THIRD BIENNIAL

ROSENBERG INTERNATIONAL FORUM ON WATER POLICY

Spain's Ebro Delta

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THE EBRO RIVER

- 910 km.
- 85.000 km² (84.000 km² in Spain)
- 2,8 millions of inhabitants (11% farmers)
- 8.000 km² irrigation area
- 330 km² Delta area

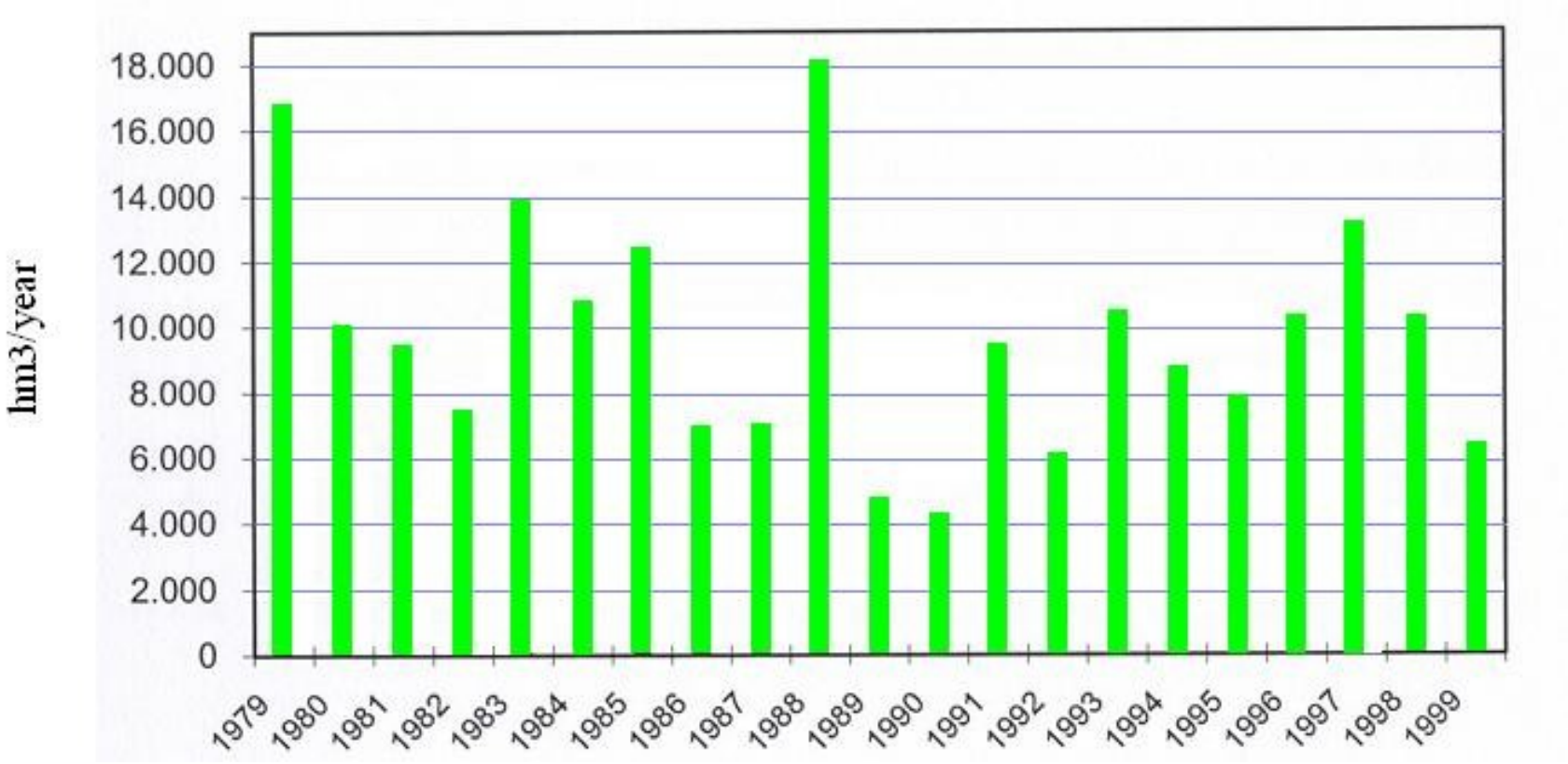
THE EBRO IN THE DELTA

WATER DISCHARGE

- **Mean annual discharge: 11.700 hm^3/year**
- **Water consumption upstream: 5.500 hm^3/year**
- **Mean natural discharge into the Delta: 17.200 hm^3/year**

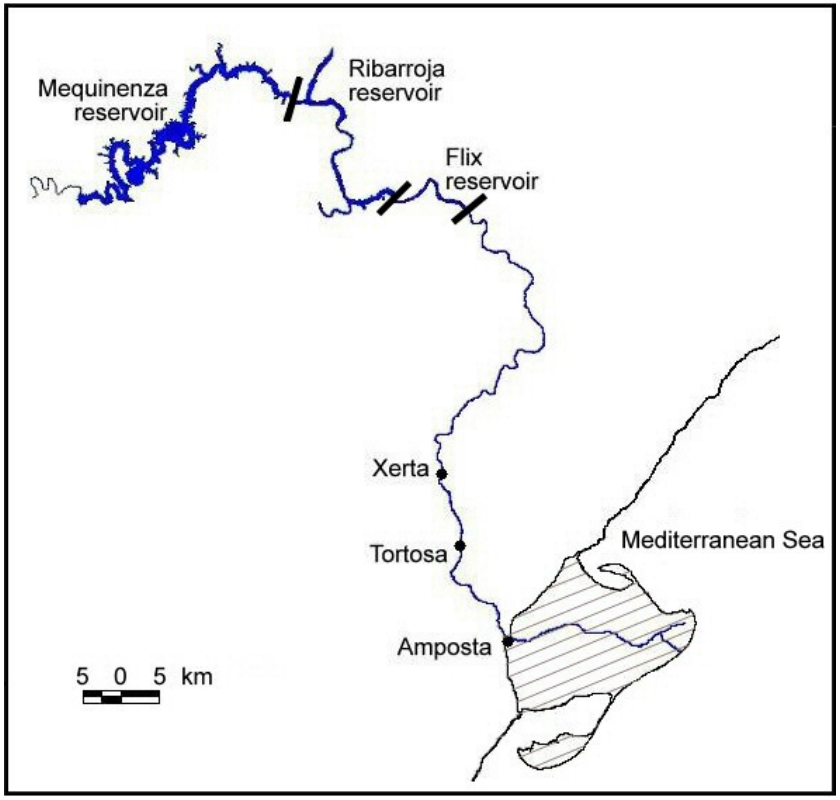
THE EBRO IN THE DELTA

ANNUAL DISCHARGE



THE EBRO IN THE DELTA

SEDIMENT TRANSPORT



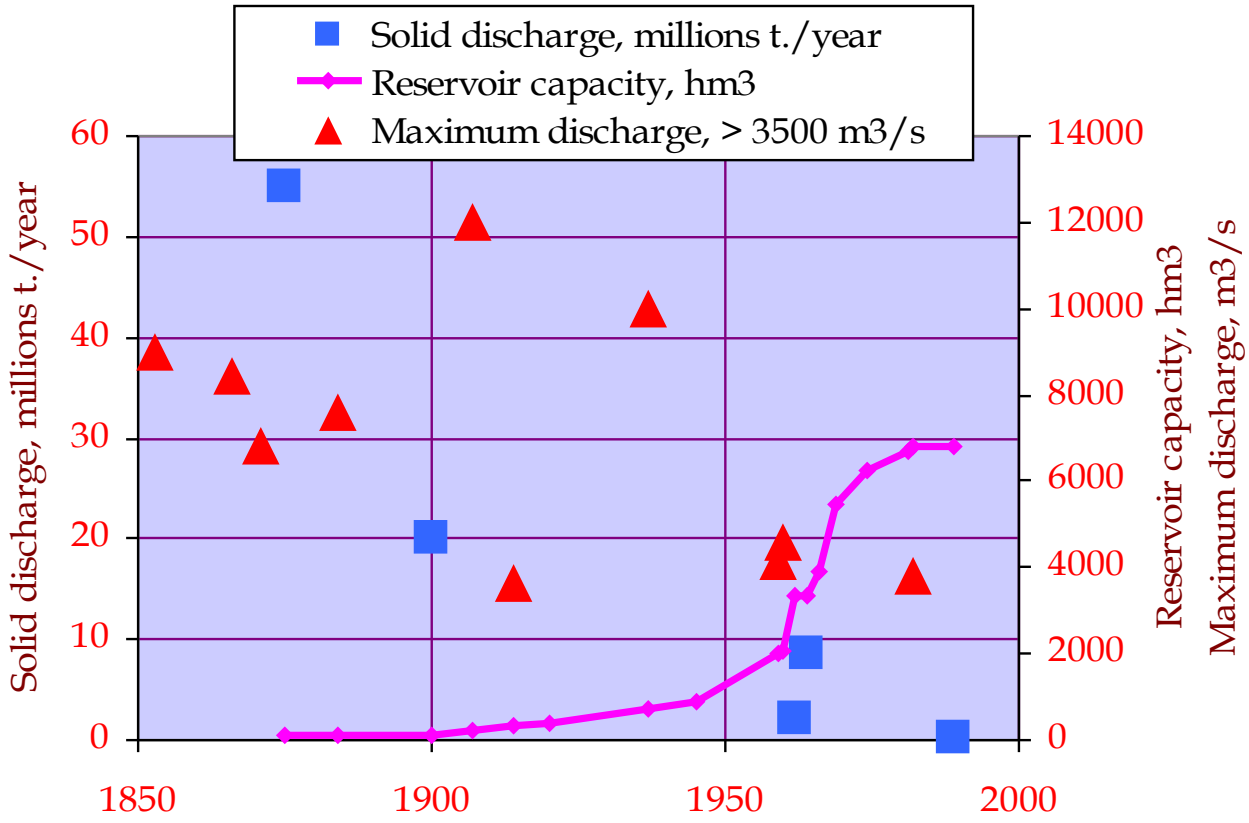
The final reach of the Ebro river

- Reduction of sediment transport due to reservoirs (151)
- Mequinenza (1.534 hm^3) and Ribarroja (210 hm^3) reservoirs

THE EBRO IN THE DELTA

SEDIMENT TRANSPORT

At the beginning of the XX century: 15-30 10^6 T/year
Now: 0,15 10^6 T/year



THE EBRO IN THE DELTA

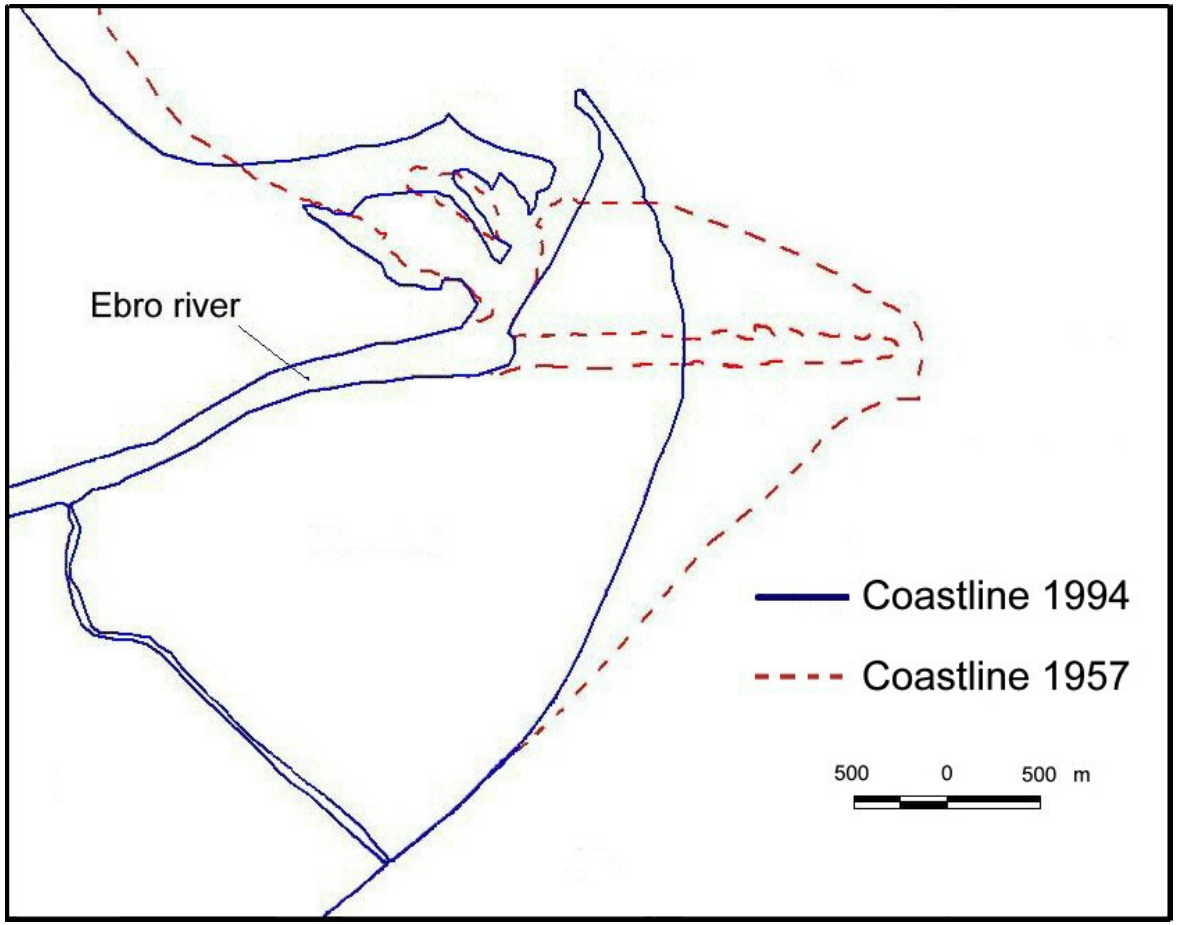
SEDIMENT DEFICIT

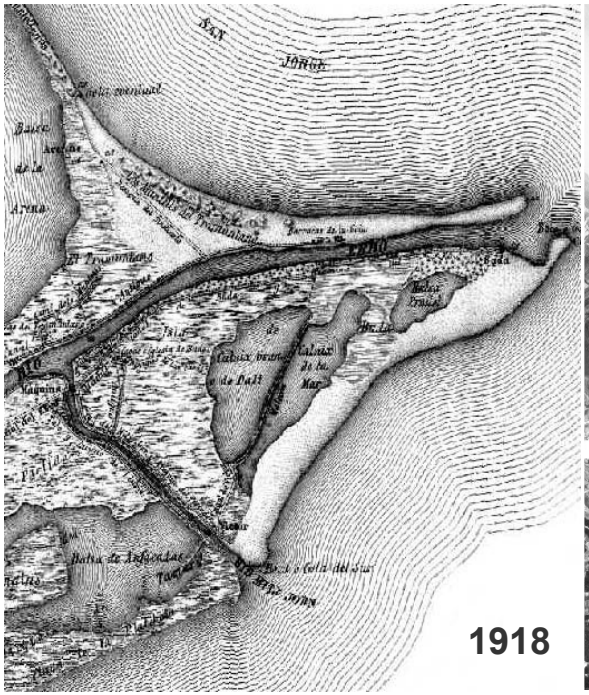
+

SUBSIDENCE (0-5 mm/year)

⇒

Backwards movement of the coastline




1918


1956


1984


1995

THE DELTA

GENERAL DESCRIPTION

- Emerged surface 330 km²
- Coastline length 45 km
- Deltaic river reach 29 km
- Mean annual temperature 18°C
- Mean annual precipitation 550 mm
- 45% of the DELTA is less than 0,5 m above mean sea level
- Astronomical tide 0,25 m
- Meteorological tide (T=10 years) 1 m
- 50.000 inhabitants

THE DELTA

AGRICULTURE

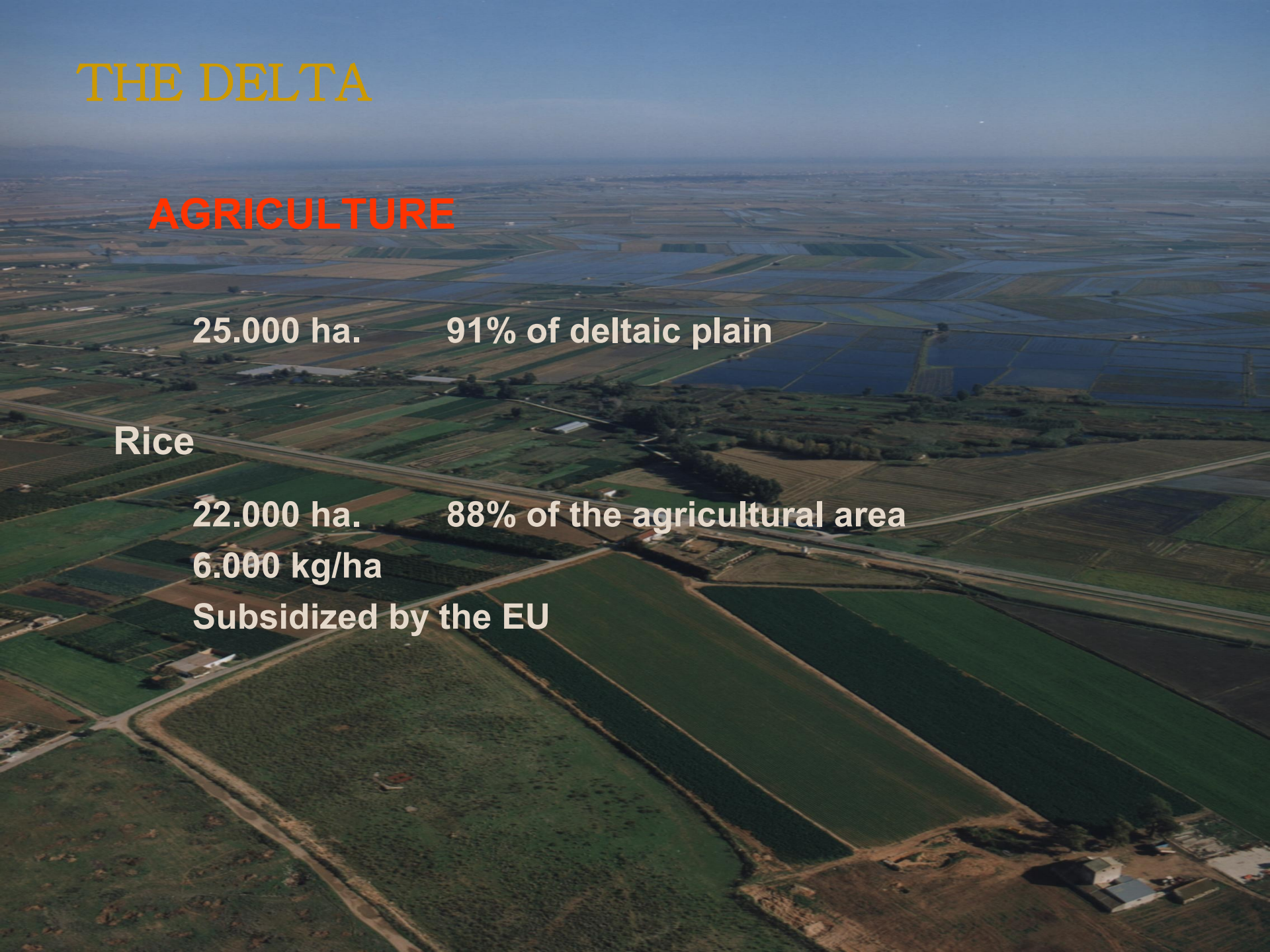
25.000 ha. 91% of deltaic plain

Rice

22.000 ha. 88% of the agricultural area

6.000 kg/ha

Subsidized by the EU



February

July

THE DELTA

18 HABITATS

600 VEGETAL SPECIES

428 ANIMAL SPECIES

330 BIRDS

50 WATERFOWL SPECIES (180.000 INDIVIDUALS IN JANUARY)

Fotografia cedida pel Parc Natural del Delta de l'Ebre

THE DELTA

- In the last century 6 species became extinct (3 birds)
- Nowadays 30 vertebrate and 22 vegetal species are in risk of extinction
- Nowadays 2.000 ha of marshes (20% of the initial area)
- 11.710 ha protected area

Fotografia cedida pel Parc Natural del Delta de l'Ebre

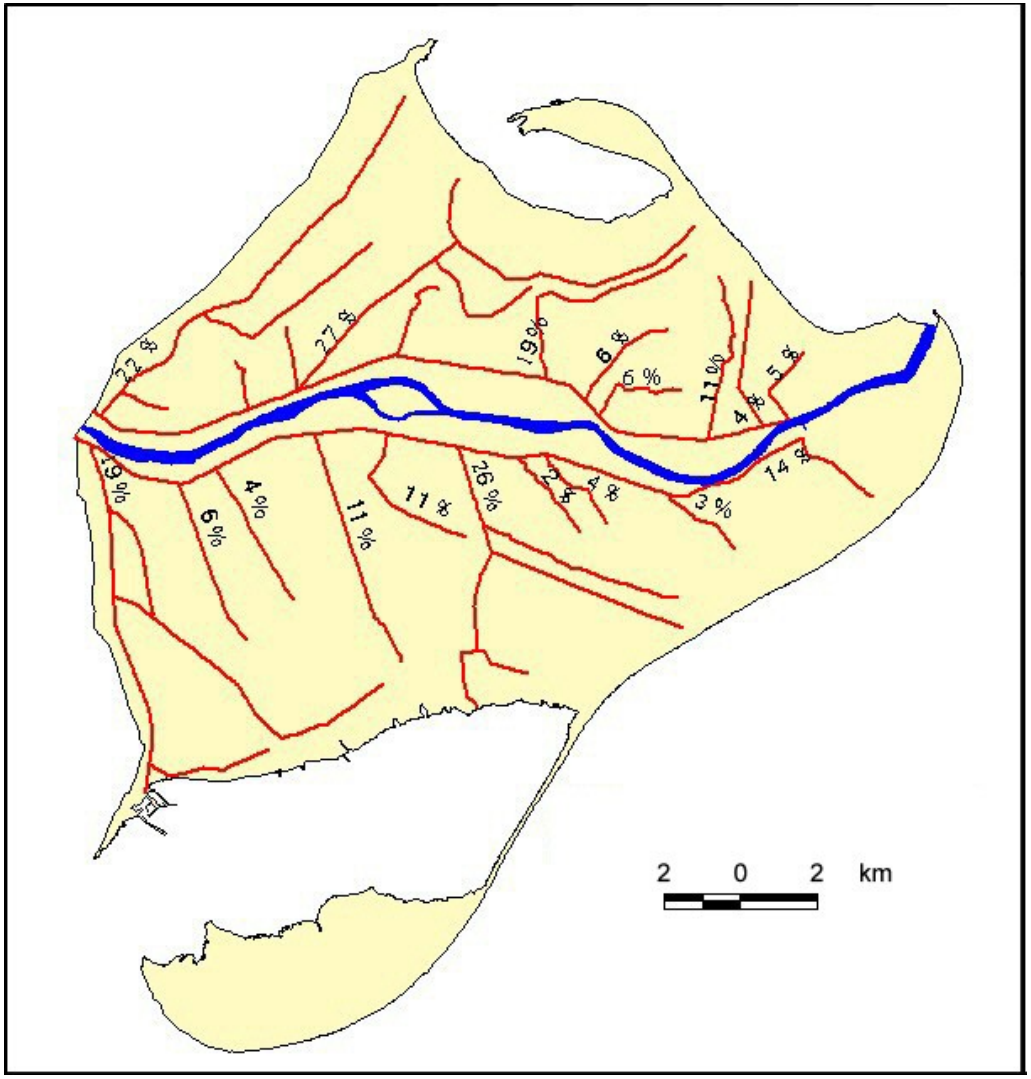
THE DELTA

IRRIGATION OF RICE FIELDS : 24.200 m3/ha

- Evapotranspiration
- Salinity control induced by groundwater (water table near the surface)

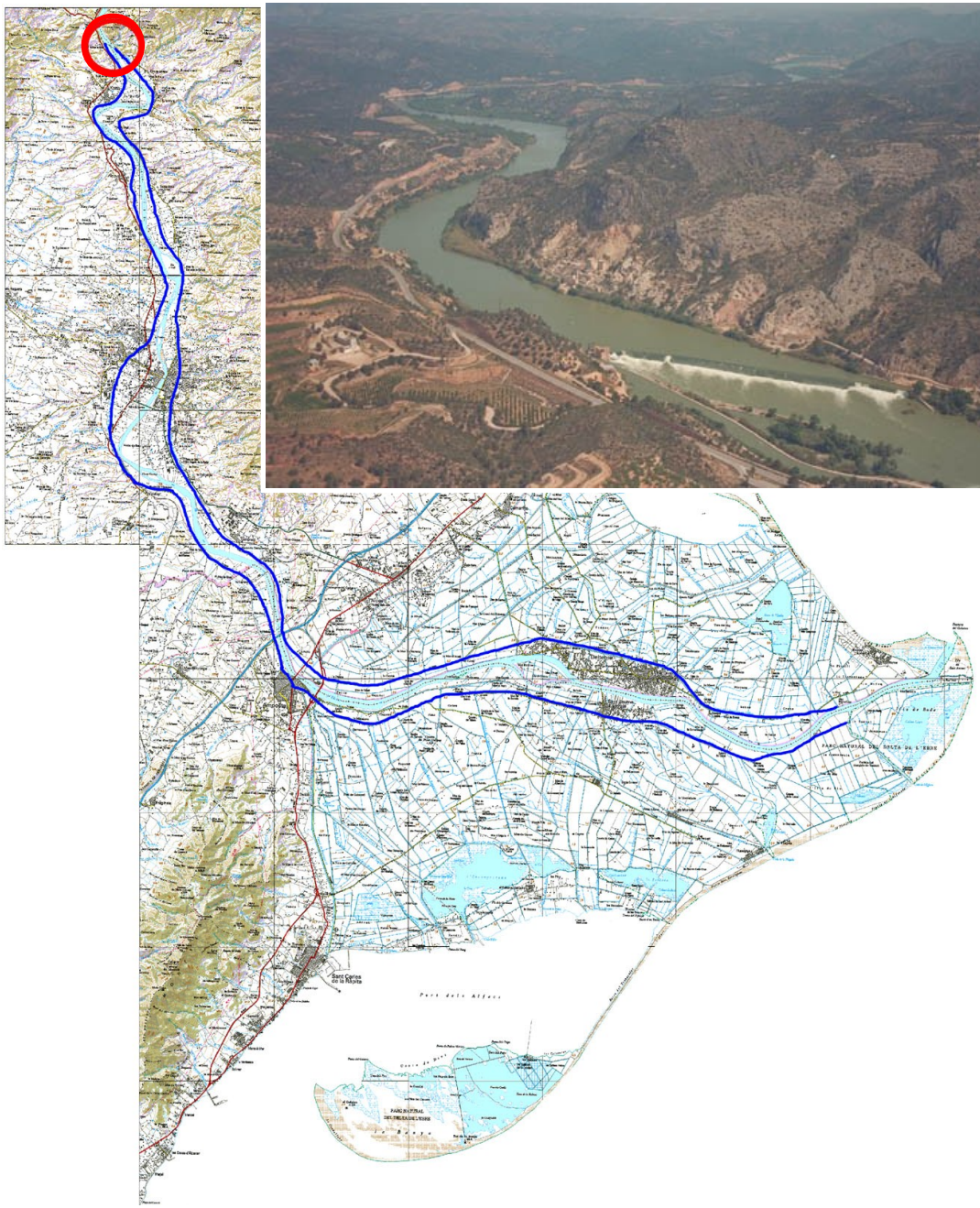
THE DELTA

IRRIGATION INFRASTRUCTURES



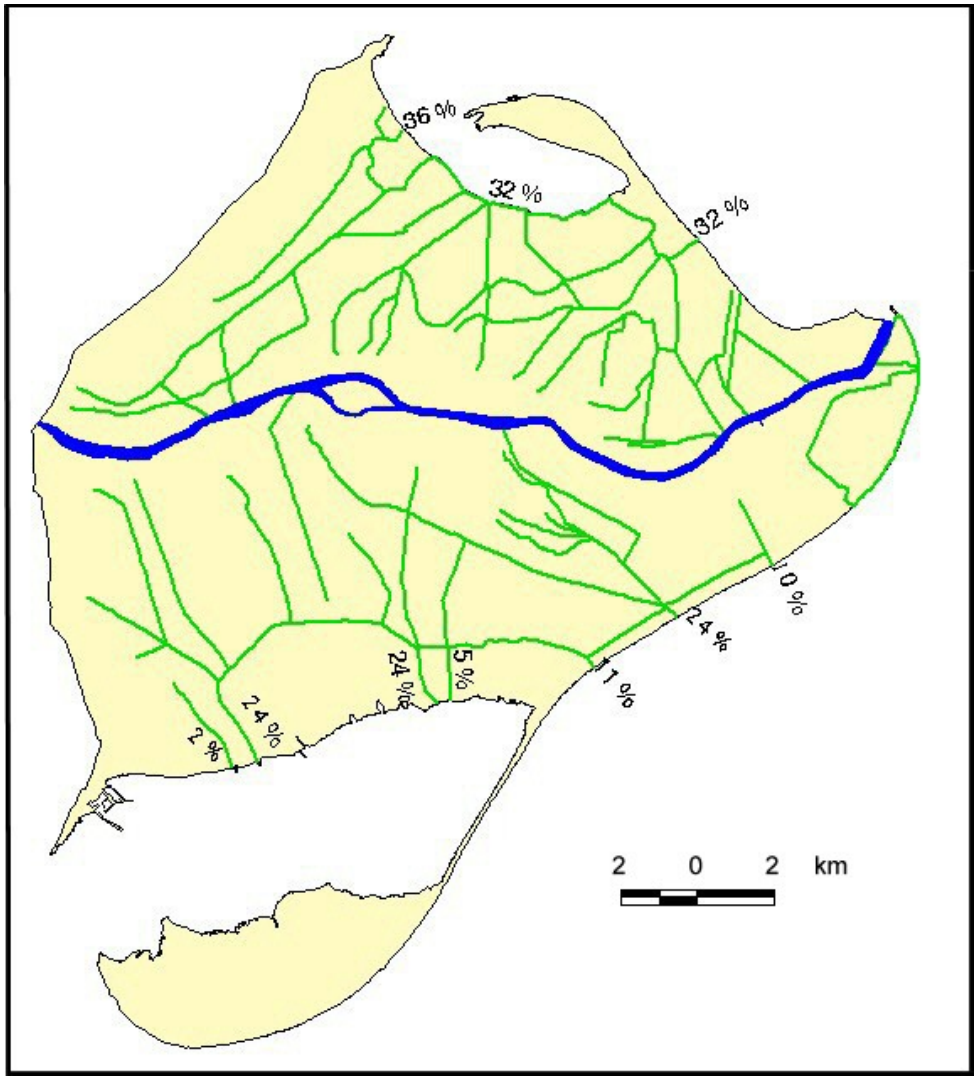
Canal network for water supply

- Two main canals (25m^3/s each) and canal network for water supply
- Canal network for land drainage. Pumping stations (total 80m^3/s)


Sant Carles
de la Ràpita
Port dels Alfacs
PARC NATURAL
DEL DELTA DE L'EBRE

THE DELTA

Canal network for land drainage



PUMPING STATIONS

NATIONAL HYDROLOGICAL PLAN (2000):

- Proposes to increase the irrigation area in Ebro basin by approximately 500.000 ha (now, 800.000 ha)

- Proposes water transfers to other basins of 1.050 hm^3/year

  This implies that the mean water discharge into the Delta will be decreased to 7.375 hm^3/year (now, 11.700 hm^3/year)

- At the Delta, a minimum river flow of 100 m^3/s is guaranteed

THE FUTURE

MAIN PROBLEM

- Coastal retreat
  - Sediment deficit
  - Subsidence (relative sea level rise)

POSSIBLE ACTIONS

- Defence structures
- Increase sediment transport
- Accept coastline evolution

FACTORS TO TAKE INTO ACCOUNT

- Increasing social request for natural areas restoration
- Decreasing subsidies for agricultural production