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Meeting of the Ecosystem Approach Correspondence Group on Monitoring (CORMON) on Coast and Hydrography

Rome, Italy; 21-22 May 2019

Agenda item 3: EO8 Coastal Ecosystems and Landscapes: Candidate Common Indicator 25 "Land use change"

Proposed amendments of the indicator guidance factsheet

UNEP/MAP
Athens, 2019

Contents

Note by the Secretariat

The 19th Meeting of the Contracting Parties (COP 19), held in February 2016, adopted the Integrated Monitoring and Assessment Programme (IMAP) of the Mediterranean Sea and Coast and Related Assessment Criteria (Decision IG. 22/7), with a list of regionally agreed good environmental status descriptions, common indicators and targets, with principles and clear timeline for its implementation. Furthermore, the UN Environment/MAP Programme of Work (PoW) adopted at COP 19, included under Output 1.4.3: "Implementation of IMAP (the EcAp-based integrated monitoring and assessment programme) coordinated, including GES common indicators factsheets". In line with IMAP, indicator guidance factsheets were developed, reviewed and agreed by the Meeting of the Ecosystem Approach Correspondence Group on Monitoring (CorMon) on Coast and Hydrography held in Madrid, Spain, 3 March 2017 and by the Meeting of the PAP/RAC Focal Points, held in Split, Croatia, 3-4 May 2017, for the Common Indicators to ensure coherent monitoring.

The indicator guidance factsheets provide concrete guidance to the Contracting Parties supporting implementation of their respective national monitoring programmes aligned with IMAP. The comments received by the Contracting Parties were considered and approved by the 6th Meeting of the Ecosystem Approach Coordination Group, held in Athens, Greece, 11th September 2017. The "Land use change" indicator is currently the candidate common indicator.

The present document outlines the guidance factsheet for the Candidate Common Indicator (CCI) 25 related to the Ecological Objective 8 (Coastal Ecosystems and Landscapes). Specific points to discuss are the amendments of the indicator guidance factsheet. These amendments mostly refer to: change of name of the indicator – from "Land use change" to "Land cover change" and the inclusion of an additional parameter to calculate the indicator related to areas within coastal belts that are under some level of protection (such as Natura 2000, IUCN or national-specific categories with the objectives to protect biodiversity, habitats, species, landscapes and alike). In this way a more direct link is made to the ecosystem approach as the categories mentioned have a higher value and potential for the protection of coastal ecosystems and landscapes.

The meeting will also have the opportunity to consider this candidate indicator for inclusion on the IMAP list of common indicators and to provide its recommendation to the EcAp Coordination Group.

1. Indicator guidance factsheet for EO8 Coastal Ecosystems and Landscapes Common Indicator 25 "Land use change"

Ecological Objective 8: The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved

Indicator Title	*Land ~~use~~ cover change (Candidate common indicator)*	
Relevant GES definition	**Related Operational Objective**	**Proposed Target(s)**
- Linear coastal development minimised, with perpendicular development being in balance with integrity and diversity of coastal ecosystems and landscapes. *- Mixed land-use structure achieved in predominantly man-made coastal landscapes*	*Integrity and diversity of coastal ecosystems, landscapes and their geomorphology are preserved.*	*Proposed targets should be considered as general recommendations to be adapted to regional/local specificities and knowledge.* *- No further construction within the setback zone* *- Change of coastal land use structure, dominance of urban land use reversed* *- Keep, and increase where needed, landscape diversity*

Rationale		
Justification for indicator selection *The UNEP/MAP's Correspondence Group on Monitoring (CORMON) on Coast and Hydrography agreed, in May 2013, on a specific candidate common indicator for the Mediterranean region addressing land ~~use~~ cover change.* *Identifying and understanding the processes of land ~~use~~ cover change (i.e. how land cover has been changed by humans and the processes that result in landscape transformation) is especially relevant for critical and vulnerable areas such as coastal zones, where several competitive uses are pressing. In this context urbanization, or land take, is the most dramatic change given the (almost) irreversibility of the process. The associated impacts could be listed as follows* (Figure 1): • *Habitat loss with the associated impact on related ecosystem functions like C sequestration, regulation of water cycle, or biomass production.* • *Fragmentation. The division of natural habitats in smaller parcels contributes to the isolation of number of species and also compromises its viability.* *Therefore, the accumulated impacts of urbanization highly compromise ecosystem integrity. Since impacts are dependent on the scale and pace of changes it is important to consider these aspects when monitoring land ~~use~~ cover changes.* *Beyond the process of urbanization there are other changes that are less irreversible and also have important consequences:* • *Conversion from forest to agricultural use. This results in habitat loss, habitat fragmentation and, consequently, loss of biodiversity. There is also a decrease on the degree of soil coverage by vegetation which in turn determines the risk of erosion. Also this type of change results in a net loss of soil carbon.* • *Conversion from agriculture to semi-natural. The impact strongly depends on the conditions at the time of abandonment. If conditions are favorable, land abandonment can lead to a recovery of natural vegetation. However, in case of unfavorable conditions like low vegetation coverage and/or steep slope, agricultural abandonment could lead to further land degradation.* • *Conversion from agricultural land to forest (forestation). This change involves tree plantation and it has a positive impact on land stability by increasing the vegetation cover of the soil and the increase of C sequestration. In terms of biodiversity it strongly depends on the species used for plantation. Native species definitely increase diversity and connectivity.*		

Indicator Title	*Land ~~use~~ cover change (Candidate common indicator)*

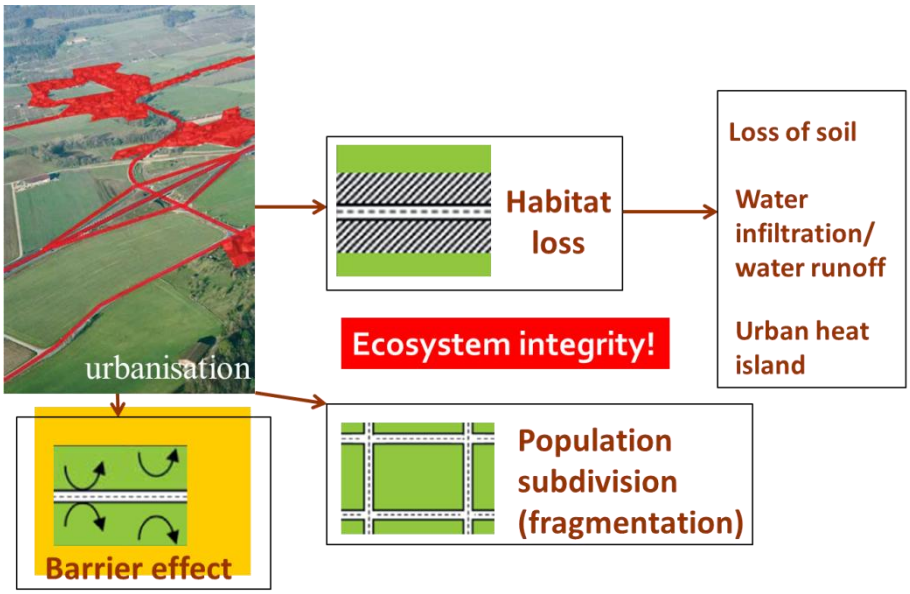

Figure 1. ***Overview of major impacts on land take***

Scientific References

References are grouped by the topic addressed. Within each section references are sorted by relevance (the first ones are more relevant to the current indicator)

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Methodology to compute land use change indicator:

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spatial analysis of driving forces integrating biophysical and human factors. *Applied Geography*, 28(3): 189-209.

- Weber, J.-L., 2007, 'Implementation of land and ecosystem accounts at the European Environment Agency', *Ecological Economics*, 61(4), p.695-707.
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Policy Context and targets

Policy context description

After agreeing on including the candidate common indicator on Land use change in CORMON on Coast and Hydrography in 2013, it was decided that this candidate common indicator would need further testing, pilot implementation (including during the initial phase of IMAP), before the Contracting Parties could agree to its regional usage as a common indicator.
In order to follow-up on this CORMON Coast and Hydrography recommendation, an EcAp pilot project took place in the Adriatic to test the feasibility of this candidate common indicator on the sub-regional level, in the framework of an EU funded project on the "Implementation of the Ecosystem Approach in the Mediterranean by the Contracting Parties in the context of the Barcelona Convention for the Protection of the Marine Environment and the Coastal region of the Mediterranean and its Protocols (EcAp-MED project 2012-2015)". The main conclusions of the Pilot project suggest that by using the common remote data and a common method for processing and presenting the results are feasible and a very positive step forward as far as monitoring the processes, the state and evolution of the coastal zones.
The results of this pilot are presented in document UNEP(DEPI)/MED WG.420/Inf.18.

As for the protocols of the Barcelona convention, The ICZM protocol identifies the need of balanced use of coastal zones in several articles.
For example, the **Article 5** sets the objectives of integrated coastal management:

(a) to facilitate, through the rational planning of activities, the sustainable development of coastal zones by ensuring that the environment and landscapes are taken into account in harmony with economic, social and cultural development;
(b) preserve coastal zones for the benefit of current and future generations;
(c) ensure the sustainable use of natural resources, particularly with regard to water use;
(d) ensure preservation of the integrity of coastal ecosystems, landscapes and geomorphology;

In **Article 6**, where general principles of ICZM are discussed, it is highlighted that the formulation of land use strategies, plans and programs covering urban development and socioeconomic activities, as well as other relevant sectoral policies, shall be required (f). In addition, the Article 6 calls for the allocation of uses throughout the entire coastal zone to be balanced, and unnecessary concentration and urban sprawl to be avoided(h).

The **Article 8**callstoContracting Parties to ensure that their national legal instruments include criteria for sustainable use of the coastal zone. Some of such criteria ask for "identifying and delimiting, outside protected areas, open areas in which urban development and other activities are restricted or, where necessary, prohibited" (a). In addition, it asks for limiting the linear extension of urban development and the creation of new transport infrastructure along the coast(b).

In addition, the EU's Habitats Directive (92/43/EEC), Birds Directive (2009/147/EC), as well as Convention of Biological Diversity can also be relevant for policy context regarding land ~~use~~ cover change.

Indicator Title	*Land ~~use~~ cover change (Candidate common indicator)*

Targets

- No further construction within the setback zone
- Change of coastal land use structure, dominance of urban land use reversed
- Keep, and increase, where needed, landscape diversity

Interpretation of targets and setting the measures to achieve them should be left to the countries.

The reason is the strong socio-economic, historic and cultural dimensions in addition to specific geomorphological and geographical conditions in each country. In other words: although the indicator is a simple tool to show trends in land-use changes for interpretation purposes, additional criteria should be taken into account i.e. due to strong socio-economic, historic and cultural dimensions in addition to specific geomorphological and geographical conditions the interpretation should be left to the countries.

These targets should be taken as general guidelines that need to be considered in light with the local knowledge. Given the relevance of the socio-economic, historic and cultural dimension, in addition to specific geographical conditions, local experts will provide the needed input in support to this indicator.

Policy documents

ICZM Protocol (available in different languages at
http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A22009A0204(01))

Convention on Biological Diversity (www.cbd.int)

Habitats Directive (92/43/EEC)
http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043

Birds Directive (2009/147/EC)
http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147

Indicator analysis methods

Indicator Definition

Land use/land ~~cover~~ change is the change of purpose to which land is profited by humans (e.g., protected areas, forestry for timber products, plantations, row-crop agriculture, pastures, or human settlements). Different parameters can be considered for evaluation of indicator on land use/land cover change. The parameters are summed in Table 1. The combined analysis of these parameters entails an inventory of the urbanization pressures on coastal ecosystems. In practice the parameters can identify: (i) where pressures are higher (by amount of change and by pace of the process); (ii) spatial trends (along the coast and landwards); and (iii) areas for priority action. However, responsible (local) institutions are necessary to correctly interpret these processes and to understand the drivers behind them.

Table 1. ***Description of the parameters calculated for the indicator Land Cover Change***

Parameter	*Units*	*Data required*	*Reporting units*	*Meaning*
Area of built-up land in coastal zone as a proportion of the total area in the same unit	*% of artificial areas*	*Artificial surfaces at a single time shot*	*Coastal zone as defined by the country* *Also coastal strips (<300m*, 300m-1km, 1-10 km).*	*State of urban areas at a particular time. This is used as a baseline, i.e. initial condition for the analysis of changes.*

Indicator Title		*Land ~~use~~ cover change (Candidate common indicator)*		
Area of built-up land in coastal units as a proportion of the area of built-up land in the wider coastal unit	*% of artificial areas*	*Artificial surfaces at a single time shot*	*Narrower coastal strips within the wider ones (or even within the whole coastal unit).*	*This parameter shows to what extent the process of urbanization has been more intense on the coast than on the inland. It also reflects the relevance of economic activities on the coast as a driver of urban development.*
Land take as % initial urban area on the coastal zone	*% of increase of urban areas*	*Artificial surfaces at t_0 and t_1*	*Coastal zone as defined by the country. Also coastal strips (<300m*, 300m-1km, 1-10 km)*	*Intensity of the process of urbanization in a given period of time.*
Change of forest and semi-natural areas	*% of change of forest and semi-natural areas*	*Forest and semi-natural land at t_0 and t_1*	*Coastal zone as defined by the country. Also coastal strips (<300m*, 300m-1km, 1-10 km)*	*This parameter would reflect to what extent management is leading to an increase, maintenance or decrease of forest and semi-natural areas. This represents the land cover closer to "natural land" excluding wetlands (specific indicator).*
Change of wetlands	*% of change of wetlands*	*Wetlands at t_0 and t_1*	*Coastal zone as defined by the country. Also coastal strips (<300m*, 300m-1km, 1-10 km*	*This parameter will indicate how effective is the protection of wetlands, in terms of coverage. The indicator could reflect and increase, maintenance or a decrease of wetlands.*
Change of protected areas	*% of change of protected areas*	*Protected areas at t_0 and t_1*	*Coastal zone as defined by the country. Also coastal strips (<300m*, 300m-1km, 1-10 km*	*This parameter shows how the extent of protected areas changes in time.*

**the 300m wide coastal strip is proposed as relevant representation of the coastal setback (also considering the resolution issues)*

Methodology for indicator calculation

*1. **Data compilation** - Land cover classes are typically mapped from digital remotely sensed data through the process of a supervised digital image classification or, alternatively, determined by in situ monitoring. Land cover classes needed for the indicator are listed in the Table 2. If more detailed classification is available, then it could be provided making the clear link with Table 2.*

Table 2. ***Land cover classes for the Land ~~Use~~ Cover Change indicator***

LU/LC class	*Definition*

Indicator Title	*Land ~~use~~ cover change (Candidate common indicator)*
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.*
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).*
Forest and semi-natural land	*It includes: forests, scrub and/or herbaceous vegetation associations, open spaces with little or no vegetation*
Wetlands	*Inland marshes, peatbogs, salt marshes, salinas, intertidal flats*
Water bodies	*Water courses, water bodies, coastal lagoons, estuaries, sea and ocean.*
Protected areas	*Surfaces with any of the protection status (such as Natura 2000, IUCN or national-specific categories with the objectives to protect biodiversity, habitats, species, landscapes and alike in the coastal zone)*

*2. **Data processing***

Data processing includes the following steps (Figure 2):

(i) Pre-processing

Land ~~use~~ cover data could be available in two formats: vector data (polygons) or raster data (grid). For practical reasons, and to simplify the computing process, the first step is to ensure that all the data is in a grid of 1 ha. Conversion of vector data to a grid, or raster, is a common procedure in GIS techniques. Most of the GIS software provides different options to convert vector data into a grid. Here the 'Maximum area' criterion is suggested as one of the most standard methods.

(II) Combining data

Once the data is available in 1 ha grid, the different layers are combined. This process is automatically done by any GIS software and creates an associated table with all the information available for each cell in the grid. The layers to be combined are listed as follows:

1. *Baseline land cover data (y0).*
2. *Land cover change data (y0-y1)*
3. *Delimitation of coastal zone*
4. *Administrative unit where the coastal zone belongs (NUTS3 or equivalent)*

Therefore the minimum information that the resulting table should contain is as follows:

1. *Grid ID. Unique identifier for each cell in the grid of 1 ha*
2. *Coastal zone. Yes/No. Boolean parameter that indicates if the cell is within the coastal zone, as defined by the country*
3. *Administrative unit. Code that identifies the administrative unit where the cell is located (NUTS3 of equivalent).*

Indicator Title	*Land ~~use~~ cover change (Candidate common indicator)*

4. *Land cover class at t_0. Code for the land cover class of the cell.*

(iii) extracting statistics

As a result of the previous step a table should be available with the unique code of each cell of the 1 ha grid and all related parameters. Therefore the extraction of the statistics for the calculation of the indicator could be done in a spreadsheet and does not require any GIS processing (see Data analysis and assessment outputs section for the details).

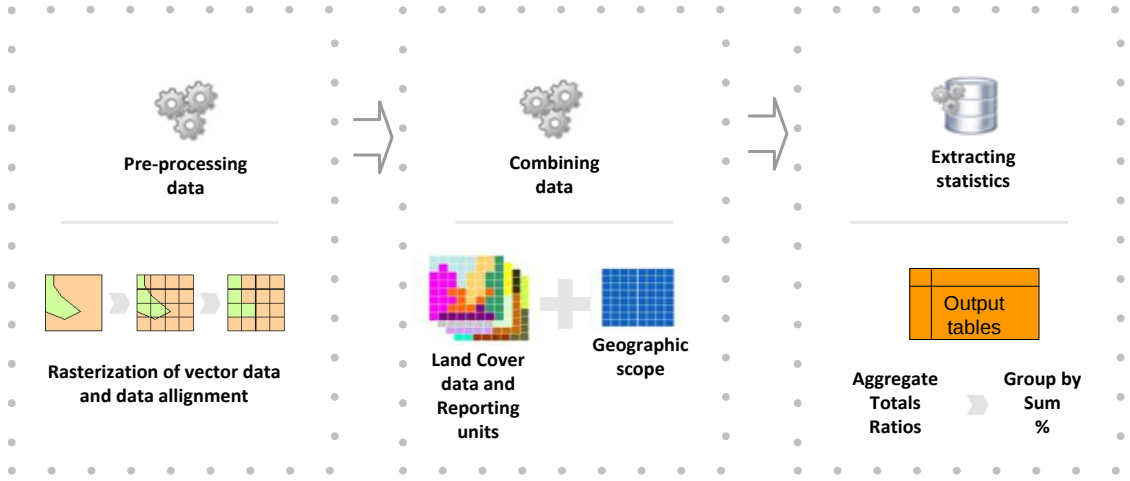

Figure 2. ***Data processing for the Land ~~Use~~ Cover Change indicator***

Indicator units

The first monitoring will focus on the base line. The indicator units are indicated below:

1. *km^2 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 (see Table 1) compared to wider coastal units*
5. *% of other land cover classes within coastal strips of different width (see Table 1) compared to wider coastal units*
6. *km^2 of protected areas within coastal strips of different width*

For second monitoring the following units will also be relevant:

7. *% of increase of built-up area, or land take*
8. *% of change of other land cover classes*
9. *% of change of protected areas*

List of Guidance documents and protocols available

Pilot project in the Adriatic on testing the candidate common indicator 'Land use change' in the Mediterranean, by: Anna Marín. Raquel Ubach. and JaumeFons-Esteve. Coordinated by: Marko Prem, PAP/RAC. URL: http://www.pap-thecoastcentre.org/pdfs/Pilot%20Adriatic_Final_Sep2015.pdf

Indicator Title	*Land ~~use~~ cover change (Candidate common indicator)*

Data confidence and uncertainties

Production of land use/land cover data from remote sensing is always a compromise between precision and efforts required to derive the information from satellite images. The data sources listed below (see Available data sources) have been validated by the responsible institutions or providers of the data. Additionally, if analogue maps from official institutions are available they could be digitalised and used accordingly.
Quality assurance/control always involve a selection of percentage of points where the derived information is checked against "ground truth" –usually ancillary information like official maps, cadastre,... but also field inspections.

Methodology for monitoring, temporal and spatial scope

Available Methodologies for Monitoring and Monitoring Protocols

The most elaborated guidelines are available from the Corine Land Cover programme (currently integrated in the Copernicus Programme).

http://www.eea.europa.eu/publications/technical_report_2007_17

Available data sources

The data sources listed below are transnational data bases (the first one only European, the rest global). Existing national data (official) is also suitable for this indicator.

- Corine land Cover (only European coverage)
http://land.copernicus.eu/pan-european/corine-land-cover

- GlobCover. Global land cover dataset at 300m resolution from the MERIS sensor on the ENVISAT satellite.
http://due.esrin.esa.int/page_globcover.php

-Climatge Change Initiative Land Cover map. Global land cover dataset at 300m resolution, for 1998-2002, 2003-2007, 2008-2012.
http://maps.elie.ucl.ac.be/CCI/viewer/index.php

-GLC-SHARE: Global Land Cover data combined from 'best available' national land cover maps. 1km resolution.
http://www.fao.org/geonetwork/srv/en/main.home?uuid=ba4526fd-cdbf-4028-a1bd-5a559c4bff38

Spatial scope guidance and selection of monitoring stations

The exact territorial extent (coastal area for the analysis) of the monitoring should be defined. The Mediterranean ICZM Protocol defines the landward limit of coastal zone as the "limit of the competent coastal units as defined by the Parties (Article 3)." In other words, the landward limit will be country-specific, e.g. dependant on definition given by certain Contracting party when ratifying the Protocol.

As for the resolution of the source data it is a „compromise between precision and efforts needed in processing the satellite images. The following indications could be considered
minimum requirements:

- *Minimum mapping unit of 25 ha and 100 m of linear elements*
- *Minimum change detection 5 ha*

Temporal Scope guidance
The temporal scale should be 5 years, in order to be effective on the counteracting negative effects and taking early actions on problematic areas.

Data analysis and assessment outputs

Indicator Title	*Land ~~use~~ cover change (Candidate common indicator)*

Statistical analysis and basis for aggregation

The statistics can be computed as follows:

1. *Percentage of built-up area in coastal zone.*
   a) *Filter the data by the grids belonging to the coastal zone*
   b) *Calculate total area by counting the total number of cells. This is the area in km^2.*
   c) *Filter, within the coastal zone, by land cover "artificial areas" (see Table 1 for the definition of land cover classes).*
   d) *Calculate area of "artificial areas" by counting the number of cells. This is the area in km^2.*
   e) *Divide 1d by 1b in order to obtain the percentage of artificial area on the coastal zone.*
2. *Percentage of other land cover classes on the coastal zone. As complementary to "Percentage of built-up area in coastal zone" the same procedure could be applied to each land cover class as defined in Table 1. In that case the procedure described in 1 will be replicataed by changing "artificial areas" with the other land cover classes*
3. *Area of built-up land in coastal units as a proportion of the area of built-up land in the wider reference region.*
   a) *Filter the data by the grids belonging to the entire administrative unit where the coastal zone belongs (NUTS3 or equivalent).*
   b) *Filter by land cover "artificial areas" (see Table 1 for the definition of land cover classes).*
   c) *Calculate area of "artificial areas" by counting the number of cells. This is the area in km^2.*
   d) *Sum 1d with 3c.*
   e) *Divide 1d by3d. This value is the percentage of built-up area within the administrative unit that is located on the coastal zone.*
4. *Land take as % of initial urban area on the coastal zone. This parameter will start to be computed on the second monitoring since the first monitoring focus only on the baseline (state at t_0).*
   a) *Filter the data by the grids belonging to the coastal zone.*
   b) *Calculate total area by counting the total number of cells. This is the area in km^2.*
   c) *Filter, within the coastal zone, by land cover "artificial areas" (see Table 1 for the definition of land cover classes) for t_0.*
   d) *Filter, within the coastal zone, by land cover "artificial areas" (see Table 1 for the definition of land cover classes) for t_1.*
   e) *Calculate 4d-4c and then divide by 4c. This provides the percentage of land take compared to the initial built-up area.*
5. *Change of forest and semi-natural land. This parameter will start to be computed on the second monitoring since the first monitoring focus only on the baseline (state at t_0).*
   a) *Filter the data by the grids belonging to the coastal zone.*
   b) *Calculate total area by counting the total number of cells. This is the area in km^2.*
   c) *Filter, within the coastal zone, by land cover "Forest and semi-natural land" (see Table 1 for the definition of land cover classes) for t_0.*
   d) *Filter, within the coastal zone, by land cover "Forest and semi-natural land" (see Table 1 for the definition of land cover classes) for t_1.*
   e) *Calculate 5d-5c and then divide by 5c. This provides the percentage of change of forest and semi-natural areas for the given period.*
6. *Change of wetlands. This parameter will start to be computed on the second monitoring since the first monitoring focus only on the baseline (state at t_0).*

Indicator Title	*Land ~~use~~ cover change (Candidate common indicator)*

a) Filter the data by the grids belonging to the coastal zone.

b) Calculate total area by counting the total number of cells. This is the area in km^2.

c) Filter, within the coastal zone, by land cover "Wetlands" (see Table 1 for the definition of land cover classes) for t_0.

d) Filter, within the coastal zone, by land cover "Wetlands" (see Table 1 for the definition of land cover classes) for t_1.

e) Calculate 6d-6c and then divide by 6c. This provides the percentage of change of wetlands for the given period.

The above mentioned analysis can be complemented with the following ones that provide additional insight on the land cover indicator.

7. Additional analytical units

a) Setback zone (if defined by country). Given the relevance of this part of the coastal area, as referred on the ICZM protocol, the indicators on % of built-up and land take can be analysed for this specific zone.

b) Elevation breakdown within the coastal area. Distance to the coast and elevation are elements that configure different habitat distribution and patterns. With available local knowledge 3 to 5 elevations classes could be considered to be analysed independently within the coastal area in order to better link the pressure of land take to specific habitats. An example follows: < 50 m asl, 50 – 300 m, >300 m).

8. Additional parameters

What has been lost by urbanization?

a) Filter the data by the grids belonging to the coastal zone.

b) Calculate total area by counting the total number of cells. This is the area in km^2.

c) Develop a pivot table with land cover classes at t_0, on rows, and land cover classes at t_1 on columns. Cells in this matrix will contain the area that has changed from certain land cover class at $t_0$to a new class in t_1.

d) Select the column for "Built-up areas".

e) Values on the rows indicate the different land cover classes at t_0 that have been converted into built-up area.

f) Values from 5 can be divided by the corresponding area of the same class at t_0. This will provide the percentage of certain land cover class that has been converted into built-up.

Expected assessments outputs

The outputs are detailed below:

- *Digital map with the land cover classes for the coastal area. Land cover classes should follow the classification provided in Table1. If more detailed classification is available, then it could be provided making the clear link with Table 1. The following specifications will ensure the interoperability of the maps provided by different institutions/countries:*
  - *Format: raster GeoTIFF (Geographic Tagged Image File Format) 1 ha*
  - *Metadata:*
    - *Title of the map*
    - *Geographic reference.*
      - *Bounding box.*
      - *Coordinate reference system*
    - *Temporal reference (year)*
    - *Responsible organisation*
- Spreadsheet with the calculated indicators as described in the methodology.
- Starting with the second monitoring, additional maps will be provided indicating areas of land take (new urbanization). The specifications for these maps are the same as indicated above.

Indicator Title	*Land ~~use~~ cover change (Candidate common indicator)*

Known gaps and uncertainties in the Mediterranean

The definition of the analytical units of the coastal zone could be revised in view of more detailed data on habitats distribution, or input from national experts. In any case it is important to take into account the implications of the different delineations on the interpretation of the results.
The use of remote sensing and the selected resolution is the main constrain when analysing the outcomes

- *Not all changes are observed since there is minimum change detection. Therefore the patterns observed indicate that changes are underestimated. In any case the proposed approach is still relevant since it provides an idea of the magnitude of the processes of urbanization.*
- *Given the resolution and processing, linear elements are not well captured; therefore linear elements perpendicular to the coast, for example, are not detected.*
- *The information currently available does not allow identifying built-up on the territorial waters.*

Since these limitations arise from the definition of the resolution, there is space for improvement if it is needed. However, there is always a trade-off between resolution and efforts required to obtain the information.

In addition, countries may obtain data from different sources (different resolution, different level of precision) which may make comparability of data difficult.

Contacts and version Date

Key contacts within UNEP for further information

Version No	**Date**	**Author**
V.1	27/6/16	PAP/RAC
V.2	20/07/16	UAB
v.3	01/04/19	PAP/RAC