

## **Annex B: Geographical data**

The main geographical data in this file concern the various first nature characteristics such as a city's location (landlocked, on the sea coast, at a river), its elevation (in m) above sea level and its geographical coordinates (in decimal degrees). A distinction is made between time-varying and permanent first nature characteristics over the time period of the study. Its second nature characteristics – a city's position in relation to already existing cities, and therefore time-varying by definition – which historically was important too for an individual city's chances of urban growth, will also be briefly covered in this section.

The geographical data described in this section have been collected from a medieval transport perspective and do not cover early-modern canals, nineteenth-century railways, or twentieth-century networks of automobile highways or airports that recently increased transport possibilities for specific cities and influenced their growth. In principle all medieval sea cities will have had the possibility to profit from sea transport because the then relatively small ships generally could beach or harbor nearly anywhere along the coast and (un)loading was done by man power. Location on a river was based on different criteria than the width and gauge of waterways requested by current day fluvial transport with large motorized barges. The actual early medieval river transport was taken as a point of departure. This medieval transport by inland waterways was very well accustomed to cope with shallows and sometimes temporary obstructions. The *Fossa Carolina* was a grand project of Charlemagne to connect the shipping in his empire on the rivers Rhine and Danube, by way of a canal dug between the much smaller Rhine and Danube tributaries Rezat and Altmühl (Grewe, 1996, p. 112)<sup>1</sup>. Such unsightly rivers as the Rezat and Altmühl have been therefore considered as medieval models which at the time were deemed passable for medieval river transport. This means that in this database more cities have been classified as having the possibility of river transport on the basis of this comparison, than would have been concluded if the very much more stringent requirements of water gauge and width for shipping by current day fluvial transport would have been used.

### *Time-varying first nature characteristics*

This study discerns the three main possibilities ('sea', 'river' or 'landlocked') for medieval transport to describe differences in the location of the various European cities:

- 'Sea' as a category is rather straightforward as every medieval city located on the sea coast has been classified as a sea city.

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<sup>1</sup> It is not relevant here that this project of Charlemagne eventually failed because it was not completely executed. Relevant is, however, that for medieval people these two rivers then were deemed perfectly suitable for river transport.

- 'River' is a location of a city that has the possibility of transport on an inland waterway. When a local river was deemed similar in size to the Rezat and Altmühl or when a town was indicated to be lying on a waterway that is presented on one of the maps of the atlas by Dumont and Miermans (1959) with a scale of at least 1:2,000,000 it was classified as a 'river' city.
- All other cities were classified as 'landlocked'.

The actual variation over time of a medieval city's first nature characteristics (when its transport possibilities had changed to one of the other classes discerned) has not been included in the current database. The location of each city has been classified to the class that was appropriate for the larger part of the study period. One needs to be aware of the possibility that these characteristics may have changed over time because these seemingly permanent first nature characteristics were time-varying at some places. Cities originally classified as sea cities sometimes later ended up landlocked or found themselves located on a river due to growing sandbanks, the silting of its connection to the sea or continental rise (Scandinavia). This means that a number of cities, which according to their current geographical location would not have been defined as sea cities (such as Bruges, Seville<sup>2</sup> or Middelburg) have nevertheless been classified as medieval sea cities because during the larger fraction of the Middle Ages they could have been regularly reached by sea going vessels, although in due time they eventually ended up in a different category.

When a city close to the sea was located on a river arm in which the tide still had its influence on the water levels, cities such as London, Rotterdam or Bordeaux, it was classified as a sea city too (in the database such cities have been indicated with the sea name + river).

As a proxy for a city's accessibility one could use its elevation above sea level in meters. This elevation has been derived either from Wikipedia or from the flood maps available on the internet. Negative values of a city's elevation indicate a location below sea level (such low values were only found for some (later) cities in the Netherlands and areas of the Caspian Sea).

#### *Permanent first nature characteristics*

A city's latitude and longitude in decimal degrees have been collected from various sources. The values with three or more decimal numbers have been collected from Bosker et al.

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<sup>2</sup> In the sixteenth century Seville still was the home port of the Spanish Treasure Fleet, that regularly sailed between Spain and the West Indies, making Spain then one of the richest countries in Western Europe.

(2013), the others are from Wikipedia or from Bairoch et al. (1988). The positive values of longitude are east and negative values are west of the Greenwich meridian.

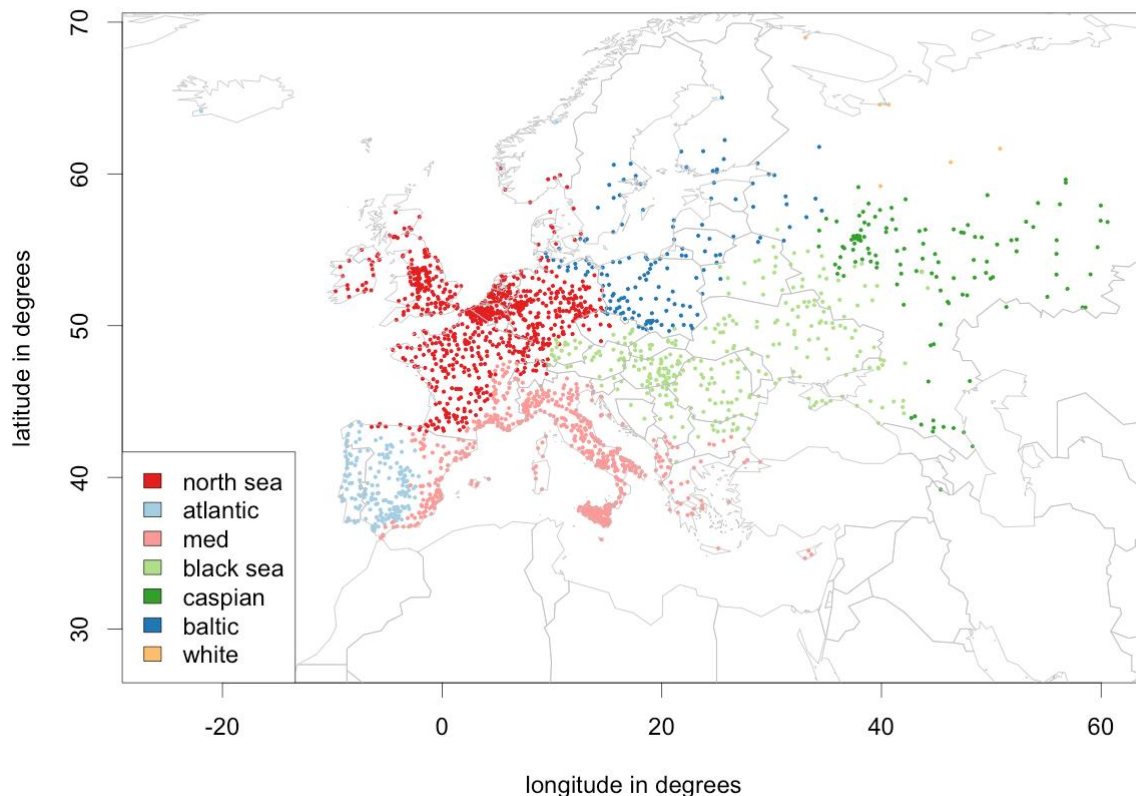
Other permanent first nature characteristics are the seven major fluvial catchment areas that can be discerned (see Figure B-1). These seven areas cover the whole of the European landmass. And each of the more than two thousand individual European cities contained in the database has been classified into one of them:

- The 'White Sea' area, north of European Russia, which includes the White Sea and the Barents Sea, into which the Russian rivers Onega, Dvina and Mezen flow.
- The second area is the 'Baltic', defined as the seas east of the Great and Little Belt and of the Sound. It comprises the fluvial catchments of all rivers that flow into it, such as, the Oder, Vistula, Narva, Neva and other smaller rivers in Denmark, Germany, Poland, Russia, Belarus, Czech Republic, Lithuania, Estonia, Latvia, Finland and Sweden.
- The third is the 'North Sea' area, covering the western European seas from Bergen in Norway in the north, passing west of the Little and Great Belt and Sound, and then going all the way down to and including the Bay of Biscay in Spain. It comprises the fluvial catchments of all its feeding rivers, such as the Thames, Garonne, Loire, Seine, Meuse, Rhine and Elbe and other minor rivers in Norway, Sweden, United Kingdom, Ireland, Denmark, Germany, Netherlands, Belgium, Luxembourg, France, Switzerland, Czech Republic and in (a small fraction of) Spain.
- The fourth, the 'Atlantic' comprises the seas north of Bergen in Norway and from Santiago de Compostela in Spain right up to Tarifa in the south western part of the continent. Its catchment area has as main rivers the Tagus, Douro and Guadalquivir and other rivers passing through, northern Norway, Iceland, Spain (as far as it is not contained in the North Sea or Mediterranean area) and Portugal.
- The fifth is the 'Mediterranean', and defined as the whole stretch of sea east of Tarifa in Spain running along the southern European coasts right up to and including the Bosphorus. Its main tributaries are the Ebro, Rhone, Tiber and Po, as well as the other minor rivers in Spain, France, Italy, Slovenia, Croatia, Cyprus, Malta, Kosovo, Montenegro, Belarus, Bulgaria, North Macedonia, Switzerland, Albania, Greece and Turkey flowing into the Mediterranean.
- The sixth is the 'Black Sea' area, along the European coasts from the Bosphorus up to Georgia, which also includes the Sea of Azov. The main tributaries of this 'Black Sea area' are the Danube, Don and Dnieper. Its fluvial catchment comprises other minor rivers in Turkey, Bulgaria, Romania, Ukraine, Russia, Belarus, Austria, Bosnia Herzegovina, Croatia, Czech Republic, Hungary, Kosovo, Macedonia, Moldova,

Slovenia, Serbia and Slovakia, including small parts of southern Germany whose waters eventually end up in the Black Sea.

- The seventh and last is the 'Caspian Sea' area of which only a minor part of its coast is considered that has the Russian rivers Kuma, Volga and Ural flowing into it.

Figure B-1. The main European fluvial catchment areas.



### *Second nature characteristics*

Economic geography theory predicts that a city's position relative to already-existing cities – its second nature characteristics – becomes increasingly important for its urban chances (Fujita and Mori, 1997). Recently this theoretical notion was confirmed by Bosker and Buringh (2017) for the development of the actual western European city system between 800 and 1800. When assuming similar first nature characteristics, neighboring cities lying in a distance band between some 20 km to 100 km from the city in question generally were more important for its further chances of economic development than cities closer by or further away. If the adjacent cities were located at larger distances transport and other costs might have increased so much that possibilities for fruitful contact and commerce decreased. If some other city was lying too close by or was very much larger, the development of the city in question generally was hampered by what could be called an

'urban shadow'. One could say that there exists a certain 'golden window' of opportunity of specific distance bands favoring city development. The city's coordinates allow future users of the database to construct the distance bands they think relevant to quantify second nature characteristics over time and space.

### References

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