

SUSTAINABLE ESTUARINE ZONE MANAGEMENT FOR CONTROL OF EUTROPHICATION, TOXIC BLOOMS, INVASIVE SPECIES AND CONSERVATION OF BIODIVERSITY (GUADIANA ESTUARY, PORTUGAL)

Up-dated in June 2015

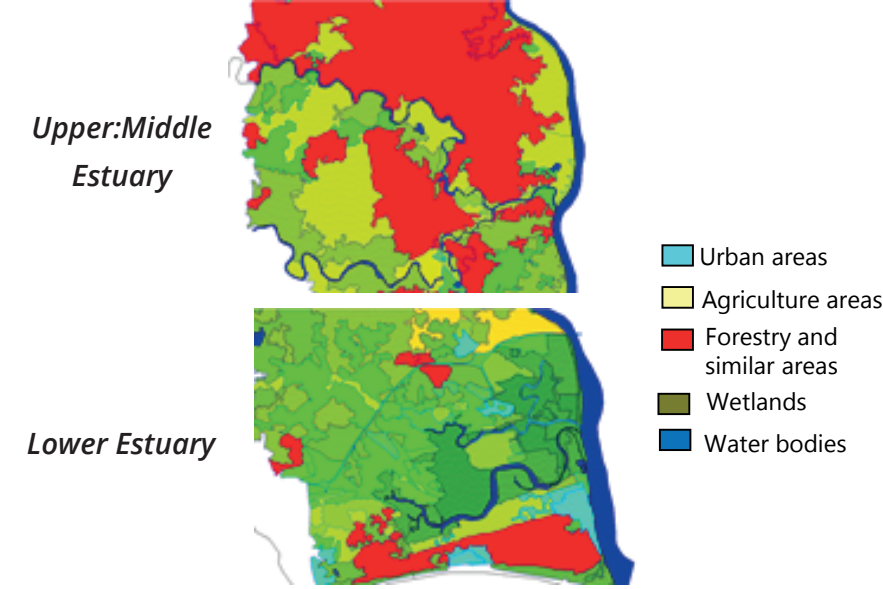
Demosite description

Lithology / Geochemistry

Light metamorphic shales and greywackes from the Palaeozoic, with low permeability; dolomites and dolomitic limestones, though Miocene silts and Plio-Quaternary sands also occur



37°10'N 7°39'W



Courtesy of L. Chicharo, 2012

Main description:

- ▶ **Guadiana River Basin is the 4th largest basin in the Iberian Peninsula:** 83% in Spain and 17% in Portugal
- ▶ **There exists 1824 dams in the basin.** The Guadiana estuary and the coastal areas are affected by the biggest one called the Alqueva dam. It modified the hydrological regime of the estuary and also its ecological functions reducing the ecosystem service of water regulation.
- ▶ **There are three main protected areas in Guadiana estuary and its floodplains:** RAMSAR site, National Reserve, Special Protection Zone (ZPE), Important Bird Area

Conserve Ecohydrological processes in natural ecosystems

✗ NO

Enhance Ecohydrological processes in novel ecosystems

✓ YES

Apply complementary Ecohydrological processes in high impacted systems

✓ YES

Ecohydrology Principles and Solutions

EH IMPLEMENTATION PRINCIPLES

- * Quantification of the hydrological processes at catchment scale and mapping the impacts;
- * Distribution of ecosystems and their relevant processes;
- * Ecological engineering

EH SOLUTIONS

Release of freshwater pulses from the reservoir to control the risks of harmful algal blooms



HYDROLOGICAL FLOW

Use of two species of bivalves and saltmarsh plants as indication of water quality (fig. 1)



PHYTOTECHNOLOGY



FAUNATECHNOLOGY

Lifelines

Life Zone
Warm Temperate
Thorn Steppe

PPT (mm/yr) 350 - 580
T (°C) 16

PET ratio: 1,62 - 2,69
Elevation: at sea level
Humidity: semi-arid



Fig.1-Corbicula fluminea
(Courtesy of L. Chicharo, 2011)

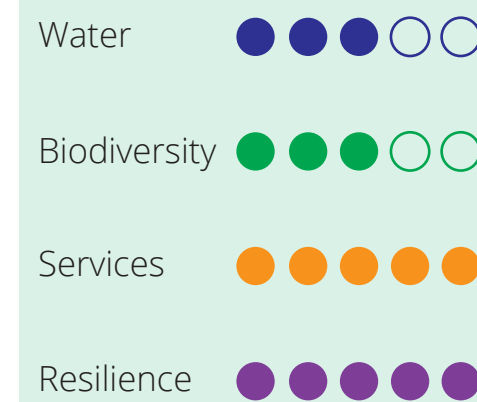
Major Issues

- * Risk of eutrophication and harmful algal blooms
- * The Alqueva dam (fig. 2)
- * Loss of saltmarsh (loss of nursery functions)
- * Coastal erosion
- * Loss of biodiversity due to changes in salinity spatial distribution and colonization of alien species

Social-Ecohydrological System

Catchment Ecohydrological sub-system

EH Objectives



Are inputs to:

EH Methodology

- * Quantification of river flows, residence time and productivity on estuarine and coastal ecological functioning and services.

Set conditions for:

Objectives

- * Discuss trade off between water allocation for agriculture and hydroelectric power production against sustainability of estuarine ecosystems and coastal services

Set conditions for:

Catchment Sociological sub-system

Stakeholders

- * Researchers (ICCE, University of Algarve)
- * Major industries
- * Protected areas representatives
- * Hydroelectric power station at the Alqueva dam
- * EU Water Framework Directive

Participate in:

ACTIVITIES

- * Monitoring biota and water quality in estuarine areas
- * Analysis of the role of salt marsh plants as buffer vegetation
- * Control of the risks of eutrophication
- * Academic research (ICCE) and academic training course (Erasmus Mundus Master of Science in Ecohydrology)

Results

MAIN EXPECTED OUTCOME

Adapt and restore the ecological functions of estuaries and coastal areas impacted by dams and climatic changes

LATEST RESULTS

- ▶ Modelling simulations indicate that a discharge of **50 m³/s every day** during critical periods, such as summer/autumn, could be enough to avoid cyanobacteria blooms (L. Chicharo *et al*, 2006).
- ▶ The Guadiana estuary is expected to be **strongly** impacted by **climatic changes** in the next decades (M.A. Chicharo *et al*, 2009).

[CLICK HERE TO SEE THE REFERENCES](#)



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