

HISTORICAL DIMENSION OF MEDITERRANEAN CLIMATE: CLIMATIC HAZARDS AND WATER RESOURCES.

The example of Barcelona city, 12th to 19th Centuries



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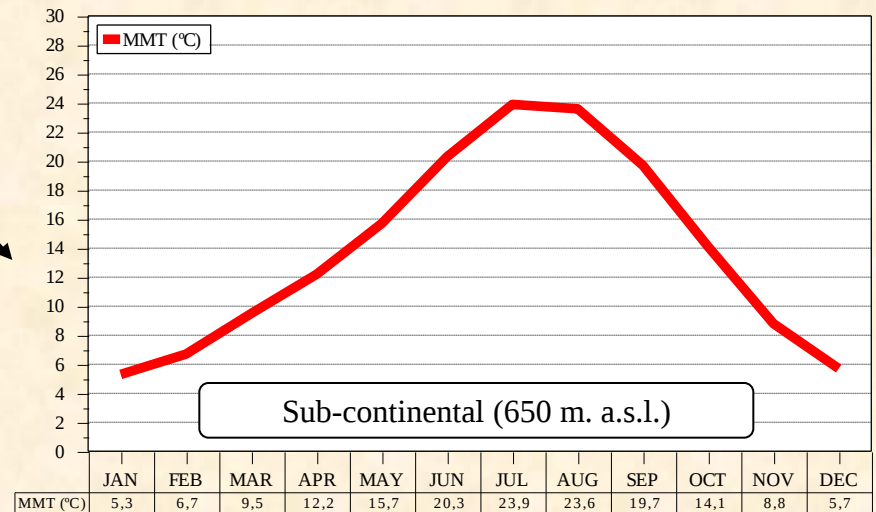
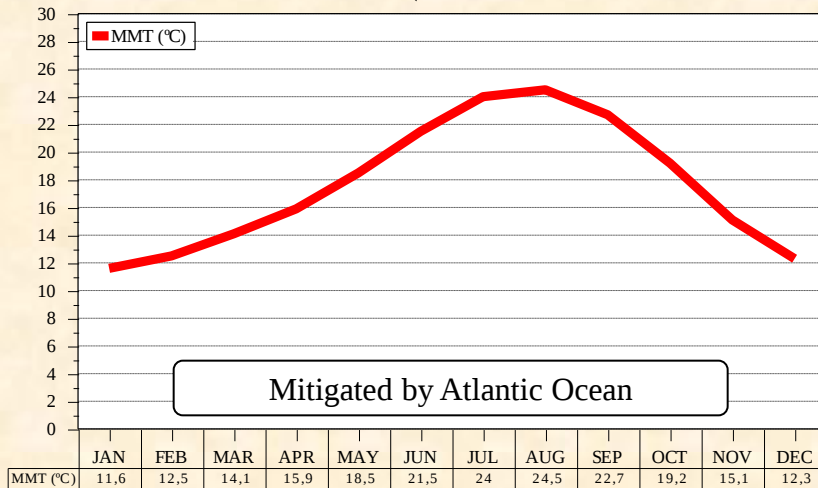
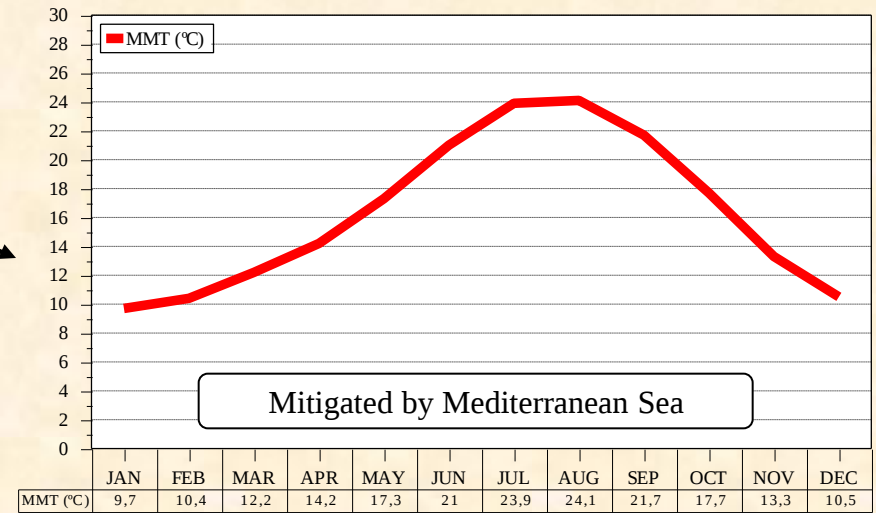
6) Itinerary

Section 1: Water management and water uses in historical time.

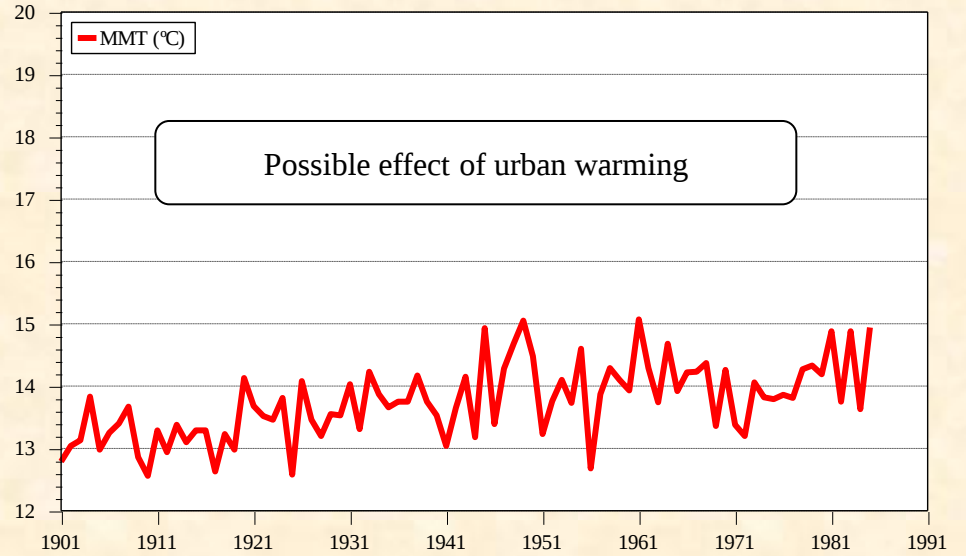
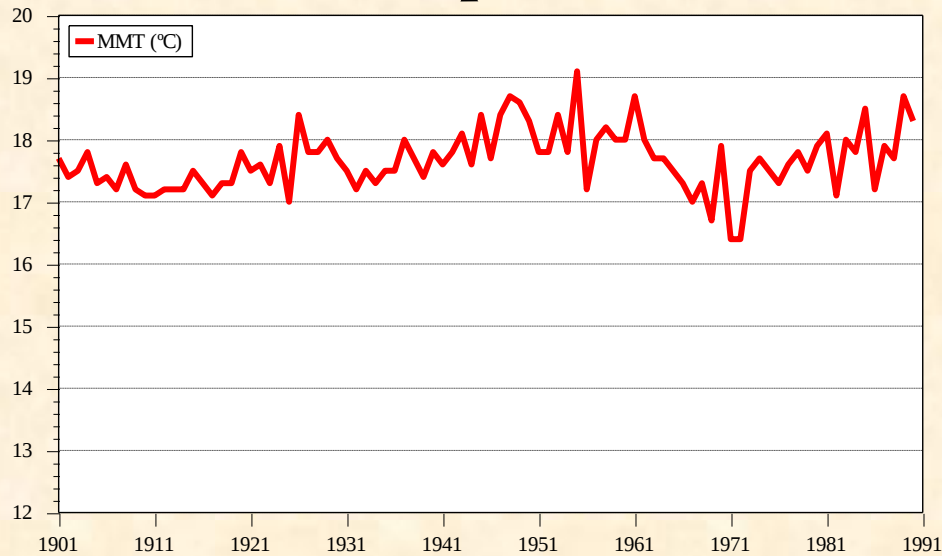
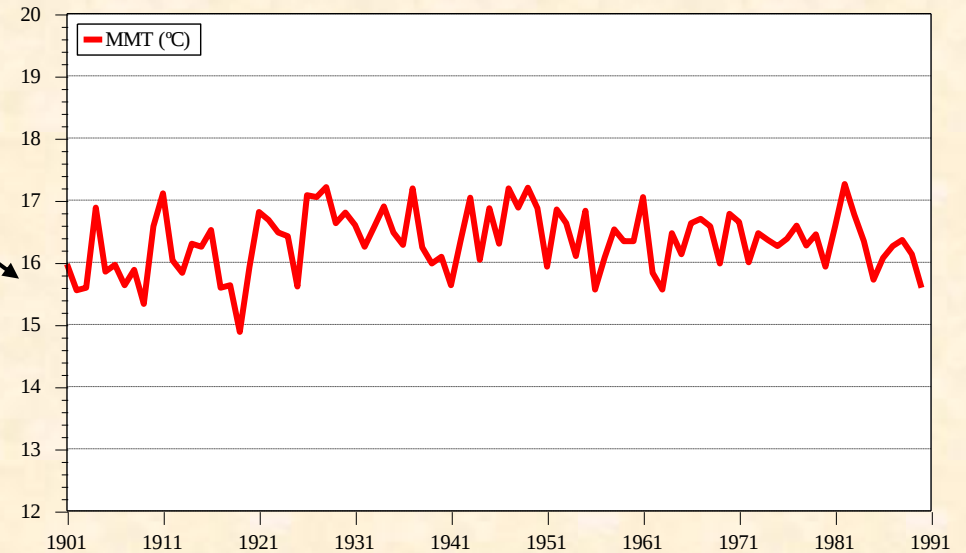
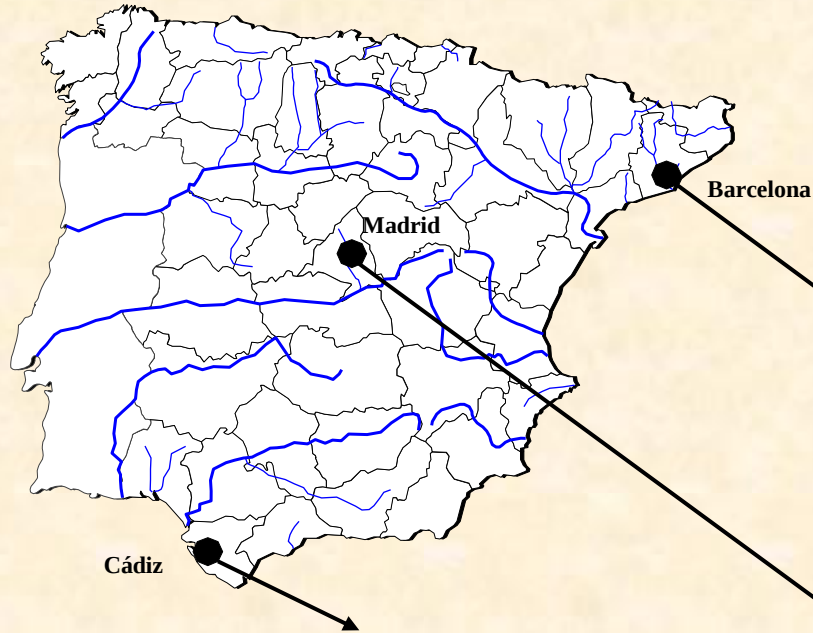
Section 2: Commercial activity. Ribera Quarter: trading and seamen.

Section 3: Institutions into a little medieval kingdom.

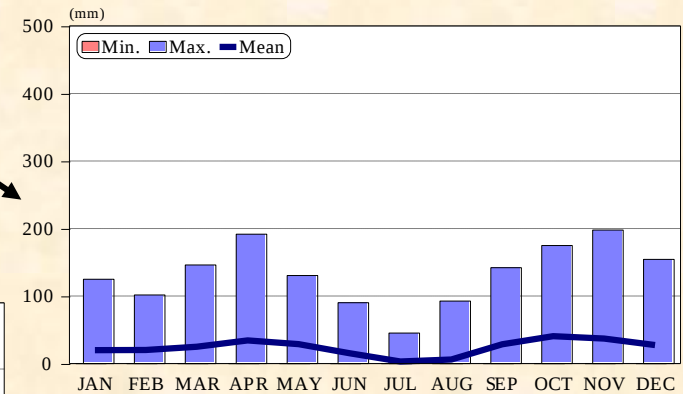
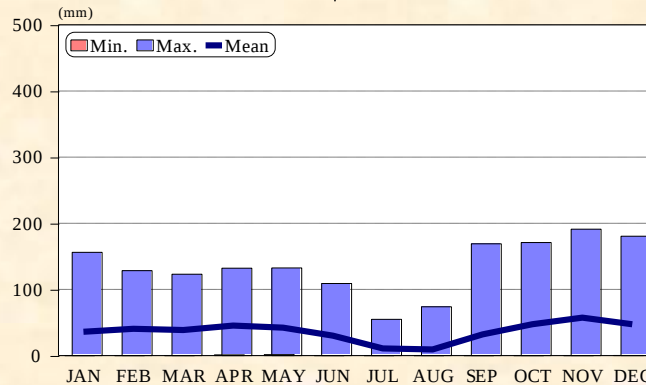
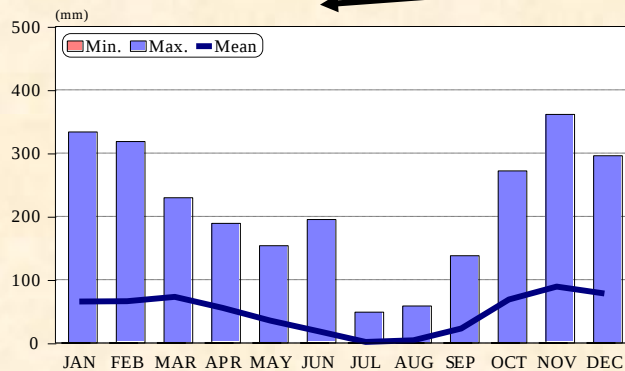
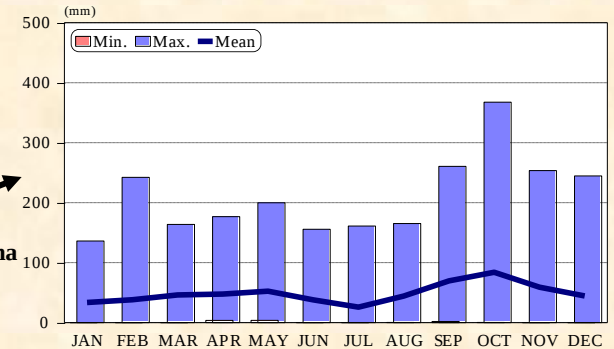
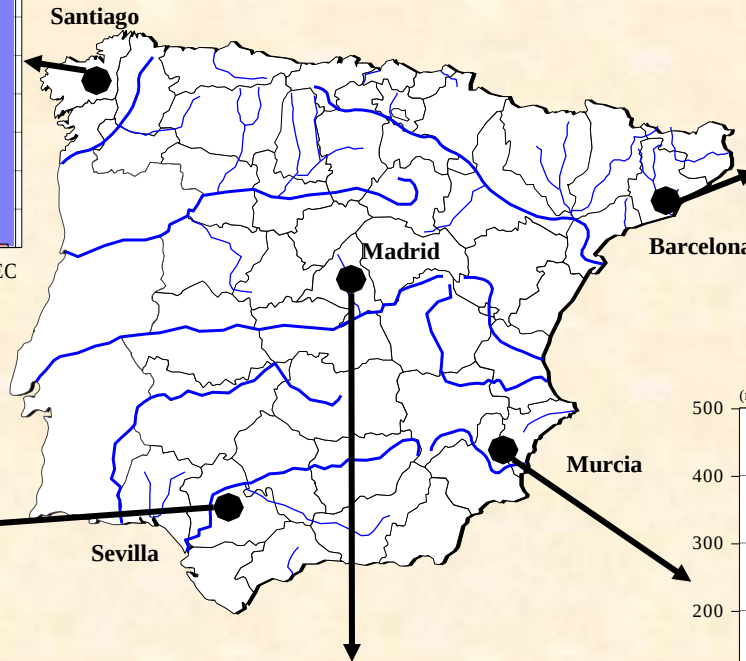
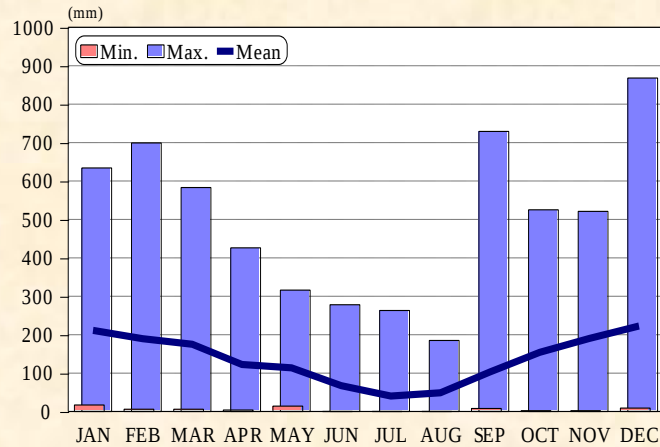
1) Climatic conditions: Temperature. Monthly regime (Mean values. Period 1901-1990)



1) Climatic conditions: Temperature. Yearly Mean Values 1901-1990

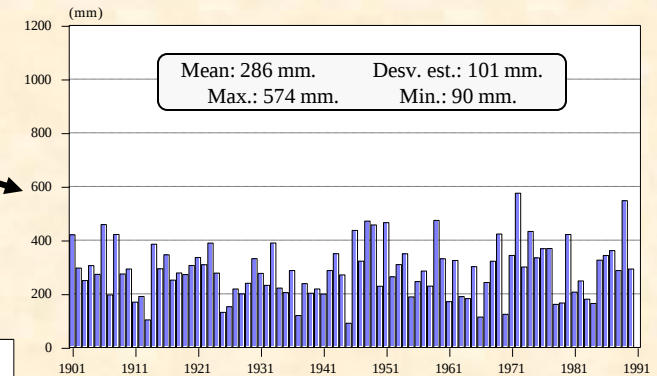
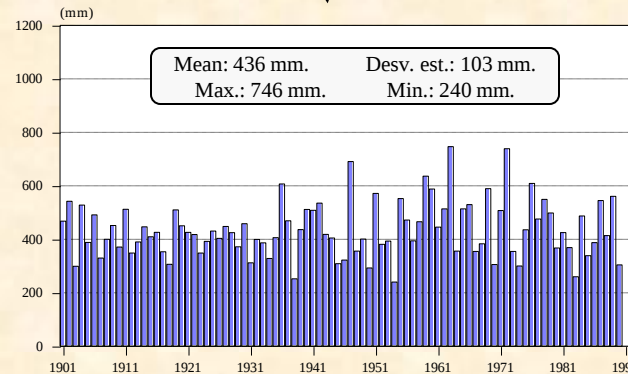
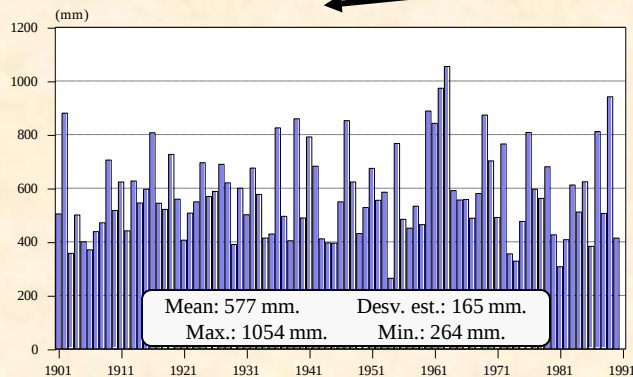
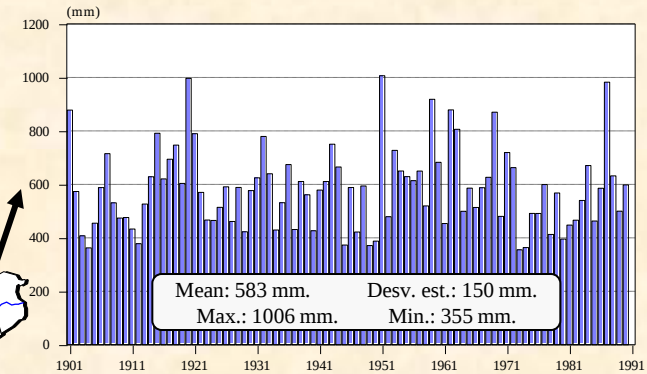
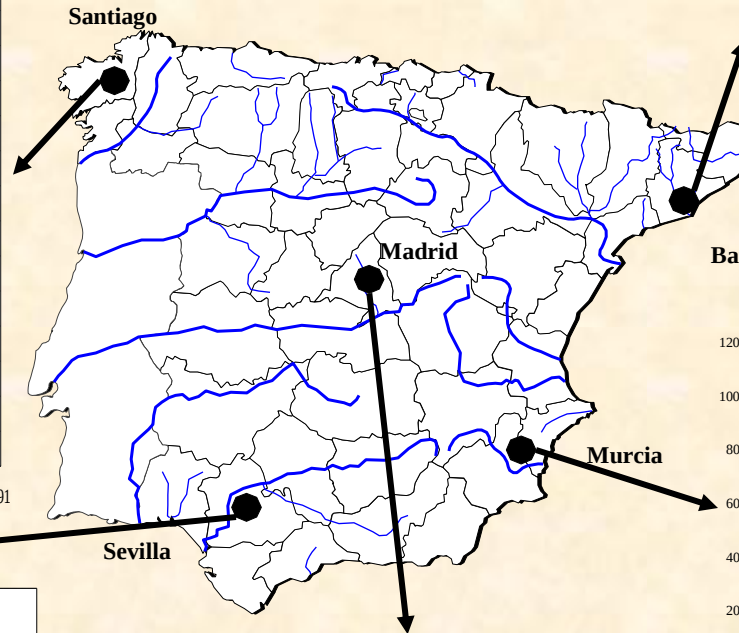
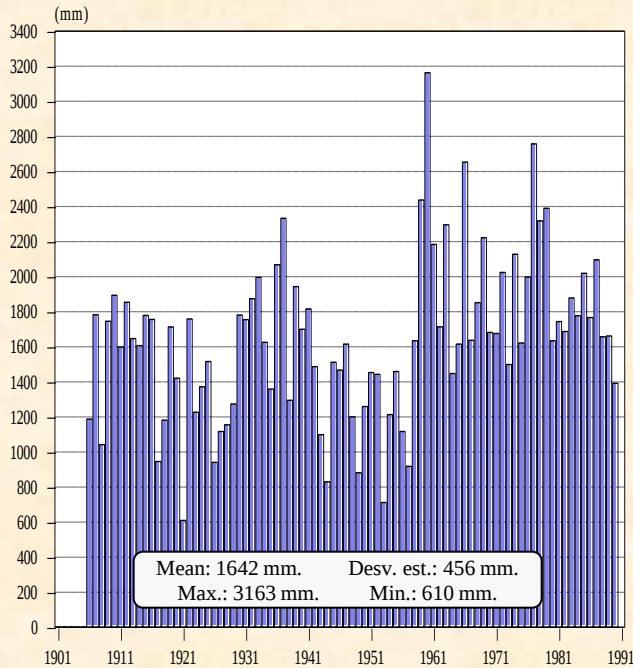


1) Climatic conditions: Precipitation. Monthly Mean, Max. and Min. Period 1901-1990



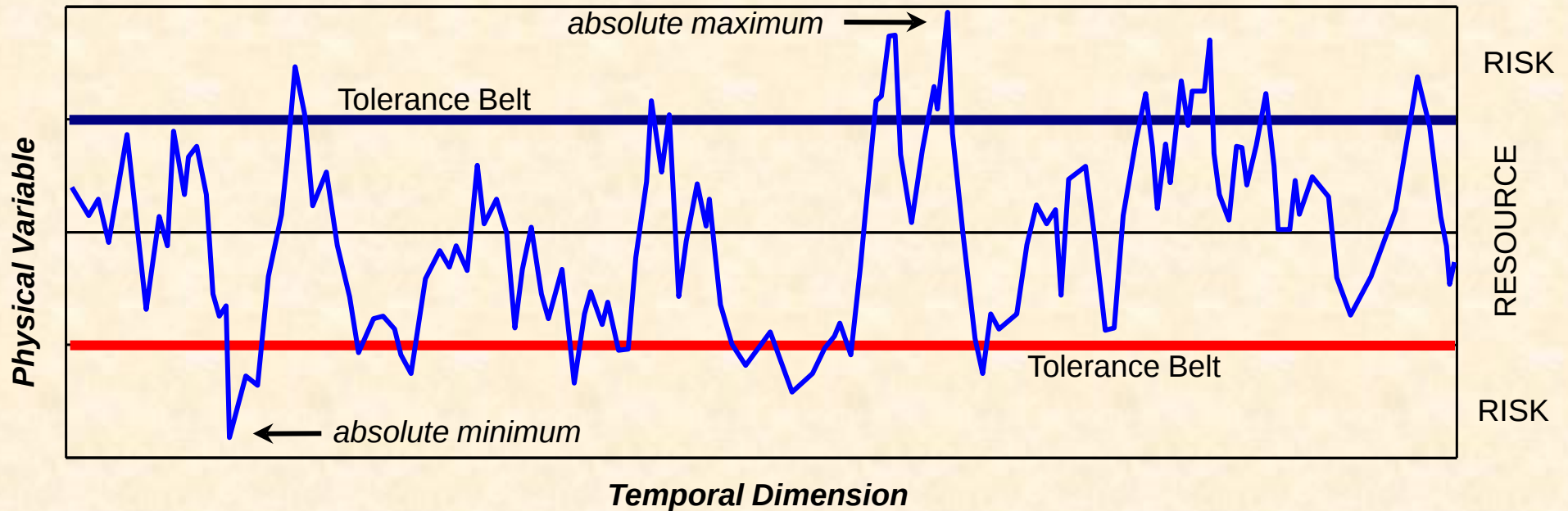
All series show months with absolute minimums of 0 mm. and absolute maximums 200/400% higher than the respective monthly average. Drought and torrential rainfalls are characteristic phenomena of iberian rainfall regime

1) Climatic conditions: Precipitation. Yearly Total Values. 1901-1990



Only with 1000 km. (Santiago-Murcia)
we find mean values between
1642 and **286** mm.
The absolute **minimum** of Santiago
is **610** mm. meanwhile the absolute
maximum in Murcia is **574** mm.

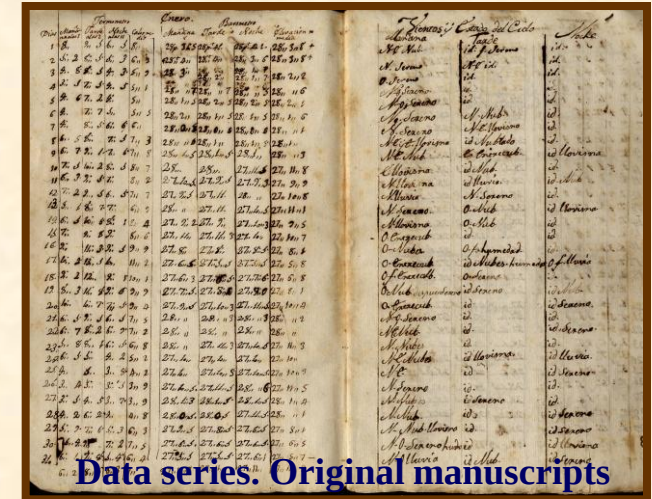
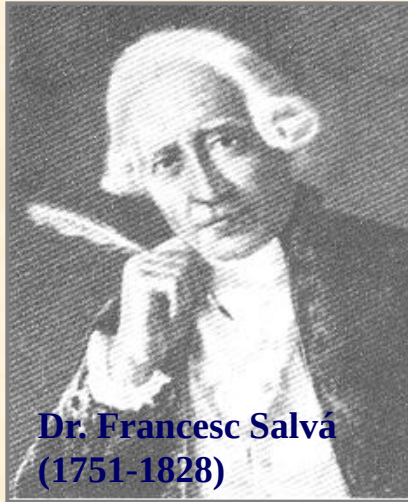
2) Climatic Hazards: rainfall extremes are the first climatic variable producing hazardous situations... in both directions:



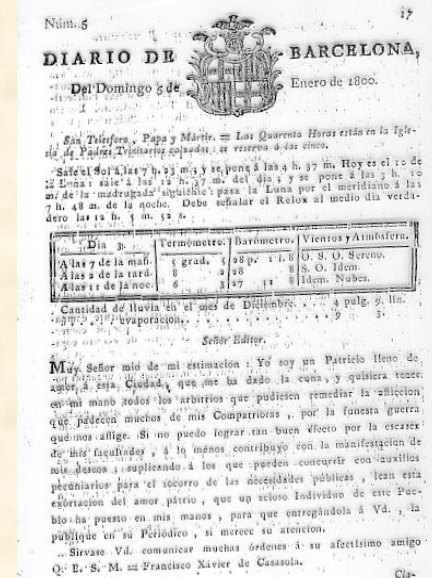
With so frequent occurrence of droughts and floods into mediterranean rainfall pattern, it's obvious water resources management is: no easy, expensive, and limiting factor for social and economic development.



3) Data Sources: Early Meteorological Observations. Daily instrumental series
Scientific activity of physicians. Example of Barcelona since January 1780.



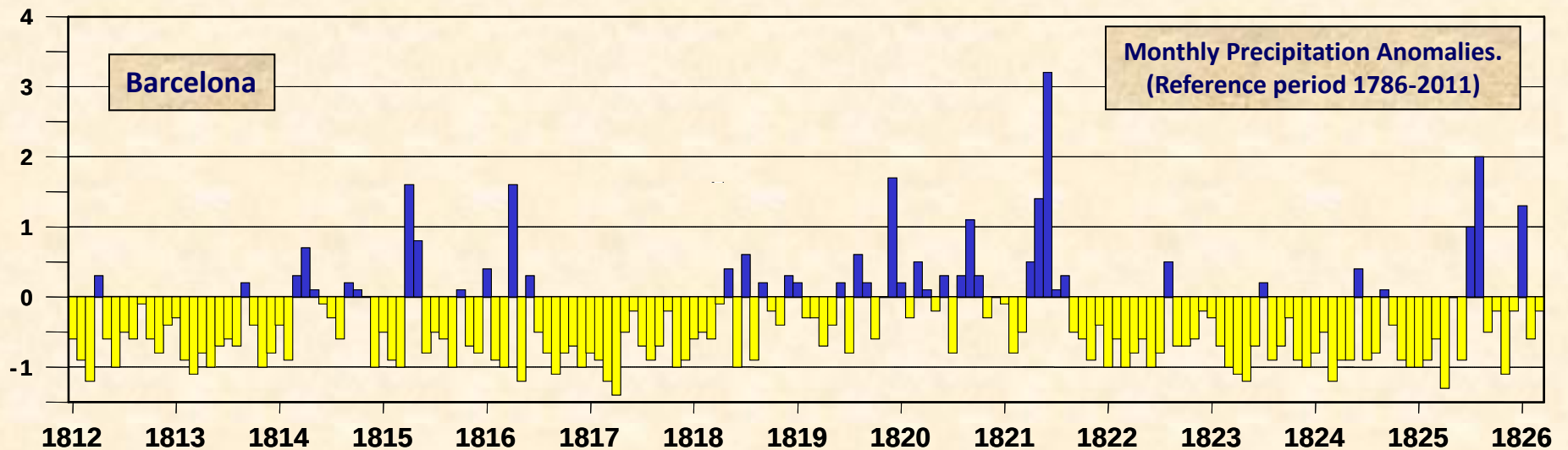
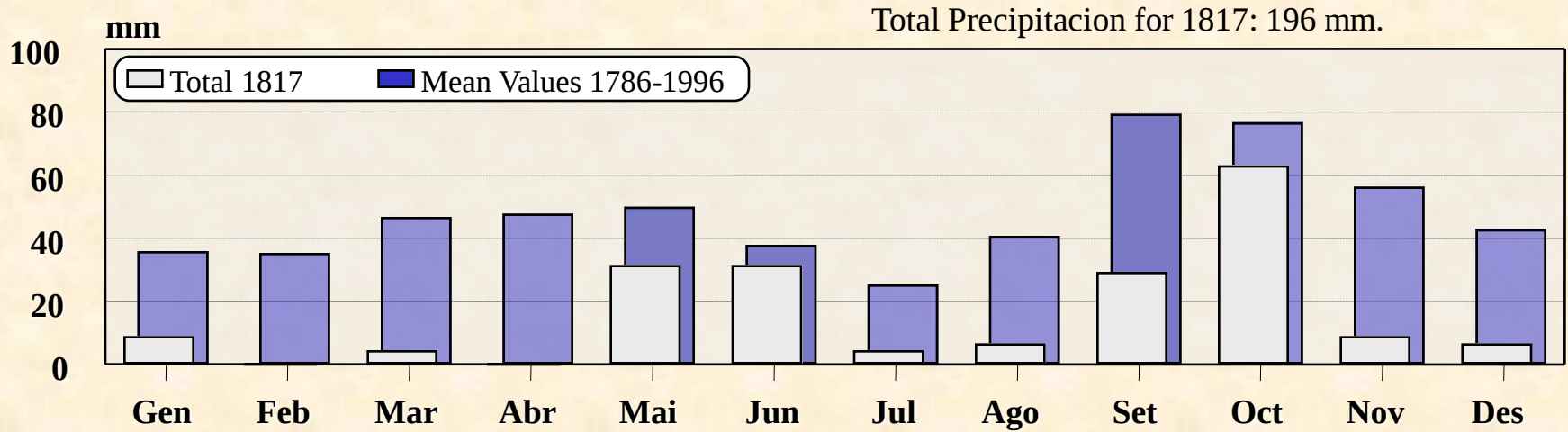
Holy Cross General Hospital.
14-19th centuries.
Workplace of Dr. Salvá



Dissemination of results. Local press

3) Data Sources: Early Meteorological Observations.

First results: Identification of strongest drought in Barcelona, 1817, “The Year of Famine”



3) Data Sources: Proxy-Data from documentary sources. Information to be obtained

80%:

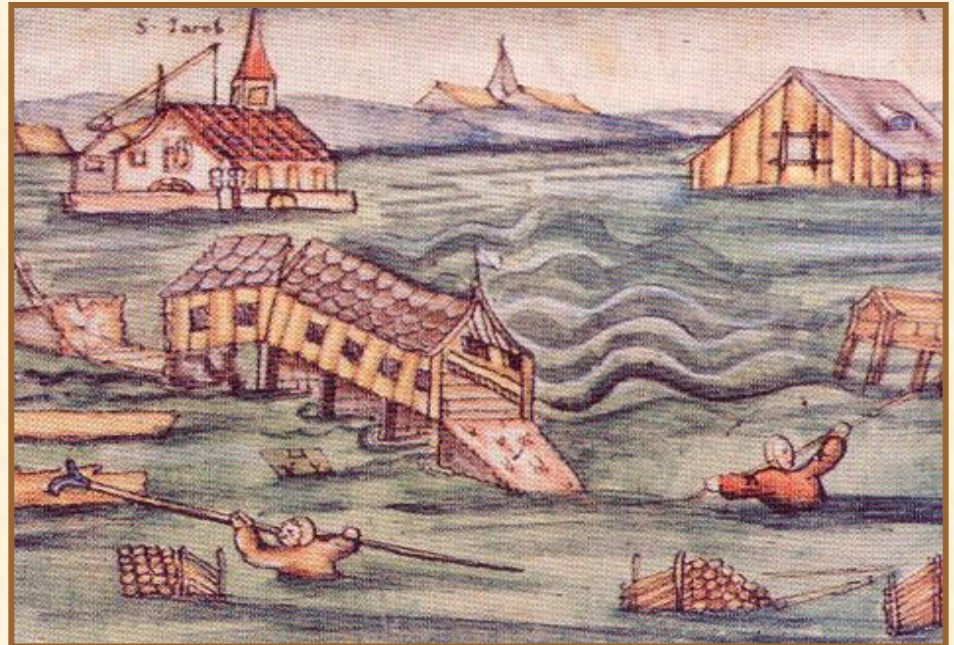
**Rogation Ceremonies
(Cultural indirect answer to
environmental anomalies)**

by environmental elements producing
hazardous situations and impacts:
droughts, rainy periods,
storms, epidemics, locusts.



20%:

Direct Descriptions
of climatic impacts:
floods, sea-storms,
strong wind events,
strong snowfalls
cold and hot waves.



3) Data Sources: Quantification of Rogation Ceremonies by drought.

**Prevention Level
(I)**
Mental Prayer
into parish churches
Intra Ecclesiam
Intra Civitatem



**Low Level
(II)**
Relics Showing
into Cathedrals
Intra Ecclesiam
Intra Civitatem



**Medium Level
(III)**
Public Processions
with Relics by streets
Extra Ecclesiam
Intra Civitatem



**Strong Level
(IV)**
Water Contact
of Relics
Extra Ecclesiam
Intra Civitatem
Substitution
by other
ceremonies in 1619



**Critical Level
(V)**
Pilgrimages
Extra Ecclesiam
Extra Civitatem

Rogations were suggested by Guildic Authorities, ordered by Municipal Authorities and developed by Ecclesiastical Authorities, generating in all moment documentary records of deliberations and decisions. Liturgical procedures were defined and preserved by Vatican regulations

3) Data Sources: Description of Flood Events from municipal documentary sources.

First testimony of catastrophic flood in Barcelona



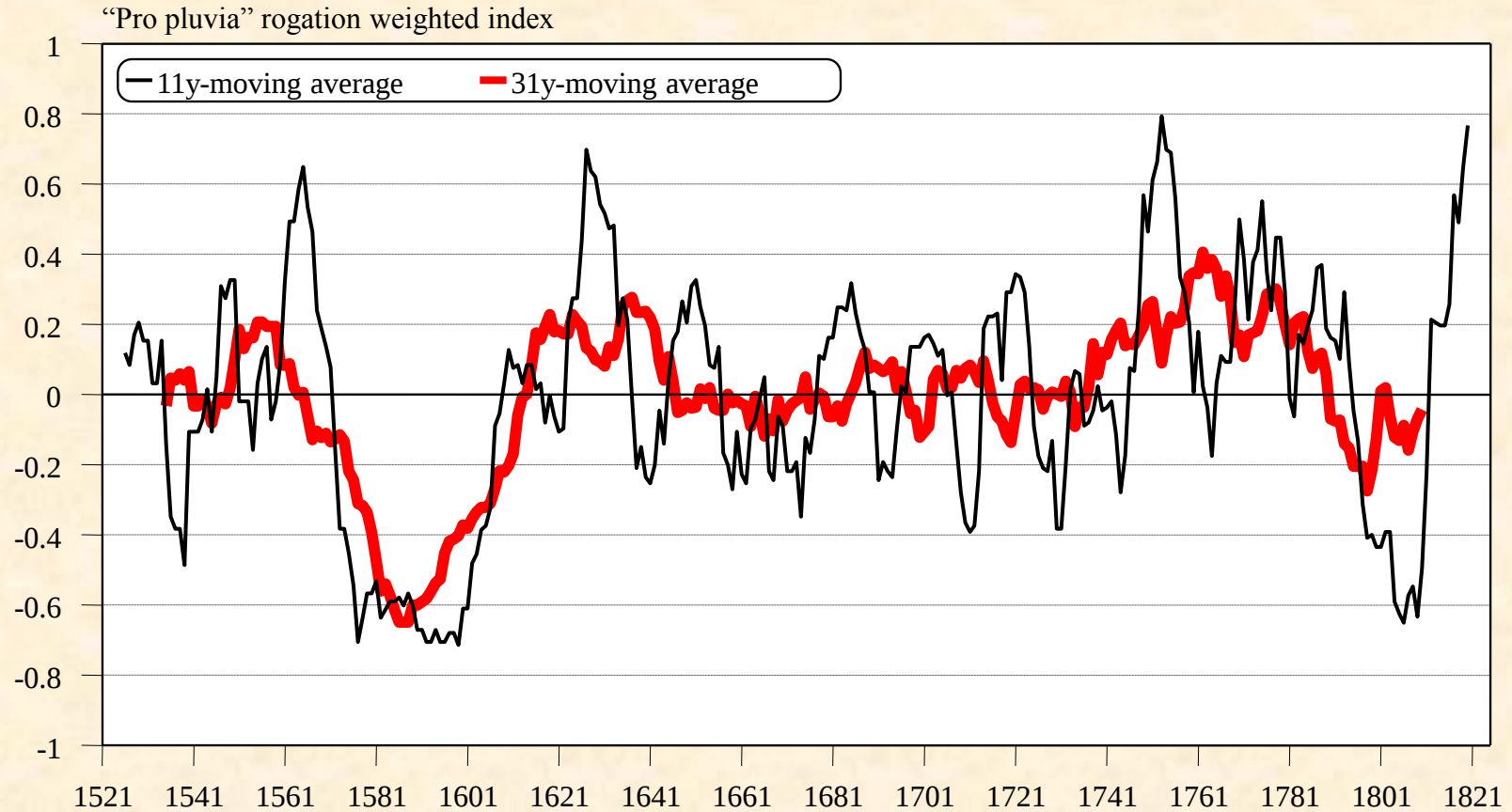
1866: Flood in Barcelona recovering the old bed river of “Ramblas” after the destruction of walled perimeter.

Biblioteca Nacional de Catalunya, Ms. 485, 27 d’agost de 1389, fol. 293:
“Anno domini m ccc lxxx ix dies xxvii mensis augusti circa horam vespro
fuit tot et tanta multitudo et tempestas aquas pluvialis in civitate barchinona
et in eio territorio et duravit per tres horas et plo ita qui postravit ad terram
murum ditem Civitatis quod erat retro monasterius sancti damiani barchinone
et pte dormitori dicti monasteri et per maiori pt ora hospitia q erant in vico dls
Orbs et in vico den juglar et in alys diversis locus barchinona et multas vineas
destruxit et eraditavit/ Et inplevit regum comdale lapidibus et cementis in tum
qp per xii dies stetit qp no potuit intrar aquam moledinos in civitate barchn.”

Translation from latin:

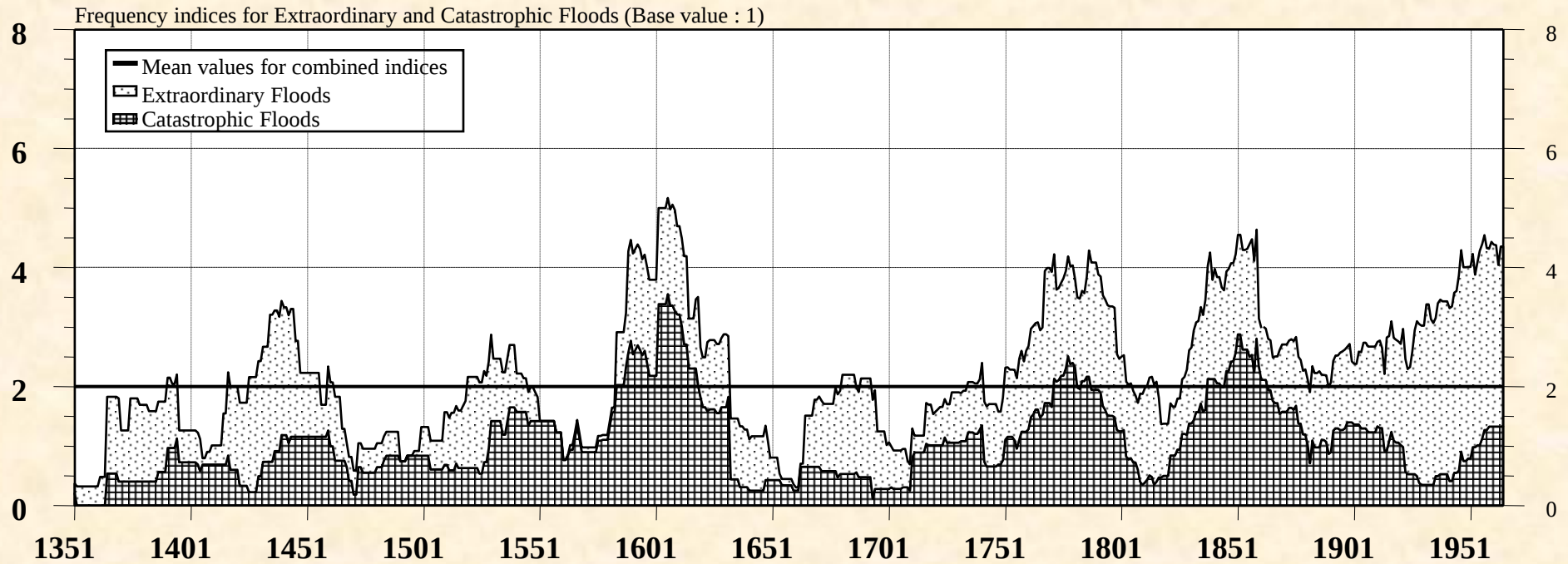
In the year 1389, 7th September, by evening, strong thunderstorm occurred in Barcelona and sorroundings during 3 hours. One sector of walled perimeter collapsed close to St. Damian monastery. Different buildings collapsed in Orbs Street and Jugclar Street and other sites. Flood also destroyed a lot of vineyards. Flood covered the “Comtal” Channel with stones and sand. Consequently, water mills of the city were closed during 12 days because water didn’t arrive enoughly to them”.

3) Climatic Variability from proxy-data: Drought frequency in catalan coast (Data series from Girona, Barcelona, Tarragona and Tortosa).

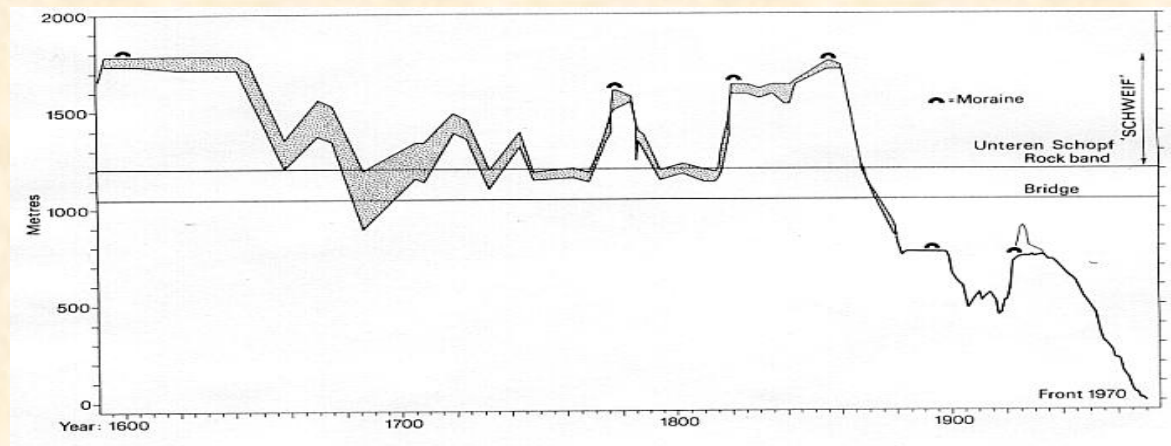


3) Climatic Variability from proxy-data: Flood frequency in Catalonia.

Averaged frequency indices from 12 data series.



...and variations in length of *Unterer Grindelwalgletscher* (Pfister, 1988)



4) Water Management in the mediterranean cities of “Ancient Regime”

Two basic factors were important for the cities:

Military defense by means of walled perimeters

Water supplying in continuous flow for:

Direct Human Use

Hydraulic Energy

Industrial Activities

Agricultural Activities

Mediterranean Climate generated singular water management because of irregular water flows available on rivers:

Irrigation channels for agriculture

Urban channels for human consume and industry

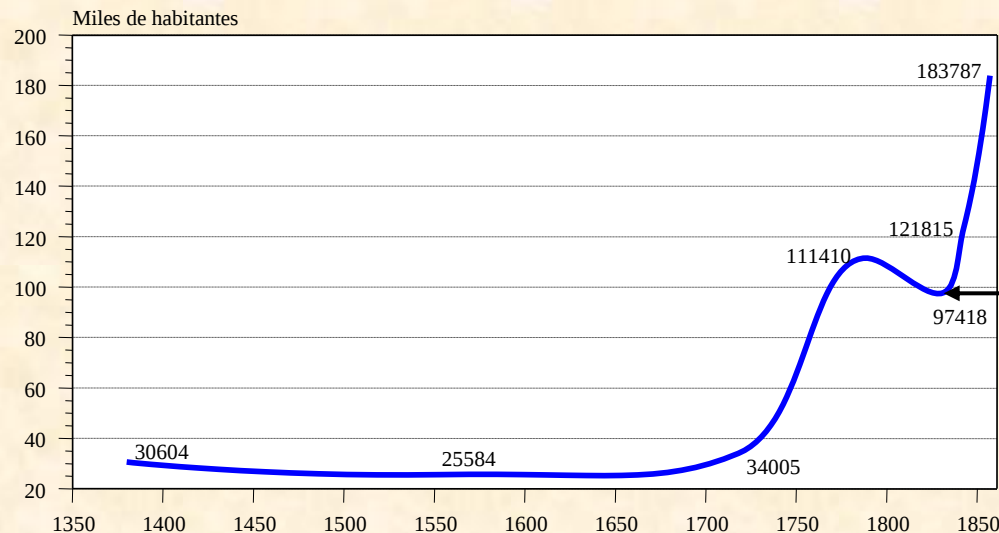
Singular water mills to obtain energy

Forced water sources in mountains by mines

But also walled perimeters were necessities to stop and derive the flood events in close rivers, maintaining the overflow out of the cities.

4) Water Management in the cities of “Ancient Regime”.

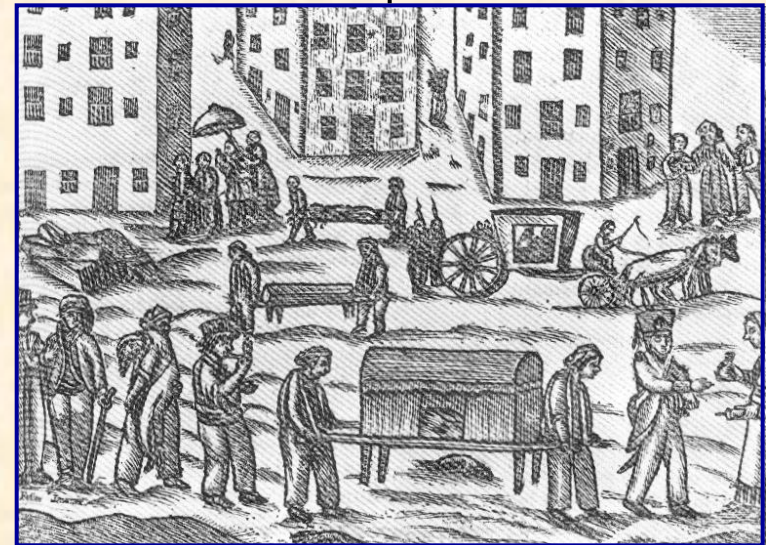
Negative effects of population increasing: human pressure into the walled city, water quality decreasing, epidemics...



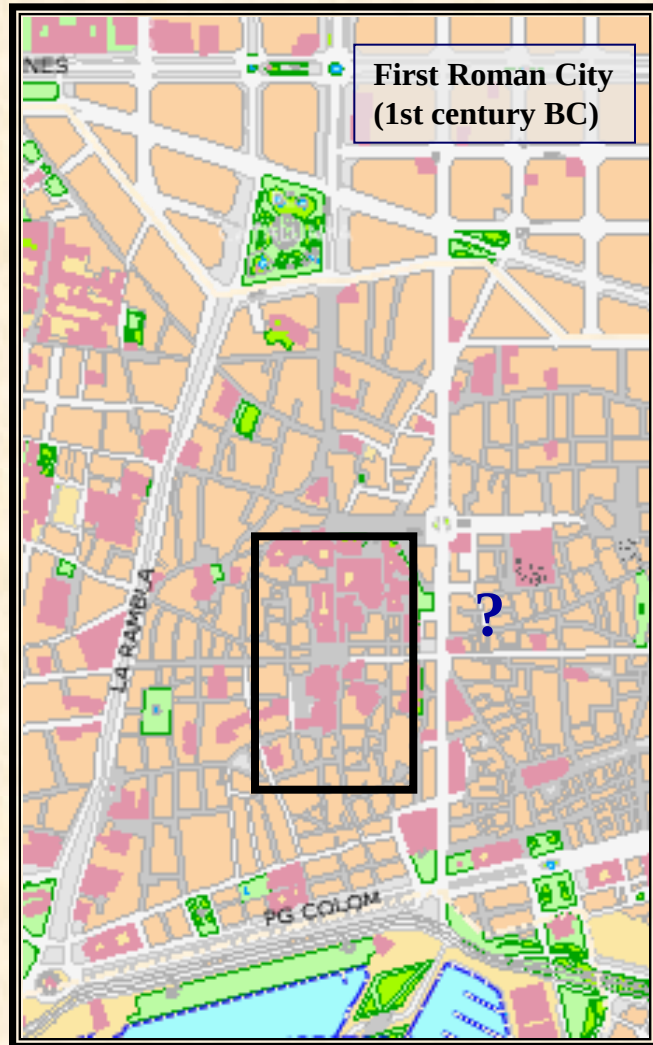
Barcelona population increasing by “Industrial Revolution”

If water infrastructures and management don't go in parallel development, life quality is decreasing.

Example: Yellow Fever Event 1821 provoked the death of 6% inhabitants of Barcelona in 2 months.

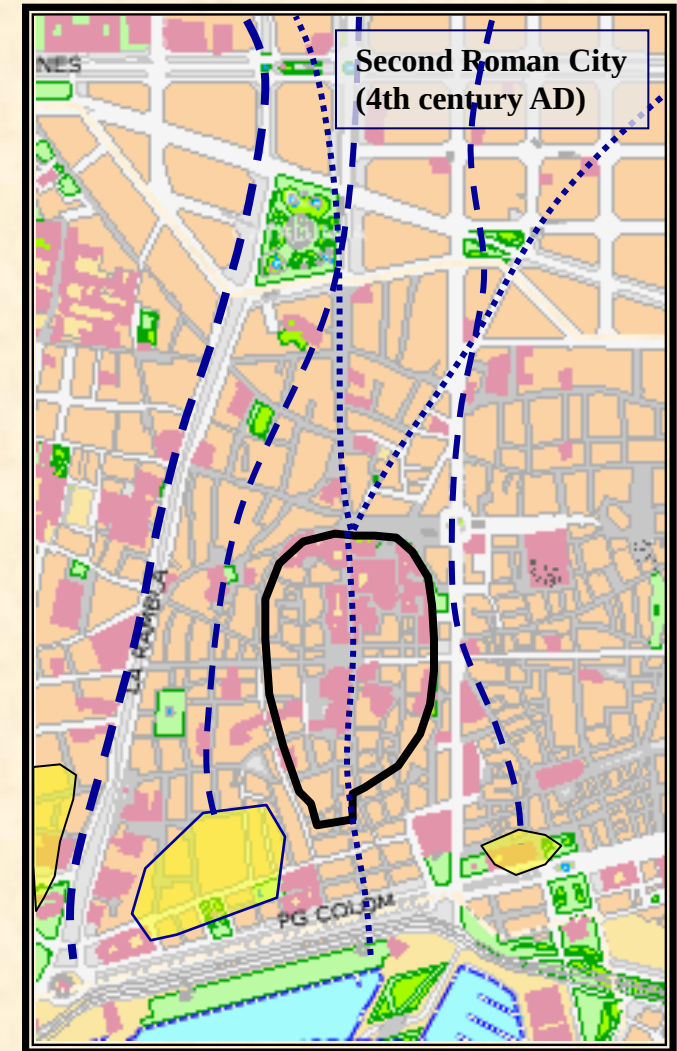


5) Urban evolution of Barcelona

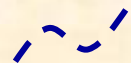


Water channels only for direct consume and leisure (baths)

Roman city (Colonia Barcino)



Water channels



Non-permanent rivers

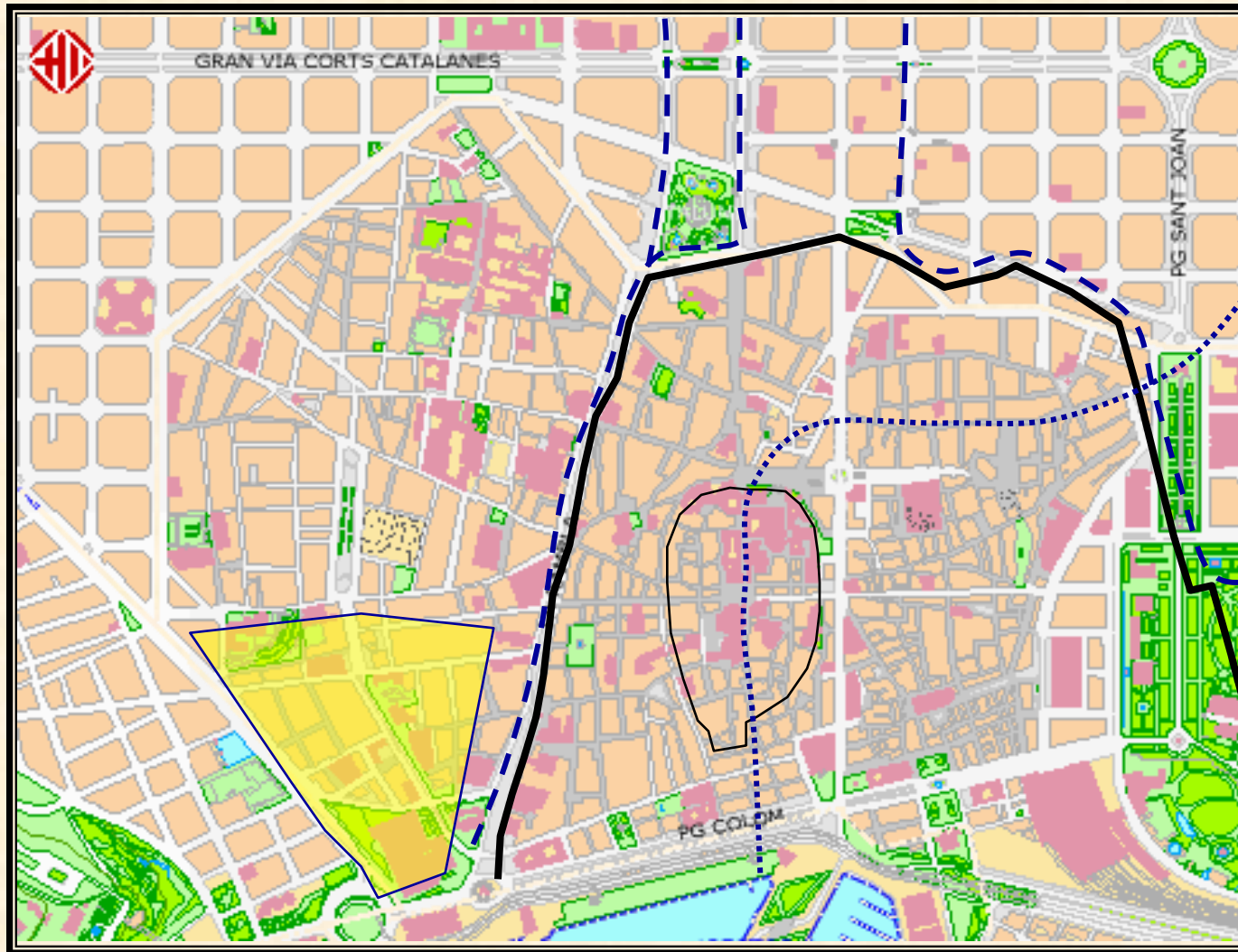


Littoral lagoon



Walled perimeter

5) Urban evolution of Barcelona



*Walled perimeter
open to the sea
(12-14th)*

*Catalan Kingdom
was confident
with dynamic
coastal defense
(different types
of galley,
rowing vessels)*



Water channels



Non-permanent rivers

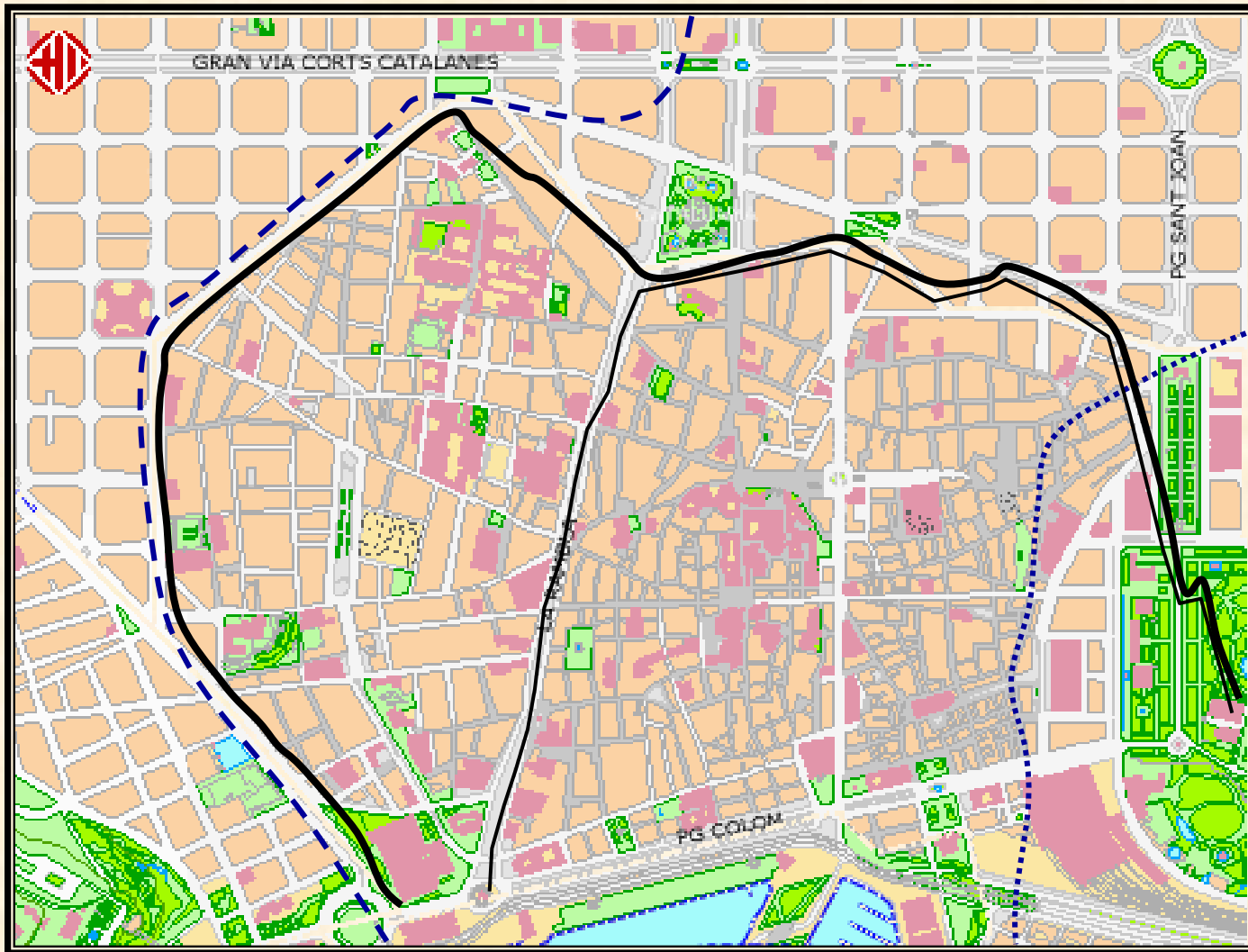


Litoral lagoon



Walled perimeter

5) Urban evolution of Barcelona



Increased walled perimeter open to the sea (14-16th)

Barcelona increased the population and a new perimeter was necessary.

Plague epidemics of mid 14th century stopped this process.

The soil available was used like agriculture reserve during sieges.



Water channels



Non-permanent rivers

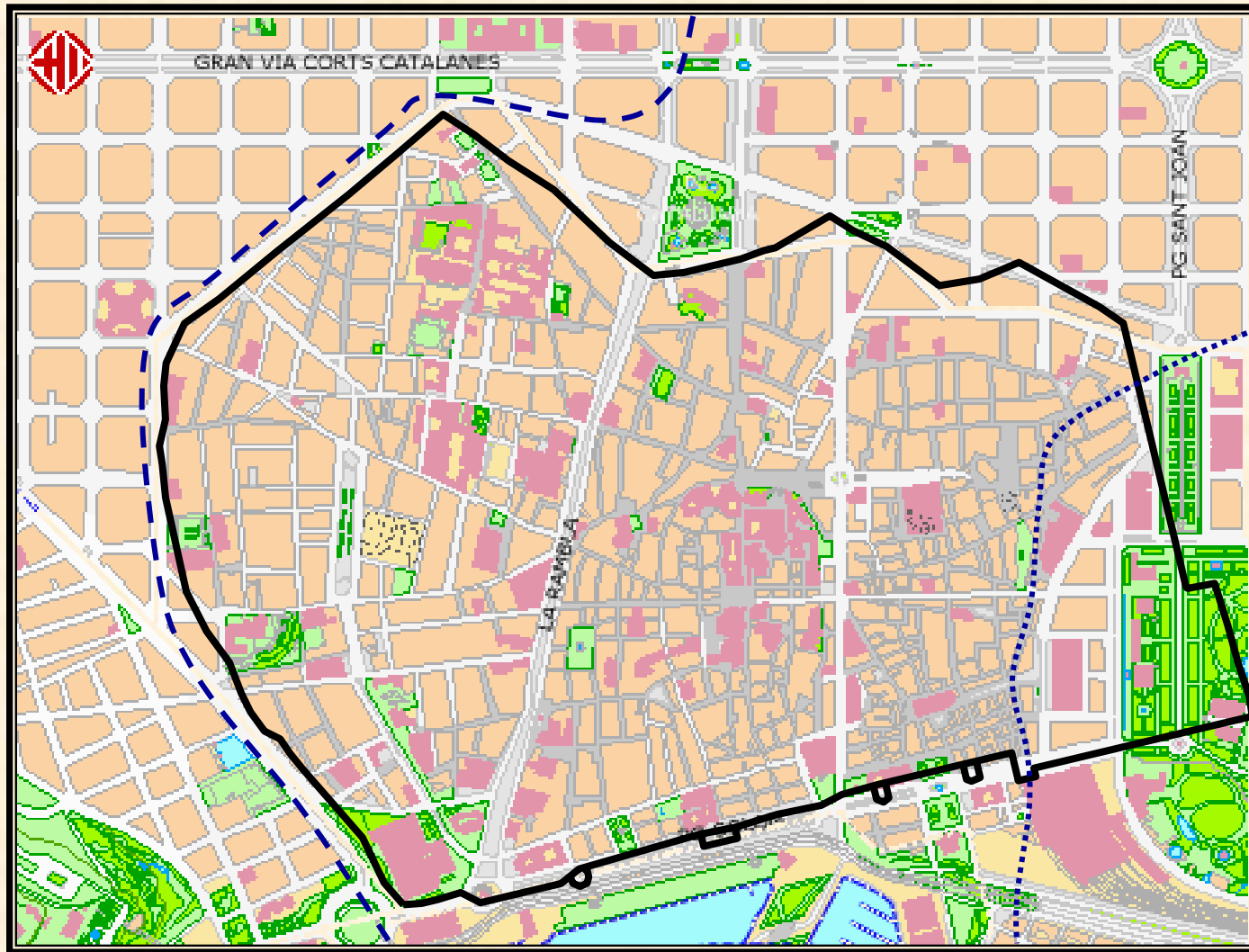


Litoral lagoon



Walled perimeter

5) Urban evolution of Barcelona



Closed walled perimeter (16-18th)

Turkey and muslim pirates obliged the authorities to take static defenses.

The Sea Wall generated problems to access to harbour and sanitary disturbances because it stopped sea breezes.



Water channels



Non-permanent rivers



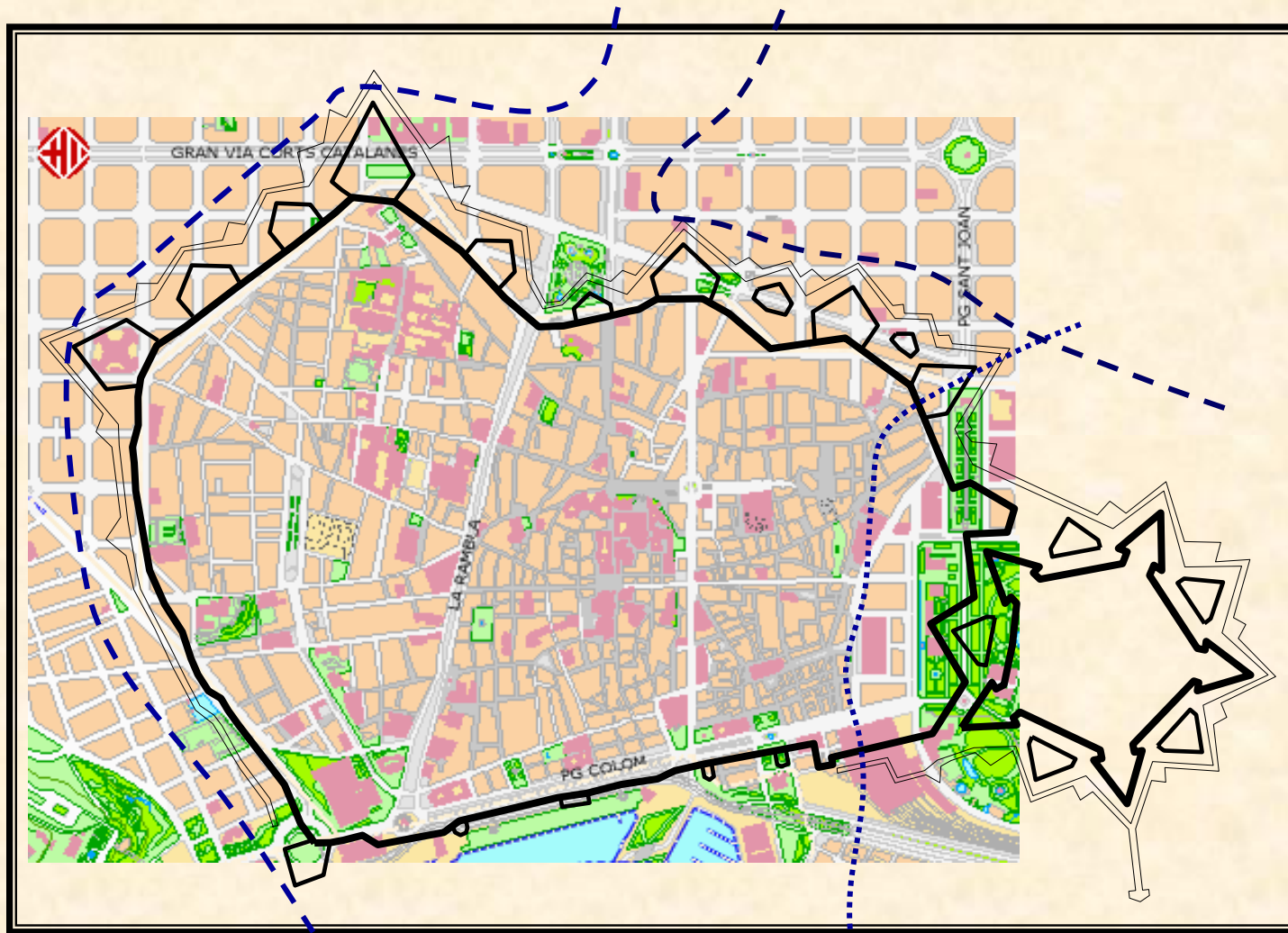
Litoral lagoon



Walled perimeter

5) Urban evolution of Barcelona

Militarized city (Borbon dynasty) (18-19th)



Militarized city (18-19th)

After the Succession War, Borbon dynasty Stablished a new Administration and Institutions.

Military control of the city is evident by presence of thousands of soldiers but also with the second citadele or large fortress to control the city.



Water channels



Non-permanent rivers



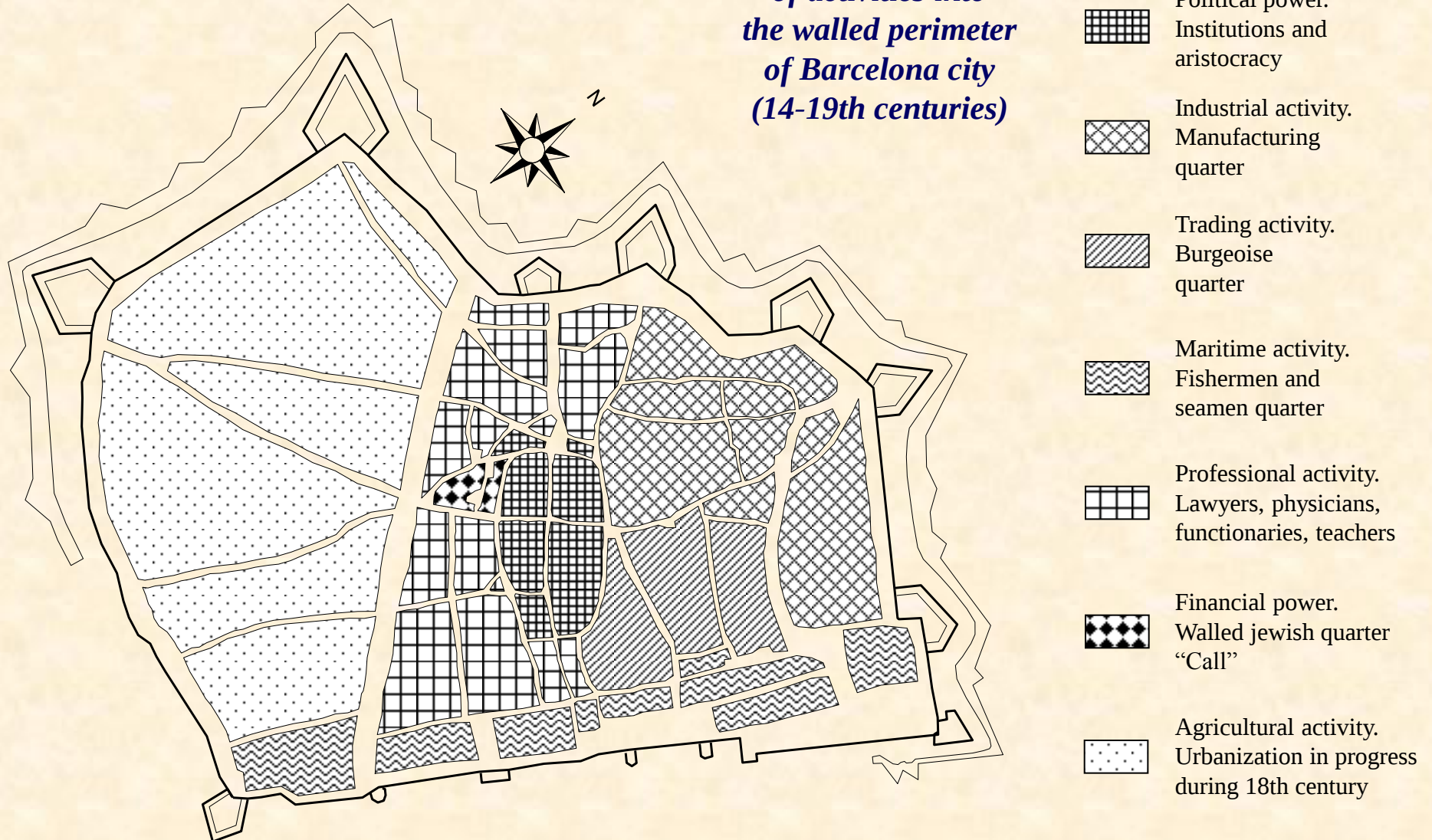
Litoral lagoon



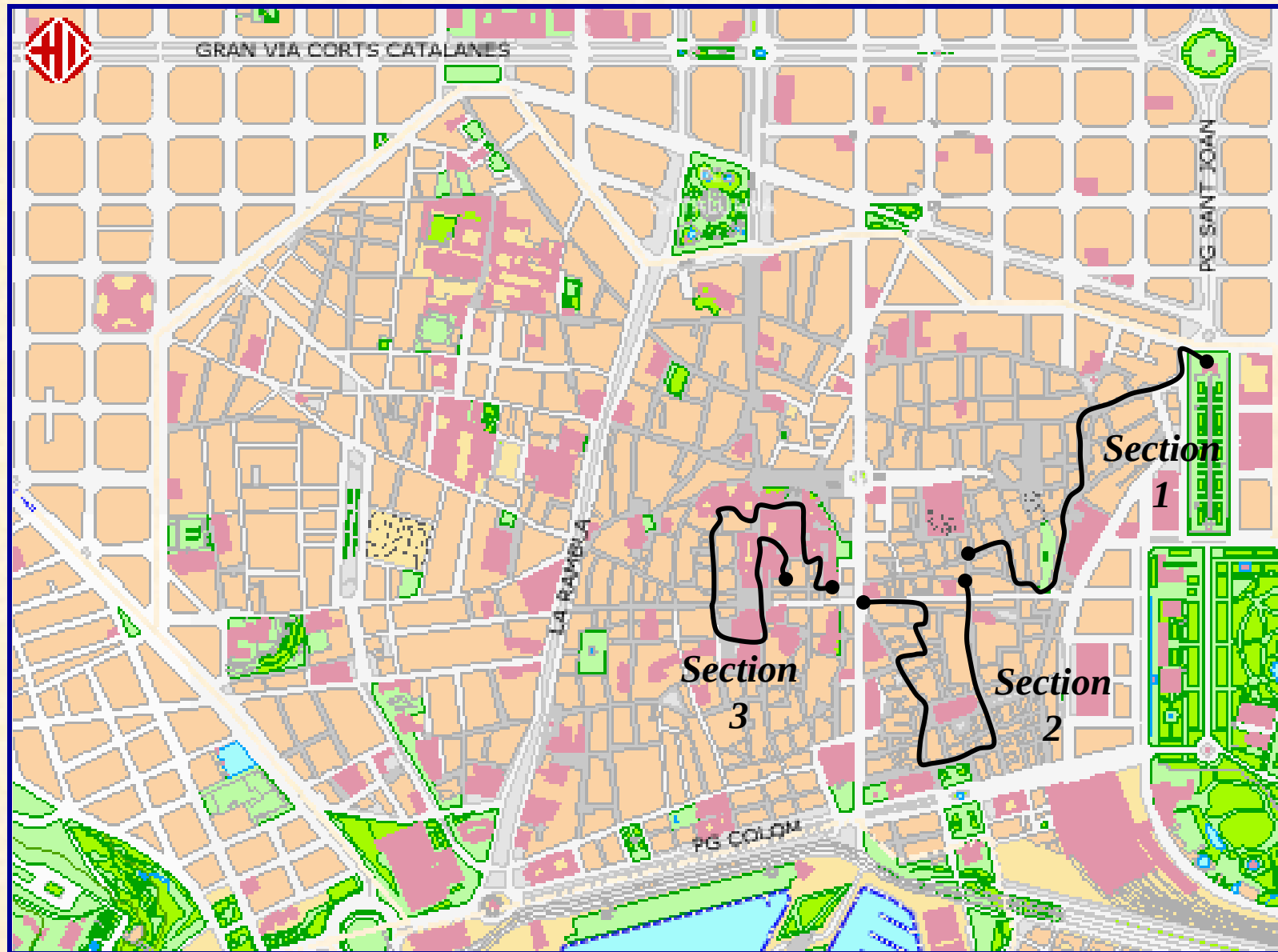
Walled perimeter

5) Urban evolution of Barcelona

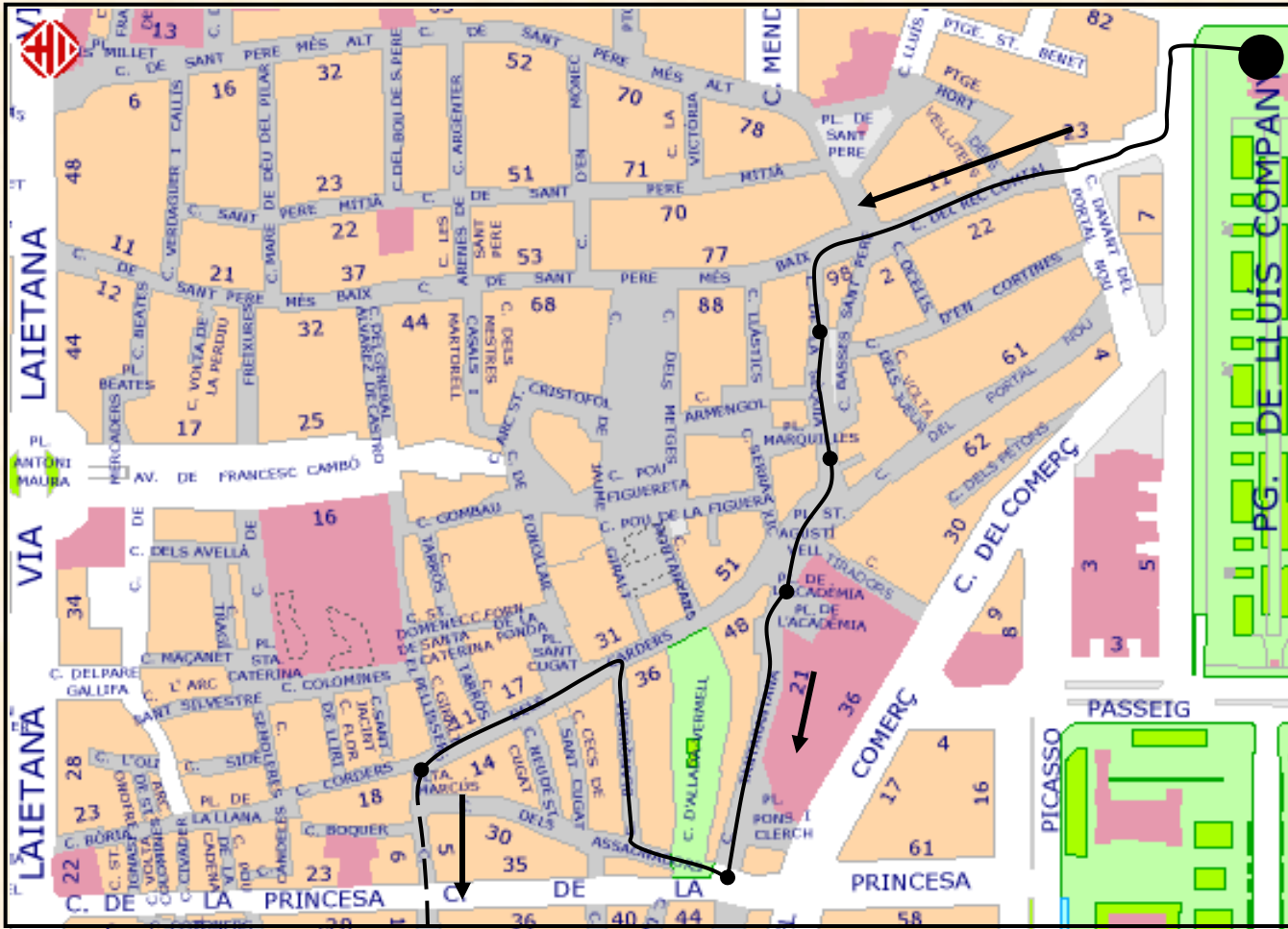
Geographical distribution of activities into the walled perimeter of Barcelona city (14-19th centuries)



6) Itinerary. General overview



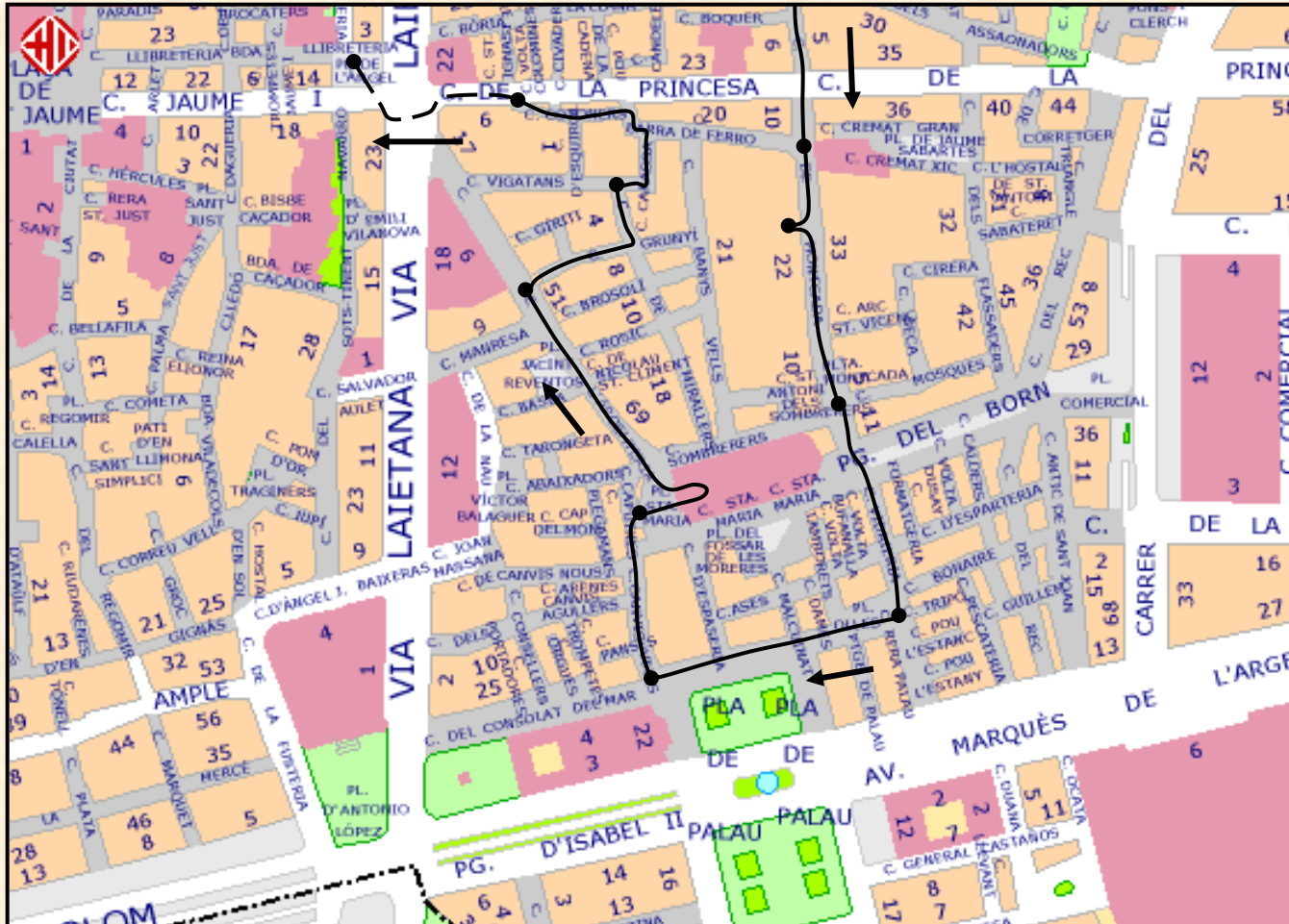
6) Itinerary. Section 1.



SECTION 1: WATER MANAGEMENT AND WATER USES IN HISTORICAL TIME

- Departure. St. Pere Sq.
- Basses St. Pere Sq.
Energy production by
hydraulic mills.
- Old water mill structures
- St. Agusti Square.
Catalan Army Academy.
Industrial use of water:
Textil quarter.
- Assaonadors Street.
Leather quarter.
- Connection with section 2:
Marcús Square
Montcada Street

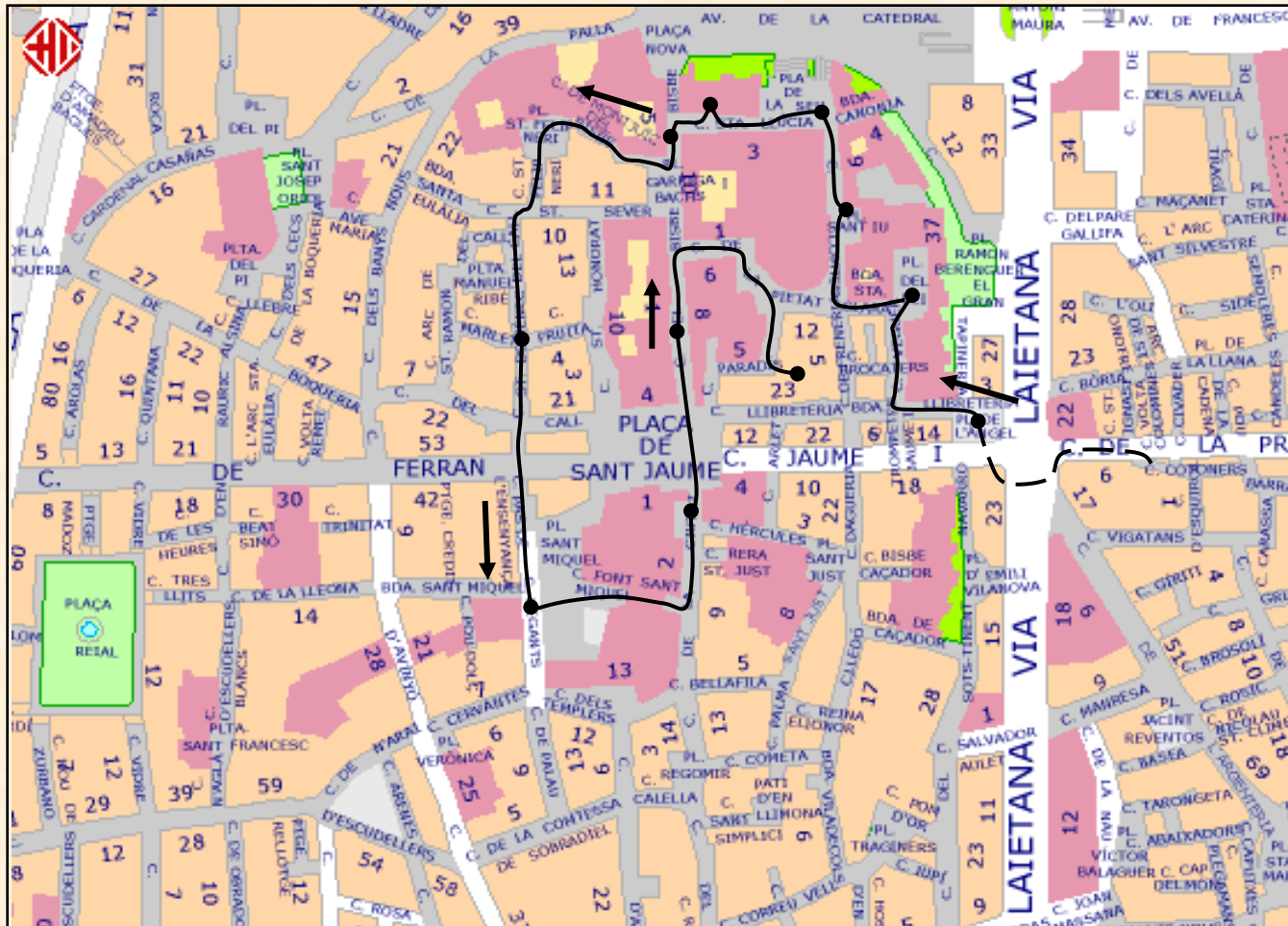
6) Itinerary. Section 2.



SECTION 2: COMMERCIAL ACTIVITY: RIBERA QUARTER. TRADING, AND SEAMEN

- Departure. Montcada Street.
 - Visit to any trade “palace”.
 - Mosques Street: the money flow.
 - Olles Square. Seamen hazards: floods in land, storms in sea.
 - Canvis Vells Street.
- Financial aspects.
- Caputxes Street.
- Human pressure in walled cities.
- Argenteria Street.
- Medieval Shopping Center
- Carassa Street.
- Prostitution like economic activity.
- Cotoners Street.
- 18th Century Industrial Take-Off.
-
- Connection with section 3:
Angel Square/Swiss Hotel/City Jail

6) Itinerary. Section 3.



SECTION 3:

INSTITUTIONS INTO A LITTLE MEDIEVAL KINGDOM

- Departure. Angel Square. Prison. Justice system.
- Rei Square. Religious Court. Kingdom Palace Buildings.
- Sant Iu Square. Kingdom Palace. Private residence
- Cathedral. Local Ecclesiastical Authority. Poors Hospital.
- Ardiaca Palace. Economic Chapter Authority. City Archive.
- Bishop Palace. Territorial Ecclesiastical Authority.
- Marlet Street. Jewish ghetto. Financial power
- St. Miquel Square. High Court
- Ciutat Street. Municipal authority
- Bisbe Street. Territorial authority. (Permanent Representation of Medieval Parliament)
- Paradis Street. Roman Temple. End of itinerary.