

# Coastal Land Use and Land Cover: the missing link to the Large Marine Ecosystem Assessment Framework

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The intergovernmental Oceanographic Commission (IOC) of UNESCO is leading the assessment of Large Marine Ecosystems (LMEs). These LMEs provide a diverse range of ecosystem services that are of immense socio-economic value to the countries bordering them. A central theme to the LMEs assessment is the impact of natural and anthropogenic stressors on marine ecosystems and the sustainability of ecosystem services. Through a conceptual framework that illustrates the interaction between natural and human systems, the consequences of these impacts on humans can be assessed. Currently, the LMEs assessment is based on six themes: productivity, fisheries, habitats, pollution, socio-economics and governance. For each theme, a number of indicators of current status and future projections are available allowing for a global comparative assessment of all 66 LMEs and the Pacific Warm Pool and to identify the ones most at risk and where human dependency is greatest.

The LMEs assessment is not currently taking into account land use and land cover changes in their coastal vicinity. Through processes like Integrated Coastal Area Management (ICAM), it has been recognized that terrestrial sectors like agriculture, forestry and industries hold a high stake in coastal development. Therefore, excluding the monitoring of land cover and land use (LULC) changes occurring in coastal areas does not give the full picture of the state of LMEs worldwide. In this research, the additional theme of coastal LULC is suggested as the missing link of the LMEs assessment program. Drivers of LULC often relate to socio-economic indicators, which are already well documented. However, socio-economic factors do not always impact marine and coastal ecosystems in a direct manner, but first through LULC, which in turn interacts with the sea. For instance, water quality is the most obvious example of impacts of LULC (e.g rapid urbanization, deforestation for agricultural land) on marine and coastal areas. Accelerated coastal erosion due to coastal wetlands and mangrove loss is also an important stressor on coastal and marine ecosystems and its ability to provide ecosystem services to communities who depend on them.

In order to achieve these objectives, a variety of satellite-derived open-source global and regional land cover products from the period 2000 and 2014 have been used to assess the change in forest, agriculture and urban cover, the land cover classes most accurately estimated at reasonably high spatial resolution on a global scale, and the ones impacting coastal and marine ecosystems the most. The analysis is performed at the buffer distances of 10 km, 20 km, 50 km and 100 km inland from the shoreline, and the LULC change data is made available on a per-LME basis through a Web Feature Service (WFS). The derived LULC data is then compared with data from other LMEs assessment themes (i.e. socio-economic and demographics) to look for correlations in the datasets. The main goal of this research is to fulfil the data gap in the LMEs assessment undertaken by IOC and GEF under the Transboundary Water Assessment Program (TWAP), thus recognizing the importance of the land component in assessing LMEs and of the ICAM approach in the sustainable management of our marine and coastal areas.

Keywords: large marine ecosystems; LMEs; coastal areas; global land use; global land cover changes; LULC; socio-economic activities; integrated coastal area management; GIS; remote sensing