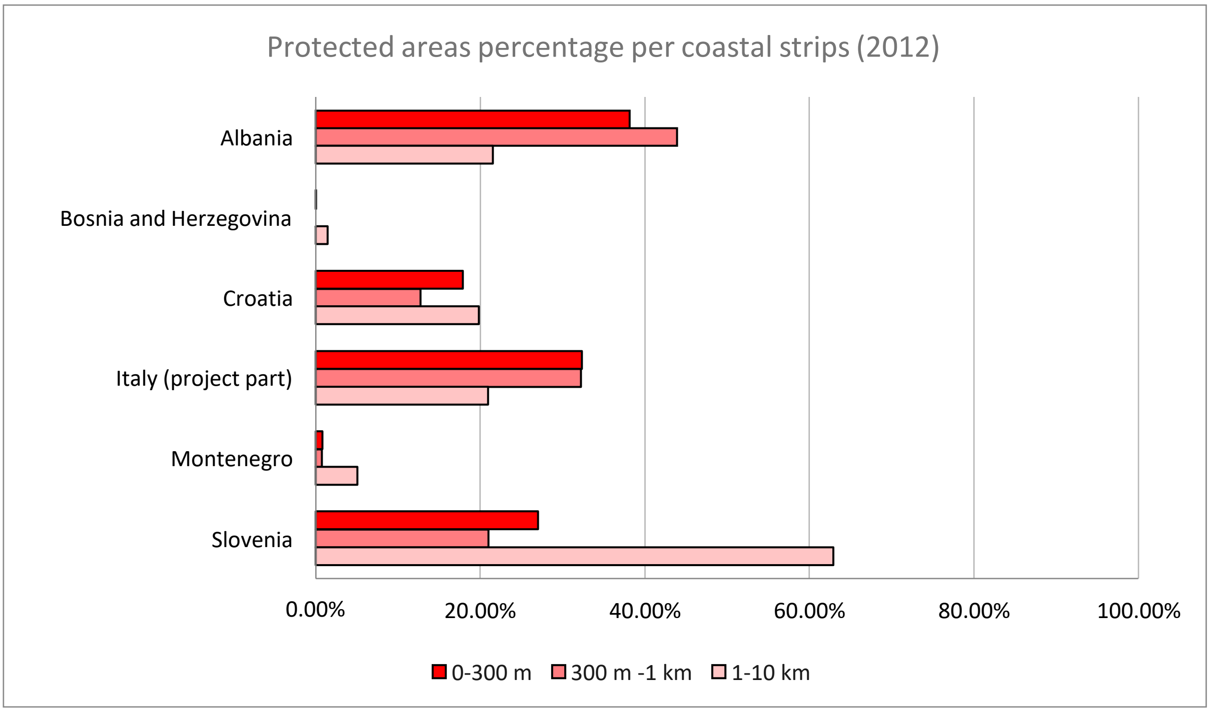


Figure 4.15: Protected areas in % per country and coastal strips in year 2012

Changes 2012 - 2018

Based on data calculated for year 2012 and 2018, the change of protected area is calculated. The change in areas is calculated so that the area for 2012 was subtracted from the area from 2018 (Table4.16, Map 4.11). The resulting negative values mean that these areas decreased and the positive values mean that these areas increased. The percentage of change was calculated by dividing the above difference with the areas from 2012 (the so-called baseline data). The largest increase of protected area occurred in Croatia with change of 4.400 km2 in coastal strip 0-10 km. This is the result of Croatia joining the NATURA 2000, the largest coordinated network of protected areas in the world, between 2012 and 2018 (Map 4.11).

Table 4.16: Protected area change in km2 from year 2012 to 2018 on country level

	Protected area change in km2 2012-2018			
			Coastal strips	**Coastal zone**
	0-300 m	**300 m -1 km**	**1-10 km**	**0 m -10 km**
Albania	9.53	14.51	62.47	86.51
Bosnia and Herzegovina	0.00	0.05	0.73	0.78
Croatia	561.88	812.99	3025.56	4400.43
Italy (project part)	24.46	29.54	189.59	243.59
Montenegro	0.07	0.09	0.04	0.20
Slovenia	1.21	0.71	0.37	2.28
Total	**597.15**	**857.90**	**3278.76**	**4733.81**

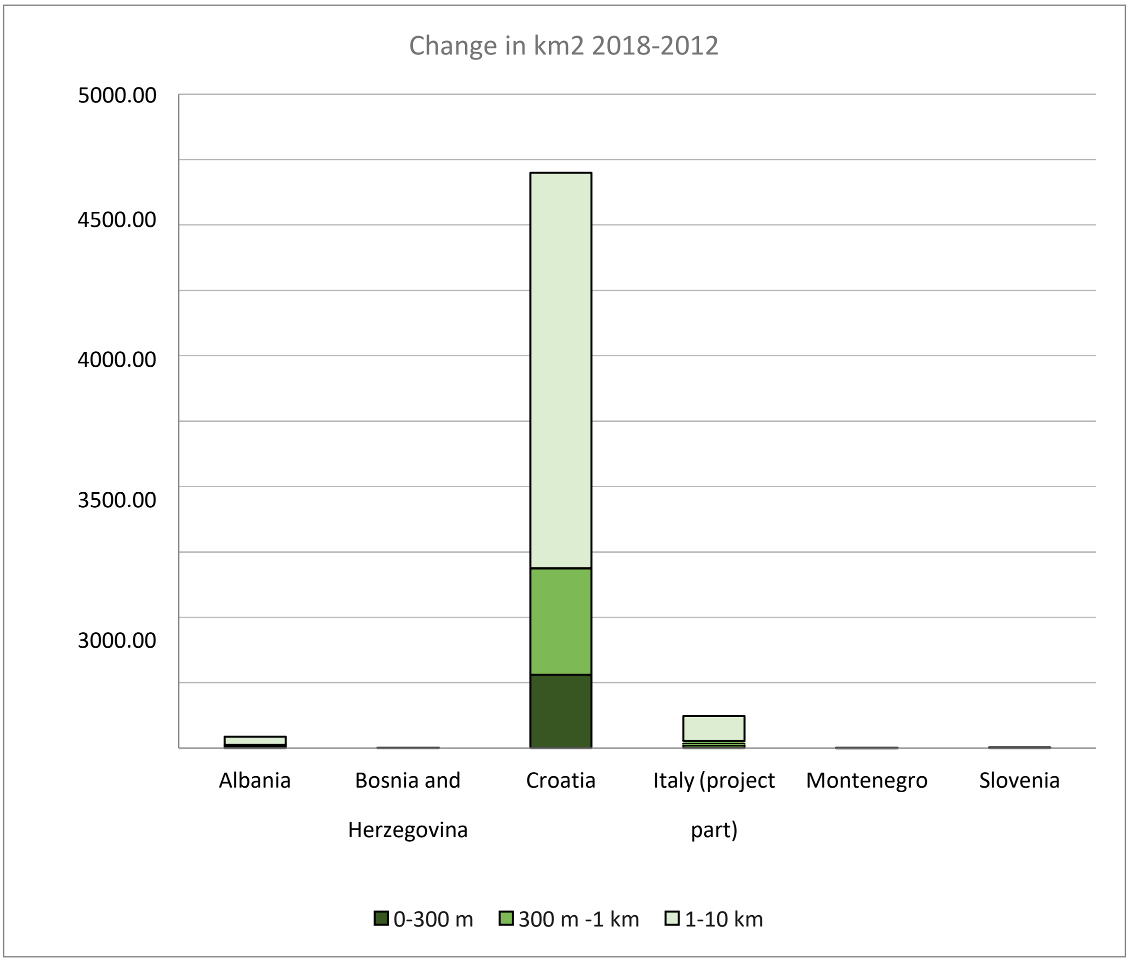


Figure 4.16: Protected area change in km2 per coastal strips per country from year 2012 to 2018

When it comes to relative values (Table 4.17), the biggest change occurs in Bosnia and Herzegovina (over 1500%). It is important to point out that the most of newly protected areas between 2012 and 2018 are located in the first coastal strip 0-300 m affecting the sea and maritime life the most. All the changes per country are positive, meaning that the countries only increased their protected areas, not reduced it which is to be expected.

Table 4.17: Protected area change in % from year 2012 to 2018 on country level

	Protected area change in % 2012-2018			
	Coastal strips			Coastal zone
	0-300 m	**300 m -1 km**	**1-10 km**	**0m -10 km**
Albania	18.14%	12.13%	9.69%	10.60%
Bosnia and Herzegovina	0.00%	1568.87%	12.24%	13.14%
Croatia	222.68%	331.14%	189.21%	209.86%
Italy (project part)	19.19%	10.85%	8.93%	9.66%
Montenegro	11.66%	8.95%	0.06%	0.31%
Slovenia	35.99%	16.34%	0.14%	0.86%
Total	**136.87%**	**133.47%**	**69.87%**	**82.02%**

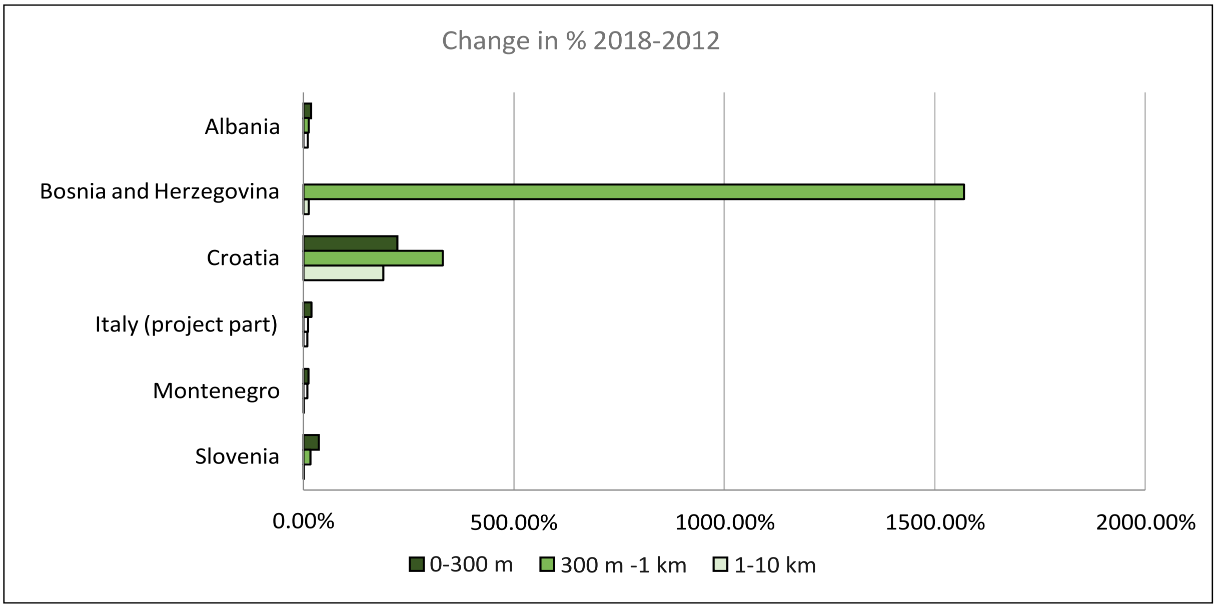
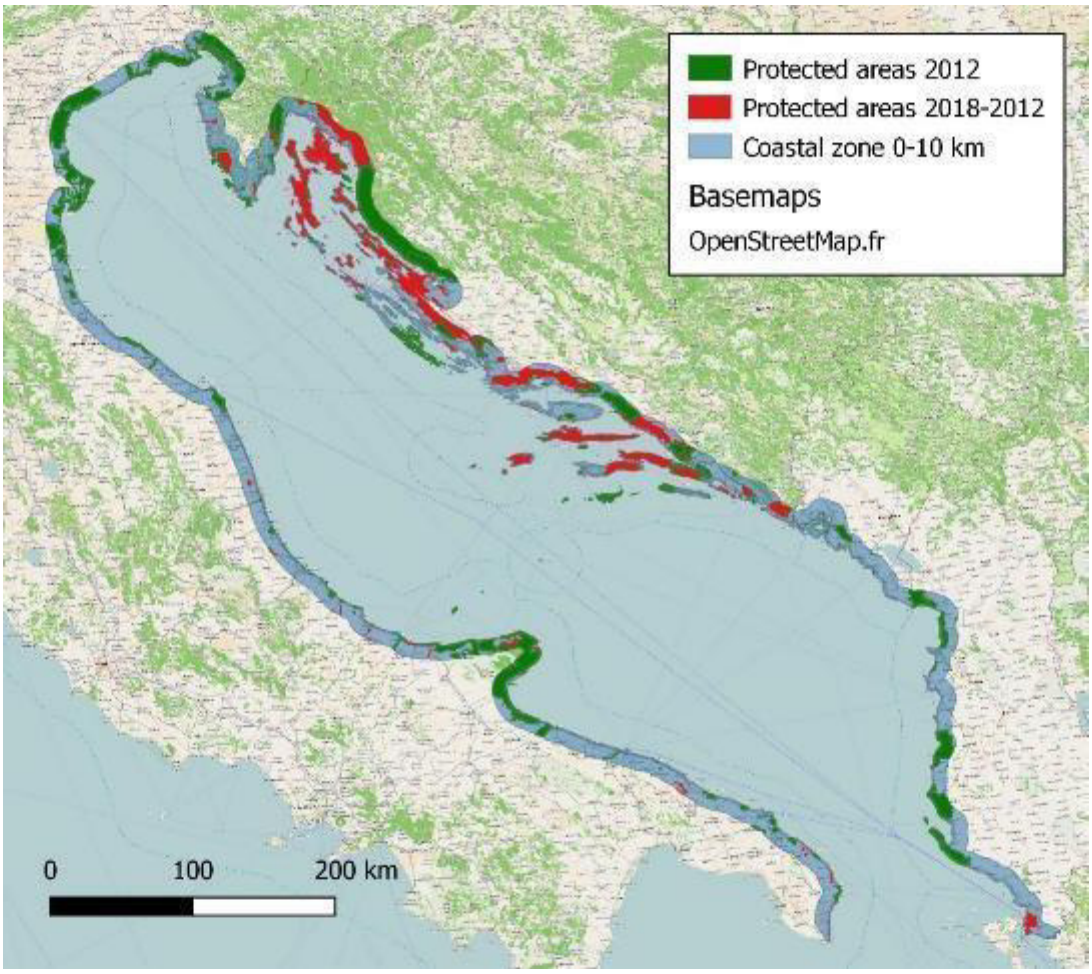


Figure 4.17: Protected area change in % per costal strips per country from year 2012 to 2018



Map 4.11: Change in protected areas 2012-2018 (colored red)

Land-take 2012-2018 within protected areas from 2018

Based on the calculated change in land use / land cover for years 2012 and 2018, the change of built-up areas within protected areas from 2018 is calculated. The resulting positive values mean increase of built-up areas (land-take) and the negative values means decrease.

Table 4.18 and Figure 4.18 present land-take data on country level per coastal strips and coastal zone. In the entire area of the Adriatic sub-region, a land take of 2,48 km 2 occurred in the protected areas from 2018 of which 1,48 km2 in the territory of Croatia. The largest land-take in the narrowest coastal strip 0-300 m occurred also in Croatia. Bosnia and Herzegovina and Montenegro have no recorded land-take. Data on land-take by administrative units is presented in Table 4.19 and illustrated on Figure 4.19.

Table 4.18: Land-take 2012-2018 in km2 within protected areas from 2018

	Land take 2012-2018 in km2 within protected areas from 2018			
	Coastal strips			**Coastal zone**
	0-300 m	**300 m -1 km**	**1-10 km**	**0m -10 km**
Albania	0.16	0.16	0.22	0.54
Bosnia and Herzegovina	0.00	0.00	0.00	0.00
Croatia	0.64	0.52	0.32	1.48
Italy	0.07	0.02	0.36	0.45
Montenegro	0.00	0.00	0.00	0.00
Slovenia	0.00	0.00	0.01	0.01
Total	**0.87**	**0.70**	**0.91**	**2.48**

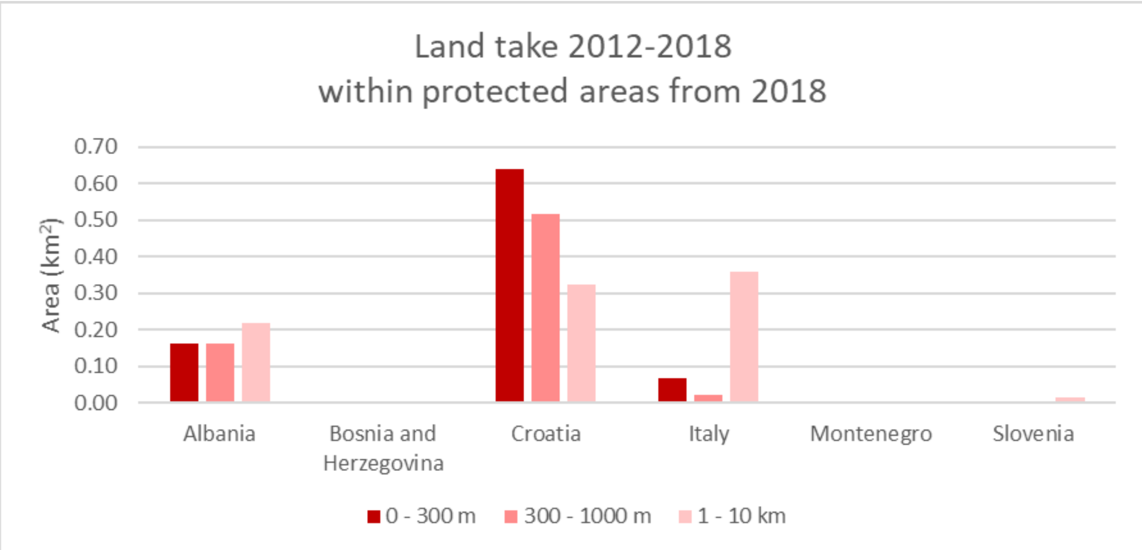


Figure 4.18: Land-take 2012-2018 in km2 within protected areas from 2018

Table 4.19: Land-take 2012-2018 in km2 within protected areas (2018) by administrative units

	Land take 2012-2018 in km2 within protected areas from 2018			
	Coastal strips			**Coastal zone**
	0-300 m	**300 m -1 km**	**1-10 km**	**0m -10 km**
Albania	**0.16**	**0.16**	**0.22**	**0.54**
Durrës County	0.00	0.02	0.00	0.02
Fier County	0.00	0.00	0.00	0.00
Lezhë County	0.07	0.05	0.06	0.18
Shkodër County	0.03	0.08	0.12	0.22
Vlorë County	0.07	0.01	0.04	0.11
Bosnia and Herzegovina	**0.00**	**0.00**	**0.00**	**0.00**
Herzegovina-Neretva Canton	0.00	0.00	0.00	0.00
Croatia	**0.64**	**0.52**	**0.32**	**1.48**
Dubrovnik-Neretva County	0.11	0.02	-0.17	-0.03
Istria County	0.18	0.11	0.14	0.43
Lika-Senj County	0.08	0.10	0.07	0.25
Primorje-Gorski Kotar County	0.13	0.18	0.15	0.46
Split-Dalmatia County	-0.04	0.05	0.30	0.31
Šibenik-Knin County	0.00	0.00	-0.25	-0.25
Zadar County	0.18	0.04	0.09	0.31
Italy	**0.07**	**0.02**	**0.36**	**0.45**
Ancona	0.00	0.00	0.00	0.00
Ascoli Piceno	0.00	0.00	0.00	0.00
Bari	0.00	0.00	0.01	0.01
Barletta-Andria-Trani	0.00	0.00	0.00	0.00
Brindisi	0.00	0.01	0.03	0.04
Campobasso	0.01	0.00	0.01	0.02
Chieti	0.00	0.00	0.00	0.00
Ferrara	0.00	0.00	0.03	0.03
Foggia	0.02	0.01	0.25	0.28
Gorizia	0.00	0.00	0.03	0.03
Lecce	0.00	0.00	0.14	0.14
Padova	0.00	0.00	0.00	0.00
Pesaro e Urbino	0.01	0.00	-0.04	-0.03
Pescara	0.00	0.00	0.00	0.00
Ravenna	0.00	0.00	-0.07	-0.07
Rovigo	0.00	0.00	0.00	0.00
Teramo	0.00	0.00	0.00	0.00
Trieste	0.00	0.00	0.00	0.00
Udine	0.00	0.00	0.00	0.00
Venezia	0.03	0.00	-0.03	0.00
Montenegro	**0.00**	**0.00**	**0.00**	**0.00**
Bar Municipality	0.00	0.00	0.00	0.00
Herceg Novi Municipality	0.00	0.00	0.00	0.00
Old Royal Capital Cetinje	0.00	0.00	0.00	0.00

	Land take 2012-2018 in km2 within protected areas from 2018			
	Coastal strips			**Coastal zone**
	0-300 m	**300 m -1 km**	**1-10 km**	**0m -10 km**
Tivat Municipality	0.00	0.00	0.00	0.00
Slovenia	**0.00**	**0.00**	**0.01**	**0.01**
Coastal-Karst Statistical Region	0.00	0.00	0.01	0.01
Gorizia Statistical Region	0.00	0.00	0.00	0.00
Grand Total	**0.87**	**0.70**	**0.91**	**2.48**

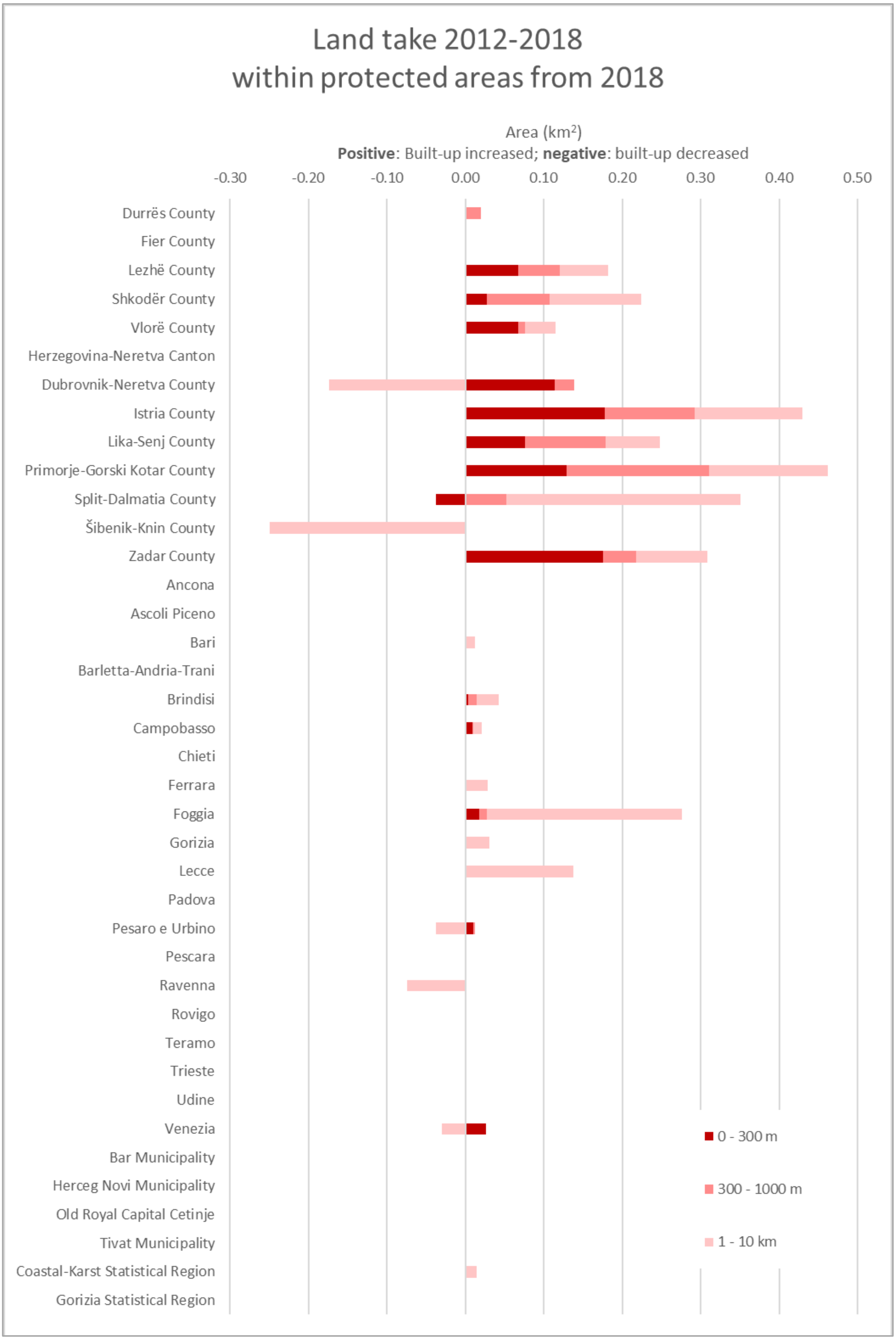


Figure 4.19: Land-take 2012-2018 in km2 within protected areas (2018) by administrative units

5. Assessment of NEAT tool application for GES

IMAP Common Indicators EO7 and EO8 Coast and Hydrography CI15, CI16 and CCI25 provide a basis for GES. To achieve an integrated assessment of GES, the Nested Environmental status Assessment Tool (NEAT) represents a potential tool for quantitatively fusing these three indicators into one.

The NEAT tool is developed for making complex marine status assessments that includes different ecosystem components and geographical areas. It enables integration of data from different sources, spatial and temporal scales and from different ecosystem components into a unique value. Hence, NEAT is not limited to the assessment of biodiversity, but it aggregates various components to final assessment values (calculated as weighted average). User, depending of the specific task, could define different aggregation rules. The whole process includes assessment of the uncertainty and thus the uncertainty associated with the final assessment result is calculated.

IMAP indicators CI15, CI16 and CCI25 do not cover the same geographical area. CCI25 covers land part of the coastal zone of 10 km width; CI16 covers coastline and CI15 sea. Their geographic features do not overlap, just touch at the borders. The prerequisite to integrate various components into one is that they share the same geographic location (in NEAT named as spatial assessment units or SAUs). NEAT tool has model of integration that do not fit the geographic representations of these three indicators.

However, this is only a consequence of the definition of the indicators, but the phenomena that they present (urbanization of the coast, construction of the coastal line and structures on the seabed) have joint impacts on the coastal area, land and sea and thus to integrated assessment of GES. Hence, in order to use NEAT tool for the integration of these three indicators, it is necessary to further explore their mutual influences and overall impacts on GES. Complex models should be built expressing impacts of land use, artificial coastlines and sea-bad structures on the sea.

Looking at the assessment of the GES, NEAT tool includes valuable features important to GES. NEAT indicators could be IMAP indicators – the parameters that are subject of GES assessment. Coastal habitats and ecosystems could be selected based on biological importance and threats from the phenomenon measured by the IMAP indicator. Weighting factors and normalization of data into scale of 0 to 1 provide aggregation of various data by integration rules defined by user. Integrated assessment is presented as NEAT value and visualized by color e.g. good GES in green, bad GES in red color. Finally, each NEAT value is accompanied by quantitative estimate of the confidence of the result. All these characteristics show the potential of the NEAT tool for application to GES and should be further investigated.

6. Conclusion and future prospects

After the assessments have been made for indicators CI15, CI16 and CCI25 for Adriatic sub-region, summary conclusions and future prospects and recommendations are given below.

The CI15 assesses marine habitats, which may be affected or disturbed by changes in hydrographic conditions due to new developments. It was concluded that the assessment according to the Guidance factsheet and based on data provided by the countries is not possible. Therefore, an alternative and more general overview of hydrographic changes was provided.

Today, the available data are not sufficient for CI15 assessments: either not collected, or collected partly (e.g. environmental assessment after construction, not before), or collected with methodologies not fitting CI15. Potential source of data are environmental impacts studies, but today prepared as written reports without associated geospatial data. Thus, a recommendation for countries is to create a digital geospatial database of all data from SEA/EIA for interventions carried out in the marine/coastal area. An example of good practice can be the EIA portal set up by the Republic of Ireland. Additionally, processes in the sea and their modelling and assessing cumulative impacts to the sea habitats are complex, still subject of scientific research and there are many knowledge gaps. The link to EO1 Biodiversity is essential for this indicator, as map of benthic habitats in the zone of interest is required. Therefore, identifying the priority benthic habitats for consideration in EO7 together with assessment of impacts, including cumulative impacts, is a cross-cutting issue of high priority. It should be noted that climate change still has many scientific gaps and uncertainties that will affect the estimation of GES.

The aggregate CI16 first monitoring is made based on national assessments reports and accompanying geospatial data. For Croatia, assessed is cca 2750 km of 7100 km of coastline. Other countries provided first monitoring data for whole coastlines. Only for Italy, there are two monitoring data sets, for years 2006 and 2012, and assessments on coastline changes are made showing slightly increase of artificial coasts, but also increase of total coastline length. Future sets of monitoring data will allow assessments of coastline status: whether is further developed or it has stayed within GES. Recommendation is that now, after first monitoring set are available, countries specify GES by setting operational objectives and proposed targets for their coastlines.

Important issues are regarding defining reference coastlines, reference scales, and to perform identification and classification of coastal types and structures in consistent manner, regardless of monitoring time or country. In addition, it should be noted that the interpretation of calculated CI16 is country/region specific and need qualitative and not only quantitative approach as provided by CI16.

The CCI25 assessment is made based on open source data: Copernicus Coastal zones (CLMS-CZ), OpenStreetMap and World Database on Protected Areas. Use of that data is validated in (4-2) as fitting the CCI25 requirements from Guidance factsheet and higher. At this moment, assessment of change can only be made by referring to the general GES defined in the Guidance Factsheet. This would mean that a positive change is example when land cover class change from built up to semi natural or the increase of protected areas, and as negative the increase of built up areas. But, assessment of GES by CCI25 should be country specific and should use qualitative as well as quantitative approach provided by CCI25. As first step, guidelines could be prepared to assist countries to define GES. For a more detailed analysis the GES should be defined more objectively. In this way GES assessment could be done for specific areas where significant changes occurred (fragmentation of habitats, mono-cultural production of crops, loss of green corridors, reduction of hedges, trees etc).

Current CCI25 includes land use/land cover change of purpose to which land is profited by humans. Therefore, the urbanization pressures on coastal ecosystems are identified. In the context of climate changes and particularly the coastal flooding, the pressures on the coastal ecosystems are becoming more complex. Since low urbanized areas prone to coastal flooding potentially generate more pressures over coastal ecosystems such as pollution of coastal waters, it is important to consider coastal flooding risks together with land take. Moreover, there are many direct impacts of coastal flooding on coastal ecosystems and landscapes such as erosion and salinization particularly effecting beaches, wetlands and river deltas. This is the reason why Low Elevation Coastal Zone is proposed as analytical unit in (4-2). In this way the information generated with CCI25 will allow multiple analyses and synergies, such as between the evolution of coastal zones, mainly urbanization and climate change.

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8. Annex 1

8.1. Reporting units: coastal strips area in km2 per administrative units NUTS3 level

Country/NUTS3 level unit	Reporting units areas in km2			
	0-300 m	300 m - 1 km	1 km - 10 km	Total
Albania	137.75	272.43	2,991.77	3,401.96
Durrës County	20.35	39.37	373.14	432.86
Fier County	13.97	31.99	432.87	478.83
Gjirokastër County	0.00	0.00	8.89	8.89
Lezhë County	16.40	29.55	409.17	455.13
Shkodër County	4.16	9.57	122.70	136.44
Tirana County	10.22	23.11	241.89	275.22
Vlorë County	72.65	138.84	1,403.10	1,614.59
Bosnia and Herzegovina	6.13	7.26	412.55	425.93
City of Trebinje	0.00	0.00	96.39	96.39
Herzegovina-Neretva Canton	6.13	7.26	316.15	329.54
Croatia	1,413.36	1,927.57	8,072.63	11,413.56
Dubrovnik-Neretva County	247.60	371.11	1,061.54	1,680.26
Istria County	117.53	172.01	1,340.07	1,629.61
Lika-Senj County	71.33	112.02	844.73	1,028.08
Primorje-Gorski Kotar County	259.19	382.03	1,282.28	1,923.50
Šibenik-Knin County	152.30	117.65	528.14	798.09
Split-Dalmatia County	257.38	375.53	1,652.26	2,285.18
Zadar County	308.01	397.22	1,363.62	2,068.85
Italy	394.05	844.94	10,131.09	11,370.08
Ancona	18.77	40.12	490.81	549.71
Ascoli Piceno	6.18	13.83	190.71	210.71
Bari	29.81	59.47	733.21	822.49
Barletta-Andria-Trani	16.19	37.81	438.66	492.66
Brindisi	30.85	61.77	704.28	796.90
Campobasso	11.27	25.10	321.92	358.30
Chieti	20.41	45.63	605.55	671.59
Fermo	8.16	18.77	225.23	252.16
Ferrara	14.37	31.90	355.21	401.48
Foggia	54.74	111.00	1,397.48	1,563.22
Forlì-Cesena	2.72	6.05	143.38	152.15

Country/NUTS3 level unit	Reporting units areas in km2			
	0-300 m	**300 m - 1 km**	**1 km - 10 km**	**Total**
Gorizia	15.27	30.90	245.05	291.22
Lecce	34.42	72.80	777.36	884.58
Macerata	6.59	14.27	168.51	189.37
Padova	0.00	0.00	14.24	14.24
Pesaro e Urbino	13.62	29.75	339.93	383.30
Pescara	4.14	9.61	154.37	168.13
Ravenna	15.14	33.56	390.04	438.74
Rimini	10.32	24.18	290.19	324.69
Rovigo	16.92	37.69	422.40	477.01
Teramo	13.78	31.64	379.62	425.03
Trieste	14.45	29.14	168.50	212.09
Udine	5.40	11.53	261.96	278.89
Venezia	30.55	68.43	912.46	1,011.44
Slovenia	12.44	20.68	409.86	442.98
Coastal-Karst Statistical Region	12.44	20.68	365.00	398.12
Gorizia Statistical Region	0.00	0.00	44.86	44.86
Montenegro	72.77	142.85	1,257.11	1,472.73
Bar Municipality	10.47	20.53	319.54	350.54
Budva Municipality	8.98	18.11	95.32	122.40
Herceg Novi Municipality	15.04	27.67	165.57	208.28
Kotor Municipality	18.96	38.88	239.70	297.53
Old Royal Capital Cetinje	0.00	0.00	265.25	265.25
Tivat Municipality	9.36	18.81	18.10	46.26
Ulcinj Municipality	9.96	18.87	153.64	182.47
Grand Total	**2,036.50**	**3,215.73**	**23,275.01**	**28,527.24**

9. Annex 2

9.1. Difference of reporting units areas in km2 (Reporting units - CLMS-CZ data)

Reporting units (country/NUTS3 level)	Areas in km2 defined by the reporting units				Areas in km2 defined by Copernicus Coastal zones (CLMS-CZ) LC / LU data 2012/2018				Difference of areas in km2 (Reporting units - CLMS-CZ data)			
	0-300 m	300 m - 1 km	1 km - 10 km	Total	0-300 m	300 m - 1 km	1 km - 10 km	Total	0-300 m	300 m - 1 km	1 km - 10 km	Total
Albania	137.75	272.43	2,991.77	3,401.96	137.75	272.43	2,989.56	3,399.75	0.00	0.00	-2.21	-2.21
Durrës County	20.35	39.37	373.14	432.86	20.35	39.37	373.12	432.84	0.00	0.00	-0.02	-0.02
Fier County	13.97	31.99	432.87	478.83	13.97	31.99	432.87	478.83	0.00	0.00	0.00	0.00
Gjirokastër County	0.00	0.00	8.89	8.89	0.00	0.00	8.87	8.87	0.00	0.00	-0.02	-0.02
Lezhë County	16.40	29.55	409.17	455.13	16.40	29.55	409.12	455.07	0.00	0.00	-0.05	-0.05
Shkodër County	4.16	9.57	122.70	136.44	4.16	9.57	122.70	136.44	0.00	0.00	0.00	0.00
Tirana County	10.22	23.11	241.89	275.22	10.22	23.11	241.78	275.10	0.00	0.00	-0.11	-0.11
Vlorë County	72.65	138.84	1,403.10	1,614.59	72.65	138.84	1,401.09	1,612.58	0.00	0.00	-2.00	-2.00
Bosnia and Herzegovina	6.13	7.26	412.55	425.93	6.13	7.26	410.45	423.84	0.00	0.00	-2.10	-2.10
City of Trebinje	0.00	0.00	96.39	96.39	0.00	0.00	95.96	95.96	0.00	0.00	-0.43	-0.43
Herzegovina-Neretva Canton	6.13	7.26	316.15	329.54	6.13	7.26	314.49	327.88	0.00	0.00	-1.66	-1.66
Croatia	1,413.36	1,927.57	8,072.63	11,413.56	1,413.36	1,927.57	8,057.34	11,398.27	0.00	0.00	-15.29	-15.29
Dubrovnik-Neretva County	247.60	371.11	1,061.54	1,680.26	247.60	371.11	1,061.41	1,680.13	0.00	0.00	-0.13	-0.13
Istria County	117.53	172.01	1,340.07	1,629.61	117.53	172.01	1,336.56	1,626.10	0.00	0.00	-3.51	-3.51
Lika-Senj County	71.33	112.02	844.73	1,028.08	71.33	112.02	841.25	1,024.61	0.00	0.00	-3.47	-3.47
Primorje-Gorski Kotar County	259.19	382.03	1,282.28	1,923.50	259.19	382.03	1,279.68	1,920.90	0.00	0.00	-2.60	-2.60
Šibenik-Knin County	152.30	117.65	528.14	798.09	152.30	117.65	527.41	797.36	0.00	0.00	-0.73	-0.73

Reporting units (country/NUTS3 level)	Areas in km2 defined by the reporting units				Areas in km2 defined by Copernicus Coastalzones (CLMS-CZ) LC / LU data 2012/2018				Difference of areas in km2 (Reporting units - CLMS-CZ data)			
	0-300 m	300 m - 1 km	1 km - 10 km	Total	0-300 m	300 m - 1 km	1 km - 10 km	Total	0-300 m	300 m - 1 km	1 km - 10 km	Total
Split-Dalmatia County	257.38	375.53	1,652.26	2,285.18	257.38	375.53	1,649.02	2,281.94	0.00	0.00	-3.24	-3.24
Zadar County	308.01	397.22	1,363.62	2,068.85	308.01	397.22	1,362.00	2,067.23	0.00	0.00	-1.62	-1.62
Italy	394.05	844.94	10,131.09	11,370.08	394.05	844.94	10,121.39	11,360.38	0.00	0.00	-9.70	-9.70
Ancona	18.77	40.12	490.81	549.71	18.77	40.12	490.31	549.21	0.00	0.00	-0.50	-0.50
Ascoli Piceno	6.18	13.83	190.71	210.71	6.18	13.83	190.66	210.66	0.00	0.00	-0.05	-0.05
Bari	29.81	59.47	733.21	822.49	29.81	59.47	731.15	820.43	0.00	0.00	-2.06	-2.06
Barletta-Andria-Trani	16.19	37.81	438.66	492.66	16.19	37.81	438.31	492.31	0.00	0.00	-0.35	-0.35
Brindisi	30.85	61.77	704.28	796.90	30.85	61.77	703.18	795.80	0.00	0.00	-1.10	-1.10
Campobasso	11.27	25.10	321.92	358.30	11.27	25.10	321.30	357.68	0.00	0.00	-0.62	-0.62
Chieti	20.41	45.63	605.55	671.59	20.41	45.63	604.78	670.82	0.00	0.00	-0.77	-0.77
Fermo	8.16	18.77	225.23	252.16	8.16	18.77	225.11	252.04	0.00	0.00	-0.12	-0.12
Ferrara	14.37	31.90	355.21	401.48	14.37	31.90	355.14	401.41	0.00	0.00	-0.07	-0.07
Foggia	54.74	111.00	1,397.48	1,563.22	54.74	111.00	1,396.95	1,562.69	0.00	0.00	-0.53	-0.53
Forlì-Cesena	2.72	6.05	143.38	152.15	2.72	6.05	143.34	152.10	0.00	0.00	-0.05	-0.05
Gorizia	15.27	30.90	245.05	291.22	15.27	30.90	244.05	290.22	0.00	0.00	-1.00	-1.00
Lecce	34.42	72.80	777.36	884.58	34.42	72.80	775.99	883.21	0.00	0.00	-1.37	-1.37
Macerata	6.59	14.27	168.51	189.37	6.59	14.27	168.45	189.30	0.00	0.00	-0.07	-0.07
Padova	0.00	0.00	14.24	14.24	0.00	0.00	14.24	14.24	0.00	0.00	0.00	0.00
Pesaro e Urbino	13.62	29.75	339.93	383.30	13.62	29.75	339.47	382.84	0.00	0.00	-0.46	-0.46
Pescara	4.14	9.61	154.37	168.13	4.14	9.61	154.26	168.01	0.00	0.00	-0.11	-0.11
Ravenna	15.14	33.56	390.04	438.74	15.14	33.56	389.78	438.47	0.00	0.00	-0.27	-0.27
Rimini	10.32	24.18	290.19	324.69	10.32	24.18	290.10	324.60	0.00	0.00	-0.09	-0.09
Rovigo	16.92	37.69	422.40	477.01	16.92	37.70	422.40	477.01	0.00	0.00	0.00	0.00
Teramo	13.78	31.64	379.62	425.03	13.78	31.64	379.52	424.93	0.00	0.00	-0.10	-0.10
Trieste	14.45	29.14	168.50	212.09	14.45	29.14	168.50	212.09	0.00	0.00	0.00	0.00
Udine	5.40	11.53	261.96	278.89	5.40	11.53	261.96	278.89	0.00	0.00	0.00	0.00

Reporting units (country/NUTS3 level)	Areas in km2 defined by the reporting units				Areas in km2 defined by Copernicus Coastalzones (CLMS-CZ) LC / LU data 2012/2018				Difference of areas in km2 (Reporting units - CLMS-CZ data)			
	0-300 m	300 m - 1 km	1 km - 10 km	Total	0-300 m	300 m - 1 km	1 km - 10 km	Total	0-300 m	300 m - 1 km	1 km - 10 km	Total
Venezia	30.55	68.43	912.46	1,011.44	30.55	68.43	912.44	1,011.42	0.00	0.00	-0.02	-0.02
Slovenia	12.44	20.68	409.86	442.98	12.44	20.68	408.43	441.55	0.00	0.00	-1.43	-1.43
Coastal-Karst Statistical Region	12.44	20.68	365.00	398.12	12.44	20.68	363.74	396.85	0.00	0.00	-1.26	-1.26
Gorizia Statistical Region	0.00	0.00	44.86	44.86	0.00	0.00	44.70	44.70	0.00	0.00	-0.17	-0.17
Montenegro	72.77	142.85	1,257.11	1,472.73	72.77	142.85	1,251.87	1,467.49	0.00	0.00	-5.24	-5.24
Bar Municipality	10.47	20.53	319.54	350.54	10.47	20.53	319.01	350.01	0.00	0.00	-0.53	-0.53
Budva Municipality	8.98	18.11	95.32	122.40	8.98	18.11	95.32	122.40	0.00	0.00	0.00	0.00
Herceg Novi Municipality	15.04	27.67	165.57	208.28	15.04	27.67	165.20	207.90	0.00	0.00	-0.38	-0.38
Kotor Municipality	18.96	38.88	239.70	297.53	18.96	38.88	238.84	296.68	0.00	0.00	-0.86	-0.86
Old Royal Capital Cetinje	0.00	0.00	265.25	265.25	0.00	0.00	261.91	261.91	0.00	0.00	-3.34	-3.34
Tivat Municipality	9.36	18.81	18.10	46.26	9.36	18.81	18.10	46.26	0.00	0.00	0.00	0.00
Ulcinj Municipality	9.96	18.87	153.64	182.47	9.96	18.87	153.49	182.32	0.00	0.00	-0.15	-0.15
Grand Total	**2,036.50**	**3,215.73**	**23,275.01**	**28,527.24**	**2,036.50**	**3,215.73**	**23,239.04**	**28,491.27**	**0.00**	**0.00**	**-35.97**	**-35.97**

10. Annex 3

10.1. CCI25 parameters for Albania

Calculated CCI25 parameters for year 2012 on the level of reporting units are given in the following tables and graphs. These parameters represent so called baseline data for calculation of land use/cover changes. Thus, following the data for year 2012, there are tables and graphs with the calculation of changes. The change in areas is calculated so that the area for 2012 was subtracted fromthe area from 2018. The resulting negative values mean that these areas decreased and the positive vales mean that these areas increased. The percentage of change was calculated by dividing the abovedifference with the areas from 2012. Thus, the resulting percentage has the meaning of percentage change with respect to the baseline data. Detailed data for year 2012, 2018 and changes are providedin auxiliary Excel files and GIS database.

10.2. Year 2012 – baseline data

Baseline data for year 2012 indicates that forest and semi-natural land dominates in the coastal zoneof Albania with 49%, followed by agricultural land with 36%. Regarding built-up area, Durrës County has the largest relative and absolute values with 64 km2 and 15%.

Looking at the narrowest coastal strip 0-300 m, Vlorë County has the largest absolute and relativebuilt-up area (8 km2, 12% within coastal zone).

Table A3.1: Areas of CCI25 land use classes in the coastal zones and their percentage, year 2012

2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Durrës County	Area in km 2	63.68	225.17	127.00	7.96	9.04	432.84
	% in coastal zone	14.71%	52.02%	29.34%	1.84%	2.09%	100.00%
Fier County	Area in km 2	12.86	264.54	88.26	80.65	32.52	478.83
	% in coastal zone	2.69%	55.25%	18.43%	16.84%	6.79%	100.00%
Gjirokastër County	Area in km 2	0.00	0.00	8.87	0.00	0.00	8.87
	% in coastal zone	0.00%	0.00%	100.00%	0.00%	0.00%	100.00%
Lezhë County	Area in km 2	43.49	219.54	158.29	17.23	16.52	455.07

	% in coastal zone	9.56%	48.24%	34.78%	3.79%	3.63%	100.00%
Shkodër County	Area in km 2	6.92	61.26	52.43	7.03	8.80	136.44
	% in coastal zone	5.07%	44.90%	38.43%	5.15%	6.45%	100.00%
Tirana County	Area in km 2	26.75	143.35	94.65	6.28	4.08	275.10
	% in coastal zone	9.72%	52.11%	34.41%	2.28%	1.48%	100.00%
Vlorë County	Area in km 2	62.89	305.94	1,140.67	67.30	35.79	1,612.58
	% in coastal zone	3.90%	18.97%	70.74%	4.17%	2.22%	100.00%
Albania	Area in km 2	216.59	1,219.79	1,670.18	186.44	106.75	3,399.75
	% in coastal zone	6.37%	35.88%	49.13%	5.48%	3.14%	100.00%

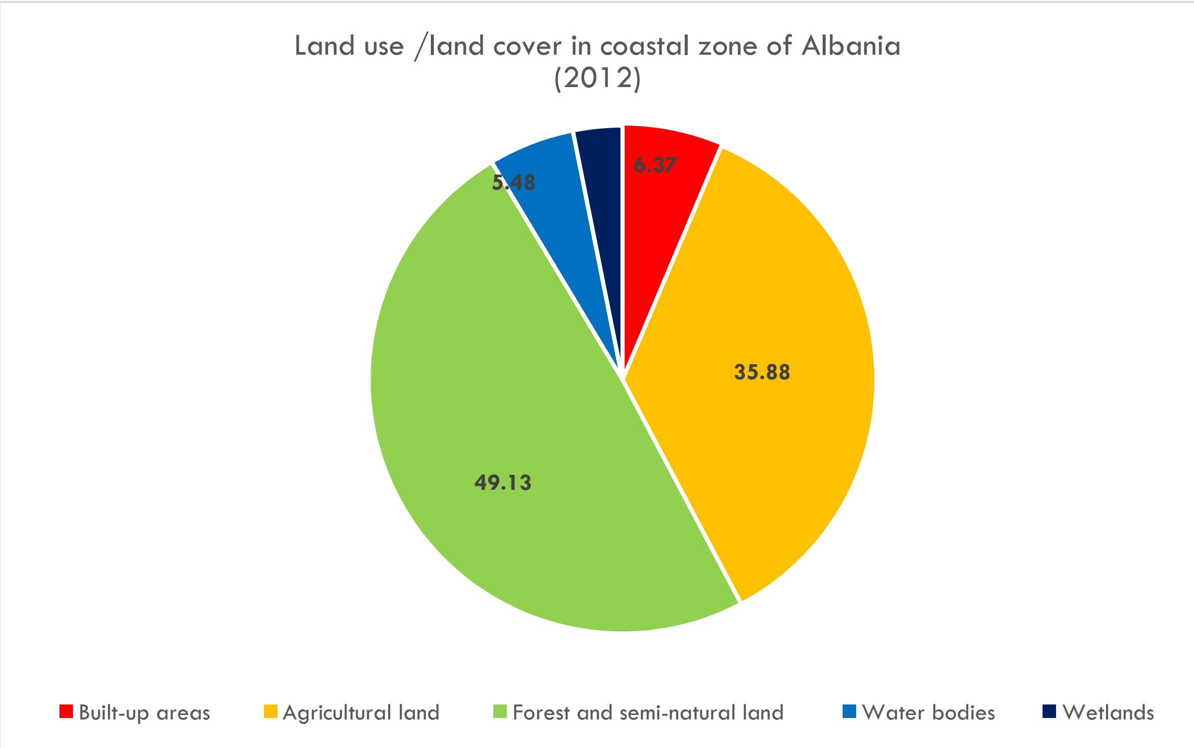


Figure A3.1: CCI25 land use classes in the coastal zone of Albania, year 2012

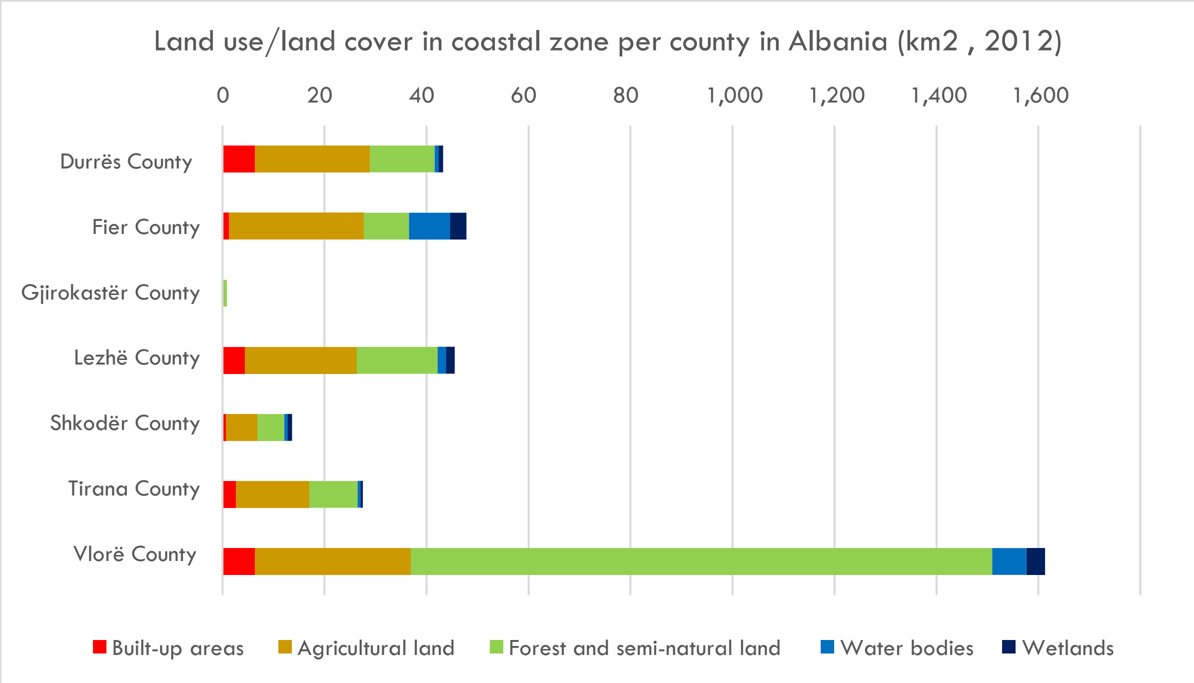


Figure A3.2: CCI25 land use classes in the coastal zone per county in km 2, year 2012

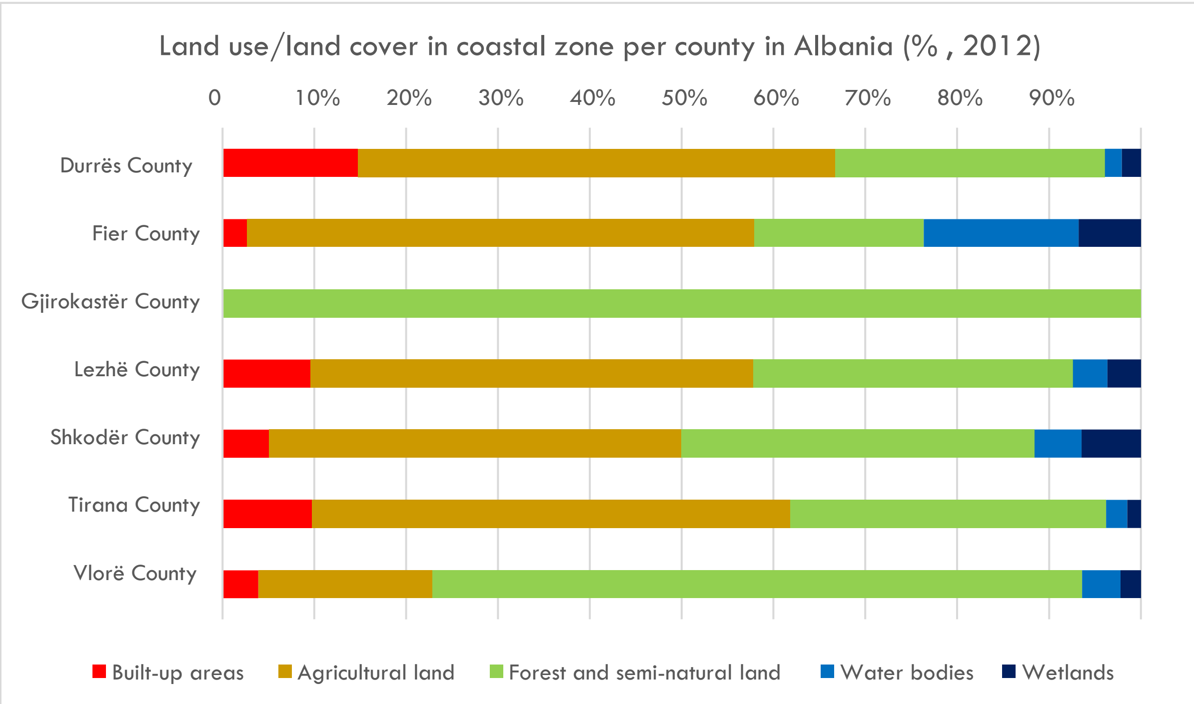


Figure A3.3: CCI25 land use classes in the coastal zone per county in percentage, year 2012

Table A3.2: Areas of CCI25 land use classes and their percentage in the coastal zone, year 2012

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	0-300 m	300 m - 1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km (control column)
Built-up areas	Areas in km2				% of c. strips within c. zone (0m-1km)			
Durrës County	3.75	8.81	51.11	63.68	5.89%	13.84%	80.27%	100.00%
Fier County	0.00	0.03	12.84	12.86	0.00%	0.20%	99.80%	100.00%
Gjirokastër County	0.00	0.00	0.00	0.00				
Lezhë County	1.23	1.35	40.91	43.49	2.83%	3.10%	94.07%	100.00%
Shkodër County	0.34	1.27	5.32	6.92	4.84%	18.32%	76.84%	100.00%
Tirana County	1.34	2.57	22.84	26.75	5.01%	9.59%	85.40%	100.00%
Vlorë County	7.70	10.68	44.50	62.89	12.24%	16.99%	70.77%	100.00%
Total	14.36	24.71	177.52	216.59	6.63%	11.41%	81.96%	100.00%
Agriculturalland	Areas in km2				% of c. strips within c. zone (0m-1km)			
Durrës County	1.42	9.53	214.22	225.17	0.63%	4.23%	95.14%	100.00%
Fier County	0.05	0.77	263.73	264.54	0.02%	0.29%	99.69%	100.00%
Gjirokastër County	0.00	0.00	0.00	0.00				
Lezhë County	0.80	4.92	213.82	219.54	0.36%	2.24%	97.40%	100.00%
Shkodër County	0.02	1.06	60.18	61.26	0.03%	1.73%	98.24%	100.00%
Tirana County	1.18	8.20	133.97	143.35	0.82%	5.72%	93.46%	100.00%
Vlorë County	3.40	13.44	289.09	305.94	1.11%	4.39%	94.49%	100.00%
Total	6.87	37.92	1,175.00	1,219.79	0.56%	3.11%	96.33%	100.00%
Forest and semi-natural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
Durrës County	11.36	16.91	98.74	127.00	8.94%	13.31%	77.75%	100.00%
Fier County	5.40	10.76	72.10	88.26	6.12%	12.19%	81.69%	100.00%
Gjirokastër County	0.00	0.00	8.87	8.87	0.00%	0.00%	100.00%	100.00%
Lezhë County	6.71	10.95	140.64	158.29	4.24%	6.92%	88.85%	100.00%

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	0-300 m	300 m - 1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km (control column)
Shkodër County	2.66	4.92	44.85	52.43	5.07%	9.38%	85.55%	100.00%
Tirana County	5.69	9.36	79.61	94.65	6.01%	9.89%	84.10%	100.00%
Vlorë County	55.83	99.50	985.34	1,140.67	4.89%	8.72%	86.38%	100.00%
Total	87.64	152.39	1,430.15	1,670.18	5.25%	9.12%	85.63%	100.00%
Water bodies	Areas in km2				% of c. strips within c. zone (0m-1km)			
Durrës County	0.85	0.25	6.86	7.96	10.73%	3.08%	86.19%	100.00%
Fier County	6.68	10.33	63.64	80.65	8.28%	12.81%	78.91%	100.00%
Gjirokastër County	0.00	0.00	0.00	0.00				
Lezhë County	3.00	5.29	8.94	17.23	17.41%	30.72%	51.87%	100.00%
Shkodër County	0.63	0.76	5.63	7.03	8.98%	10.88%	80.14%	100.00%
Tirana County	0.89	1.13	4.26	6.28	14.13%	17.98%	67.89%	100.00%
Vlorë County	4.11	9.00	54.19	67.30	6.11%	13.37%	80.52%	100.00%
Total	16.16	26.76	143.52	186.44	8.67%	14.35%	76.98%	100.00%
Wetlands	Areas in km2				% of c. strips within c. zone (0m-1km)			
Durrës County	2.97	3.88	2.19	9.04	32.82%	42.92%	24.26%	100.00%
Fier County	1.85	10.11	20.56	32.52	5.68%	31.09%	63.23%	100.00%
Gjirokastër County	0.00	0.00	0.00	0.00				
Lezhë County	4.66	7.04	4.81	16.52	28.21%	42.64%	29.14%	100.00%
Shkodër County	0.52	1.56	6.72	8.80	5.87%	17.76%	76.37%	100.00%
Tirana County	1.12	1.85	1.10	4.08	27.52%	45.43%	27.05%	100.00%
Vlorë County	1.61	6.22	27.97	35.79	4.49%	17.37%	78.14%	100.00%
Total	12.72	30.67	63.36	106.75	11.92%	28.73%	59.36%	100.00%

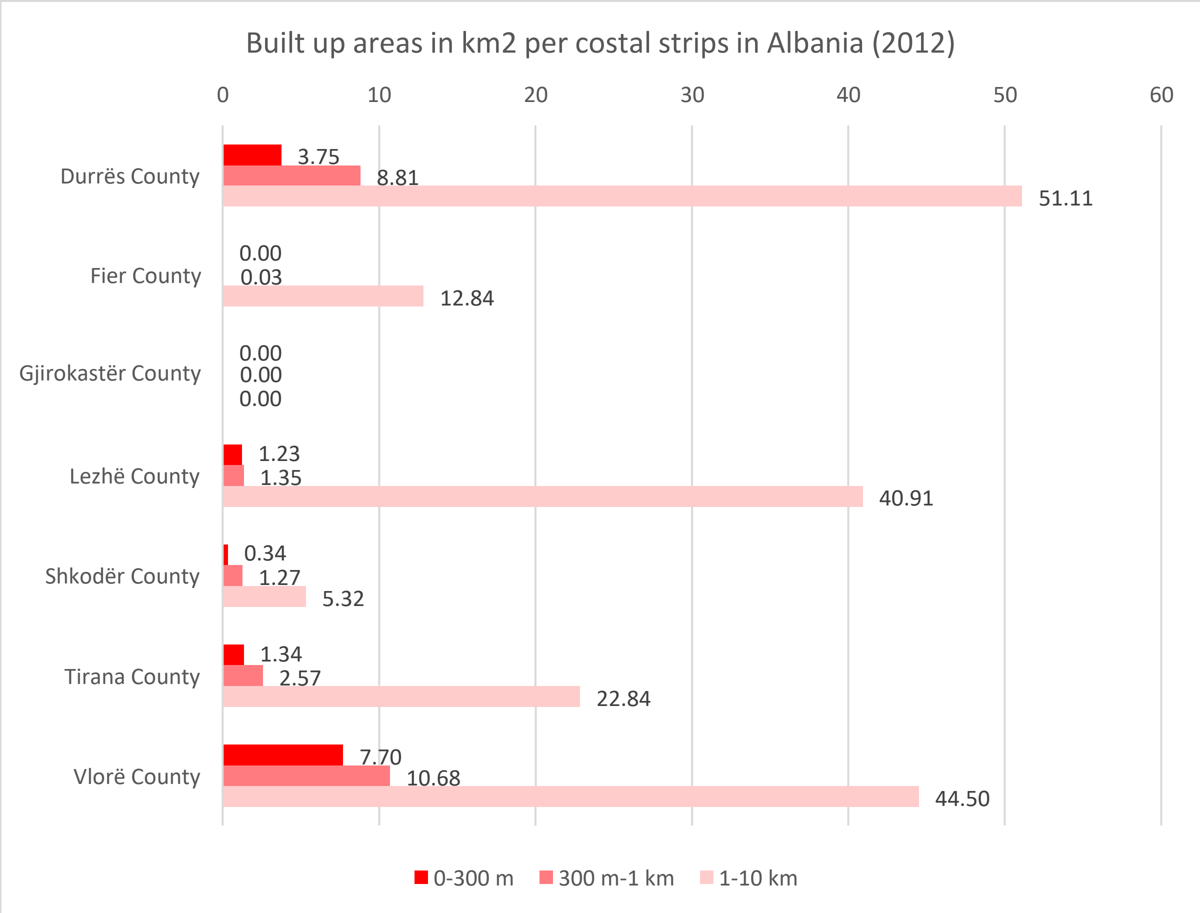


Figure A3.4: Built up area in km2 per costal strips per county in year 2012

10.3. Changes 2012-2018

Analysing land use/cover changes, built-up areas increased in all reporting units. Durrës and Vlorë County have the largest increase of 3 and 2 km2 of which the most is located in the third coastal strip 1-10 km. Map A3.1 illustrates land take by city development in the area of Durrës in Albania.

Table A3.3: Land use/cover change in km2 and percentage from year 2012 to 2018 on county level

2018-2012		Built-up areas	Agricultural land	Forest and semi- natural land	Water bodies	Wetlands
Durrës County	Area in km 2	2.68	-1.66	-0.92	0.17	-0.27
	% of change	4.20%	-0.74%	-0.72%	2.14%	-2.95%
Fier County	Area in km 2	1.23	-1.18	1.43	-1.23	-0.25
	% of change	9.58%	-0.45%	1.62%	-1.53%	-0.76%
Gjirokastër County						

2018-2012		Built-up areas	Agricultural land	Forest and semi- natural land	Water bodies	Wetlands
	Area in km 2	0.00	0.00	0.00	0.00	0.00
	% of change	0.00%	0.00%	0.00%	0.00%	0.00%
Lezhë County	Area in km 2	0.60	-0.40	-0.01	-0.41	0.21
	% of change	1.38%	-0.18%	0.00%	-2.35%	1.26%
Shkodër County	Area in km 2	0.25	-0.35	0.02	-0.14	0.22
	% of change	3.63%	-0.58%	0.04%	-1.93%	2.45%
Tirana County	Area in km 2	0.27	-0.18	0.12	-0.24	0.03
	% of change	1.02%	-0.12%	0.13%	-3.89%	0.62%
Vlorë County	Area in km 2	2.30	0.12	-2.62	0.15	0.03
	% in coastal zone	3.66%	0.04%	-0.23%	0.23%	0.10%
Albania	Area in km 2	7.34	-3.65	-1.96	-1.69	-0.03
	% of change	3.39%	-0.30%	-0.12%	-0.91%	-0.03%

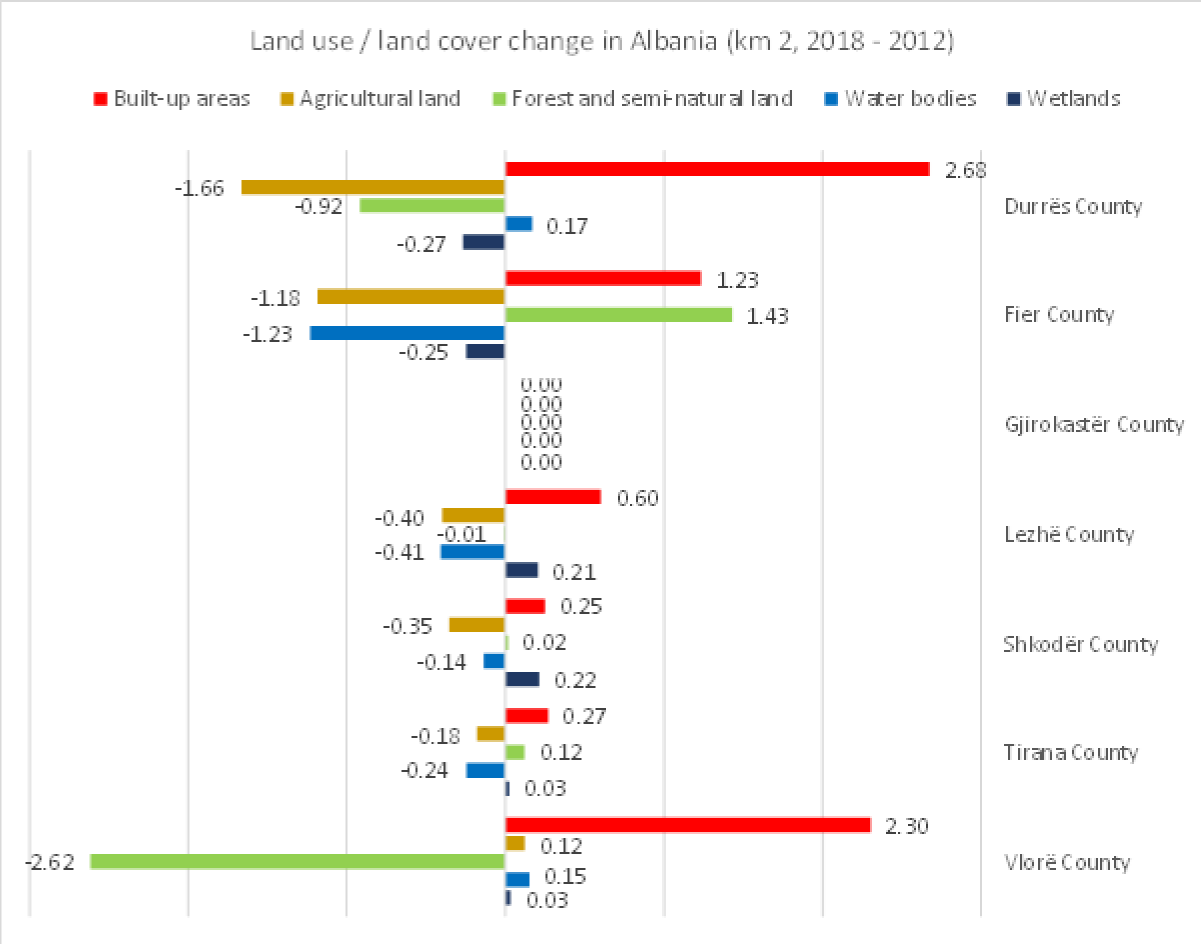


Figure A3.5: Land use/cover change in km2 from year 2012 to 2018 on county level

Table A3.4: Land use/cover change from year 2012 to 2018 in km2 and percentage for coastal strips

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Built-up areas	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Durrës County	0.52	0.60	1.56	2.68	13.76%	6.83%	3.05%	4.20%
Fier County	0.00	0.01	1.22	1.23	0.00%	25.64%	9.54%	9.58%
Gjirokastër County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Lezhë County	0.12	0.06	0.42	0.60	9.76%	4.65%	1.03%	1.38%
Shkodër County	0.03	0.11	0.12	0.25	8.37%	8.48%	2.18%	3.63%
Tirana County	0.04	0.08	0.15	0.27	3.29%	3.13%	0.65%	1.02%
Vlorë County	0.61	0.33	1.37	2.30	7.88%	3.06%	3.08%	3.66%
Total	1.32	1.19	4.84	7.34	9.16%	4.80%	2.72%	3.39%
Agricultural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Durrës County	-0.09	-0.12	-1.45	-1.66	-6.03%	-1.31%	-0.68%	-0.74%
Fier County	0.00	0.00	-1.18	-1.18	0.00%	0.00%	-0.45%	-0.45%
Gjirokastër County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Lezhë County	0.00	0.00	-0.40	-0.40	0.00%	0.00%	-0.19%	-0.18%
Shkodër County	0.00	-0.02	-0.33	-0.35	0.00%	-1.94%	-0.55%	-0.58%
Tirana County	-0.01	-0.06	-0.11	-0.18	-1.05%	-0.70%	-0.08%	-0.12%
Vlorë County	-0.19	-0.02	0.34	0.12	-5.63%	-0.15%	0.12%	0.04%
Total	-0.29	-0.22	-3.14	-3.65	-4.22%	-0.59%	-0.27%	-0.30%
Forest and semi-natural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Durrës County	-0.30	-0.46	-0.16	-0.92	-2.63%	-2.71%	-0.16%	-0.72%
Fier County	1.45	-0.02	0.00	1.43	26.89%	-0.20%	0.00%	1.62%
Gjirokastër County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Lezhë County	0.05	-0.02	-0.04	-0.01	0.70%	-0.15%	-0.03%	0.00%
Shkodër County	0.11	-0.09	0.00	0.02	4.04%	-1.77%	0.00%	0.04%
Tirana County	0.20	-0.02	-0.06	0.12	3.56%	-0.24%	-0.07%	0.13%
Vlorë County	-0.33	-0.28	-2.01	-2.62	-0.58%	-0.29%	-0.20%	-0.23%
Total	1.18	-0.89	-2.26	-1.96	1.35%	-0.58%	-0.16%	-0.12%
Water bodies	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Durrës County	-0.13	0.00	0.30	0.17	-15.44%	0.00%	4.41%	2.14%
Fier County	-1.34	0.11	0.00	-1.23	-20.02%	1.06%	0.00%	-1.53%
Gjirokastër County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Lezhë County	-0.22	-0.10	-0.09	-0.41	-7.27%	-1.92%	-0.96%	-2.35%
Shkodër County	-0.14	0.00	0.00	-0.14	-21.48%	0.00%	0.00%	-1.93%
Tirana County	-0.22	0.00	-0.03	-0.24	-24.55%	0.00%	-0.63%	-3.89%
Vlorë County	-0.07	0.00	0.22	0.15	-1.63%	0.00%	0.41%	0.23%
Total	-2.11	0.01	0.41	-1.69	-13.04%	0.03%	0.28%	-0.91%
Wetlands	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Durrës County	0.00	-0.02	-0.25	-0.27	0.00%	-0.51%	-11.26%	-2.95%
Fier County	-0.11	-0.09	-0.04	-0.25	-6.20%	-0.93%	-0.19%	-0.76%
Gjirokastër County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Lezhë County	0.05	0.06	0.10	0.21	1.10%	0.79%	2.10%	1.26%
Shkodër County	0.00	0.00	0.22	0.22	0.00%	0.00%	3.21%	2.45%
Tirana County	-0.02	0.00	0.04	0.03	-1.45%	0.00%	3.75%	0.62%
Vlorë County	-0.02	-0.02	0.08	0.03	-1.39%	-0.35%	0.28%	0.10%
Total	-0.10	-0.08	0.15	-0.03	-0.80%	-0.26%	0.24%	-0.03%

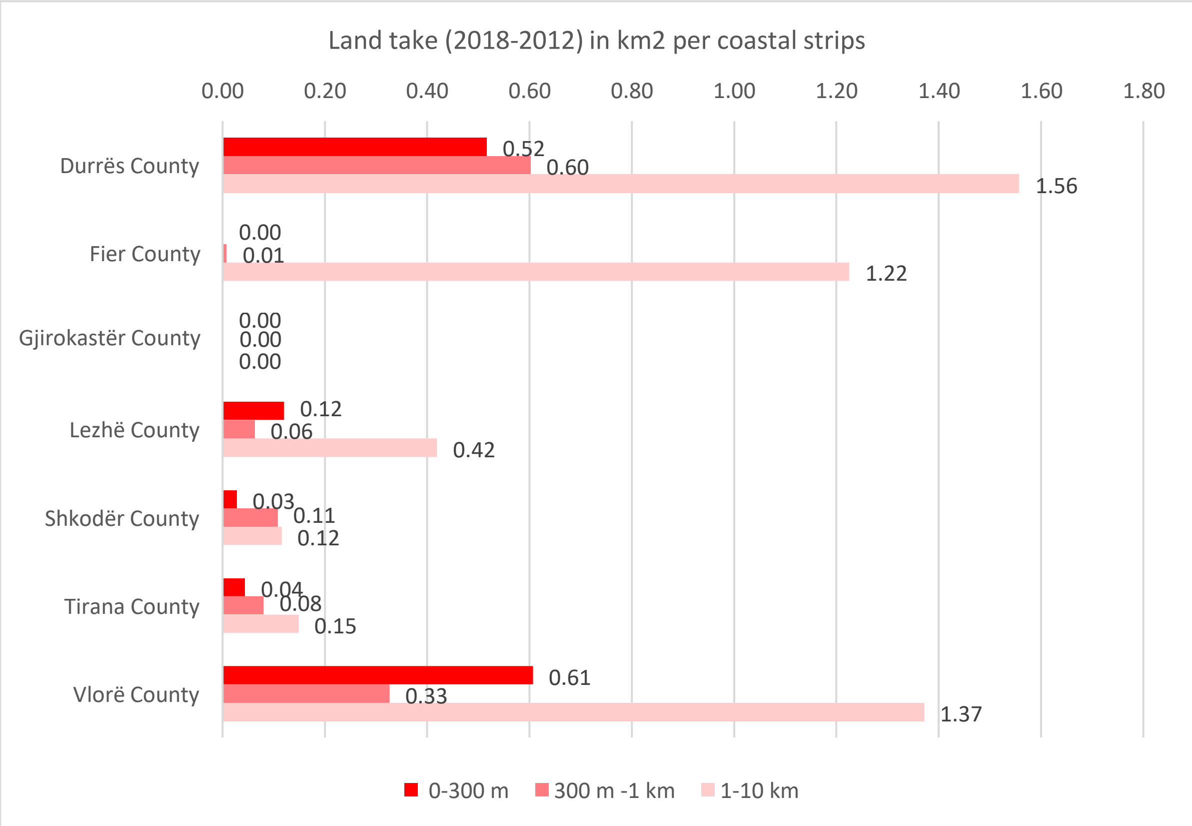
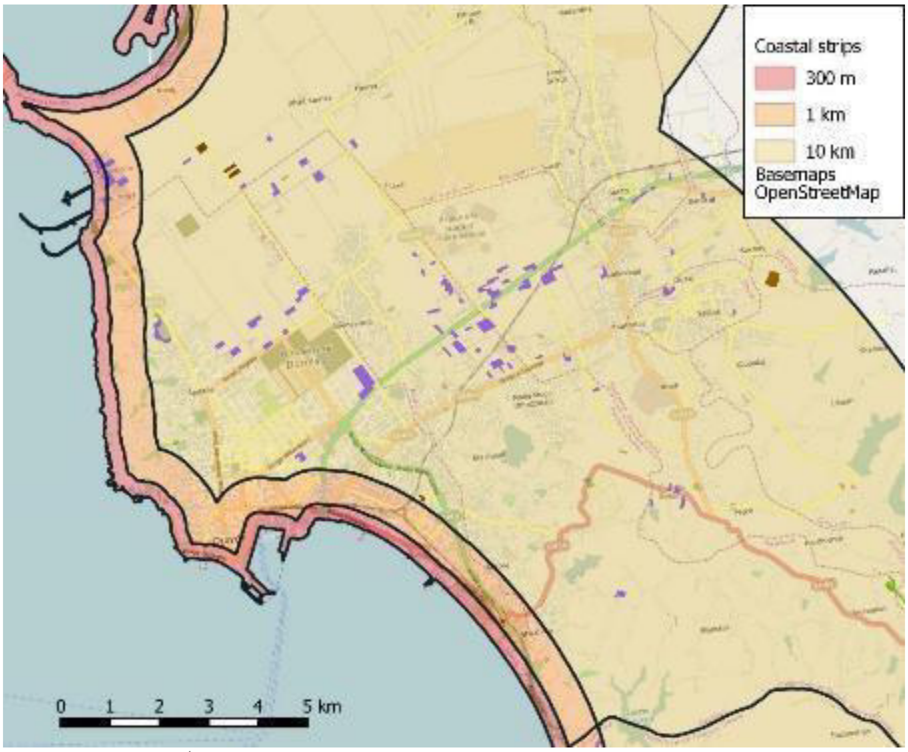


Figure A3.6: Land take (increase of built up areas) from 2012 to 2018 on county level per coastal strips



Map A3.1: Change in land use/cover classes – land take by city development in the area of Durrës in Albania (purple coloured areas)

11. Annex 4

11.1. CCI25 parameters for Bosnia and Herzegovina

Calculated CCI25 parameters for year 2012 on the level of reporting units are given in the following tables and graphs. These parameters represent so called baseline data for calculation of land use/cover changes. Thus, following the data for year 2012, there are tables and graphs with the calculation of changes. The change in areas is calculated so that the area for 2012 was subtracted fromthe area from 2018. The resulting negative values mean that these areas decreased and the positive vales mean that these areas increased. The percentage of change was calculated by dividing the abovedifference with the areas from 2012. Thus, the resulting percentage has the meaning of percentage change with respect to the baseline data. Detailed data for year 2012, 2018 and changes are providedin auxiliary Excel files and GIS database.

11.2. Year 2012 – baseline data

Table A4.1: Areas of CCI25 land use classes in the coastal zones and their percentage, year 2012

2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
City of Trebinje	Area in km 2	0.87	1.80	93.29	0.00	0.00	95.96
	% in coastal zone	0.91%	1.87%	97.22%	0.00%	0.00%	100.00%
Herzegovina-Neretva Canton	Area in km 2	3.51	7.89	316.45	0.04	0.00	327.88
	% in coastal zone	1.07%	2.41%	96.51%	0.01%	0.00%	100.00%
Bosnia and Herzegovina	Area in km 2	4.38	9.68	409.73	0.04	0.00	423.84
	% in coastal zone	1.03%	2.28%	96.67%	0.01%	0.00%	100.00%

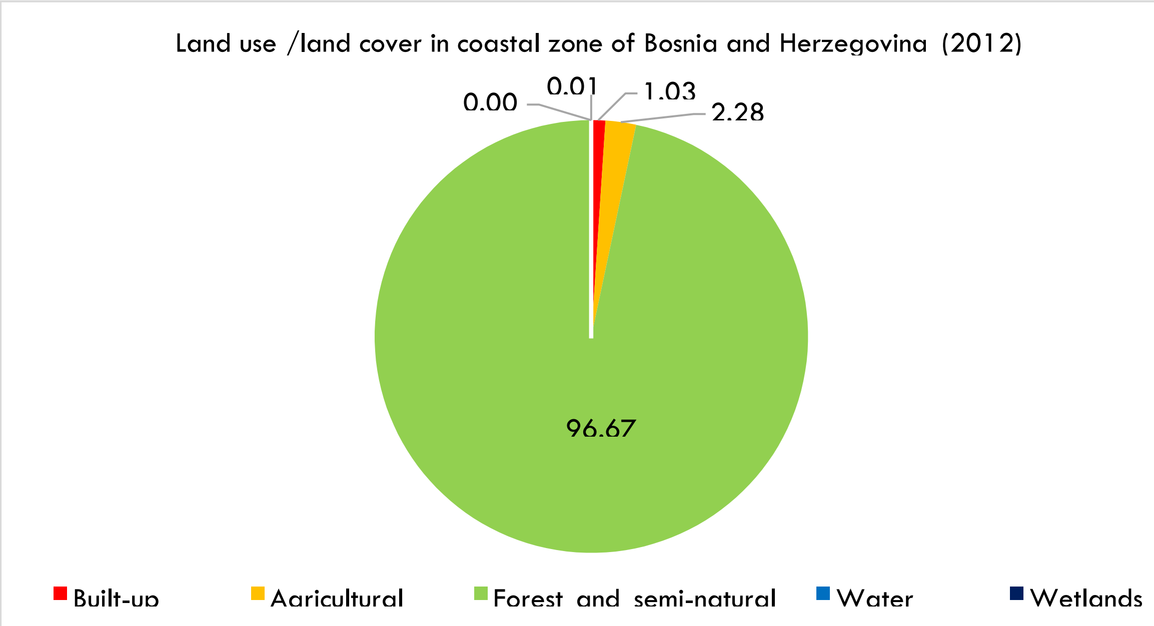


Figure A4.1: CCI25 land use classes in the coastal zone of Bosnia and Herzegovina, year 2012

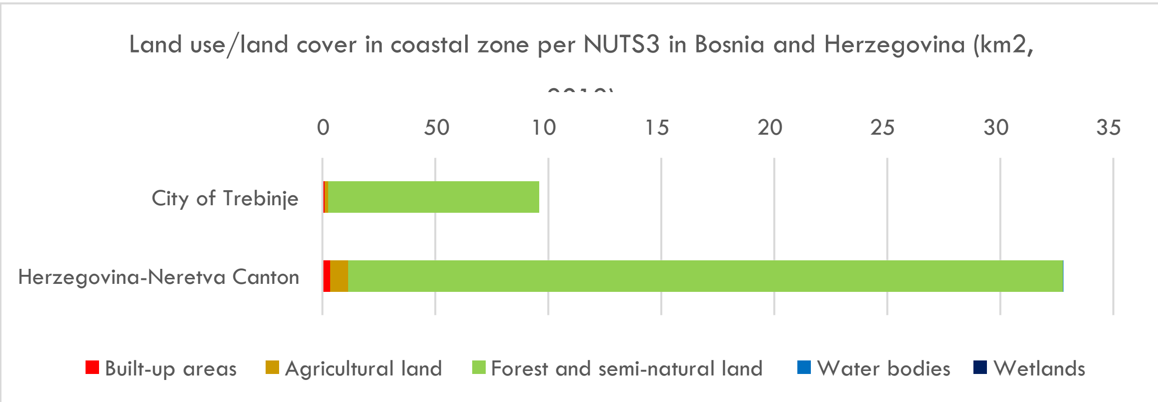


Figure A4.2: CCI25 land use classes in the coastal zone per NUTS3 in km 2, year 2012

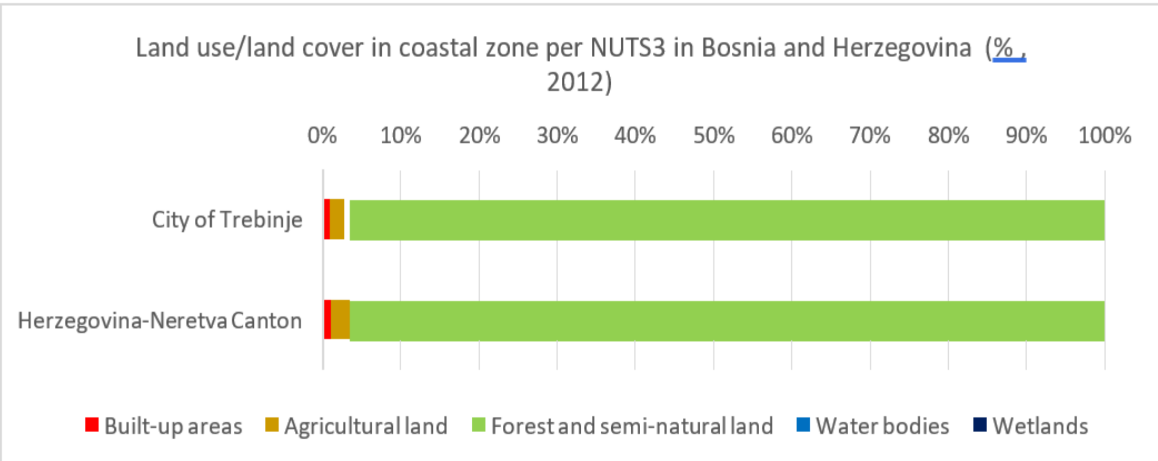


Figure A4.3: CCI25 land use classes in the coastal zone per NUTS3 in percentage, year 2012

Table A4.2: Areas of CCI25 land use classes and their percentage in the coastal zone, year 2012

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km (control column)**
Built-up areas	Areas in km2				% of c. strips within c. zone (0m-1km)			
City of Trebinje	0.00	0.00	0.87	0.87	0.00%	0.00%	100.00%	100.00%
Herz.-Neretva Canton	0.77	0.53	2.21	3.51	22.04%	15.10%	62.86%	100.00%
Bosnia and Herz.	0.77	0.53	3.08	4.38	17.66%	12.10%	70.24%	100.00%
Agricultural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
City of Trebinje	0.00	0.00	1.80	1.80	0.00%	0.00%	100.00%	100.00%
Herz.-Neretva Canton	0.04	0.16	7.70	7.89	0.45%	1.97%	97.58%	100.00%
Bosnia and Herz.	0.04	0.16	9.49	9.68	0.37%	1.60%	98.03%	100.00%
Forest and semi-natural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
City of Trebinje	0.00	0.00	93.29	93.29	0.00%	0.00%	100.00%	100.00%
Herz.-Neretva Canton	5.28	6.57	304.59	316.45	1.67%	2.08%	96.25%	100.00%
Bosnia and Herz.	5.28	6.57	397.88	409.73	1.29%	1.60%	97.11%	100.00%
Water bodies	Areas in km2				% of c. strips within c. zone (0m-1km)			
City of Trebinje	0.00	0.00	0.00	0.00				
Herz.-Neretva Canton	0.04	0.00	0.00	0.04	100.00 %	0.00%	0.00%	100.00%
Bosnia and Herz.	0.04	0.00	0.00	0.04	100.00 %	0.00%	0.00%	100.00%
Wetlands	Areas in km2				% of c. strips within c. zone (0m-1km)			
City of Trebinje	0.00	0.00	0.00	0.00				
Herz.-Neretva Canton	0.00	0.00	0.00	0.00				
Bosnia and Herz.	0.00	0.00	0.00	0.00				

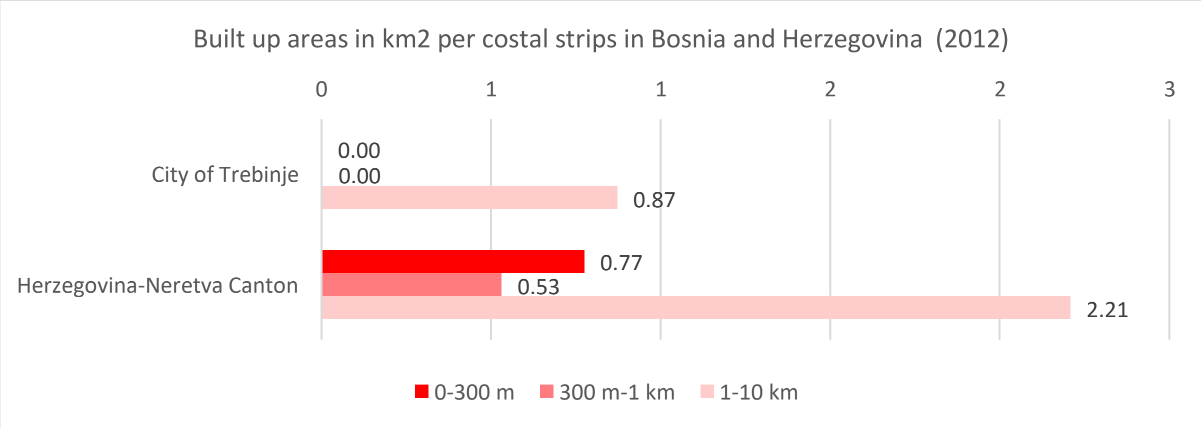


Figure A4.4: Built up area in km2 per costal strips per country in year 2012

11.3. Changes 2012-2018

Table A4.3: Land use/cover change in km2 and percentage from year 2012 to 2018 on NUTS3 level

2018-2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands
City of Trebinje	Area in km 2	0.01	0.00	-0.01	0.00	0.00
	% of change	0.89%	0.00%	-0.01%	0.00%	0.00%
Herzeg.-Neretva Canton	Area in km 2	0.25	0.03	-0.28	0.00	0.00
	% of change	7.05%	0.37%	-0.09%	0.00%	0.00%
Bosnia and Herzegovina	Area in km 2	0.26	0.03	-0.28	0.00	0.00
	% of change	5.83%	0.30%	-0.07%	0.00%	0.00%

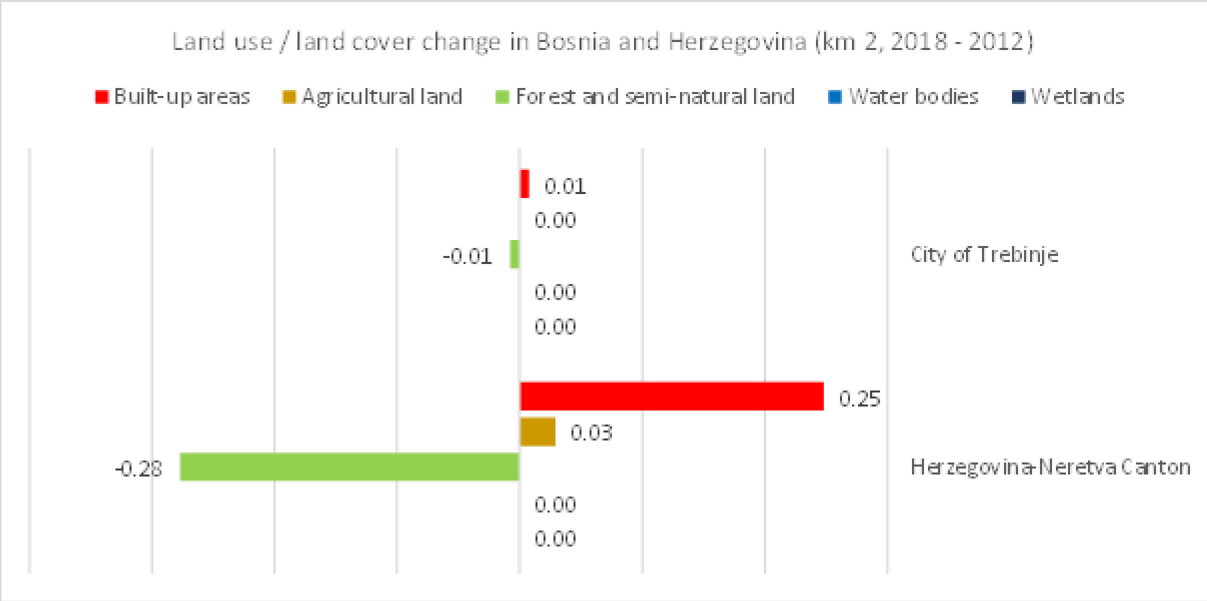


Figure A4.5: Land use/cover change in km2 from year 2012 to 2018 on NUTS3 level

Table A4.4: Land use/cover change from year 2012 to 2018 in km2 and percentage for coastal strips

	Coastal strips 2018-2012			**Coastal zone**	**Coastal strips 2018-2012**			**Coastal zone**
	0-300 m	**300 m -1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**
Built-up areas	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
City of Trebinje	0.00	0.00	0.01	0.01	0.00%	0.00%	0.89%	0.89%
Herz.-Neretva Canton	0.01	0.00	0.24	0.25	0.89%	0.00%	10.91%	7.05%
Bosnia and Herzegovina	0.01	0.00	0.25	0.26	0.89%	0.00%	8.07%	5.83%
Agricultural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
City of Trebinje	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Herz.-Neretva Canton	0.00	0.00	0.03	0.03	0.00%	0.00%	0.38%	0.37%
Bosnia and Herzegovina	0.00	0.00	0.03	0.03	0.00%	0.00%	0.31%	0.30%
Forest and semi-natural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
City of Trebinje	0.00	0.00	-0.01	-0.01	0.00%	0.00%	-0.01%	-0.01%
Herz.-Neretva Canton	-0.01	0.00	-0.27	-0.28	-0.13%	0.00%	-0.09%	-0.09%

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Bosnia and Herzegovina	-0.01	0.00	-0.28	-0.28	-0.13%	0.00%	-0.07%	-0.07%
Water bodies	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
City of Trebinje	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Herz.-Neretva Canton	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Bosnia and Herzegovina	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Wetlands	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
City of Trebinje	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Herz.-Neretva Canton	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Bosnia and Herzegovina	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%

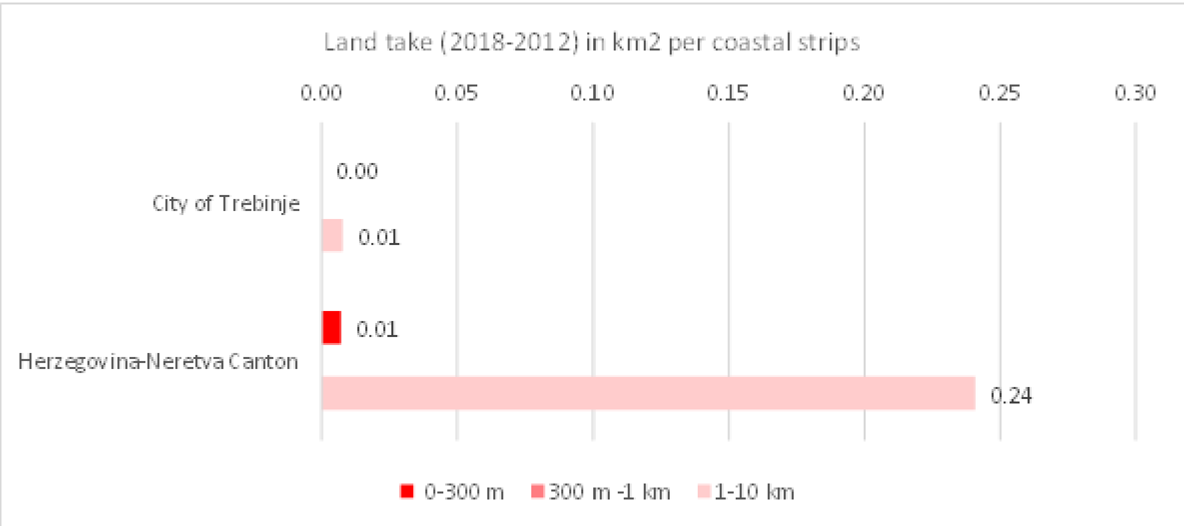


Figure A4.6: Land take (increase of built up areas) from year 2012 to 2018 on NUTS3 level per coastalstrips

12. Annex 5

12.1. CCI25 parameters for Croatia

Calculated CCI25 parameters for year 2012 on the level of reporting units are given in the following tables and graphs. These parameters represent so called baseline data for calculation of land use/cover changes. Thus, following the data for year 2012, there are tables and graphs with the calculation of changes. The change in areas is calculated so that the area for 2012 was subtracted fromthe area from 2018. The resulting negative values mean that these areas decreased and the positive vales mean that these areas increased. The percentage of change was calculated by dividing the abovedifference with the areas from 2012. Thus, the resulting percentage has the meaning of percentage change with respect to the baseline data. Detailed data for year 2012, 2018 and changes are providedin auxiliary Excel files and GIS database.

12.2. Year 2012 – baseline data

Table A5.1: Areas of CCI25 land use classes in the coastal zones and their percentage, year 2012

2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Dubrovnik-Neretva County	Area in km 2	49.94	188.07	1,401.77	16.46	23.88	1,680.13
	% in coastal zone	2.97%	11.19%	83.43%	0.98%	1.42%	100.00%
Istria County	Area in km 2	135.00	405.54	1,080.59	3.93	1.05	1,626.10
	% in coastal zone	8.30%	24.94%	66.45%	0.24%	0.06%	100.00%
Lika-Senj County	Area in km 2	11.78	11.69	1,000.00	1.04	0.10	1,024.61
	% in coastal zone	1.15%	1.14%	97.60%	0.10%	0.01%	100.00%
Primorje-Gorski Kotar County	Area in km 2	125.58	61.84	1,720.61	11.58	1.29	1,920.90
	% in coastal zone	6.54%	3.22%	89.57%	0.60%	0.07%	100.00%
Split-Dalmatia County	Area in km 2	125.20	198.25	1,952.16	6.13	0.19	2,281.94
	% in coastal zone	5.49%	8.69%	85.55%	0.27%	0.01%	100.00%
Zadar County	Area in km 2	117.12	342.22	1,558.71	38.10	11.08	2,067.23

	% in coastal zone	5.67%	16.55%	75.40%	1.84%	0.54%	100.00%
Šibenik-Knin County	Area in km 2	47.06	122.61	608.41	18.83	0.44	797.36
	% in coastal zone	5.90%	15.38%	76.30%	2.36%	0.05%	100.00%
Croatia	Area in km 2	611.68	1,330.23	9,322.26	96.06	38.04	11,398.27
	% in coastal zone	5.37%	11.67%	81.79%	0.84%	0.33%	100.00%

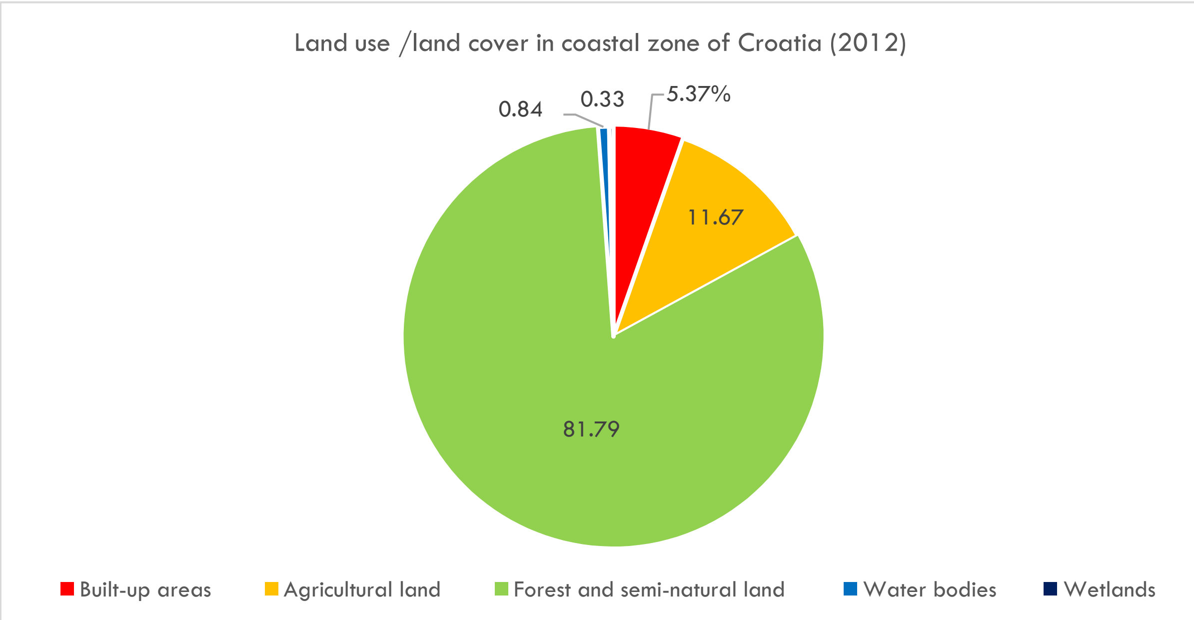


Figure A5.1: CCI25 land use classes in the coastal zone of Croatia, year 2012

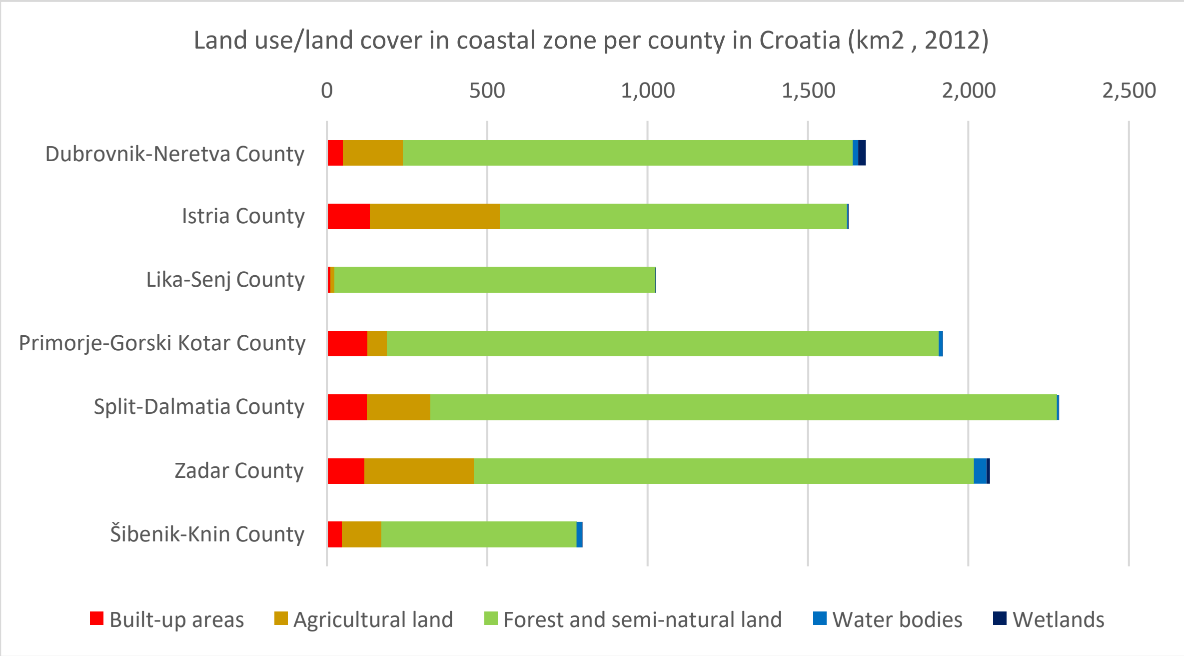


Figure A5.2: CCI25 land use classes in the coastal zone per county in km 2, year 2012

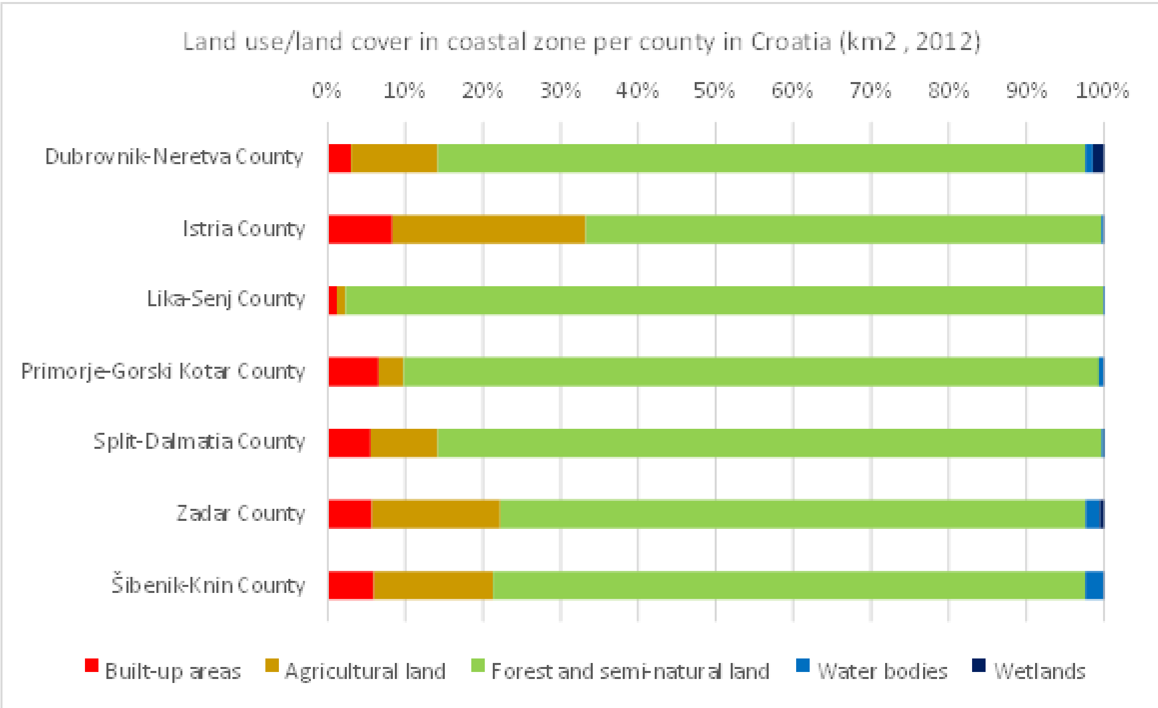


Figure A5.3: CCI25 land use classes in the coastal zone per county in percentage, year 2012

Table A5.2: Areas of CCI25 land use classes and their percentage in the coastal zone, year 2012

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m - 1 km**	**1-10 km**	**0m -10 km (control column)**
Built-up areas	Areas in km2				% of c. strips within c. zone (0m-1km)			
Dubrovnik-Neretva County	18.11	11.00	20.83	49.94	36.26%	22.02%	41.72%	100.00%
Istria County	31.58	26.07	77.35	135.00	23.39%	19.31%	57.30%	100.00%
Lika-Senj County	5.98	2.75	3.05	11.78	50.79%	23.33%	25.88%	100.00%
Primorje-Gorski Kotar County	31.29	29.46	64.83	125.58	24.91%	23.46%	51.62%	100.00%
Split-Dalmatia County	39.18	30.20	55.82	125.20	31.30%	24.12%	44.58%	100.00%
Zadar County	37.03	23.56	56.53	117.12	31.62%	20.12%	48.27%	100.00%
Šibenik-Knin County	15.24	9.11	22.71	47.06	32.37%	19.36%	48.26%	100.00%
Croatia	178.41	132.15	301.13	611.68	29.17 %	21.60 %	49.23 %	100.00%
Agricultural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
Dubrovnik-Neretva County	12.92	30.24	144.91	188.07	6.87%	16.08%	77.05%	100.00%
Istria County	7.18	32.13	366.24	405.54	1.77%	7.92%	90.31%	100.00%
Lika-Senj County	0.84	1.98	8.87	11.69	7.18%	16.92%	75.90%	100.00%
Primorje-Gorski Kotar County	6.37	20.48	34.99	61.84	10.30%	33.12%	56.59%	100.00%
Split-Dalmatia County	13.50	44.25	140.50	198.25	6.81%	22.32%	70.87%	100.00%
Zadar County	24.13	48.24	269.85	342.22	7.05%	14.10%	78.85%	100.00%
Šibenik-Knin County	8.24	17.66	96.71	122.61	6.72%	14.40%	78.88%	100.00%
Croatia	73.17	194.98	1,062.07	1,330.23	5.50%	14.66 %	79.84 %	100.00 %
Forest and semi-natural land	Areas in km2				% of c. strips within c. zone (0m-1km)			

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m - 1 km**	**1-10 km**	**0m -10 km (control column)**
Dubrovnik-Neretva County	209.75	326.96	865.06	1,401.77	14.96%	23.32%	61.71%	100.00%
Istria County	76.12	112.74	891.73	1,080.59	7.04%	10.43%	82.52%	100.00%
Lika-Senj County	63.45	107.28	829.27	1,000.00	6.35%	10.73%	82.93%	100.00%
Primorje-Gorski Kotar County	216.82	331.95	1171.84	1720.61	12.60%	19.29%	68.11%	100.00%
Split-Dalmatia County	199.69	300.93	1,451.55	1,952.16	10.23%	15.41%	74.36%	100.00%
Zadar County	239.67	322.88	996.16	1,558.71	15.38%	20.71%	63.91%	100.00%
Šibenik-Knin County	125.98	90.00	392.44	608.41	20.71%	14.79%	64.50%	100.00%
Croatia	1,131.48	1,592.73	6,598.05	9,322.26	12.14%	17.09%	70.78%	100.00%
Water bodies	Areas in km2				% of c. strips within c. zone (0m-1km)			
Dubrovnik-Neretva County	5.68	1.66	9.12	16.46	34.49%	10.08%	55.43%	100.00%
Istria County	2.35	0.49	1.09	3.93	59.74%	12.40%	27.86%	100.00%
Lika-Senj County	0.95	0.02	0.06	1.04	91.92%	1.88%	6.20%	100.00%
Primorje-Gorski Kotar County	4.33	0.07	7.18	11.58	37.36%	0.63%	62.01%	100.00%
Split-Dalmatia County	4.83	0.15	1.15	6.13	78.81%	2.38%	18.82%	100.00%
Zadar County	5.57	0.50	32.03	38.10	14.61%	1.32%	84.07%	100.00%
Šibenik-Knin County	2.74	0.86	15.22	18.83	14.57%	4.59%	80.84%	100.00%
Croatia	26.44	3.75	65.86	96.06	27.53%	3.91%	68.57%	100.00%
Wetlands	Areas in km2				% of c. strips within c. zone (0m-1km)			
Dubrovnik-Neretva County	1.15	1.25	21.48	23.88	4.80%	5.25%	89.95%	100.00%
Istria County	0.32	0.58	0.15	1.05	30.07%	55.45%	14.48%	100.00%

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m - 1 km	1-10 km	0m -10 km (control column)
Lika-Senj County	0.10	0.00	0.00	0.10	97.14%	2.86%	0.00%	100.00%
Primorje-Gorski Kotar County	0.39	0.06	0.84	1.29	30.62%	4.47%	64.92%	100.00%
Split-Dalmatia County	0.17	0.01	0.01	0.19	92.22%	3.52%	4.26%	100.00%
Zadar County	1.61	2.04	7.43	11.08	14.57%	18.40%	67.03%	100.00%
Šibenik-Knin County	0.11	0.01	0.32	0.44	25.12%	2.40%	72.48%	100.00%
Croatia	3.85	3.96	30.23	38.04	10.13 %	10.40 %	79.47 %	100.00 %

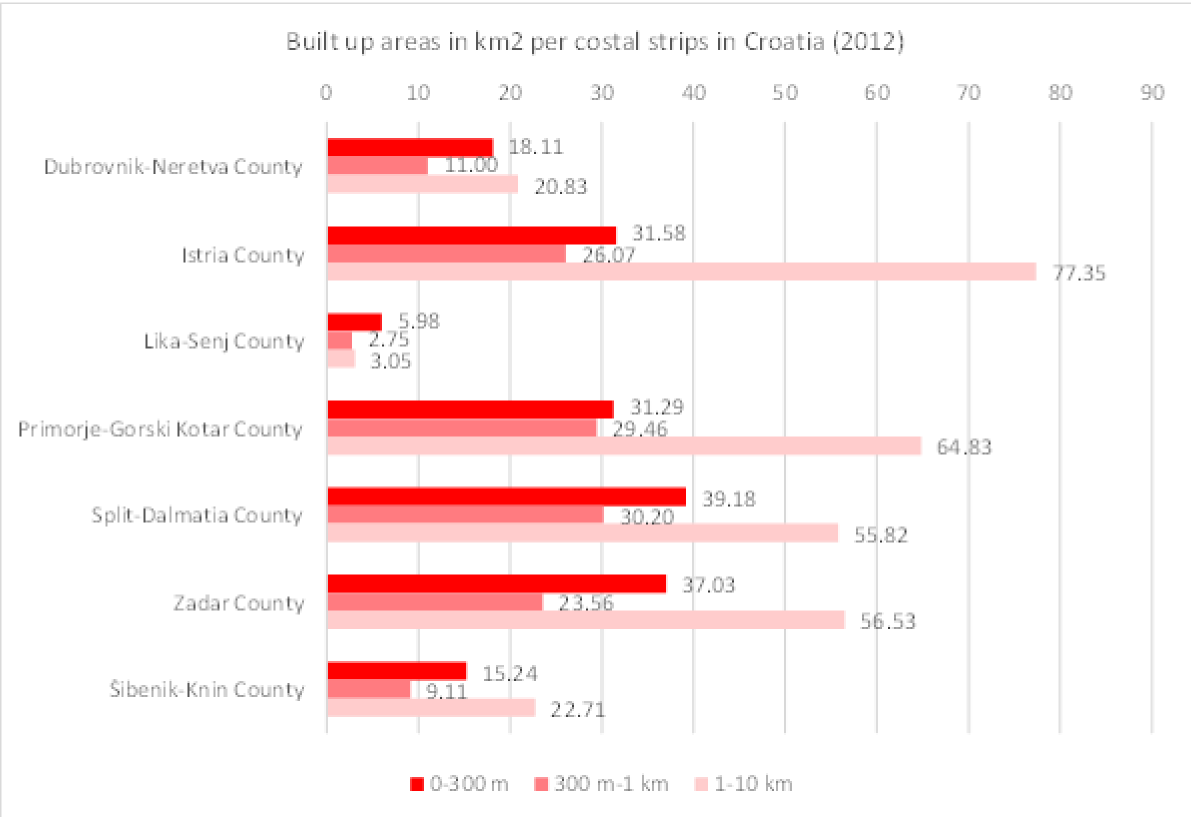


Figure A5.4: Built up area in km2 per costal strips per county in year 2012

12.3. Changes 2012-2018

Table A5.3: Land use/cover change in km2 and percentage from year 2012 to 2018 on county level

2018 - 2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Dubrovnik-Neretva County	Area in km 2	0.25	0.37	-0.44	-0.17	-0.01	0.00
	% of change	0.50%	0.20%	-0.03%	-1.01%	-0.06%	0.00%
Istria County	Area in km 2	2.38	0.65	-3.12	0.09	0.00	0.00
	% of change	1.76%	0.16%	-0.29%	2.37%	0.00%	0.00%
Lika-Senj County	Area in km 2	0.25	-0.01	-0.25	0.00	0.00	0.00
	% of change	2.15%	-0.04%	-0.02%	0.00%	0.00%	0.00%
Primorje-Gorski Kotar County	Area in km 2	1.23	0.72	-1.93	-0.02	0.00	0.00
	% of change	0.98%	1.17%	-0.11%	-0.21%	0.00%	0.00%
Split-Dalmatia County	Area in km 2	0.73	1.14	-1.84	-0.02	0.00	0.00
	% of change	0.58%	0.57%	-0.09%	-0.34%	0.00%	0.00%
Zadar County	Area in km 2	0.89	6.90	-7.80	0.00	0.00	0.00
	% of change	0.76%	2.02%	-0.50%	0.01%	0.00%	0.00%
Šibenik-Knin County	Area in km 2	0.04	0.67	-0.70	0.00	0.00	0.00
	% of change	0.08%	0.55%	-0.12%	-0.02%	0.00%	0.00%
Croatia	Area in km 2	5.77	10.45	-16.08	-0.12	-0.01	0.00
	% of change	0.94%	0.79%	-0.17%	-0.12%	-0.04%	0.00%

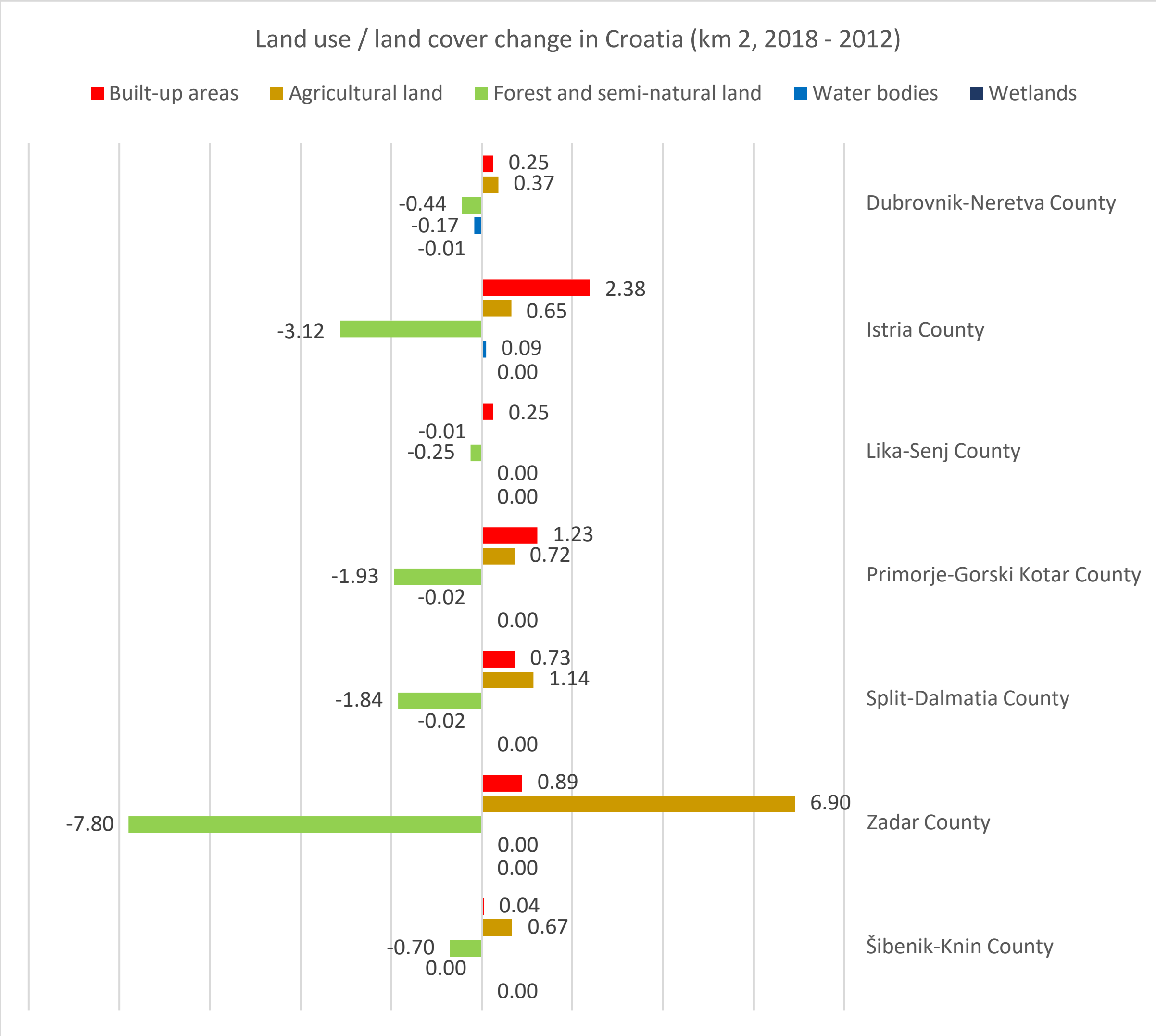


Figure A5.5: Land use/cover change in km2 from year 2012 to 2018 on county level

Table A5.4: Land use/cover change from year 2012 to 2018 in km2 and percentage for coastal strips

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Built-up areas	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Dub-Neretva County	0.38	0.15	-0.28	0.25	2.10%	1.38%	-1.35%	0.50%
Istria County	0.70	0.65	1.03	2.38	2.21%	2.51%	1.33%	1.76%
Lika-Senj County	0.08	0.10	0.07	0.25	1.36%	3.73%	2.28%	2.15%
Primorje-Gorski Kotar County	0.44	-0.11	0.90	1.23	1.41%	-0.38%	1.39%	0.98%
Split-Dalmatia County	0.05	0.21	0.47	0.73	0.13%	0.69%	0.84%	0.58%
Zadar County	0.37	0.17	0.35	0.89	0.99%	0.74%	0.62%	0.76%
Šibenik-Knin County	0.14	0.08	-0.19	0.04	0.94%	0.93%	-0.84%	0.08%
Croatia	2.16	1.26	2.35	5.77	1.21%	0.96%	0.78%	0.94%
Agricultural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Dub-Neretva County	0.19	0.13	0.04	0.37	1.50%	0.44%	0.03%	0.20%
Istria County	0.22	-0.03	0.45	0.65	3.06%	-0.08%	0.12%	0.16%
Lika-Senj County	-0.01	0.00	0.00	-0.01	-0.60%	0.00%	0.00%	-0.04%
Primorje-Gorski Kotar County	0.07	0.51	0.14	0.72	1.07%	2.50%	0.41%	1.17%
Split-Dalmatia County	0.12	0.10	0.91	1.14	0.91%	0.24%	0.65%	0.57%
Zadar County	0.08	0.63	6.19	6.90	0.33%	1.32%	2.29%	2.02%
Šibenik-Knin County	0.01	0.03	0.63	0.67	0.09%	0.18%	0.65%	0.55%
Croatia	0.69	1.39	8.37	10.45	0.94%	0.71%	0.79%	0.79%
Forest and semi-natural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Dub-Neretva County	-0.41	-0.27	0.24	-0.44	-0.19%	-0.08%	0.03%	-0.03%
Istria County	-0.92	-0.63	-1.58	-3.12	-1.21%	-0.56%	-0.18%	-0.29%
Lika-Senj County	-0.08	-0.10	-0.07	-0.25	-0.12%	-0.10%	-0.01%	-0.02%
Primorje-Gorski Kotar County	-0.49	-0.40	-1.04	-1.93	-0.22%	-0.12%	-0.09%	-0.11%

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Split-Dalmatia County	-0.15	-0.31	-1.38	-1.84	-0.08%	-0.10%	-0.09%	-0.09%
Zadar County	-0.40	-0.81	-6.59	-7.80	-0.17%	-0.25%	-0.66%	-0.50%
Šibenik-Knin County	-0.15	-0.12	-0.44	-0.70	-0.12%	-0.13%	-0.11%	-0.12%
Croatia	-2.58	-2.64	-10.86	-16.08	-0.23%	-0.17%	-0.16%	-0.17%
Water bodies	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Dub-Neretva County	-0.17	0.00	0.00	-0.17	-2.93%	0.00%	0.00%	-1.01%
Istria County	0.00	0.00	0.09	0.09	0.00%	0.00%	8.49%	2.37%
Lika-Senj County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Primorje-Gorski Kotar County	-0.02	0.00	0.00	-0.02	-0.55%	0.00%	0.00%	-0.21%
Split-Dalmatia County	-0.02	0.00	0.00	-0.02	-0.43%	0.00%	0.00%	-0.34%
Zadar County	-0.05	0.00	0.05	0.00	-0.86%	0.00%	0.16%	0.01%
Šibenik-Knin County	0.00	0.00	0.00	0.00	-0.17%	0.00%	0.00%	-0.02%
Croatia	-0.26	0.00	0.14	-0.12	-1.00%	0.00%	0.22%	-0.12%
Wetlands	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Dub-Neretva County	0.00	-0.01	0.00	-0.01	0.00%	-1.15%	0.00%	-0.06%
Istria County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Lika-Senj County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Primorje-Gorski Kotar County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Split-Dalmatia County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Zadar County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Šibenik-Knin County	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Croatia	0.00	-0.01	0.00	-0.01	0.00%	-0.37%	0.00%	-0.04%

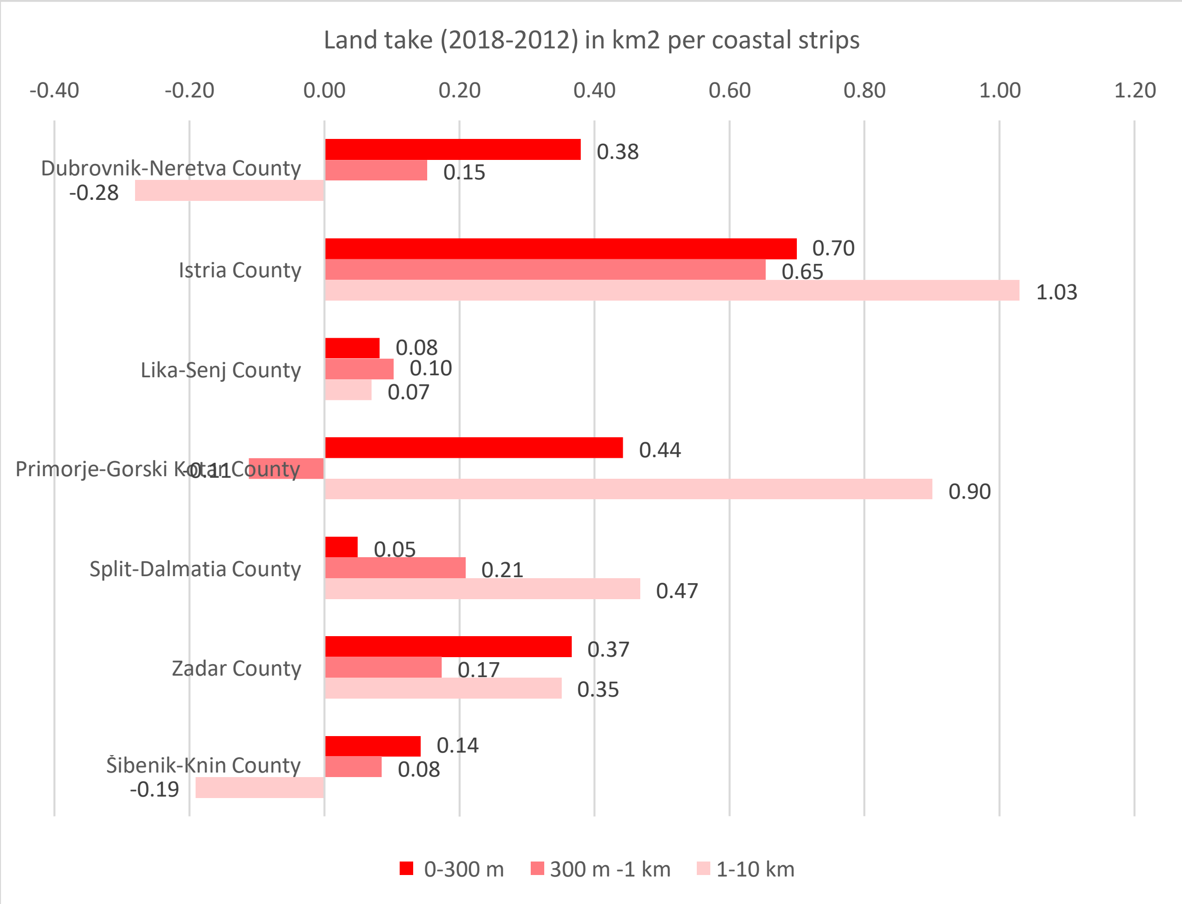


Figure A5.6: Land take (increase of built up areas) from year 2012 to 2018on county level per coastal strips

13. Annex 6

13.1. CCI25 parameters for Italy

Calculated CCI25 parameters for year 2012 on the level of reporting units are given in the following tables and graphs. These parameters represent so called baseline data for calculation of land use/cover changes. Thus, following the data for year 2012, there are tables and graphs with the calculation of changes. The change in areas is calculated so that the area for 2012 was subtracted fromthe area from 2018. The resulting negative values mean that these areas decreased and the positive values mean that these areas increased. The percentage of change was calculated by dividing the abovedifference with the areas from 2012. Thus, the resulting percentage has the meaning of percentage change with respect to the baseline data. Detailed data for year 2012, 2018 and changes are providedin auxiliary Excel files and GIS database.

13.2. Year 2012 – baseline data

Table A6.1: Areas of CCI25 land use classes in the coastal zones and their percentage, year 2012

2012		Built-up areas	Agricultural land	Forest and semi- natural land	Water bodies	Wetlands	Total coastal zone
Ancona	Area in km 2	110.71	359.03	77.51	1.93	0.02	549.21
	% in coastal zone	20.16%	65.37%	14.11%	0.35%	0.00%	100.00%
Ascoli Piceno	Area in km 2	34.50	118.57	56.67	0.87	0.05	210.66
	% in coastal zone	16.38%	56.28%	26.90%	0.41%	0.02%	100.00%
Bari	Area in km 2	163.92	594.58	61.28	0.56	0.09	820.43
	% in coastal zone	19.98%	72.47%	7.47%	0.07%	0.01%	100.00%
Barletta-Andria-Trani	Area in km 2	67.05	368.22	8.03	1.72	47.29	492.31
	% in coastal zone	13.62%	74.79%	1.63%	0.35%	9.61%	100.00%
Brindisi	Area in km 2	114.06	628.02	47.28	2.58	3.85	795.80
	% in coastal zone	14.33%	78.92%	5.94%	0.32%	0.48%	100.00%
Campobasso	Area in km 2	26.41	298.23	30.74	2.29	0.00	357.68
	% in coastal zone	7.38%	83.38%	8.60%	0.64%	0.00%	100.00%
Chieti	Area in km 2	91.93	482.94	94.21	1.75	0.00	670.82
	% in coastal zone	13.70%	71.99%	14.04%	0.26%	0.00%	100.00%

2012		Built-up areas	Agricultural land	Forest and semi- natural land	Water bodies	Wetlands	Total coastal zone
Fermo	Area in km 2	44.57	168.82	37.19	1.44	0.02	252.04
	% in coastal zone	17.68%	66.98%	14.76%	0.57%	0.01%	100.00%
Ferrara	Area in km 2	25.94	225.21	27.62	116.11	6.53	401.41
	% in coastal zone	6.46%	56.10%	6.88%	28.93%	1.63%	100.00%
Foggia	Area in km 2	65.80	775.76	576.29	121.06	23.77	1,562.69
	% in coastal zone	4.21%	49.64%	36.88%	7.75%	1.52%	100.00%
Forlì-Cesena	Area in km 2	42.19	105.63	2.76	1.53	0.00	152.10
	% in coastal zone	27.74%	69.45%	1.81%	1.01%	0.00%	100.00%
Gorizia	Area in km 2	37.81	81.12	81.89	80.41	8.98	290.22
	% in coastal zone	13.03%	27.95%	28.22%	27.71%	3.10%	100.00%
Lecce	Area in km 2	103.42	658.02	107.08	4.89	9.80	883.21
	% in coastal zone	11.71%	74.50%	12.12%	0.55%	1.11%	100.00%
Macerata	Area in km 2	40.11	127.97	19.94	1.28	0.01	189.30
	% in coastal zone	21.19%	67.60%	10.53%	0.67%	0.00%	100.00%
Padova	Area in km 2	0.27	4.77	0.18	7.73	1.30	14.24
	% in coastal zone	1.90%	33.48%	1.23%	54.29%	9.10%	100.00%
Pesaro e Urbino	Area in km 2	80.73	241.35	59.13	1.54	0.09	382.84
	% in coastal zone	21.09%	63.04%	15.44%	0.40%	0.02%	100.00%
Pescara	Area in km 2	52.32	93.01	21.41	1.23	0.04	168.01
	% in coastal zone	31.14%	55.36%	12.74%	0.73%	0.02%	100.00%
Ravenna	Area in km 2	76.99	227.69	58.99	55.17	19.64	438.47
	% in coastal zone	17.56%	51.93%	13.45%	12.58%	4.48%	100.00%
Rimini	Area in km 2	106.40	187.41	27.49	2.73	0.57	324.60
	% in coastal zone	32.78%	57.73%	8.47%	0.84%	0.18%	100.00%
Rovigo	Area in km 2	18.85	223.78	36.45	168.96	28.97	477.01
	% in coastal zone	3.95%	46.91%	7.64%	35.42%	6.07%	100.00%
Teramo	Area in km 2	73.78	283.10	64.84	3.16	0.06	424.93
	% in coastal zone	17.36%	66.62%	15.26%	0.74%	0.01%	100.00%
Trieste	Area in km 2	57.81	14.02	139.65	0.62	0.00	212.09

2012		Built-up areas	Agricultural land	Forest and semi- natural land	Water bodies	Wetlands	Total coastal zone
	% in coastal zone	27.26%	6.61%	65.84%	0.29%	0.00%	100.00%
Udine	Area in km 2	25.10	144.57	18.95	82.02	8.25	278.89
	% in coastal zone	9.00%	51.84%	6.79%	29.41%	2.96%	100.00%
Venezia	Area in km 2	96.99	393.54	53.15	373.42	94.32	1,011.42
	% in coastal zone	9.59%	38.91%	5.25%	36.92%	9.33%	100.00%
Italy (project part)	Area in km 2	1 557.66	6 805.37	1 708.74	1 034.97	253.65	11 360.38
	% in coastal zone	13.71%	59.90%	15.04%	9.11%	2.23%	100.00%

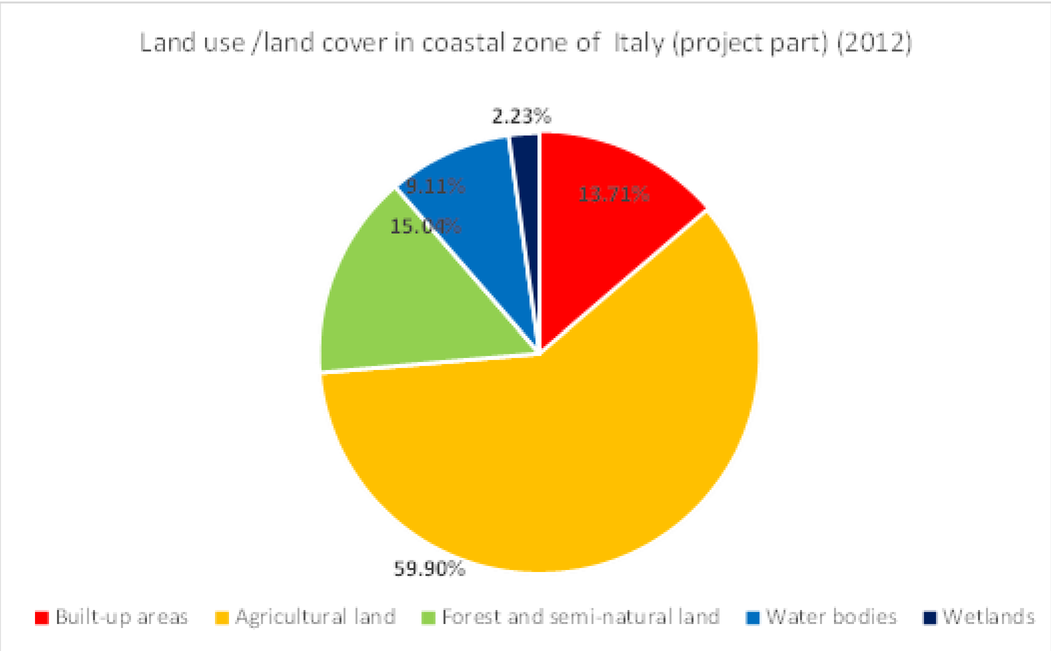


Figure A6.1: CCI25 land use classes in the coastal zone of Italy (project part), year 2012

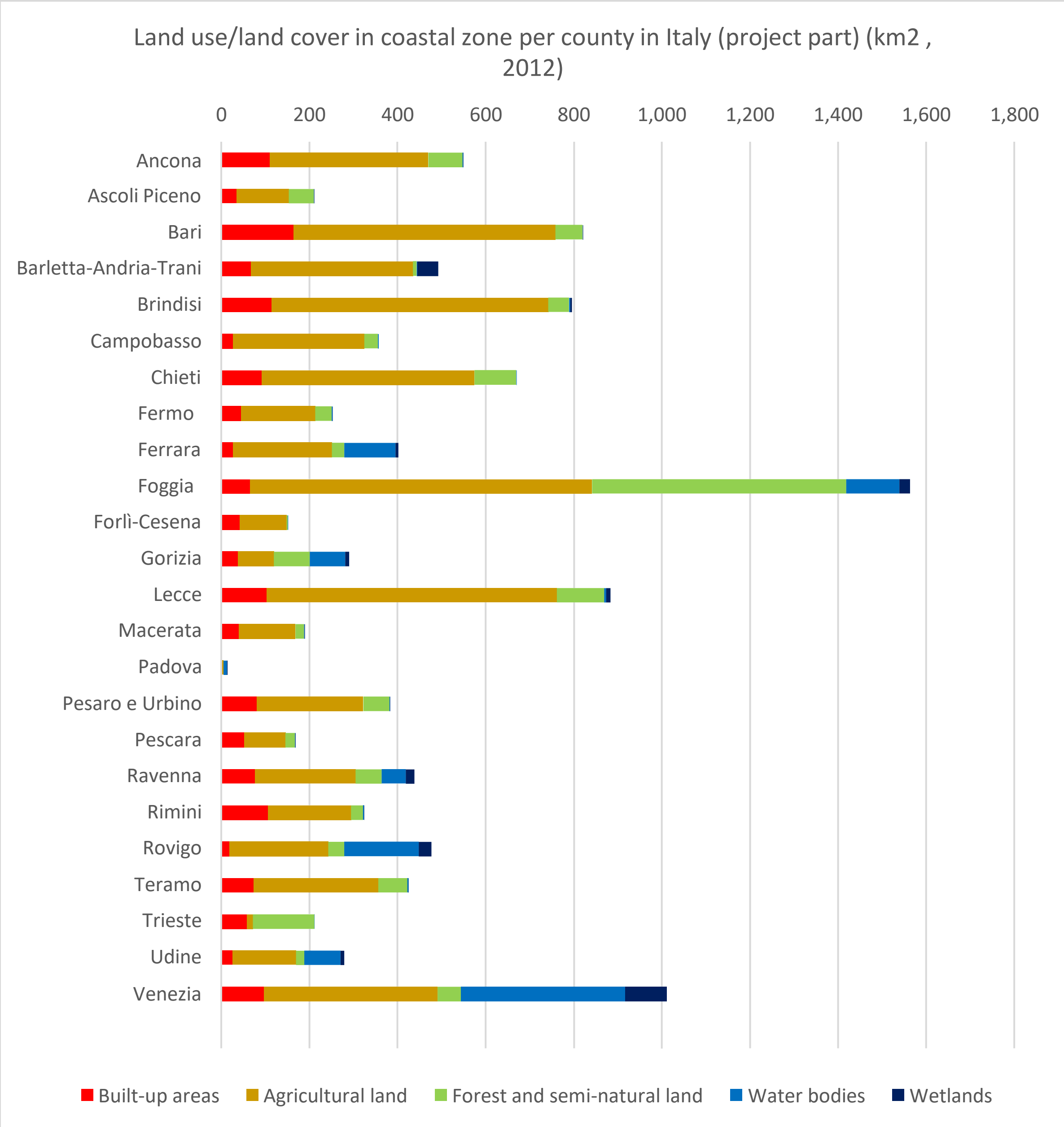


Figure A6.2: CCI25 land use classes in the coastal zone per provinces in km 2, year 2012

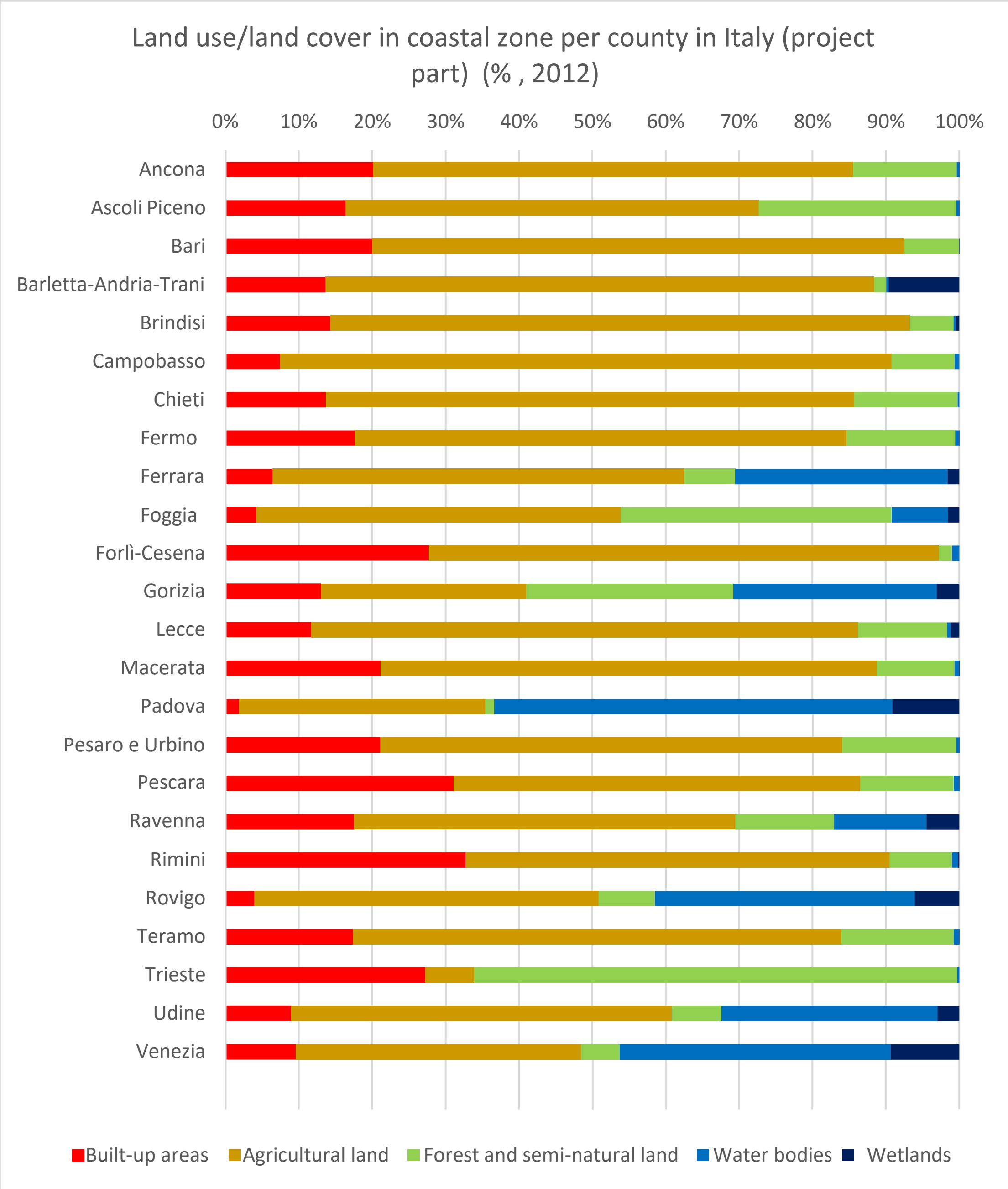


Figure A6.3: CCI25 land use classes in the coastal zone per provinces in percentage, year 2012

Table A6.2: Areas of CCI25 land use classes and their percentage in the coastal zone, year 2012

	Coastal strips			**Coastal zone**	**Coastal strips**			**Coastal zone**
2012	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km (control column**
Built-up areas	Areas in km2				% of c. strips within c. zone (0m-1km)			
Ancona	10.06	17.21	83.44	110.71	9.09%	15.54%	75.37%	100.00%
	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km (control column
Ascoli Piceno	3.64	6.34	24.52	34.50	10.55%	18.38%	71.08%	100.00%
Bari	17.27	24.83	121.81	163.92	10.54%	15.15%	74.32%	100.00%
Barletta-Andria-Trani	7.53	14.01	45.51	67.05	11.23%	20.90%	67.87%	100.00%
Brindisi	11.91	17.53	84.62	114.06	10.44%	15.37%	74.19%	100.00%
Campobasso	2.86	5.62	17.94	26.41	10.82%	21.27%	67.90%	100.00%
Chieti	7.22	10.44	74.26	91.93	7.86%	11.36%	80.79%	100.00%
Fermo	4.36	7.81	32.40	44.57	9.78%	17.52%	72.70%	100.00%
Ferrara	2.30	6.95	16.70	25.94	8.85%	26.79%	64.36%	100.00%
Foggia	12.22	15.53	38.05	65.80	18.57%	23.61%	57.82%	100.00%
Forlì-Cesena	2.07	5.20	34.91	42.19	4.90%	12.34%	82.76%	100.00%
Gorizia	4.04	7.02	26.76	37.81	10.67%	18.55%	70.77%	100.00%
Lecce	8.30	10.06	85.06	103.42	8.02%	9.73%	82.25%	100.00%
Macerata	4.23	5.09	30.79	40.11	10.54%	12.70%	76.76%	100.00%
Padova	0.00	0.00	0.27	0.27	0.00%	0.00%	100.00%	100.00%
Pesaro e Urbino	6.36	10.40	63.97	80.73	7.88%	12.88%	79.24%	100.00%
Pescara	2.82	8.45	41.06	52.32	5.39%	16.15%	78.46%	100.00%
Ravenna	5.36	10.37	61.27	76.99	6.96%	13.46%	79.58%	100.00%
Rimini	6.69	18.25	81.46	106.40	6.28%	17.15%	76.56%	100.00%
Rovigo	1.21	2.39	15.25	18.85	6.41%	12.68%	80.91%	100.00%
Teramo	7.55	14.87	51.36	73.78	10.23%	20.16%	69.61%	100.00%

2012	Coastal strips 0-300 m	300 m -1 km	1-10 km	Coastal zone 0m -10 km	Coastal strips 0-300 m	300 m -1 km	1-10 km	Coastal zone 0m -10 km (control column
Trieste	9.95	15.59	32.26	57.81	17.21%	26.98%	55.81%	100.00%
Udine	1.23	4.40	19.47	25.10	4.91%	17.54%	77.55%	100.00%
Venezia	11.33	25.76	59.90	96.99	11.68%	26.56%	61.75%	100.00%
Italy (project part)	150.49	264.13	1 143.04	1 557.66	9.66%	16.96%	73.38%	100.00%
Agricultural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
Ancona	1.66	14.43	342.94	359.03	0.46%	4.02%	95.52%	100.00%
Ascoli Piceno	0.41	4.83	113.33	118.57	0.35%	4.07%	95.58%	100.00%
Bari	5.88	30.08	558.62	594.58	0.99%	5.06%	93.95%	100.00%
Barletta-Andria-Trani	5.42	13.08	349.72	368.22	1.47%	3.55%	94.98%	100.00%
Brindisi	8.25	37.61	582.16	628.02	1.31%	5.99%	92.70%	100.00%
Campobasso	2.76	15.75	279.72	298.23	0.92%	5.28%	93.79%	100.00%
Chieti	4.64	27.36	450.95	482.94	0.96%	5.66%	93.38%	100.00%
Fermo	0.96	7.34	160.52	168.82	0.57%	4.35%	95.08%	100.00%
Ferrara	2.00	10.10	213.11	225.21	0.89%	4.49%	94.63%	100.00%
Foggia	11.72	44.13	719.91	775.76	1.51%	5.69%	92.80%	100.00%
Forlì-Cesena	0.00	0.47	105.16	105.63	0.00%	0.44%	99.56%	100.00%
Gorizia	1.16	6.25	73.72	81.12	1.43%	7.70%	90.87%	100.00%
Lecce	6.02	36.95	615.05	658.02	0.92%	5.62%	93.47%	100.00%
Macerata	0.66	7.07	120.24	127.97	0.52%	5.53%	93.96%	100.00%
Padova	0.00	0.00	4.77	4.77	0.00%	0.00%	100.00 %	100.00%
Pesaro e Urbino	1.34	12.41	227.60	241.35	0.55%	5.14%	94.30%	100.00%
Pescara	0.03	0.50	92.48	93.01	0.03%	0.54%	99.43%	100.00%
Ravenna	0.70	10.59	216.40	227.69	0.31%	4.65%	95.04%	100.00%
Rimini	0.17	4.39	182.85	187.41	0.09%	2.34%	97.57%	100.00%
Rovigo	0.00	1.30	222.48	223.78	0.00%	0.58%	99.42%	100.00%
Teramo	1.51	13.16	268.43	283.10	0.53%	4.65%	94.82%	100.00%
Trieste	0.24	1.21	12.57	14.02	1.68%	8.65%	89.67%	100.00%

2012	Coastal strips 0-300 m	 300 m -1 km	 1-10 km	Coastal zone 0m -10 km	Coastal strips 0-300 m	 300 m -1 km	 1-10 km	Coastal zone 0m -10 km (control column
Udine	0.08	0.03	144.46	144.57	0.06%	0.02%	99.93%	100.00%
Venezia	0.75	16.86	375.93	393.54	0.19%	4.28%	95.52%	100.00%
Italy (project part)	56.36	315.91	6 433.10	6 805.37	0.83%	4.64%	94.53%	100.00%
Forest and semi-natural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
Ancona	6.74	8.36	62.41	77.51	8.70%	10.79%	80.51%	100.00%
Ascoli Piceno	1.91	2.61	52.15	56.67	3.37%	4.61%	92.02%	100.00%
Bari	6.28	4.54	50.46	61.28	10.25%	7.41%	82.35%	100.00%
Barletta-Andria-Trani	1.88	0.68	5.47	8.03	23.40%	8.43%	68.17%	100.00%
Brindisi	7.43	4.98	34.88	47.28	15.71%	10.52%	73.76%	100.00%
Campobasso	5.18	3.41	22.15	30.74	16.84%	11.11%	72.06%	100.00%
Chieti	8.04	7.75	78.41	94.21	8.54%	8.23%	83.24%	100.00%
Fermo	2.64	3.58	30.97	37.19	7.09%	9.64%	83.27%	100.00%
Ferrara	4.92	4.44	18.25	27.62	17.83%	16.08%	66.09%	100.00%
Foggia	27.99	42.47	505.83	576.29	4.86%	7.37%	87.77%	100.00%
Forlì-Cesena	0.56	0.23	1.97	2.76	20.41%	8.23%	71.36%	100.00%
Gorizia	4.17	3.92	73.80	81.89	5.09%	4.79%	90.12%	100.00%
Lecce	15.98	20.48	70.62	107.08	14.92%	19.12%	65.95%	100.00%
Macerata	1.43	1.94	16.57	19.94	7.17%	9.73%	83.09%	100.00%
Padova	0.00	0.00	0.18	0.18	0.00%	0.00%	100.00 %	100.00%
Pesaro e Urbino	5.69	6.88	46.56	59.13	9.62%	11.64%	78.74%	100.00%
Pescara	1.09	0.57	19.75	21.41	5.09%	2.66%	92.25%	100.00%
Ravenna	7.34	9.34	42.30	58.99	12.45%	15.83%	71.72%	100.00%
Rimini	3.02	1.34	23.13	27.49	10.97%	4.89%	84.14%	100.00%
Rovigo	5.12	3.82	27.51	36.45	14.05%	10.48%	75.47%	100.00%
Teramo	4.24	3.43	57.18	64.84	6.53%	5.29%	88.17%	100.00%
Trieste	3.85	12.23	123.57	139.65	2.76%	8.75%	88.49%	100.00%

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km (control column
Udine	2.18	0.58	16.18	18.95	11.51%	3.06%	85.42%	100.00%
Venezia	12.27	6.22	34.66	53.15	23.08%	11.70%	65.22%	100.00%
Italy (project part)	139.95	153.81	1 414.98	1 708.74	8.19%	9.00%	82.81%	100.00%
Water bodies	Areas in km2				% of c. strips within c. zone (0m-1km)			
Ancona	0.30	0.12	1.50	1.93	15.79%	6.33%	77.88%	100.00%
Ascoli Piceno	0.17	0.05	0.65	0.87	19.12%	5.46%	75.43%	100.00%
Bari	0.36	0.02	0.19	0.56	63.95%	2.87%	33.18%	100.00%
Barletta-Andria-Trani	0.33	0.32	1.06	1.72	19.32%	18.88%	61.80%	100.00%
Brindisi	1.18	0.33	1.08	2.58	45.50%	12.68%	41.82%	100.00%
Campobasso	0.48	0.32	1.48	2.29	21.14%	14.00%	64.85%	100.00%
Chieti	0.51	0.08	1.16	1.75	29.08%	4.70%	66.22%	100.00%
Fermo	0.20	0.04	1.20	1.44	13.98%	2.50%	83.52%	100.00%
Ferrara	2.77	8.53	104.81	116.11	2.39%	7.35%	90.27%	100.00%
Foggia	2.26	6.21	112.59	121.06	1.87%	5.13%	93.00%	100.00%
Forlì-Cesena	0.09	0.15	1.29	1.53	5.81%	9.72%	84.47%	100.00%
Gorizia	3.18	11.07	66.16	80.41	3.95%	13.76%	82.28%	100.00%
Lecce	1.90	0.79	2.19	4.89	38.87%	16.23%	44.89%	100.00%
Macerata	0.26	0.17	0.84	1.28	20.71%	13.07%	66.23%	100.00%
Padova	0.00	0.00	7.73	7.73	0.00%	0.00%	100.00 %	100.00%
Pesaro e Urbino	0.23	0.05	1.25	1.54	15.26%	3.42%	81.32%	100.00%
Pescara	0.17	0.09	0.97	1.23	13.69%	7.30%	79.01%	100.00%
Ravenna	0.85	1.27	53.05	55.17	1.55%	2.29%	96.16%	100.00%
Rimini	0.45	0.20	2.08	2.73	16.37%	7.35%	76.29%	100.00%
Rovigo	7.95	26.12	134.88	168.96	4.71%	15.46%	79.83%	100.00%
Teramo	0.48	0.17	2.50	3.16	15.26%	5.54%	79.20%	100.00%
Trieste	0.42	0.11	0.09	0.62	67.46%	17.38%	15.16%	100.00%
Udine	1.34	5.65	75.04	82.02	1.63%	6.88%	91.49%	100.00%

		Coastal strips		Coastal zone		Coastal strips		Coastal zone
2012	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km (control column**
Venezia	5.87	17.85	349.69	373.42	1.57%	4.78%	93.65%	100.00%
Italy (project part)	31.76	79.70	923.51	1 034.97	3.07%	7.70%	89.23%	100.00%
Wetlands	Areas in km2				% of c. strips within c. zone (0m-1km)			
Ancona	0.00	0.00	0.02	0.02	0.00%	0.00%	100.00 %	100.00%
Ascoli Piceno	0.05	0.00	0.00	0.05	100.00 %	0.00%	0.00%	100.00%
Bari	0.02	0.00	0.07	0.09	22.31%	0.00%	77.69%	100.00%
Barletta-Andria-Trani	1.04	9.71	36.54	47.29	2.20%	20.53%	77.28%	100.00%
Brindisi	2.08	1.33	0.44	3.85	54.00%	34.54%	11.46%	100.00%
Campobasso	0.00	0.00	0.00	0.00				
Chieti	0.00	0.00	0.00	0.00				
Fermo	0.00	0.00	0.02	0.02	0.00%	0.00%	100.00 %	100.00%
Ferrara	2.38	1.87	2.28	6.53	36.44%	28.68%	34.87%	100.00%
Foggia	0.55	2.64	20.58	23.77	2.29%	11.13%	86.58%	100.00%
Forlì-Cesena	0.00	0.00	0.00	0.00				
Gorizia	2.73	2.64	3.61	8.98	30.40%	29.41%	40.20%	100.00%
Lecce	2.21	4.52	3.07	9.80	22.57%	46.12%	31.30%	100.00%
Macerata	0.00	0.00	0.01	0.01	0.00%	0.00%	100.00 %	100.00%
Padova	0.00	0.00	1.30	1.30	0.00%	0.00%	100.00 %	100.00%
Pesaro e Urbino	0.00	0.00	0.09	0.09	0.00%	0.00%	100.00 %	100.00%
Pescara	0.04	0.00	0.00	0.04	100.00 %	0.00%	0.00%	100.00%
Ravenna	0.88	2.00	16.76	19.64	4.48%	10.18%	85.33%	100.00%
Rimini	0.00	0.00	0.57	0.57	0.00%	0.00%	100.00 %	100.00%
Rovigo	2.63	4.06	22.27	28.97	9.09%	14.02%	76.88%	100.00%

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km (control column
Teramo	0.00	0.00	0.06	0.06	0.00%	0.00%	100.00 %	100.00%
Trieste	0.00	0.00	0.00	0.00				
Udine	0.57	0.87	6.81	8.25	6.85%	10.60%	82.55%	100.00%
Venezia	0.32	1.73	92.26	94.32	0.34%	1.83%	97.82%	100.00%
Italy (project part)	15.50	31.38	206.77	253.65	6.11%	12.37%	81.52%	100.00%

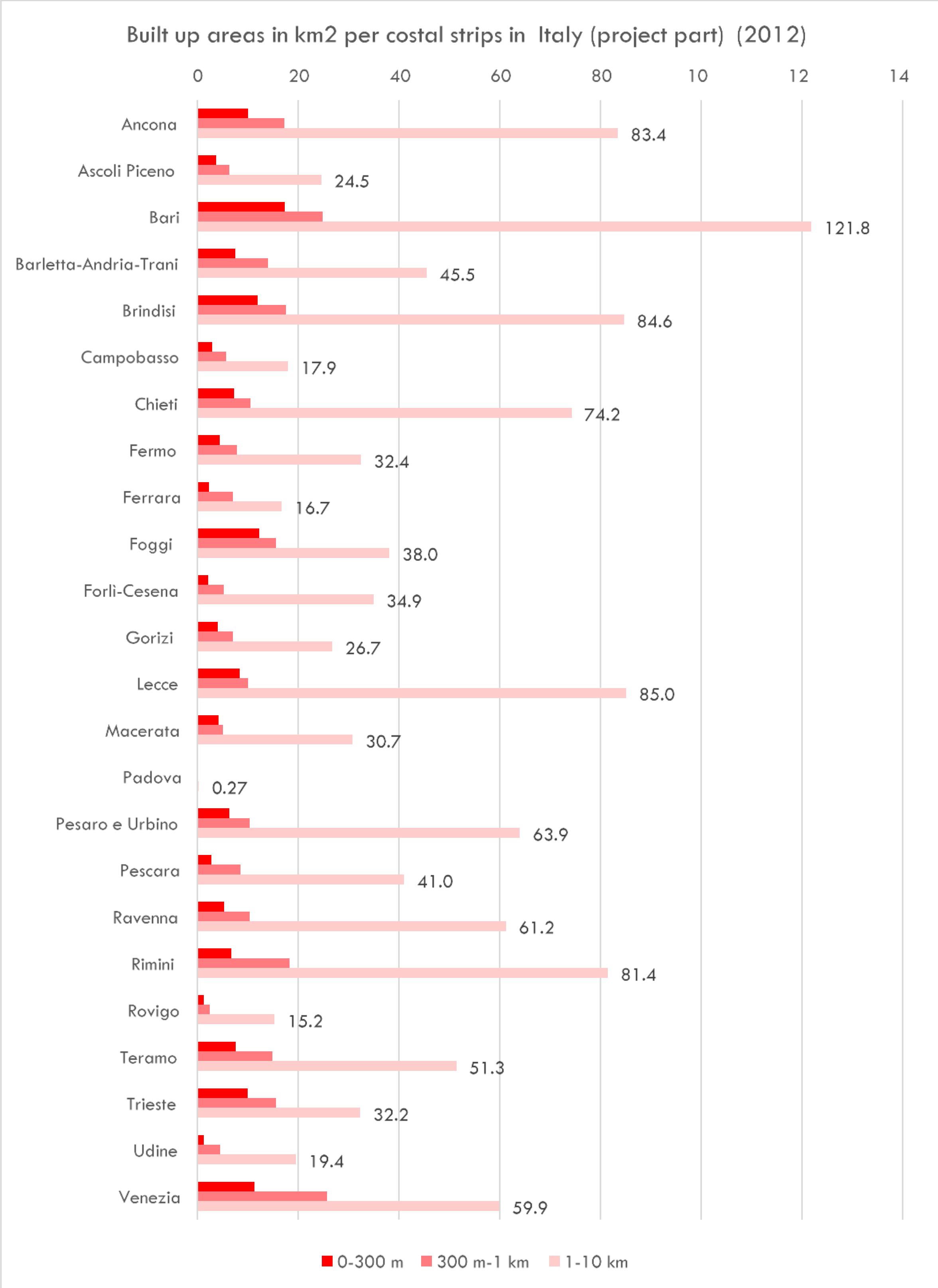


Figure A6.4: Built up area in km2 per costal strips per province in year 2012

13.3. Changes 2012-2018

Table A6.3: Land use/cover change in km2 and percentage from year 2012 to 2018 on province level

2018 - 2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Ancona	Area in km 2	-0.75	-0.24	0.95	0.06	-0.02	0.00
	% of change	-0.68%	-0.07%	1.23%	3.36%	-100.00%	0.00%
Ascoli Piceno	Area in km 2	0.26	-0.30	0.04	0.00	0.00	0.00
	% of change	0.77%	-0.26%	0.06%	0.52%	0.00%	0.00%
Bari	Area in km 2	3.35	-1.76	-1.50	-0.03	-0.07	0.00
	% of change	2.05%	-0.30%	-2.45%	-5.03%	-77.69%	0.00%
Barletta-Andria-Trani	Area in km 2	0.41	-0.22	-0.22	0.03	0.00	0.00
	% of change	0.61%	-0.06%	-2.72%	1.57%	0.00%	0.00%
Brindisi	Area in km 2	1.66	-1.80	0.13	0.01	0.00	0.00
	% of change	1.46%	-0.29%	0.28%	0.48%	0.00%	0.00%
Campobasso	Area in km 2	0.19	-0.34	0.09	0.06	0.00	0.00
	% of change	0.71%	-0.11%	0.29%	2.71%		0.00%
Chieti	Area in km 2	0.27	-0.53	0.23	0.03	0.00	0.00
	% of change	0.29%	-0.11%	0.25%	1.45%		0.00%
Fermo	Area in km 2	0.50	-0.53	0.01	0.02	0.00	0.00
	% of change	1.13%	-0.32%	0.04%	1.33%	0.00%	0.00%
Ferrara	Area in km 2	0.09	0.03	-0.12	0.00	0.00	0.00
	% of change	0.33%	0.01%	-0.43%	0.00%	0.00%	0.00%
Foggia	Area in km 2	0.76	-0.21	-1.03	0.04	0.45	0.00
	% of change	1.15%	-0.03%	-0.18%	0.04%	1.87%	0.00%
Forlì-Cesena	Area in km 2	0.01	-0.01	0.00	0.00	0.00	0.00
	% of change	0.03%	-0.01%	0.02%	0.00%		0.00%
Gorizia	Area in km 2	0.18	2.23	-2.40	0.04	-0.05	0.00
	% of change	0.47%	2.75%	-2.93%	0.05%	-0.55%	0.00%
Lecce	Area in km 2	2.00	-2.07	-0.01	0.09	0.00	0.00
	% of change	1.93%	-0.31%	-0.01%	1.82%	0.00%	0.00%

2018 - 2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Macerata	Area in km 2	0.09	-0.07	-0.01	-0.02	0.00	0.00
	% of change	0.23%	-0.05%	-0.03%	-1.21%	0.00%	0.00%
Padova	Area in km 2	0.00	0.00	0.00	0.00	0.00	0.00
	% of change	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Pesaro e Urbino	Area in km 2	-0.51	-0.29	0.80	-0.01	0.00	0.00
	% of change	-0.63%	-0.12%	1.36%	-0.69%	0.00%	0.00%
Pescara	Area in km 2	0.02	-0.16	0.14	0.01	0.00	0.00
	% of change	0.03%	-0.18%	0.66%	0.51%	0.00%	0.00%
Ravenna	Area in km 2	0.06	-0.12	0.00	0.06	0.00	0.00
	% of change	0.07%	-0.05%	-0.01%	0.11%	0.00%	0.00%
Rimini	Area in km 2	1.60	-1.77	0.17	0.00	0.00	0.00
	% of change	1.51%	-0.94%	0.60%	-0.04%	0.00%	0.00%
Rovigo	Area in km 2	0.00	0.00	0.04	-0.04	0.00	0.00
	% of change	0.00%	0.00%	0.10%	-0.02%	0.00%	0.00%
Teramo	Area in km 2	0.34	-0.46	0.14	-0.07	0.05	0.00
	% of change	0.46%	-0.16%	0.21%	-2.16%	78.29%	0.00%
Trieste	Area in km 2	0.00	0.00	0.00	0.00	0.00	0.00
	% of change	0.00%	0.01%	0.00%	0.00%		0.00%
Udine	Area in km 2	0.13	0.22	-0.41	0.06	0.00	0.00
	% of change	0.52%	0.15%	-2.16%	0.07%	0.00%	0.00%
Venezia	Area in km 2	-0.13	0.42	-0.30	-1.47	1.48	0.00
	% of change	-0.13%	0.11%	-0.56%	-0.39%	1.57%	0.00%
Italy (project part)	Area in km 2	10.52	-7.97	-3.27	-1.12	1.83	0.00
	% of change	0.68%	-0.12%	-0.19%	-0.11%	0.72%	0.00%

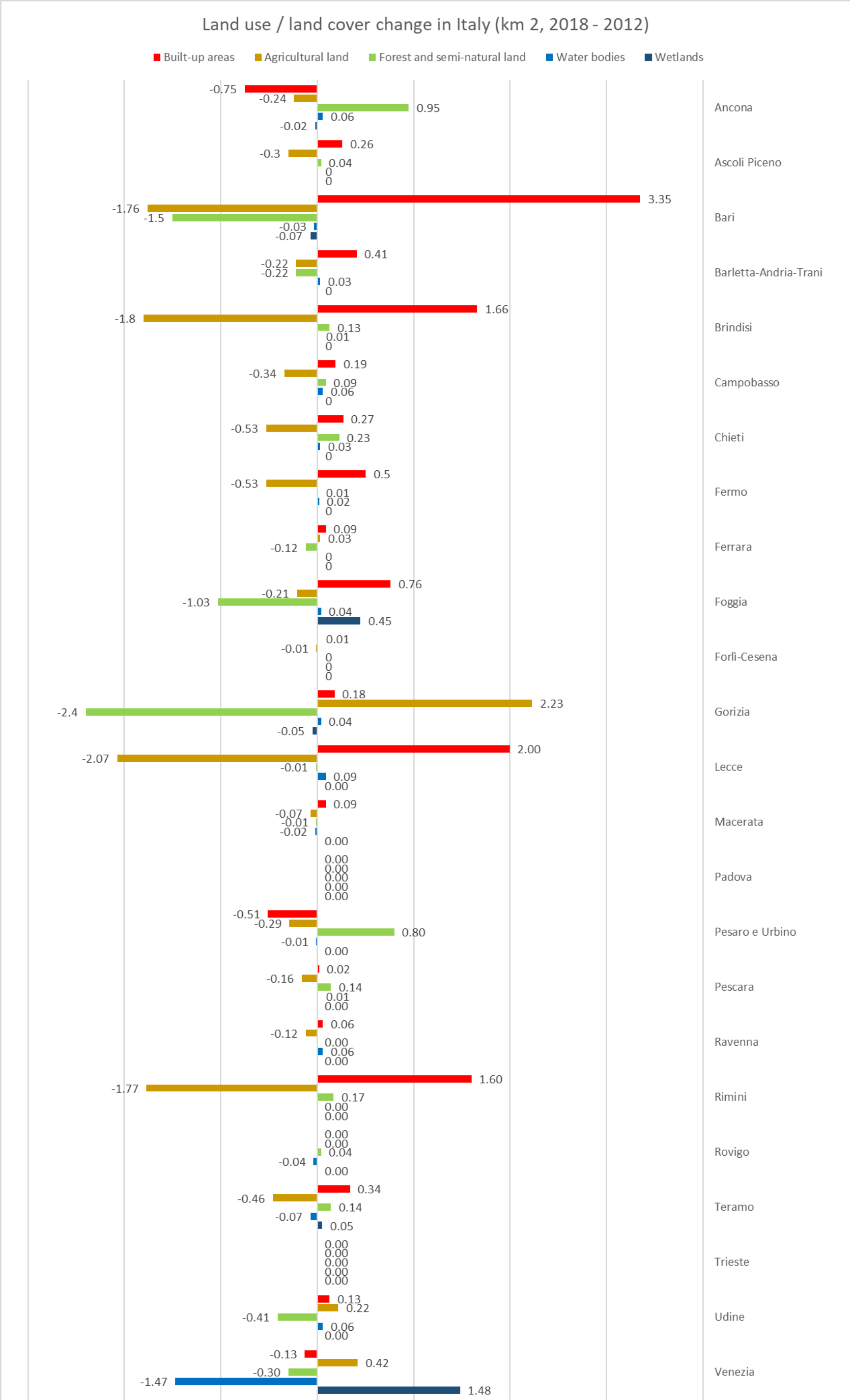


Figure A6.5: Land use/cover change in km2 from year 2012 to 2018 on province level

Table A6.4: Land use/cover change from year 2012 to 2018 in km2 and percentage for coastal strips

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Built-up areas	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Ancona	0.00	-0.33	-0.42	-0.75	0.00%	-1.92%	-0.51%	-0.68%
Ascoli Piceno	0.01	0.04	0.21	0.26	0.39%	0.60%	0.87%	0.77%
Bari	0.18	0.43	2.74	3.35	1.06%	1.72%	2.25%	2.05%
Barletta-Andria-Trani	0.04	-0.07	0.43	0.41	0.55%	-0.49%	0.95%	0.61%
Brindisi	0.05	0.13	1.48	1.66	0.42%	0.73%	1.75%	1.46%
Campobasso	0.01	0.01	0.17	0.19	0.32%	0.17%	0.95%	0.71%
Chieti	0.01	0.05	0.21	0.27	0.07%	0.46%	0.29%	0.29%
Fermo	0.01	-0.09	0.58	0.50	0.15%	-1.10%	1.79%	1.13%
Ferrara	0.00	0.00	0.09	0.09	0.00%	0.00%	0.52%	0.33%
Foggia	0.04	0.03	0.69	0.76	0.31%	0.17%	1.82%	1.15%
Forlì-Cesena	0.00	0.00	0.01	0.01	0.00%	0.00%	0.03%	0.03%
Gorizia	0.05	0.00	0.13	0.18	1.17%	0.06%	0.47%	0.47%
Lecce	0.00	0.10	1.90	2.00	0.05%	0.96%	2.23%	1.93%
Macerata	0.00	0.02	0.07	0.09	0.00%	0.43%	0.23%	0.23%
Padova	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Pesaro e Urbino	-0.01	-0.10	-0.39	-0.51	-0.23%	-0.96%	-0.61%	-0.63%
Pescara	0.00	0.01	0.01	0.02	0.00%	0.08%	0.02%	0.03%
Ravenna	0.00	0.01	0.04	0.06	0.00%	0.13%	0.07%	0.07%
Rimini	0.00	0.09	1.51	1.60	0.00%	0.49%	1.86%	1.51%
Rovigo	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Teramo	0.01	0.01	0.32	0.34	0.17%	0.05%	0.63%	0.46%
Trieste	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Udine	0.00	0.03	0.10	0.13	0.00%	0.69%	0.52%	0.52%
Venezia	0.01	0.09	-0.23	-0.13	0.13%	0.34%	-0.39%	-0.13%
Italy (project part)	0.41	0.45	9.66	10.52	0.27%	0.17%	0.85%	0.68%

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Agricultural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Ancona	0.00	0.10	-0.34	-0.24	0.00%	0.68%	-0.10%	-0.07%
Ascoli Piceno	0.00	-0.01	-0.29	-0.30	0.00%	-0.25%	-0.26%	-0.26%
Bari	-0.10	-0.23	-1.42	-1.76	-1.77%	-0.77%	-0.25%	-0.30%
Barletta-Andria-Trani	-0.04	0.07	-0.24	-0.22	-0.75%	0.52%	-0.07%	-0.06%
Brindisi	-0.10	-0.19	-1.52	-1.80	-1.21%	-0.50%	-0.26%	-0.29%
Campobasso	-0.06	-0.02	-0.25	-0.34	-2.32%	-0.15%	-0.09%	-0.11%
Chieti	-0.01	-0.08	-0.44	-0.53	-0.11%	-0.29%	-0.10%	-0.11%
Fermo	0.00	0.00	-0.53	-0.53	0.00%	0.00%	-0.33%	-0.32%
Ferrara	0.00	0.00	0.03	0.03	0.00%	0.00%	0.02%	0.01%
Foggia	-0.03	-0.02	-0.17	-0.21	-0.25%	-0.04%	-0.02%	-0.03%
Forlì-Cesena	0.00	0.00	-0.01	-0.01	0.00%	0.00%	-0.01%	-0.01%
Gorizia	0.05	0.02	2.16	2.23	4.29%	0.30%	2.93%	2.75%
Lecce	0.00	-0.10	-1.97	-2.07	-0.06%	-0.26%	-0.32%	-0.31%
Macerata	0.00	0.00	-0.07	-0.07	0.00%	0.00%	-0.06%	-0.05%
Padova	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Pesaro e Urbino	0.00	-0.02	-0.27	-0.29	0.00%	-0.12%	-0.12%	-0.12%
Pescara	0.00	0.00	-0.16	-0.16	0.00%	0.00%	-0.18%	-0.18%
Ravenna	0.00	-0.01	-0.10	-0.12	0.00%	-0.13%	-0.05%	-0.05%
Rimini	0.00	-0.08	-1.69	-1.77	0.00%	-1.71%	-0.93%	-0.94%
Rovigo	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Teramo	0.00	0.00	-0.46	-0.46	0.00%	0.00%	-0.17%	-0.16%
Trieste	0.00	0.00	0.00	0.00	0.00%	0.00%	0.01%	0.01%
Udine	0.00	0.00	0.22	0.22	0.00%	0.00%	0.15%	0.15%
Venezia	0.00	-0.03	0.45	0.42	0.00%	-0.18%	0.12%	0.11%
Italy (project part)	-0.30	-0.60	-7.07	-7.97	-0.53%	-0.19%	-0.11%	-0.12%

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Forest and semi-natural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Ancona	0.00	0.23	0.72	0.95	0.00%	2.77%	1.15%	1.23%
Ascoli Piceno	-0.02	-0.03	0.08	0.04	-0.99%	-0.98%	0.15%	0.06%
Bari	-0.06	-0.20	-1.24	-1.50	-0.99%	-4.33%	-2.46%	-2.45%
Barletta-Andria-Trani	0.00	0.00	-0.22	-0.22	-0.04%	0.00%	-3.98%	-2.72%
Brindisi	0.06	0.04	0.03	0.13	0.78%	0.82%	0.09%	0.28%
Campobasso	0.00	0.01	0.08	0.09	-0.08%	0.32%	0.37%	0.29%
Chieti	0.00	0.03	0.20	0.23	0.00%	0.40%	0.26%	0.25%
Fermo	-0.01	0.09	-0.06	0.01	-0.52%	2.40%	-0.19%	0.04%
Ferrara	0.00	0.00	-0.12	-0.12	0.00%	0.00%	-0.66%	-0.43%
Foggia	-0.02	-0.03	-0.98	-1.03	-0.06%	-0.08%	-0.19%	-0.18%
Forlì-Cesena	0.00	0.00	0.00	0.00	0.00%	0.00%	0.03%	0.02%
Gorizia	-0.17	-0.02	-2.21	-2.40	-4.07%	-0.59%	-2.99%	-2.93%
Lecce	0.00	0.00	-0.01	-0.01	0.00%	0.00%	-0.02%	-0.01%
Macerata	0.01	-0.02	0.01	-0.01	0.60%	-1.13%	0.04%	-0.03%
Padova	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Pesaro e Urbino	0.03	0.12	0.66	0.80	0.58%	1.67%	1.41%	1.36%
Pescara	0.00	-0.01	0.15	0.14	0.00%	-1.19%	0.75%	0.66%
Ravenna	0.02	0.00	-0.02	0.00	0.23%	0.00%	-0.05%	-0.01%
Rimini	0.00	-0.01	0.18	0.17	0.00%	-1.10%	0.78%	0.60%
Rovigo	0.02	0.01	0.00	0.04	0.48%	0.27%	0.00%	0.10%
Teramo	-0.02	-0.01	0.16	0.14	-0.39%	-0.21%	0.28%	0.21%
Trieste	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Udine	-0.06	-0.03	-0.32	-0.41	-2.85%	-5.20%	-1.95%	-2.16%
Venezia	-0.09	-0.05	-0.16	-0.30	-0.72%	-0.86%	-0.46%	-0.56%
Italy (project part)	-0.31	0.11	-3.07	-3.27	-0.22%	0.07%	-0.22%	-0.19%

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Water bodies	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Ancona	0.00	0.00	0.06	0.06	0.00%	0.00%	4.31%	3.36%
Ascoli Piceno	0.00	0.00	0.00	0.00	2.71%	0.00%	0.00%	0.52%
Bari	-0.02	0.00	-0.01	-0.03	-4.85%	0.00%	-5.82%	-5.03%
Barletta-Andria-Trani	0.00	0.00	0.03	0.03	0.00%	0.00%	2.54%	1.57%
Brindisi	-0.01	0.02	0.00	0.01	-0.72%	6.40%	0.00%	0.48%
Campobasso	0.06	0.00	0.00	0.06	12.12%	1.03%	0.00%	2.71%
Chieti	0.00	0.00	0.03	0.03	0.00%	0.00%	2.18%	1.45%
Fermo	0.01	0.00	0.01	0.02	3.50%	0.00%	1.01%	1.33%
Ferrara	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Foggia	0.01	0.03	0.00	0.04	0.62%	0.43%	0.00%	0.04%
Forlì-Cesena	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Gorizia	0.12	0.00	-0.08	0.04	3.83%	0.00%	-0.12%	0.05%
Lecce	0.00	0.00	0.09	0.09	0.00%	0.00%	4.06%	1.82%
Macerata	-0.01	0.00	-0.01	-0.02	-3.24%	0.00%	-0.82%	-1.21%
Padova	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Pesaro e Urbino	-0.02	0.00	0.01	-0.01	-7.75%	0.00%	0.61%	-0.69%
Pescara	0.00	0.00	0.01	0.01	0.00%	0.00%	0.64%	0.51%
Ravenna	-0.02	0.00	0.08	0.06	-1.95%	0.00%	0.15%	0.11%
Rimini	0.00	0.00	0.00	0.00	0.00%	0.00%	-0.05%	-0.04%
Rovigo	-0.02	-0.01	0.00	-0.04	-0.31%	-0.04%	0.00%	-0.02%
Teramo	0.00	0.00	-0.07	-0.07	0.84%	0.00%	-2.89%	-2.16%
Trieste	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Udine	0.06	0.00	-0.01	0.06	4.66%	0.00%	-0.01%	0.07%
Venezia	0.07	0.00	-1.54	-1.47	1.25%	-0.01%	-0.44%	-0.39%
Italy (project part)	0.25	0.04	-1.41	-1.12	0.79%	0.05%	-0.15%	-0.11%
Wetlands	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km
Ancona	0.00	0.00	-0.02	-0.02	0.00%	0.00%	-100.00%	-100.00%
Ascoli Piceno	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Bari	0.00	0.00	-0.07	-0.07	0.00%	0.00%	-100.00%	-77.69%
Barletta-Andria-Trani	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Brindisi	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Campobasso	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Chieti	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Fermo	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Ferrara	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Foggia	0.00	0.00	0.45	0.45	-0.78%	0.00%	2.18%	1.87%
Forlì-Cesena	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Gorizia	-0.05	0.00	0.00	-0.05	-1.79%	0.00%	0.00%	-0.55%
Lecce	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Macerata	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Padova	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Pesaro e Urbino	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Pescara	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Ravenna	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Rimini	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Rovigo	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Teramo	0.00	0.00	0.05	0.05	0.00%	0.00%	78.29%	78.29%
Trieste	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Udine	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Venezia	0.00	0.00	1.48	1.48	0.00%	0.00%	1.60%	1.57%
Italy (project part)	-0.05	0.00	1.88	1.83	-0.34%	0.00%	0.91%	0.72%

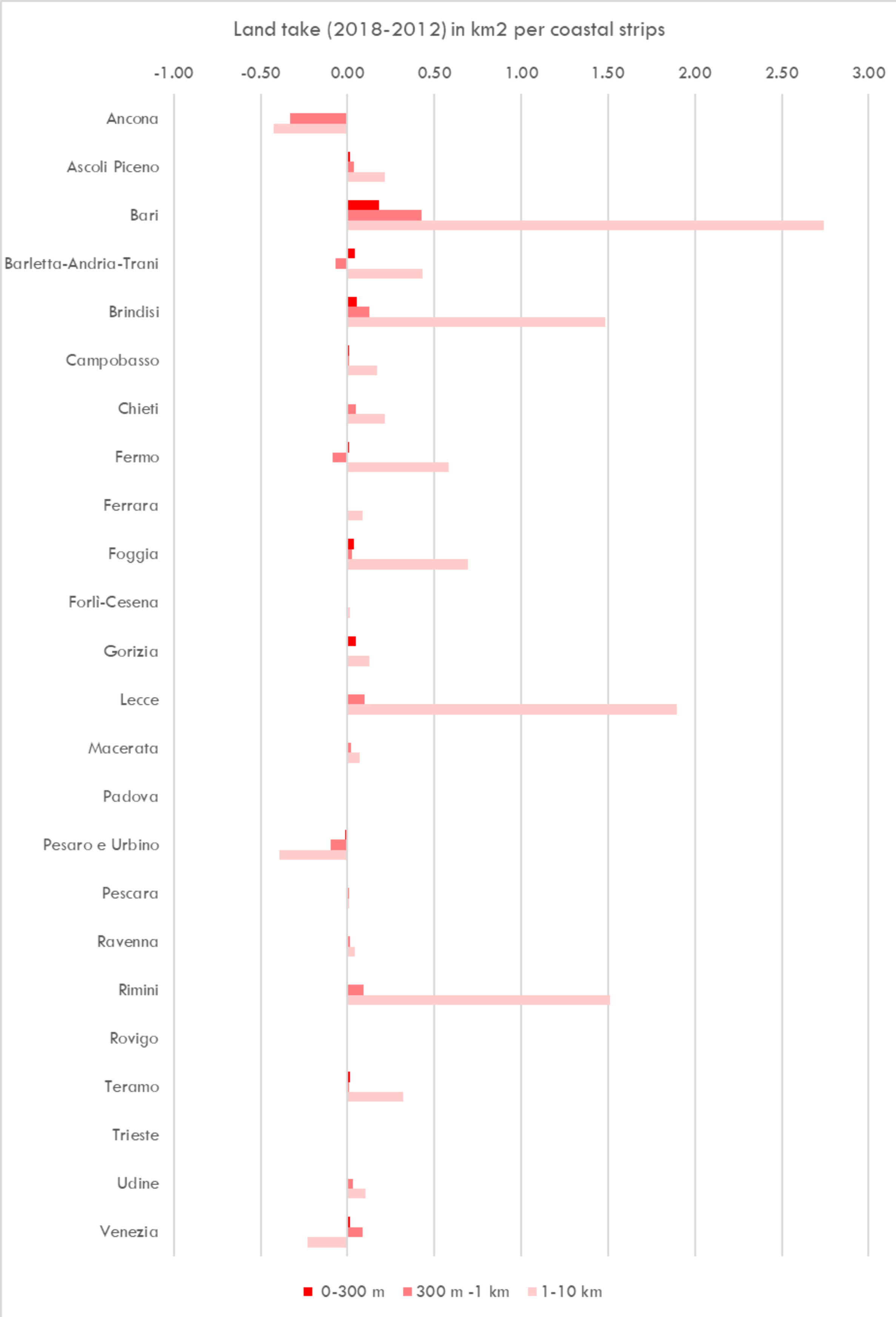


Figure A6.6: Land take (increase of built up areas) from 2012 to 2018on province level per coastal strips

14. Annex 7

14.1. CCI25 parameters for Montenegro

Calculated CCI25 parameters for year 2012 on the level of reporting units are given in the following tables and graphs. These parameters represent so called baseline data for calculation of land use/cover changes. Thus, following the data for year 2012, there are tables and graphs with the calculation of changes. The change in areas is calculated so that the area for 2012 was subtracted fromthe area from 2018. The resulting negative values mean that these areas decreased and the positive vales mean that these areas increased. The percentage of change was calculated by dividing the abovedifference with the areas from 2012. Thus, the resulting percentage has the meaning of percentage change with respect to the baseline data. Detailed data for year 2012, 2018 and changes are providedin auxiliary Excel files and GIS database.

14.2. Year 2012 – baseline data

Table A7.1: Areas of CCI25 land use classes in the coastal zones and their percentage, year 2012

2012		Built-up areas	Agricultu-ral land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Bar Municipality	Area in km 2	21.90	25.47	302.40	0.24	0.00	350.01
	% in coastal zone	6.26%	7.28%	86.40%	0.07%	0.00%	100.00%
Budva Municipality	Area in km 2	8.51	5.06	108.56	0.15	0.12	122.40
	% in coastal zone	6.95%	4.13%	88.69%	0.12%	0.10%	100.00%
Herceg Novi Mun.	Area in km 2	12.04	8.47	187.13	0.26	0.00	207.90
	% in coastal zone	5.79%	4.07%	90.01%	0.12%	0.00%	100.00%
Kotor Municipality	Area in km 2	11.59	12.69	272.21	0.18	0.00	296.68
	% in coastal zone	3.91%	4.28%	91.75%	0.06%	0.00%	100.00%
Old Royal Capital Cetinje	Area in km 2	1.68	8.09	252.13	0.01	0.00	261.91
	% in coastal zone	0.64%	3.09%	96.27%	0.00%	0.00%	100.00%
Tivat Municipality	Area in km 2	6.38	2.24	36.53	0.19	0.92	46.26
	% in coastal zone	13.79%	4.83%	78.97%	0.42%	1.99%	100.00%
Ulcinj Municipality	Area in km 2	8.26	38.46	108.57	5.91	21.12	182.32
	% in coastal zone	4.53%	21.09%	59.55%	3.24%	11.58%	100.00%

Montenegro	Area in km 2	70.37	100.46	1,267.55	6.95	22.16	1,467.49
	% in coastal zone	4.80%	6.85%	86.38%	0.47%	1.51%	100.00%

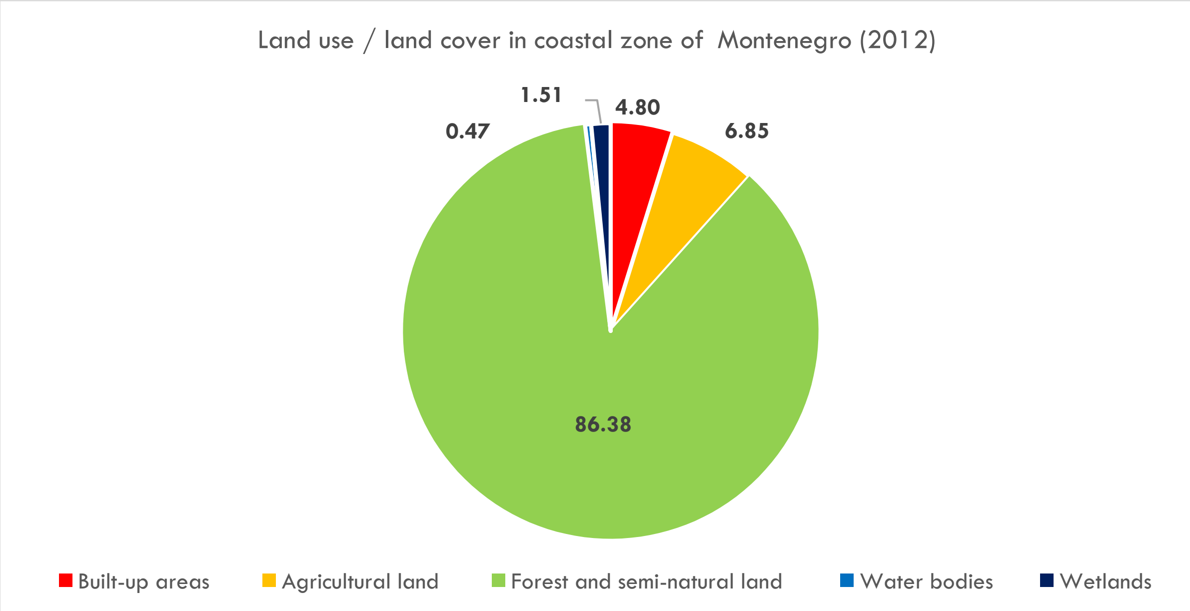


Figure A7.1: CCI25 land use classes in the coastal zone of Montenegro, year 2012

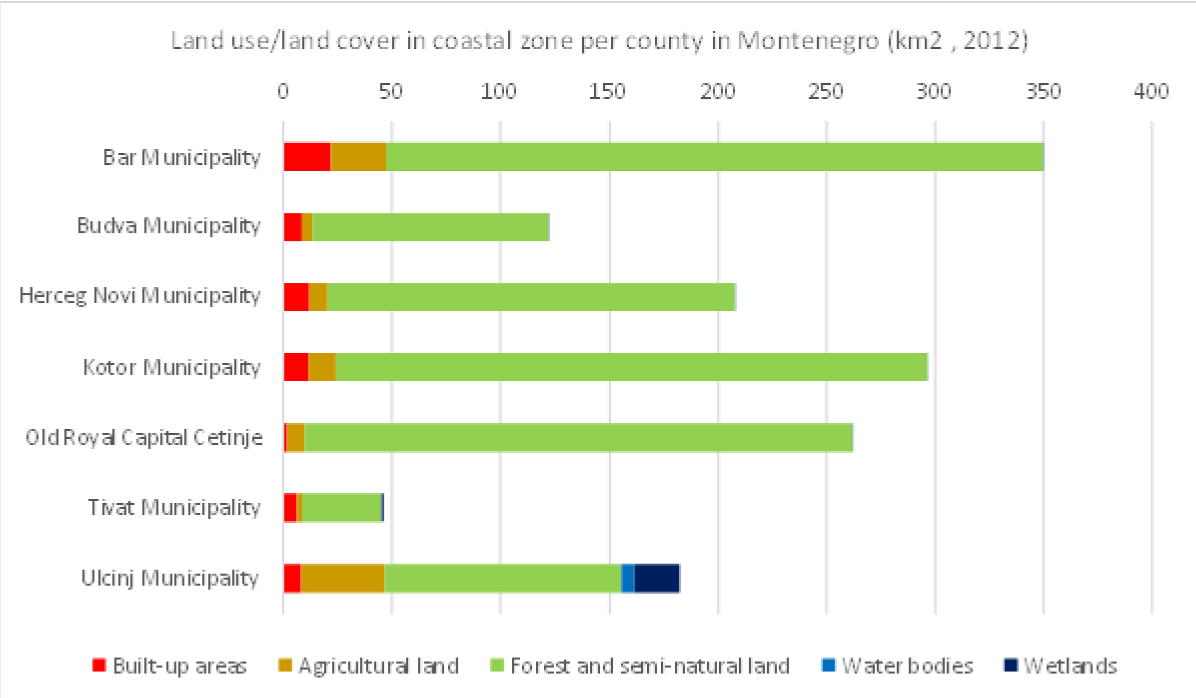


Figure A7.2: CCI25 land use classes in the coastal zone per municipality in km 2, year 2012

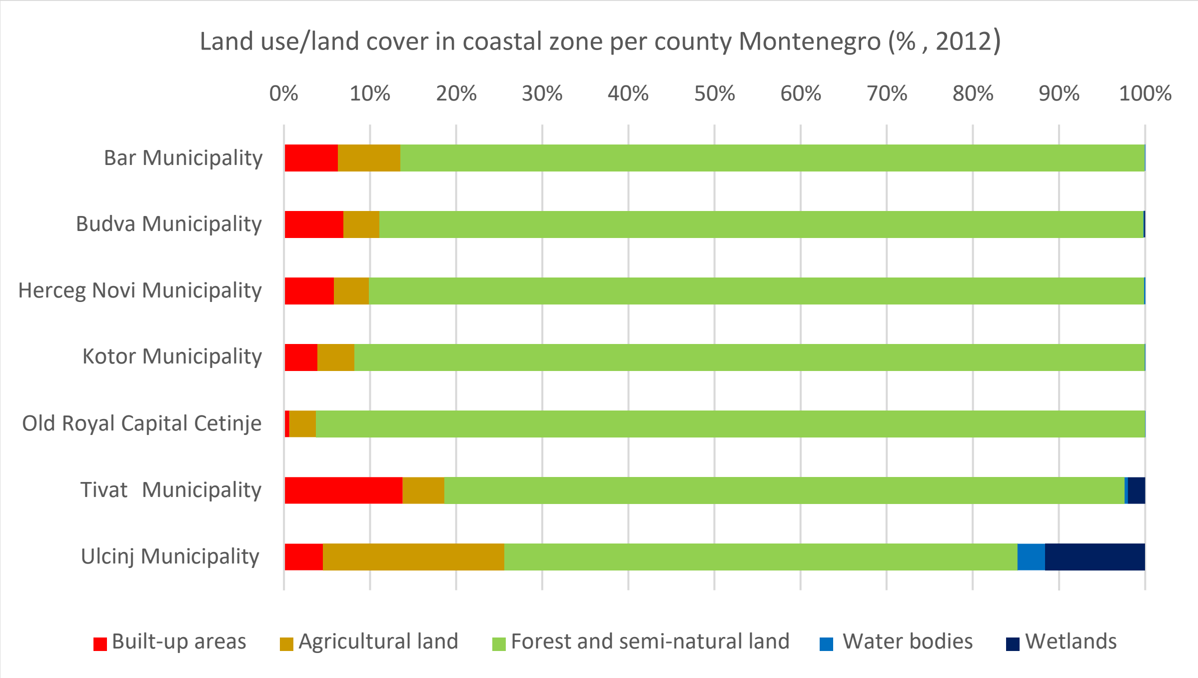


Figure A7.3: CCI25 land use classes in the coastal zone per municipality in percentage, year 2012

Table A7.2: Areas of CCI25 land use classes and their percentage in the coastal zone, year 2012

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km (control column)**
Built-up areas	Areas in km2				% of c. strips within c. zone (0m-1km)			
Bar Municipality	3.83	6.33	11.74	21.90	17.50%	28.92%	53.59%	100.00 %
Budva Municipality	2.32	3.58	2.61	8.51	27.29%	42.04%	30.67%	100.00 %
Herceg Novi Mun.	4.89	3.52	3.63	12.04	40.59%	29.27%	30.14%	100.00 %
Kotor Municipality	4.11	1.37	6.11	11.59	35.44%	11.84%	52.73%	100.00 %
Old Royal Capital Cetinje	0.00	0.00	1.68	1.68	0.00%	0.00%	100.00%	100.00 %
Tivat Municipality	2.44	2.93	1.01	6.38	38.29%	45.86%	15.84%	100.00 %
Ulcinj Municipality	0.97	1.76	5.53	8.26	11.78%	21.29%	66.92%	100.00 %
Montenegro	18.57	19.49	32.31	70.37	26.38%	27.70%	45.91%	100.00 %
Agricultural land	Areas in km2				% of c. strips within c. zone (0m-1km)			

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	0-300 m	300 m -1 km	1-10 km	0m -10 km	0-300 m	300 m -1 km	1-10 km	0m -10 km (control column)
Bar Municipality	0.01	1.62	23.83	25.47	0.05%	6.38%	93.58%	100.00 %
Budva Municipality	0.15	1.26	3.65	5.06	2.87%	24.99%	72.14%	100.00 %
Herceg Novi Mun.	0.16	0.80	7.51	8.47	1.92%	9.40%	88.68%	100.00 %
Kotor Municipality	0.49	1.29	10.92	12.69	3.87%	10.13%	86.00%	100.00 %
Old Royal Capital Cetinje	0.00	0.00	8.09	8.09	0.00%	0.00%	100.00%	100.00 %
Tivat Municipality	0.20	1.06	0.98	2.24	8.92%	47.34%	43.74%	100.00 %
Ulcinj Municipality	0.16	2.75	35.54	38.46	0.42%	7.15%	92.43%	100.00 %
Montenegro	1.17	8.78	90.51	100.46	1.17%	8.74%	90.10%	100.00 %
Forest and semi-natural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
Bar Municipality	6.46	12.57	283.38	302.40	2.14%	4.16%	93.71%	100.00 %
Budva Municipality	6.25	13.26	89.05	108.56	5.76%	12.21%	82.03%	100.00 %
Herceg Novi Mun.	9.79	23.33	154.01	187.13	5.23%	12.47%	82.30%	100.00 %
Kotor Municipality	14.21	36.22	221.79	272.21	5.22%	13.31%	81.48%	100.00 %
Old Royal Capital Cetinje	0.00	0.00	252.13	252.13	0.00%	0.00%	100.00%	100.00 %
Tivat Municipality	6.15	14.30	16.08	36.53	16.85%	39.15%	44.01%	100.00 %
Ulcinj Municipality	7.93	11.81	88.84	108.57	7.30%	10.88%	81.82%	100.00 %
Montenegro	50.79	111.49	1,105.27	1,267.55	4.01%	8.80%	87.20%	100.00 %
Water bodies	Areas in km2				% of c. strips within c. zone (0m-1km)			
Bar Municipality	0.17	0.01	0.07	0.24	70.05%	2.35%	27.60%	100.00 %
Budva Municipality	0.14	0.00	0.01	0.15	94.05%	0.00%	5.95%	100.00 %
Herceg Novi Mun.	0.20	0.01	0.05	0.26	76.73%	5.57%	17.70%	100.00 %
Kotor Municipality	0.16	0.00	0.02	0.18	86.38%	0.00%	13.62%	100.00 %

	Coastal strips			Coastal zone	Coastal strips			Coastal zone
2012	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km (control column)**
Old Royal Capital Cetinje	0.00	0.00	0.01	0.01	0.00%	0.00%	100.00%	100.00 %
Tivat Municipality	0.16	0.03	0.01	0.19	80.29%	15.05%	4.66%	100.00 %
Ulcinj Municipality	0.53	0.27	5.11	5.91	8.99%	4.56%	86.45%	100.00 %
Montenegro	1.35	0.32	5.27	6.95	19.47%	4.59%	75.94%	100.00 %
Wetlands	Areas in km2				% of c. strips within c. zone (0m-1km)			
Bar Municipality	0.00	0.00	0.00	0.00				
Budva Municipality	0.12	0.01	0.00	0.12	95.34%	4.66%	0.00%	100.00 %
Herceg Novi Mun.	0.00	0.00	0.00	0.00				
Kotor Municipality	0.00	0.00	0.00	0.00				
Old Royal Capital Cetinje	0.00	0.00	0.00	0.00				
Tivat Municipality	0.40	0.49	0.03	0.92	43.69%	53.41%	2.89%	100.00 %
Ulcinj Municipality	0.37	2.28	18.47	21.12	1.75%	10.78%	87.47%	100.00 %
Montenegro	0.89	2.77	18.50	22.16	4.01%	12.52%	83.48%	100.00 %

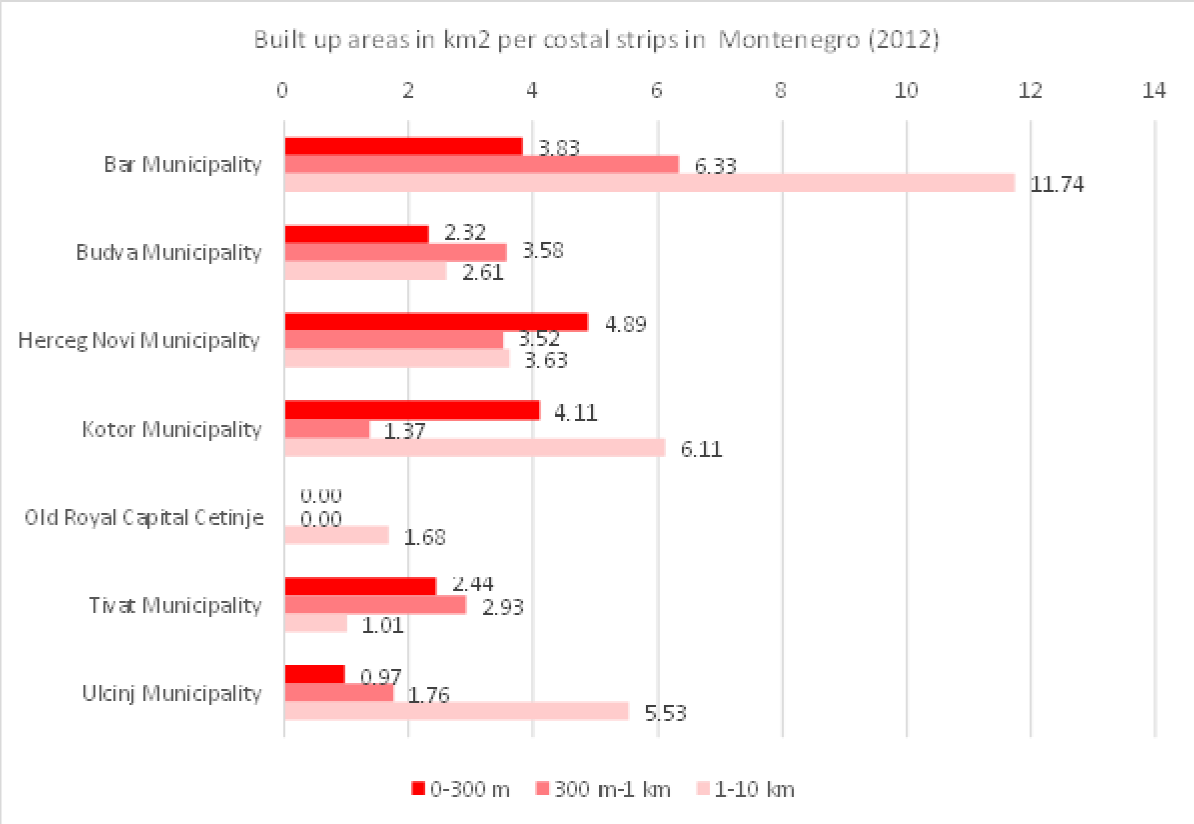


Figure A7.4: Built up area in km2 per costal strips per municipality in year 2012

14.3. Changes 2012-2018

Table A7.3: Land use/cover change in km2 and percentage from 2012 to 2018 on municipality level

2018-2012		**Built-up areas**	**Agricultu-ral land**	**Forest and semi-natural land**	**Water bodies**	**Wetlands**	**Total coastal zone**
Bar Municipality	Area in km 2	0.64	-0.01	-0.62	0.00	0.00	0.00
	% of change	2.91%	-0.05%	-0.21%	0.00%		0.00%
Budva Municipality	Area in km 2	0.20	0.00	-0.20	0.00	0.00	0.00
	% of change	2.30%	0.00%	-0.18%	0.00%	0.00%	0.00%
Herceg Novi Municipality	Area in km 2	0.08	0.00	-0.07	-0.01	0.00	0.00
	% of change	0.69%	0.00%	-0.04%	-3.48%	#DIV/0!	0.00%
Kotor Municipality	Area in km 2	0.51	-0.12	-0.39	0.00	0.00	0.00
	% of change	4.42%	-0.98%	-0.14%	0.00%	#DIV/0!	0.00%
Old Royal Capital Cetinje	Area in km 2	0.06	0.00	-0.06	0.00	0.00	0.00

2018-2012		Built-up areas	Agricultu-ral land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
	% of change	3.60%	0.00%	-0.02%	0.00%	#DIV/0!	0.00%
Tivat Municipality	Area in km 2	0.62	0.00	-0.57	-0.04	0.00	0.00
	% of change	9.67%	0.00%	-1.57%	-22.85%	0.00%	0.00%
Ulcinj Municipality	Area in km 2	0.80	-0.30	-0.50	0.00	0.00	0.00
	% of change	9.66%	-0.78%	-0.46%	0.00%	0.00%	0.00%
Montenegro	Area in km 2	2.90	-0.44	-2.41	-0.05	0.00	0.00
	% of change	4.13%	-0.44%	-0.19%	-0.77%	0.00%	0.00%

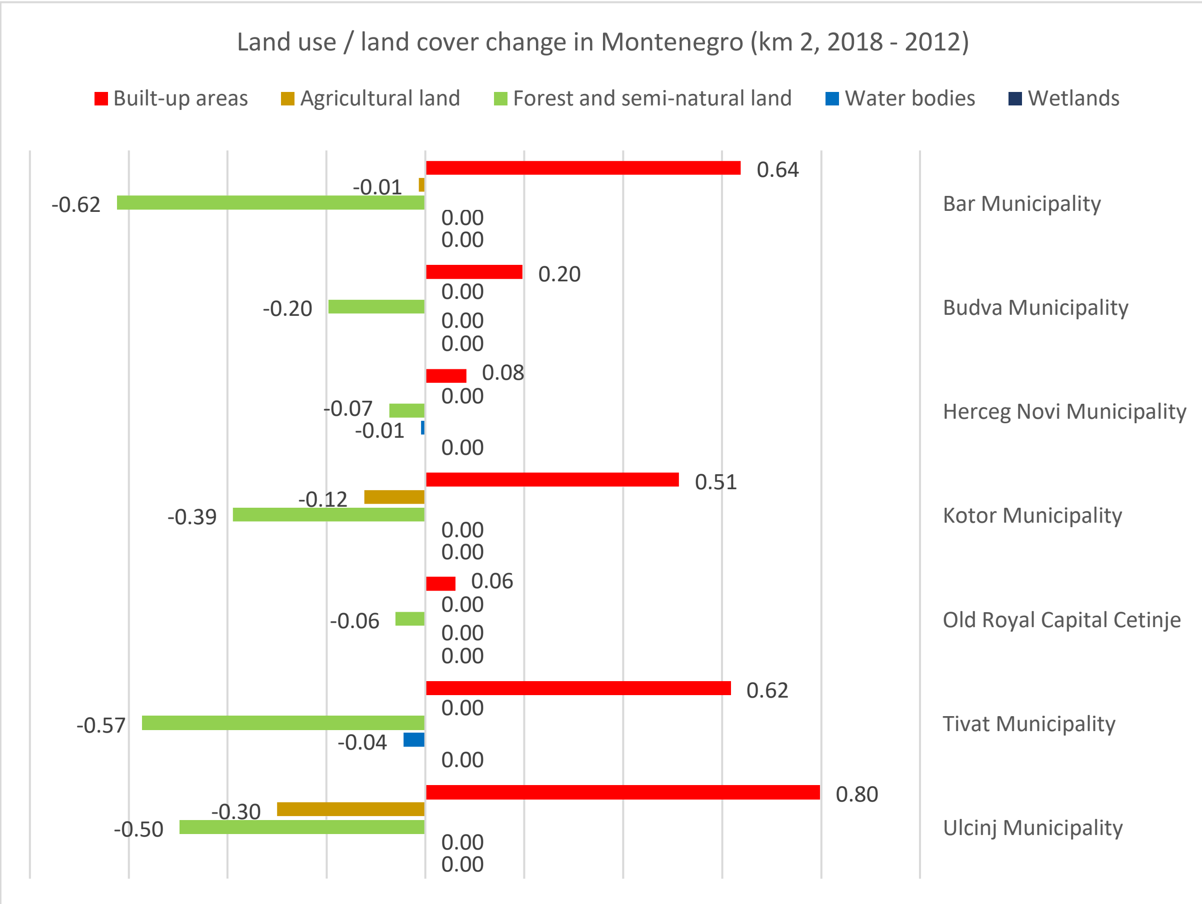


Figure A7.5: Land use/cover change in km2 from year 2012 to 2018 on municipality level

Table A7.4: Land use/cover change from year 2012 to 2018 in km2 and percentage for coastal strips

	Coastal strips 2018-2012			**Coastal zone**	**Coastal strips 2018-2012**			**Coastal zone**
	0-300 m	**300 m -1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**
Built-up areas	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Bar Municipality	0.06	0.11	0.47	0.64	1.59%	1.76%	3.96%	2.91%
Budva Municipality	0.05	0.08	0.06	0.20	2.15%	2.34%	2.39%	2.30%
Herceg Novi Mun.	0.04	0.00	0.05	0.08	0.00%	0.00%	0.00%	0.00%
Kotor Municipality	0.01	0.04	0.47	0.51	0.20%	2.70%	7.65%	4.42%
Old Royal Capital Cetinje	0.00	0.00	0.06	0.06	0.00%	0.00%	3.60%	3.60%
Tivat Municipality	0.23	0.25	0.14	0.62	9.47%	8.49%	13.58%	9.67%
Ulcinj Municipality	0.09	0.11	0.59	0.80	9.54%	6.49%	10.69%	9.66%
Montenegro	0.48	0.59	1.83	2.90	2.58%	3.05%	5.66%	4.13%
Agricultural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Bar Municipality	0.00	0.00	-0.01	-0.01	0.00%	0.00%	-0.06%	-0.05%
Budva Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Herceg Novi Mun.	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Kotor Municipality	0.00	0.01	-0.13	-0.12	0.00%	0.44%	-1.19%	-0.98%
Old Royal Capital Cetinje	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Tivat Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Ulcinj Municipality	0.00	-0.08	-0.22	-0.30	0.00%	-2.80%	-0.63%	-0.78%
Montenegro	0.00	-0.07	-0.37	-0.44	0.00%	-0.81%	-0.40%	-0.44%
Forest and semi-natural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Bar Municipality	-0.06	-0.11	-0.45	-0.62	-0.94%	-0.89%	-0.16%	-0.21%
Budva Municipality	-0.05	-0.08	-0.06	-0.20	-0.80%	-0.63%	-0.07%	-0.18%
Herceg Novi Mun.	-0.03	0.00	-0.05	-0.07	-0.28%	0.00%	-0.03%	-0.04%
Kotor Municipality	-0.01	-0.04	-0.34	-0.39	-0.06%	-0.12%	-0.15%	-0.14%
Old Royal Capital Cetinje	0.00	0.00	-0.06	-0.06	0.00%	0.00%	-0.02%	-0.02%
Tivat Municipality	-0.19	-0.25	-0.14	-0.57	-3.03%	-1.74%	-0.85%	-1.57%

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	**300 m -1 km**	**1-10 km**	**0m -10 km**	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km**
Ulcinj Municipality	-0.09	-0.04	-0.37	-0.50	-1.17%	-0.31%	-0.41%	-0.46%
Montenegro	-0.43	-0.52	-1.46	-2.41	-0.84%	-0.47%	-0.13%	-0.19%
Water bodies	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Bar Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Budva Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Herceg Novi Mun.	-0.01	0.00	0.00	-0.01	-4.53%	0.00%	0.00%	-3.48%
Kotor Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Old Royal Capital Cetinje	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Tivat Municipality	-0.04	0.00	0.00	-0.04	-28.46%	0.00%	0.00%	-22.85%
Ulcinj Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Montenegro	-0.05	0.00	0.00	-0.05	-3.96%	0.00%	0.00%	-0.77%
Wetlands	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Bar Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Budva Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Herceg Novi Mun.	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Kotor Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Old Royal Capital Cetinje	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Tivat Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Ulcinj Municipality	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Montenegro	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%

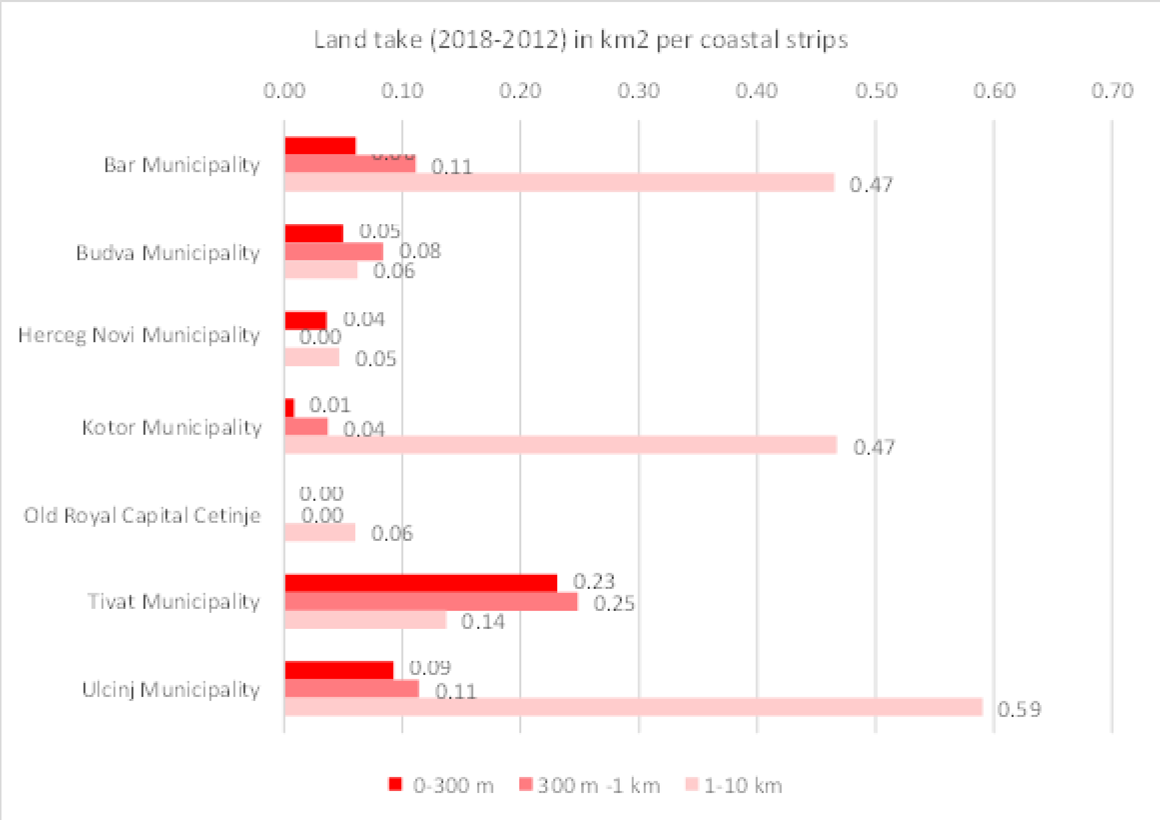


Figure A7.6: Land take (increase of built up areas) from year 2012 to 2018 on municipality level percoastal strips

15. Annex 8

15.1. CCI25 parameters for Slovenia

Calculated CCI25 parameters for year 2012 on the level of reporting units are given in the following tables and graphs. These parameters represent so called baseline data for calculation of land use/cover changes. Thus, following the data for year 2012, there are tables and graphs with the calculation of changes. The change in areas is calculated so that the area for 2012 was subtracted fromthe area from 2018. The resulting negative values mean that these areas decreased and the positive vales mean that these areas increased. The percentage of change was calculated by dividing the abovedifference with the areas from 2012. Thus, the resulting percentage has the meaning of percentage change with respect to the baseline data. Detailed data for year 2012, 2018 and changes are providedin auxiliary Excel files and GIS database.

15.2. Year 2012 – baseline data

Table A8.1: Areas of CCI25 land use classes in the coastal zones and their percentage, year 2012

2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Coastal-Karst Statistical Region	Area in km 2	37.80	105.10	245.51	1.17	7.27	396.85
	% in coastal zone	9.52%	26.48%	61.86%	0.29%	1.83%	100.00%
Gorizia Statistical Region	Area in km 2	1.33	3.87	39.50	0.00	0.00	44.70
	% in coastal zone	2.98%	8.65%	88.37%	0.00%	0.00%	100.00%
Slovenia	Area in km 2	39.13	108.97	285.01	1.17	7.27	441.55
	% in coastal zone	8.86%	24.68%	64.55%	0.26%	1.65%	100.00%

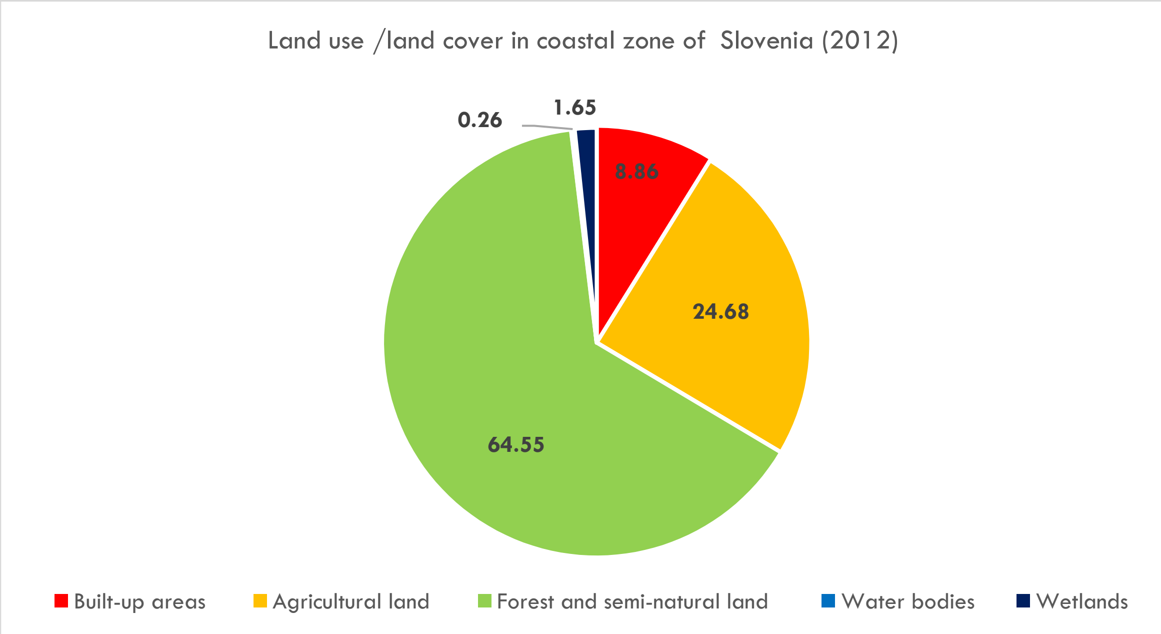


Figure A8.1: CCI25 land use classes in the coastal zone of Slovenia, year 2012

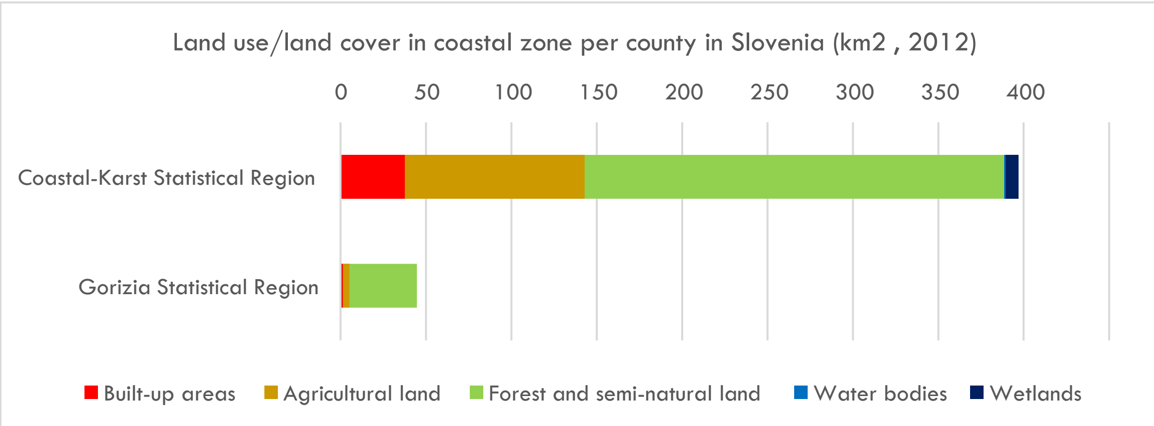


Figure A8.2: CCI25 land use classes in the coastal zone per statistical regions in km 2, year 2012

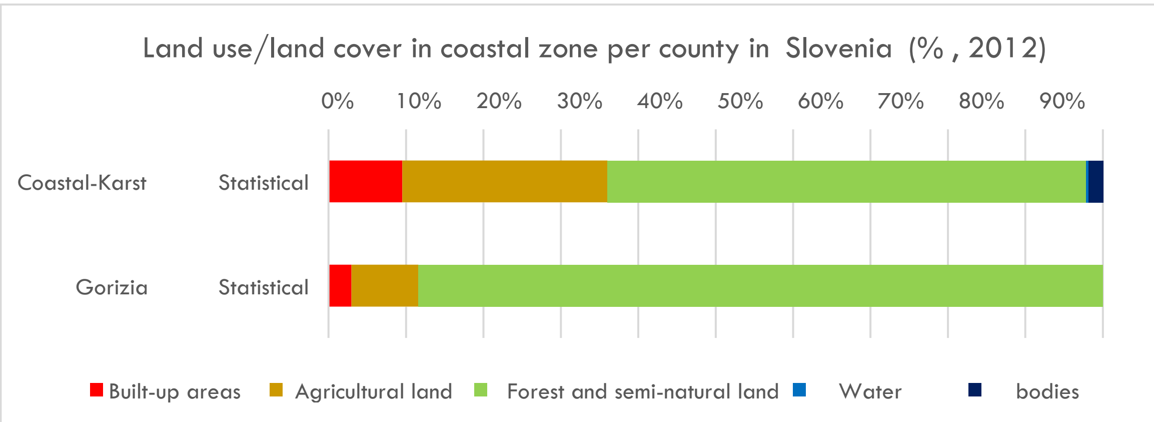


Figure A8.3: CCI25 land use classes in the coastal zone per statistical regions in percentage, year 2012

Table A8.2: Areas of CC125 land use classes and their percentage in the coastal zone, year 2012

	Coastal strips			**Coastal zone**	**Coastal strips**			**Coastal zone**
2012	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m - 10 km**	**0-300 m**	**300 m -1 km**	**1-10 km**	**0m -10 km (control column)**
Built-up areas	Areas in km2				% of c. strips within c. zone (0m-1km)			
Coastal-Karst Statistical Region	6.39	7.63	23.78	37.80	16.91%	20.19 %	62.90%	100.00%
Gorizia Statistical Region	0.00	0.00	1.33	1.33	0.00%	0.00%	100.00 %	100.00%
Slovenia	6.39	7.63	25.11	39.13	16.33%	19.50 %	64.16%	100.00%
Agricultural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
Coastal-Karst Statistical Region	2.17	6.92	96.01	105.10	2.06%	6.58%	91.35%	100.00%
Gorizia Statistical Region	0.00	0.00	3.87	3.87	0.00%	0.00%	100.00 %	100.00%
Slovenia	2.17	6.92	99.88	108.97	1.99%	6.35%	91.66%	100.00%
Forest and semi-natural land	Areas in km2				% of c. strips within c. zone (0m-1km)			
Coastal-Karst Statistical Region	2.05	3.53	239.93	245.51	0.84%	1.44%	97.72%	100.00%
Gorizia Statistical Region	0.00	0.00	39.50	39.50	0.00%	0.00%	100.00 %	100.00%
Slovenia	2.05	3.53	279.43	285.01	0.72%	1.24%	98.04%	100.00%
Water bodies	Areas in km2				% of c. strips within c. zone (0m-1km)			
Coastal-Karst Statistical Region	0.22	0.06	0.88	1.17	19.00%	5.49%	75.51%	100.00%
Gorizia Statistical Region	0.00	0.00	0.00	0.00				
Slovenia	0.22	0.06	0.88	1.17	19.00%	5.49%	75.51%	100.00%
Wetlands	Areas in km2				% of c. strips within c. zone (0m-1km)			
Coastal-Karst Statistical Region	1.60	2.53	3.14	7.27	22.05%	34.80 %	43.15%	100.00%
Gorizia Statistical Region	0.00	0.00	0.00	0.00				
Slovenia	1.60	2.53	3.14	7.27	22.05%	34.80 %	43.15%	100.00%

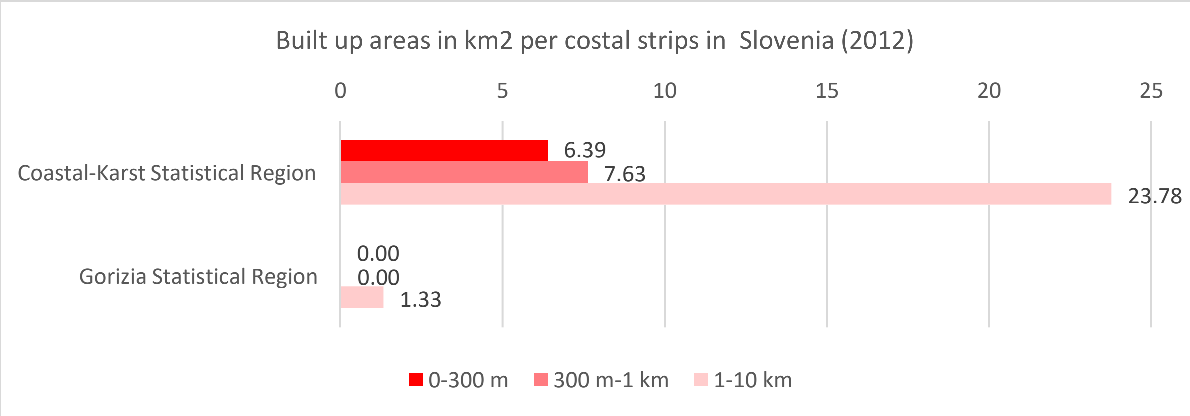


Figure A8.4: Built up area in km2 per costal strips per statistical regions in year 2012

15.3. Changes 2012-2018

Table A8.3: Land use/cover change in km2 and percentage from year 2012 to 2018 on statisticalregion level

2018-2012		Built-up areas	Agricultural land	Forest and semi-natural land	Water bodies	Wetlands	Total coastal zone
Coastal-Karst Statistical Region	Area in km 2	0.00	0.09	-0.09	0.00	0.00	0.00
	% of change	0.00%	0.08%	-0.04%	0.00%	0.00%	0.00%
Gorizia Statistical Region	Area in km 2	0.00	0.00	0.00	0.00	0.00	0.00
	% of change	0.00%	0.00%	0.00%			0.00%
Slovenia	Area in km 2	0.00	0.09	-0.09	0.00	0.00	0.00
	% of change	0.00%	0.08%	-0.03%	0.00%	0.00%	0.00%

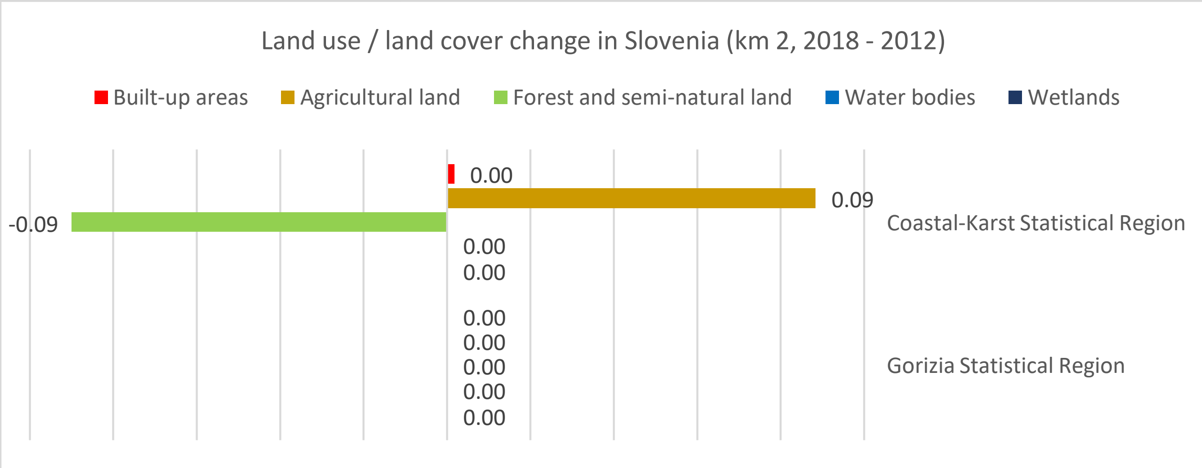


Figure A8.5: Land use/cover change in km2 from year 2012 to 2018 on statistical region level

Table A8.4: Land use/cover change from year 2012 to 2018 in km2 and percentage for coastal strips

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m - 1 km	1-10 km	0m - 10 km	0-300 m	300 m - 1 km	1-10 km	0m -10 km
Built-up areas	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Coastal-Karst Statistical Region	0.00	0.00	0.00	0.00	0.00%	0.00%	0.01%	0.00%
Gorizia Statistical Region	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Slovenia	0.00	0.00	0.00	0.00	0.00%	0.00%	0.01%	0.00%
Agricultural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Coastal-Karst Statistical Region	0.00	0.00	0.09	0.09	0.00%	0.00%	0.09%	0.08%
Gorizia Statistical Region	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Slovenia	0.00	0.00	0.09	0.09	0.00%	0.00%	0.09%	0.08%
Forest and semi-natural land	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Coastal-Karst Statistical Region	0.00	0.00	-0.09	-0.09	0.00%	0.00%	-0.04%	-0.04%
Gorizia Statistical Region	0.00	0.00	0.00	0.00	0.00%	0.00%	0.00%	0.00%
Slovenia	0.00	0.00	-0.09	-0.09	0.00%	0.00%	-0.03%	-0.03%

	Coastal strips 2018-2012			Coastal zone	Coastal strips 2018-2012			Coastal zone
	0-300 m	300 m - 1 km	1-10 km	0m - 10 km	0-300 m	300 m - 1 km	1-10 km	0m -10 km
Water bodies	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
City of Trebinje	0.00	0.00	0.00	0.00	0.00 %	0.00%	0.00%	0.00%
Herzegovina-Neretva Canton	0.00	0.00	0.00	0.00	0.00 %	0.00%	0.00%	0.00%
Slovenia	0.00	0.00	0.00	0.00	0.00 %	0.00%	0.00%	0.00%
Wetlands	Change in km2 (2018-2012)				Change in percentage (2018 - 2012)/2012			
Coastal-Karst Statistical Region	0.00	0.00	0.00	0.00	0.00 %	0.00%	0.00%	0.00%
Gorizia Statistical Region	0.00	0.00	0.00	0.00	0.00 %	0.00%	0.00%	0.00%
Slovenia	0.00	0.00	0.00	0.00	0.00 %	0.00%	0.00%	0.00%

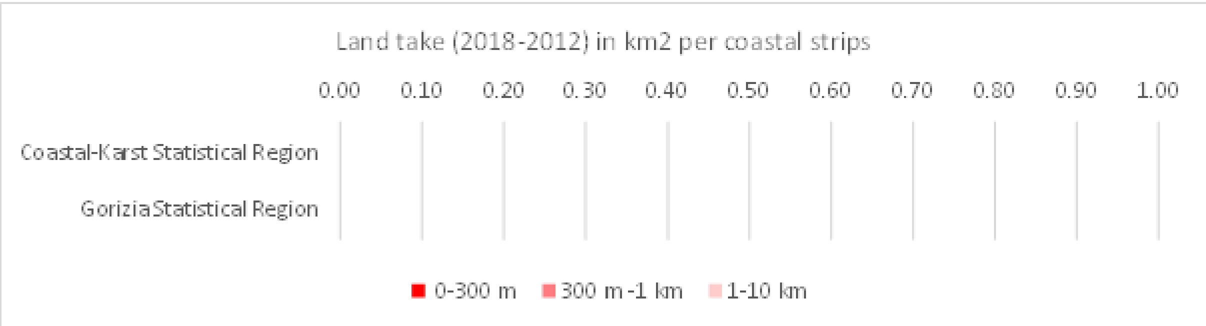


Figure A8.6: Land take (increase of built up areas) from year 2012 to 2018 on statistical regions levelper coastal strips