IMUM
Lisbon • Portugal
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Lisbon, August 26 2014

Field trip teaser: Lisbon and the Tagus estuary

André B. Fortunato and Paula Freire

Afternoon program

LABORATÓRIO NACIONAL DE ENGENHARIA CIVIL

> **13:45. Walk from LNEC to Alvalade (~1 km)**

> **Take the subway from Alvalade to Baixa-Chiado (15 min)**

> **Walk from Baixa-Chiado to Terreiro do Paço (<1 km)**

Afternoon program

LABORATÓRIO NACIONAL DE ENGENHARIA CIVIL

> **15:00. Boat trip along the Tagus estuary (2.5 hours)**

Afternoon program

LABORATÓRIO NACIONAL DE ENGENHARIA CIVIL

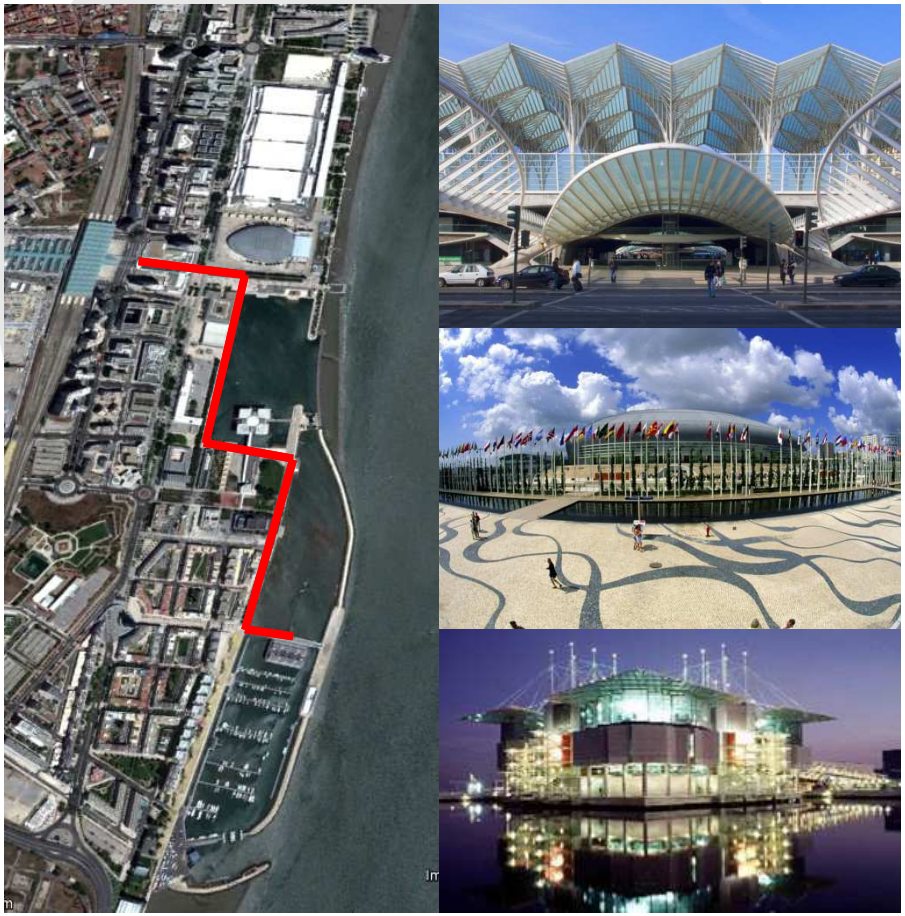
> **17:30. Take a stroll in the old town (~3 km)**

Afternoon program

LABORATÓRIO NACIONAL DE ENGENHARIA CIVIL

> **18:30-19:00. Take the subway from Cais do Sodré to Oriente (30 min)**

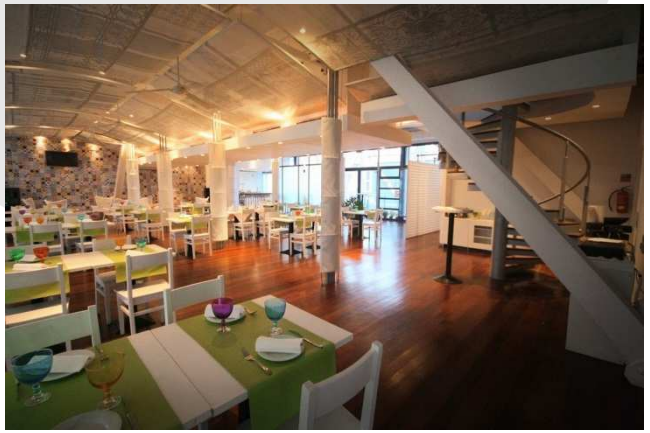
> **Take a stroll to the restaurant (<1 km)**



Afternoon program

LABORATÓRIO NACIONAL DE ENGENHARIA CIVIL

> **20:00. Dinner at the Lisboa Marina restaurant**



Tagus estuary

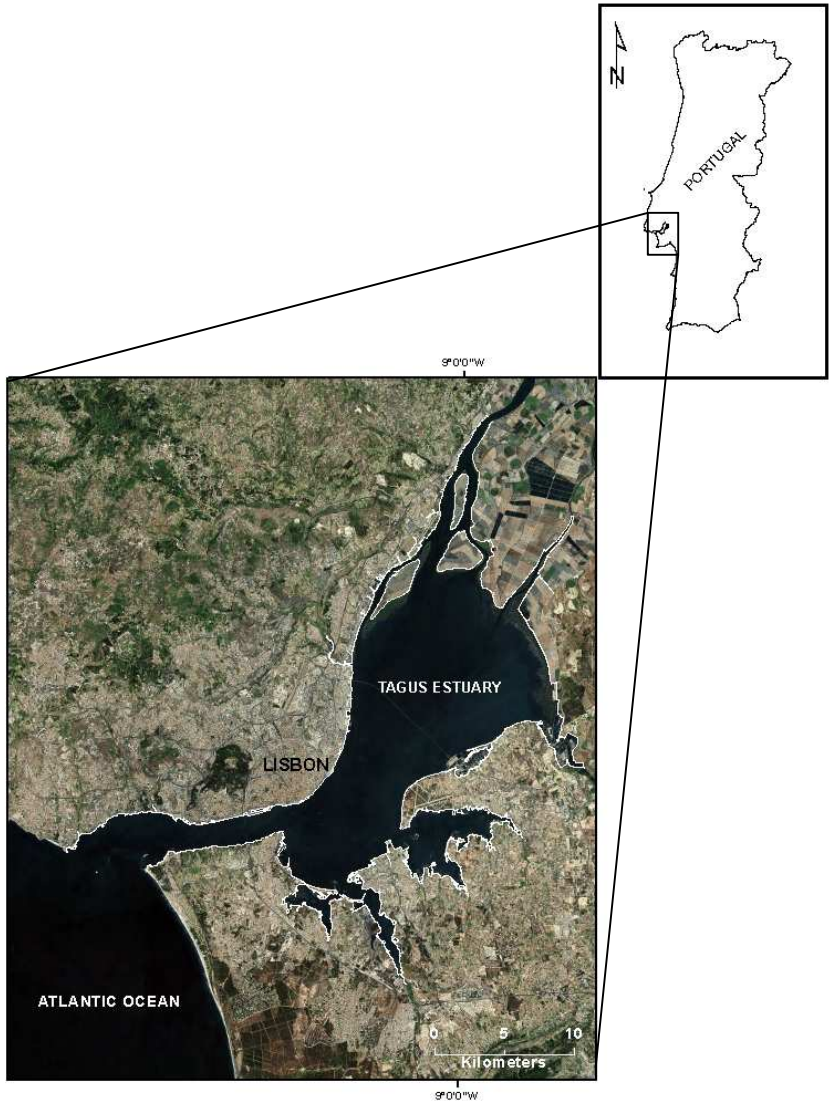
one of the largest estuaries in Europe (~320 km²)

wide intertidal area

(42% of total area)

socio-economic and environmental relevance

holds one of the largest Portuguese harbours and a major natural reserve

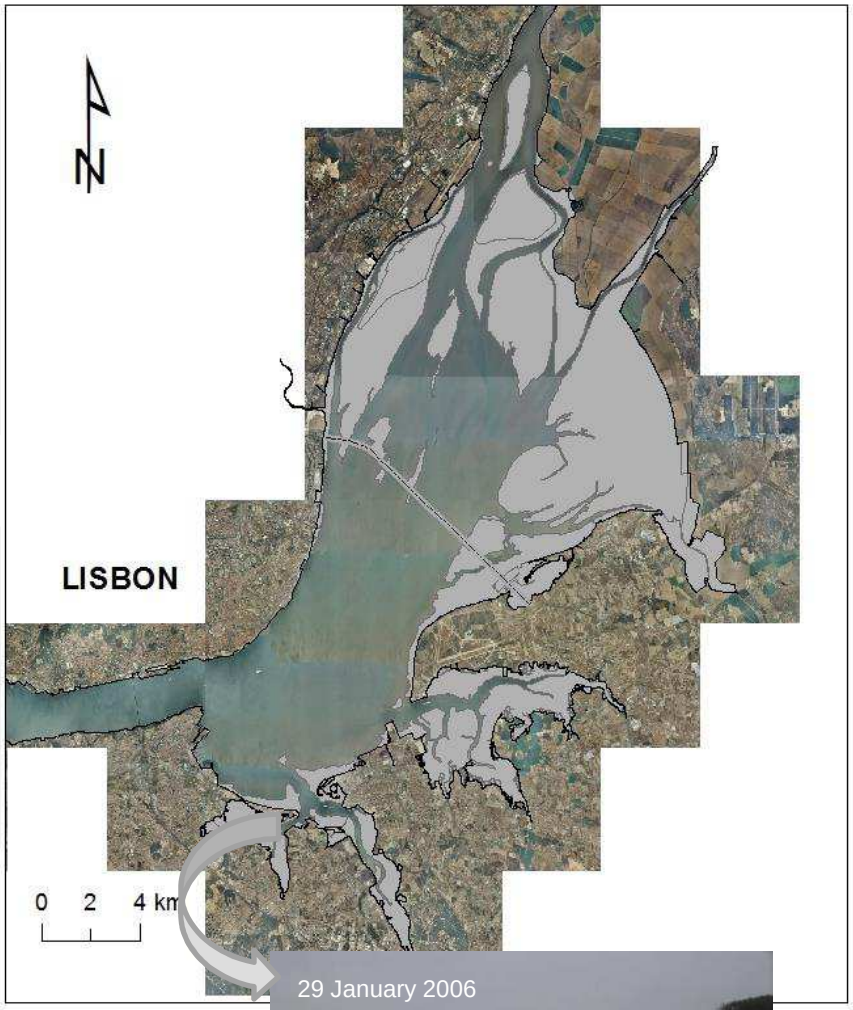


Tide

- semi-diurnal
- mean tidal range: 3.2 m (spring); 1.5 m (neap)
- upstream amplification of the semi-diurnal tidal constituents

Wave regime

- inner basin protected from ocean waves incursion
- conditions for local generation of waves



boat wakes

Bottom sediments

- **fluvial** and **local sources** (detrital Pliocene and Quaternary formations)
- predominantly silts
- sands are distributed along the deeper channels and on beaches

Freire et al., 2013

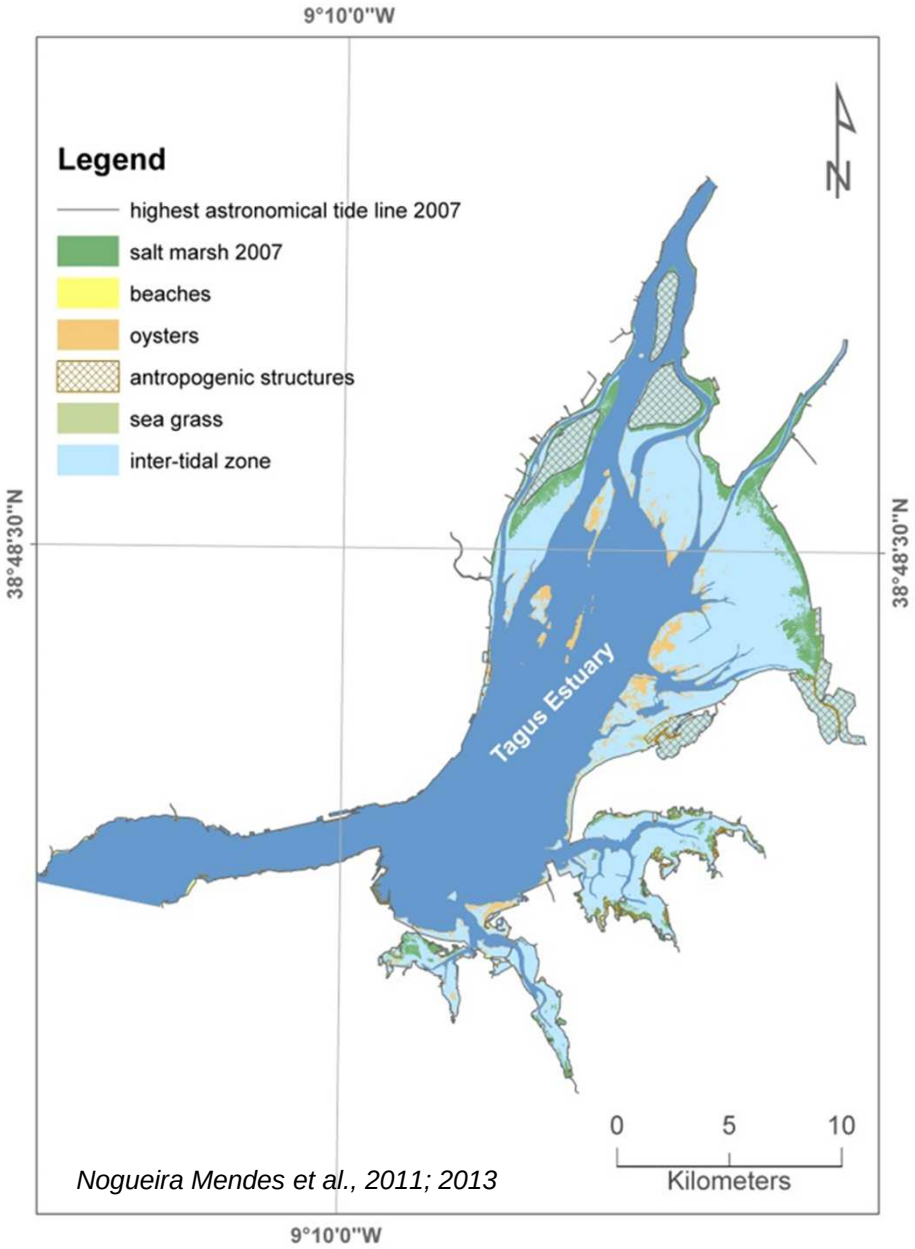
Sedimentation rates

- salt marshes: 7 to 22 mm/yr
- low tide terraces: 3 mm/yr

Silva et al., 2013

sea level rise: 2.1 mm/yr
(post-1920 mean rate at Cascais gauge)
Antunes and Taborda (2009)

Estuarine bed typology



Tidal flats

Anthropogenic structures

Salt marshes

Beaches

Estuarine fringe land use

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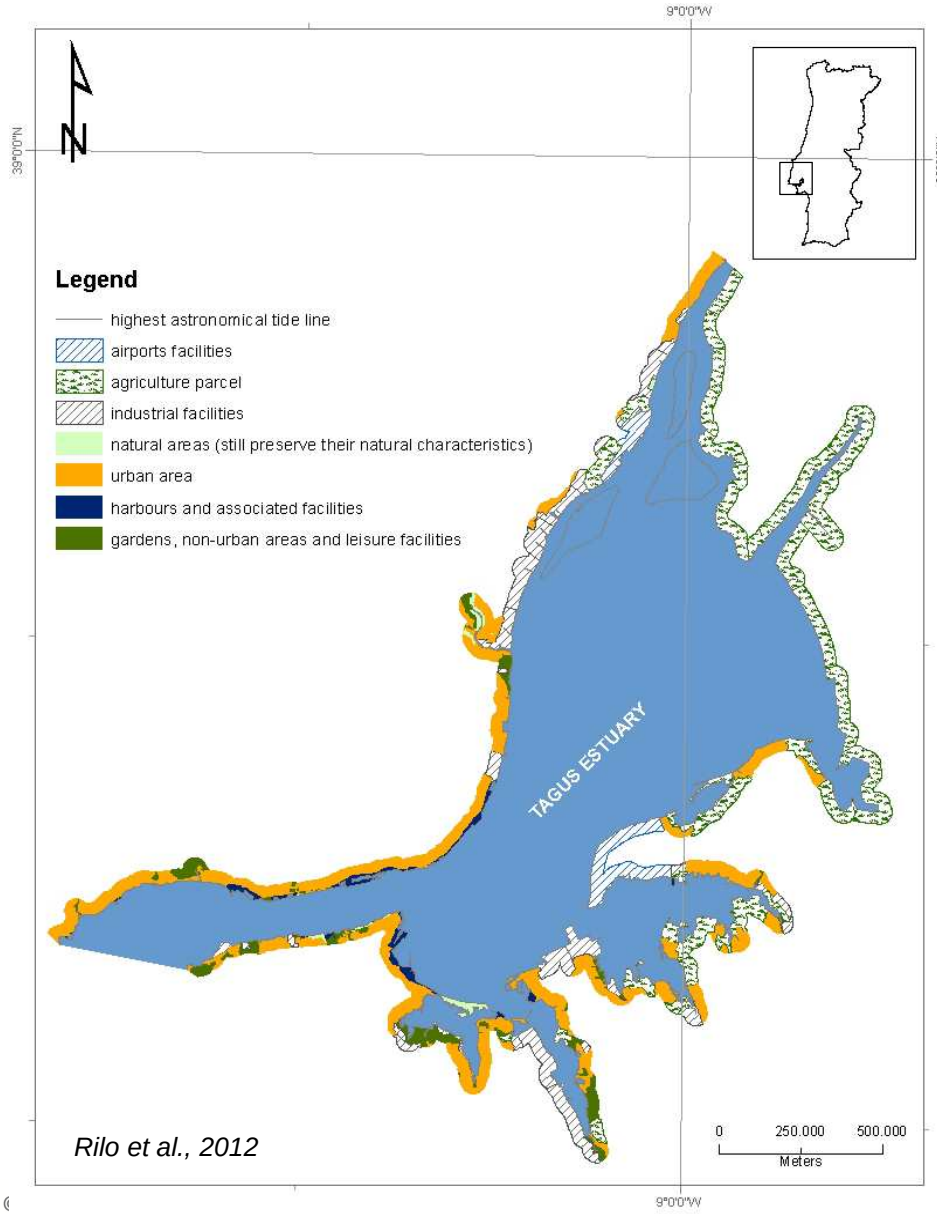
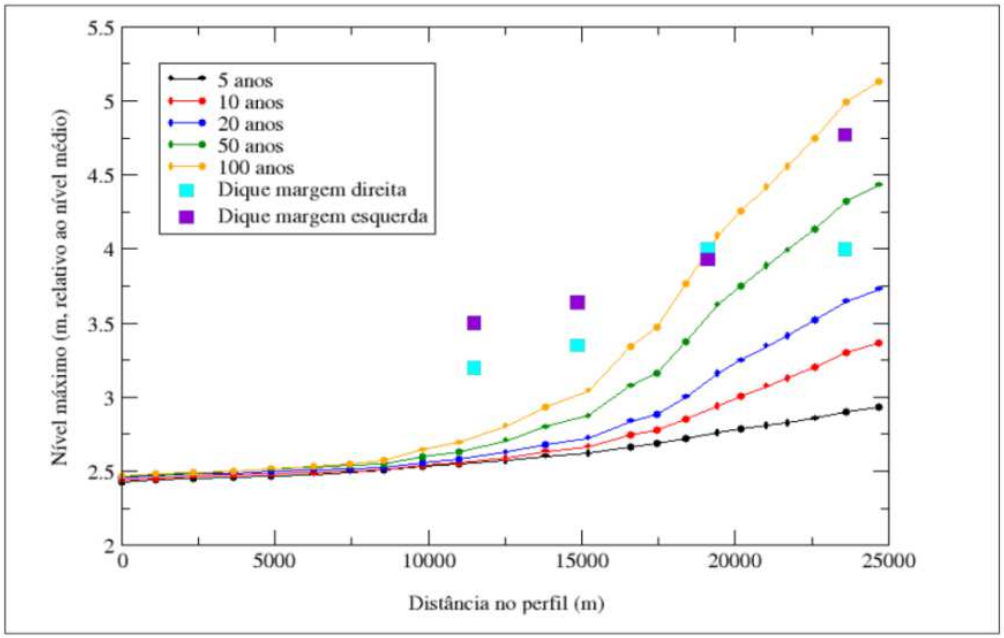


Rilo et al., 2012

Tagus river

- average discharge of about 370 $m^3 s^{-1}$
- estuarine water levels are only significantly influenced by river discharge farther than 40 km upstream



Maximum water levels simulated considering Tagus river discharge with different return periods (Ómnias)

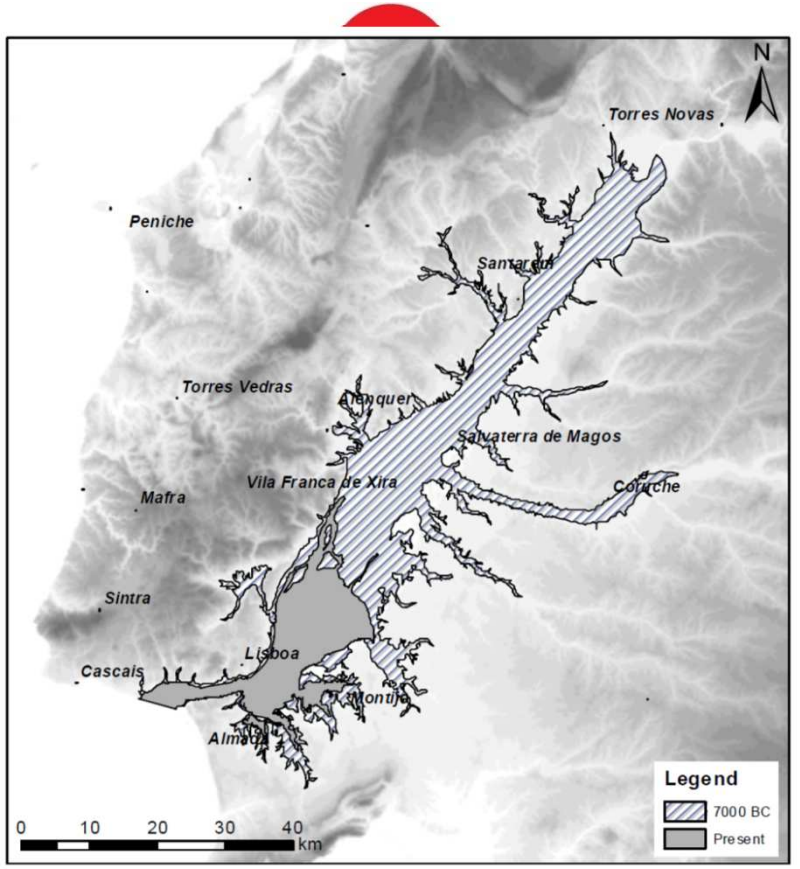
Rocha et al., 2007

Particular morphological settings associated to the recent geologic evolution

Estuary infilling after the Holocene post-glacial transgressive maximum that promoted the inundation of the lower Tagus basin

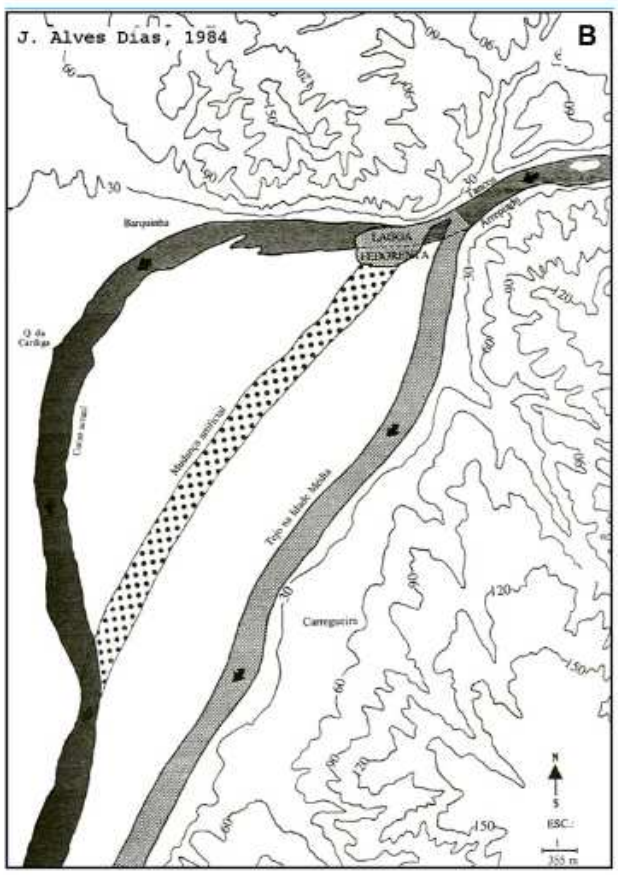
Fault-controlled inlet channel

Since historical times, human activities have influenced riverine and estuarine bottom and margins evolution



Paleogeography of lower Tagus valley around 7000 cal BP (*Taborda et al., 2009*)

Artificial Tagus channel changes in the XVI century (*Dias, 1984*)



Human impact on estuarine margins configuration (*Freire et al., 2013*)