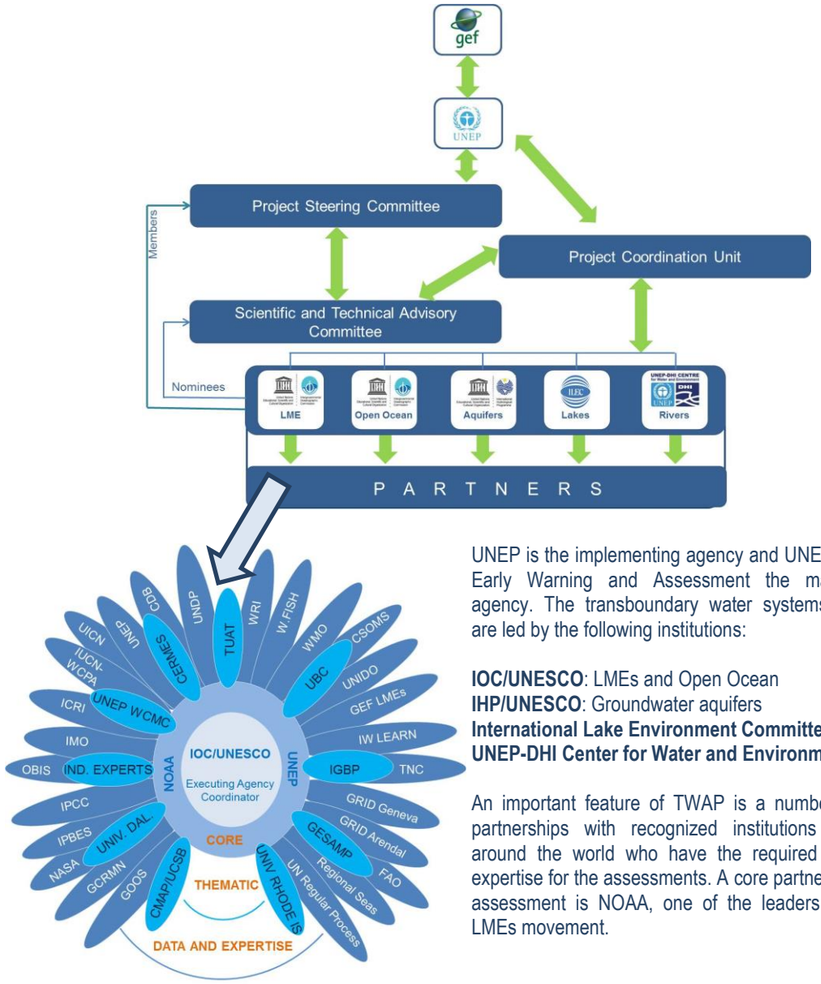
3. Partnership



UNEP is the implementing agency and UNEP's Division of Early Warning and Assessment the main executing agency. The transboundary water systems components are led by the following institutions:

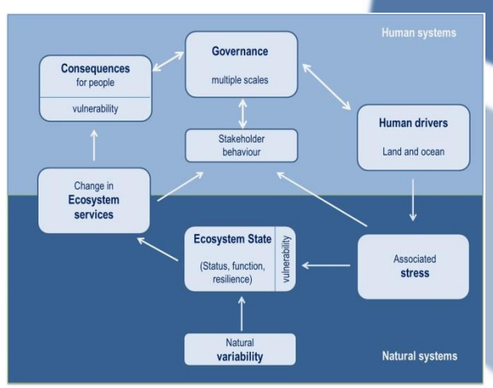
IOC/UNESCO: LMEs and Open Ocean
IHP/UNESCO: Groundwater aquifers
International Lake Environment Committee: Lakes
UNEP-DHI Center for Water and Environment: Rivers

An important feature of TWAP is a number of strategic partnerships with recognized institutions and experts around the world who have the required datasets and expertise for the assessments. A core partner for the LMEs assessment is NOAA, one of the leaders in the global LMEs movement.

4. Conceptual framework

A central theme of TWAP is the impact of natural and anthropogenic stressors on ecosystems and the sustainability of ecosystem services, and consequences for humans.

The interaction between the human and natural systems is illustrated in a conceptual framework shown on the right. In brief, human activities have associated stressors that impact natural systems and this in turn affects the delivery (and value) of ecosystem services to people (starting in the human drivers box and going clockwise). This framework helps to identify why particular indicators are proposed and their relevance.



5. Indicators

Overfishing, habitat destruction and pollution have been identified as among the priority environmental issues in LMEs by GEF LME projects. The TWAP LMEs assessment will focus on these themes as well as on productivity, socioeconomics and governance. For each theme, a number of indicators and metrics are being used in the global baseline comparative assessment of LMEs. Such an assessment requires datasets with global coverage, and is based on the best available data and information. Many of the datasets are at small spatial scales, which will allow data to be aggregated at different geographic scales.

Primary productivity *(NOAA, URI)*

Primary productivity is the basis of marine food chains but can also be considered a stressor at excessively high levels (e.g. algae blooms, eutrophication). Changes in water temperature have direct impacts on the spatial distribution and productivity of marine organisms.

Indicators: Chlorophyll *a,* Primary productivity, Sea surface temperature

Fisheries *(UBC)*

LMEs produce about 80 % of the world's annual marine fish catch, a significant source of food, livelihoods, and foreign exchange to bordering countries. Yet, overexploitation is widespread and most severe within LMEs, with the number of collapsed fish stocks increasing and unsustainable fishing practices provoking changes at the ecosystem level.

Indicators: Annual catch, catch value, marine trophic index, fishing in balance index, stock status, catch from bottom impacting gear, fishing effort.

Pollution and Ecosystem Health *(CMAP/UCSB, GESAMP, IGBP, TUAT, UNEP-WCMC)*

Pollutants arising from human activities on both land and in the sea have potential negative consequences for ecosystems and ultimately for humans. Marine habitats such as mangroves and coral reefs are increasingly under threat from a range of stressors such as overfishing, pollution, invasive alien species, nutrient over- enrichment, and climate variability.

Indicators: Nutrients (N, P, Si), coastal eutrophication potential, POPs in plastic pellets, plastic debris density, change in MPA coverage, reefs at risk index, mangrove extent, coral reef extent, cumulative human impacts, delta vulnerability index.

Socio-economics *(Independent expert)*

Human activities and associated stresses can affect ecosystem state, which may lead to changes in ecosystem services with consequences for people, buffered or exacerbated by their vulnerability and resilience to such changes. A common approach to socio-economic assessment for all five TWAP water systems focuses on human dependence, vulnerability, and livelihoods.

Indicators: %GDP fisheries, %GDP international tourism, coastal population, human development index, deaths caused by climate related natural disasters.

Governance *(CERMES/UWI, Univ. Dal.)*

Effective governance is fundamental to achieving healthy ecosystems (inclusive of people), and in this context, should focus on sustaining ecosystem services in addition to other politically negotiated goals. The LMEs assessment will evaluate the governance architecture (arrangements) relevant to four key areas: water quality, fisheries, biodiversity, and habitat destruction.

Indicator: Governance architecture.

6. Assessment products

All the assessments products will be available in 2015.

Data

Spatial information and statistics from the TWAP LME and Open Ocean Web portal.

Reports

A synthesis report, summary for decision makers and technical thematic reports.

Indicators

Indicators factsheets and accessible metrics by themes.

Web

Our websites will disseminate all products and results related to LMEs and the Open Ocean.

Target audience and potential users:

The main target audience of the TWAP LMEs assessment will be the GEF Secretariat, who requested the assessment of transboundary waters. Among other key stakeholders will be countries involved in GEF LME projects as well as UN organizations and others with global and regional programmes on assessment and management of the marine environment such as the World Ocean Assessment and Regional Seas Programmes.

All project information can be found at:
http://www.unesco.org/new/twap-lme and www.geftwap.org/large-marine-ecosystems

7. LMEs Partners

CERMES/UWI: Centre for Resource Management and Environmental Studies/Univ. West Indies, Barbados.
CMAP/UCSB: Center for Marine Assessment and Planning – Univ. California Santa Barbara, United States.
GESAMP: Joint Group of Experts on Scientific Aspects of Marine Environmental Protection.
IGBP: International Geosphere-Biosphere Programme, Sweden
NOAA: National Oceanic and Atmospheric Administration, United States
UBC: University of British Columbia, Canada.
UNEP-WCMC:United Nations Environment Programme – World Conservation Monitoring Centre, United Kingdom
Univ. Dal: University of Dalhousie, Canada.
URI: University of Rhode Island, United States
TUAT: Tokyo Univ. of Agriculture and Technology, Japan

8. Beyond TWAP

The current project will lay the foundation for sustaining transboundary waters assessments by developing and formalizing the institutional arrangements for periodic assessments and linking with other assessment processes such as the UN World Ocean Assessment. The TWAP baseline and indicators can also be adapted for use in assessment and management of aquatic systems at any scale.

(IOC/BRO/2013/3 rev.)
TWAP Large Marine Ecosystems
IOC/UNESCO, October 2013

Julian Barbière: j.barbiere@unesco.org (Task Manager)
Sherry Heileman: sh_heileman@yahoo.com (LMEs Coordinator)
Alejandro Iglesias: a.iglesias-campos@unesco.org (P.Specialist)

References: Costanza R et al. 1997. The value of the world's ecosystem services and natural capital. Nature 387(15 May 1997):253-260.
Sherman, K., 1994. Sustainability, biomass yields, and health of coastal ecosystems: An ecological perspective. Mar. Ecol. Prog. Ser., 112: 277-301.
Pictures in box5: www.worldwildlife.com ,www. CadizTurismo.com. **Graphs in box 6**: www.fourshoreservices.com, www.strategydriven.com.

Large Marine Ecosystems
TWAP
TRANSBOUNDARY WATERS ASSESSMENT PROGRAMME

1. Background and context

Without the ecosystem services or benefits provided by Earth's aquatic systems—aquifers, lakes/reservoirs, rivers, large marine ecosystems (LMEs), and open ocean— human survival and wellbeing will be seriously threatened. Most of the Earth's surface is covered by aquatic systems that are *transboundary,* extending across or beyond national boundaries. Since the early 1990s, the Global Environment Facility (GEF) has invested over one billion dollars in bringing countries together to address the major environmental issues in transboundary water systems.

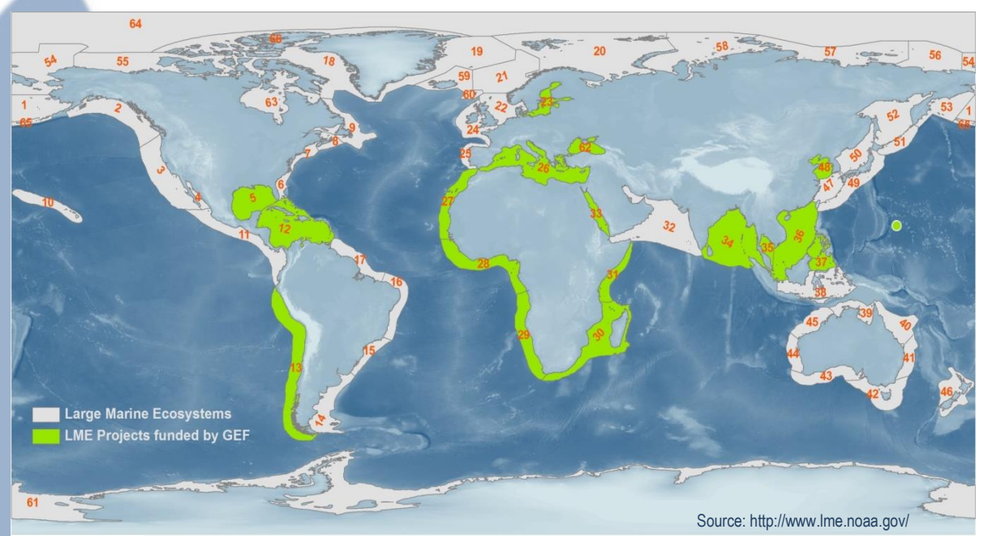
The TWAP, which is funded principally by the GEF, arose out of the need for: 1. A global baseline assessment of the status and changing condition of transboundary water systems resulting from human and natural causes, which will allow the GEF and others to set science-based priorities for financial resource allocation and 2. The institutional arrangements for conducting periodic future assessments of transboundary water systems.

The current project, which runs from April 2013 to March 2015, builds on the previous phase during which assessment methodologies were developed for the five types of transboundary water systems.

2. Large Marine Ecosystems

The global coastal ocean is divided into **66 Large Marine Ecosystems**, which encompass waters from river basins and estuaries to the seaward boundaries of continental shelves and margins of coastal currents and water masses (Sherman 1994).

Their contribution of trillions of dollars annually to the global economy highlights the critical importance of LMEs (Costanza et al 1997). But this is threatened by a burgeoning coastal human population and other human pressures as well as by climate change, whose dramatic impacts on marine ecosystems and coastal communities are increasingly evident across the globe.



Source: http://www.lme.noaa.gov/