Statistics in focus (SIF-SE background article)

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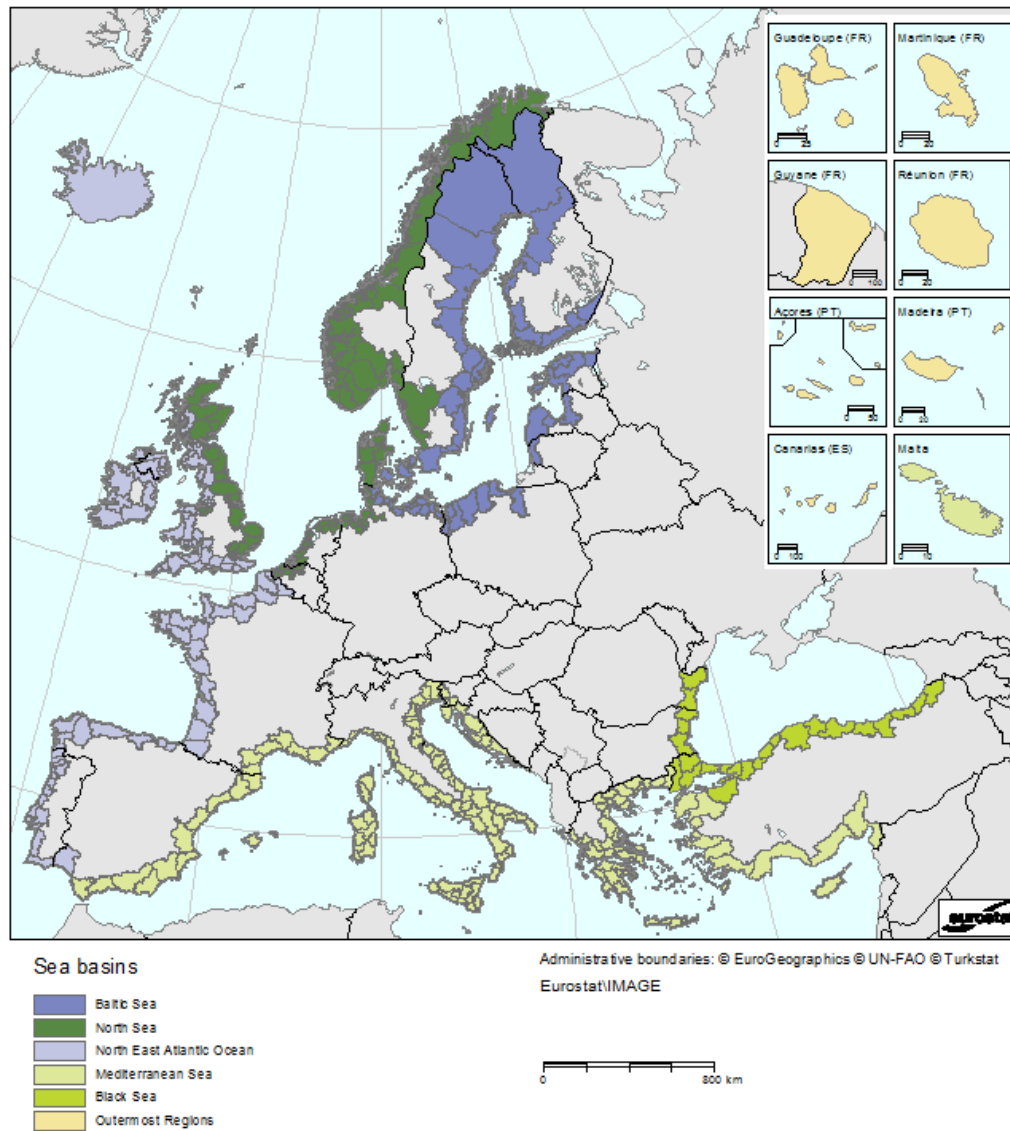
Coastal regions: People living along the coastline and integration of NUTS 2010 and latest population grid

Among the 1 294 NUTS 3 regions included in NUTS 2010 classification, 439 have been defined as coastal region. In 2011, 40.8% of the EU27 population lived in coastal regions which covered 40.0% of EU27 territory. The geo-spatial data analysis presented below highlights the disparities in population distribution patterns along the coastline.

In the EU, a coastal region is defined as a NUTS 3 region with either a sea border or without a coastline but where more than half of the population lives within 50 kilometres (km) of the sea. Coastal regions are distributed along oceans and seas (also called sea basins) bordering the EU coastline, i.e. the Baltic Sea, the North Sea, the North East Atlantic Ocean, the Mediterranean Sea, the Black Sea and outermost regions, as Map x shows. The inputs used for defining a region as coastal or non-coastal are the NUTS classification and the population grid (GEOSTAT). Both of these inputs have been updated. NUTS 2010 replaces NUTS 2006 and the 2006 population grid replaces the 2001 population grid. In order to take these changes into account, the selection of coastal regions in the EU has been updated. The definition of a coastal region has not changed thus any differences are due to the new version of the NUTS classification and the new population grid used. Moreover, the geographical coverage of the definition of coastal regions has been extended to EFTA and candidate countries, specifically the level 3 statistical regions of these countries, as shown in Map x.

Map x: Coastal_regions_by_sea_basins_and_NUTS3_regions.png

Coastal regions, by sea basins and NUTS 3 regions

Sea basins

- Baltic Sea
- North Sea
- North East Atlantic Ocean
- Mediterranean Sea
- Black Sea
- Outermost Regions

Administrative boundaries: © EuroGeographics © UN-FAO © Turkstat
Eurostat\IMAGE

Based on NUTS 2010 and population grid 2006
Source: Eurostat

The 439 coastal regions of the EU are located in the 22 Member States with a coastline. All NUTS 3 regions in the island countries of Cyprus, Malta and Iceland are coastal, as are all regions in Denmark; in Estonia and Ireland all regions except one are coastal regions. Among the European 439 coastal regions, 375 regions have a sea border; as shown in Table x.

Table x: Coastal_regions_by_countries.png

Coastal regions by countries

Unit: Number of NUTS3 regions

	Non coastal regions	Coastal regions			Total
		with sea border	without sea border	total	
EU-27	855	375	64	439	1294
Belgium	30	5	9	14	44
Bulgaria	25	3	0	3	28
Czech Repu	14	0	0	0	14
Denmark	0	11	0	11	11
Germany	372	30	10	40	412
Estonia	1	4	0	4	5
Ireland	1	7	0	7	8
Greece	7	40	4	44	51
Spain	28	31	0	31	59
France	70	30	0	30	100
Italy	41	62	7	69	110
Cyprus	0	1	0	1	1
Latvia	3	3	0	3	6
Lithuania	9	1	0	1	10
Luxembour	1	0	0	0	1
Hungary	20	0	0	0	20
Malta	0	2	0	2	2
Netherlands	18	15	7	22	40
Austria	35	0	0	0	35
Poland	58	7	1	8	66
Portugal	13	13	4	17	30
Romania	40	2	0	2	42
Slovenia	9	1	2	3	12
Slovakia	8	0	0	0	8
Finland	9	9	1	10	19
Sweden	7	14	0	14	21
United King	36	84	19	103	139
Iceland	0	2	0	2	2
Norway	2	17	0	17	19
Croatia	14	7	0	7	21
Turkey	53	28	0	28	81

Based on NUTS 2010 and population grid 2006

**Distribution of the population within coastal strips**

In addition to the update of coastal region typology, a spatial analysis has been carried out to look more closely at the distribution of the population within areas of different widths along the coastline (also called coastal strips). The analysis was applied to coastal strips of 5, 15 and 50 km. Using the latest population grid (GEOSTAT) and several sizes of coastal strips, the analysis provided a breakdown of the population living within a coastal strip and the areas of the coastal strips. The area was calculated and the population figures were estimated by NUTS 3 regions. Thus, for example, it has been possible to evaluate that around 59 500 people lived within 50 km of the sea in the northern Finnish region of 'Lappi' accounting for 32% of the total population of the region, as shown on map X. The proportion

of the regional population living within a coastal strip of 50 km, in particular, was used for updating the coastal region typology.
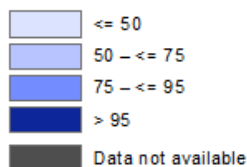
Map x:
Share_of_population_in_coastal_regions_living_within_50km_from_the_coastline_by_NUTS 3_regions.png

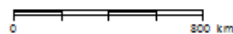Share of population in coastal regions living within 50 km from the coastline by NUTS 3 regions
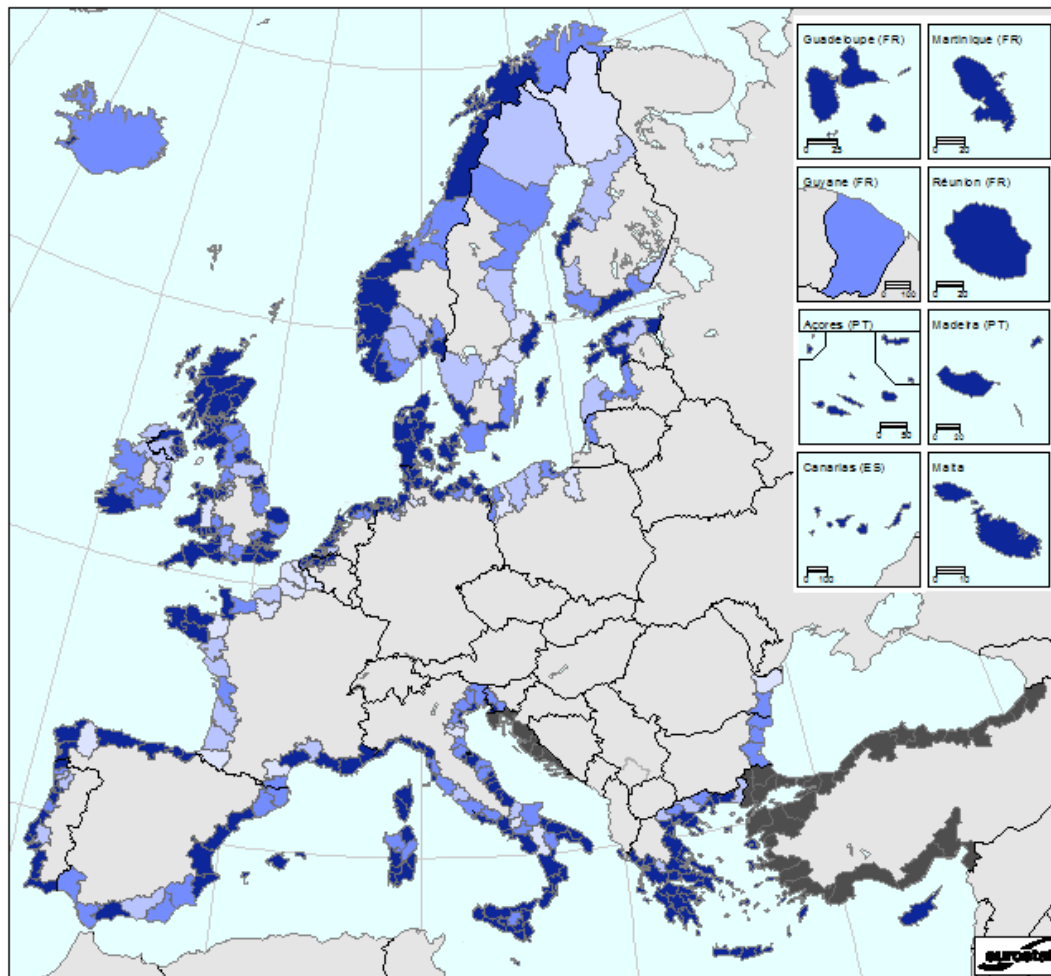
Percentage of total NUTS3 region population

%

	<= 50
	50 – <= 75
	75 – <= 95
	> 95
	Data not available

Administrative boundaries: © EuroGeographics © UN-FAO © Turkstat
Eurostat\IMAGE

Based on NUTS 2010 and population grid 2006
Source: Eurostat

The share of the regional population living in a coastal strip of 5, 15 or 50 km as the share of the regional area within 5, 15 and 50 km of the sea could also be estimated and mapped. It

is noteworthy that in all countries with a sea border the majority of the population in coastal regions lived within 50 km from the sea. However, the share of the population in coastal regions living within 15 km and 5 km from the sea showed wide disparities between the countries. Thus, as shown in Table x, 6% of the population in Belgian coastal regions lived within 5 km from the sea, this share was about 98% for Maltese coastal regions.

Table x: Share_of_population_of_coastal_regions_living_within_coastal_strips.png

**Share of population of coastal regions living within coastal strips**
Unit: (%)

	Within 5 km from the sea	Within 15 km from the sea	Within 50 km from the sea
BE	6	12	92
BG	:	:	85
DK	50	81	99
DE	23	46	64
EE	51	73	94
IE	33	57	86
EL	:	:	98
ES	46	69	94
FR	25	40	67
IT	34	55	94
CY	:	:	100
LV	18	49	88
LT	46	61	89
MT	98	100	100
NL	11	34	95
PL	17	40	72
PT	35	64	93
RO	39	47	70
SI	22	34	93
FI	43	65	86
SE	40	62	79
UK	36	63	94
IS	:	:	94
NO	62	82	94

Based on NUTS 2010 and population grid 2006

As the map series show, the share of population in coastal regions living within the coastal strips depends greatly on the strip amplitude and on the region. Thus, for the Italian region of Napoli 51% of the people lived within 5 km from the sea, 93% within 15 km and 100% within 50 km. For the Italian region of 'Campobasso' these percentages were 17% (5 km strip), 27% (15 km strip) and 51% (50 km strip), respectively.

Maps x: Share_of_population_living_within_coastal_strips_South_Italy.png
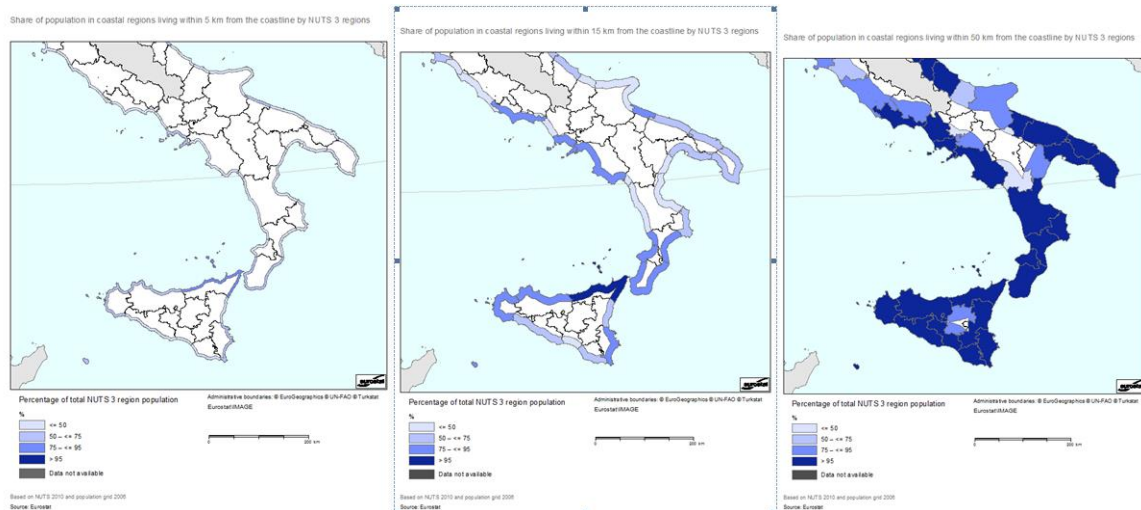
**Concentration of the population along the sea borders**

Access to the sea and by extension a coastal strip can be seen as an economic good, not a usual consumption good but an asset enjoyed by the inhabitants of a particular coastal strip. However living along the sea border may also be a risk (flood, spill), and the different concentration of the population or human activities along the coast also interact with the maritime environment. In order to evaluate the distribution and concentration of the coastal strip area (the asset) among the coastal strip inhabitants, a Gini coefficient has been calculated by country, as shown in Figure x.

The Gini coefficient measures the inequality among values of a frequency distribution. A Gini coefficient of zero expresses perfect equality, where all values are the same. For example, when 10 % of the coastal strip population live in 10 % of the coastal strip areas, 20% of the coastal strip population live in 20% of the coastal strip area, etc. A Gini coefficient of 1 (or -1 - this is a particular case) expresses maximal inequality among values.

The Gini coefficient is based on the Lorenz curve which plots the proportion of the total coastal strip area (y axis) that is cumulatively occupied by the bottom x% of the population of the coastal strip. A line at 45 degrees thus represents the perfect equality of area distribution. The Gini coefficient can then be considered as the ratio of the area that lies between the line of equality and the Lorenz curve.

In order to draw the Lorenz curve, the coastal strip of 50 km has been considered. For each country, the area and population figures were ranked by increasing area, i.e. the figures from region with the smallest coastal strip area was considered first, and so on to build the cumulative curves. The areas took into account were the surface of the coastal strip not the surface of the region.
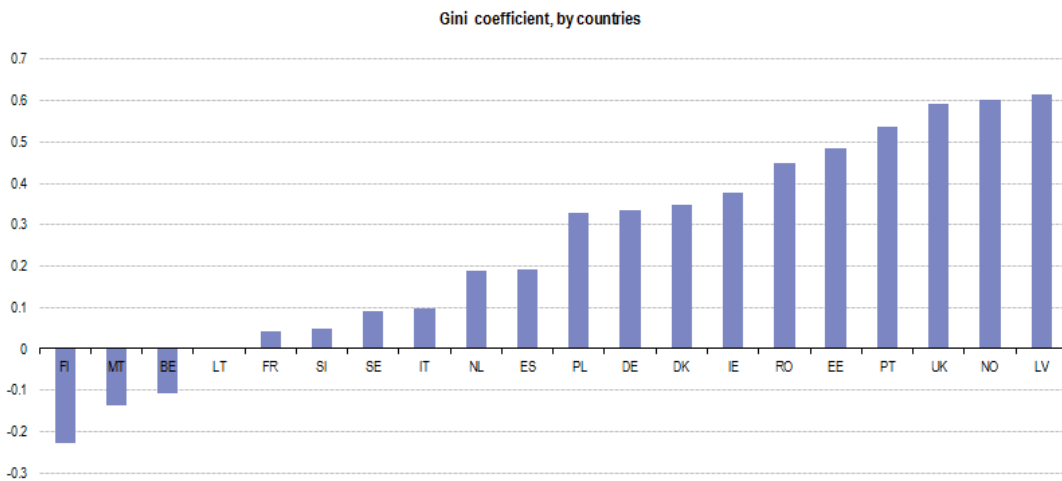
Figures x: Lorenz_curves_UK_ES_FI.png
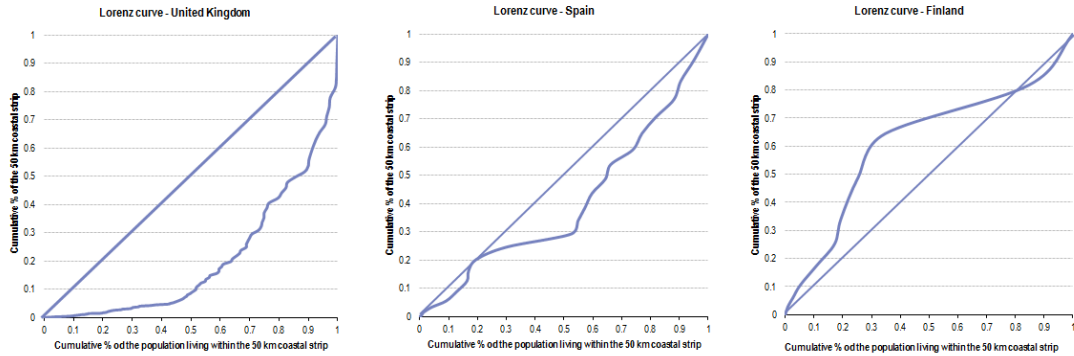
Based on NUTS 2010 and population grid 2006

Thus according to the figures the distribution of the coastal strip area was more equally distributed in Spain than in Norway as an example.

Figure x: Gini_coefficient_by_countries.png

Based on NUTS 2010 and population grid 2006

The Lorenz curve mapped for the United Kingdom, the Spain or Finland seems to underline the different patterns of the area distribution.

As shown in Figure x, around 50% of the British inhabitants living within 50 km of the sea were concentrated in 10% of the coastal strip area.

In Spain, 50% of the inhabitants living within 50 km of the sea were concentrated in 30% of the coastal strip area. In Finland, 50% of the inhabitants living within 50 km of the sea were concentrated in 70% of the coastal strip area. The pattern distribution of the population within the coastal strip was rather the same in Finland and in Spain. However, in Finland the regions with smaller coastal strips were also the regions with less coastal strip inhabitants. That is why in this particular case the Gini coefficient was negative.

Impact of NUTS 2010 and the new population grid

NUTS 2010 includes 1 294 NUTS 3 regions while NUTS 2006 included 1 303. There are now 39 new regions replacing 48 old regions. The new regions have come about as a result of mergers, splits or boundary shifts. These changes occurred in 5 Member states: Germany, Finland, Italy, the Netherlands and the United Kingdom. Of the 48 old regions, 14 were considered as coastal as shown in Table x. These regions have been replaced by 39 new regions, 15 of which are coastal. The net impact of these changes (i.e. one additional coastal region) can be called 'the NUTS' effect and is presented in Figure x.

Table x:
NUTS3_regions_with_boundary_changes_between_NUTS2006_and_NUTS2010.png

NUTS3 regions with boundary changes between NUTS2006 and NUTS2010

	Old NUTS3 regions			new NUTS3 regions		
	Coastal regions	Non coastal regions	Total	Coastal regions	Non coastal regions	Total
DE		28	28		11	11
FI	2		2	1		1
IT	5	1	6	7	2	9
NL	4		4	3	1	4
UK	3	5	8	4	10	14
Total	14	34	48	15	24	39

The other changes in NUTS 2010 compared with NUTS 2006 comprise code or label changes. In term of their boundaries, 1 255 NUTS 3 regions remained the same in NUTS 2010 compared with NUTS 2006. Of these 1 255 regions, only 10 regions belonging to 4 Member States (highlighted in Table x) have been reclassified: 9 former coastal regions can now be considered as non-coastal and the German region of Bremen can be considered as coastal.

The net impact of these changes can be termed 'the grid effect', and is presented in Figure x.

Table x:
NUTS3_regions_with_boundary_changes_between_NUTS2006_and_NUTS2010.png

NUTS 3 regions without changes between NUTS 2006 and NUTS 2010

	NUTS3 regions previously coastal		NUTS3 regions previously non-coastal		
	Coastal regions	Non coastal regions	Coastal regions	Non coastal regions	Total
EU27	423	9	1	822	1 255
BE	14			30	44
BG	3			25	28
CZ				14	14
DK	11				11
DE	39	4	1	357	401
EE	4			1	5
IE	7			1	8
EL	44			7	51
ES	31			28	59
FR	30			70	100
IT	62			39	101
CY	1				1
LV	3			3	6
LT	1			9	10
LU				1	1
HU				20	20
MT	2				2
NL	19	1		16	36
AT				35	35
PL	8	1		57	66
PT	17			13	30
RO	2			40	42
SI	3			9	12
SK				8	8
FI	9			9	18
SE	14			7	21
UK	99	3		23	125

The use of NUTS 2010 and the new population grid has affected the coastal regions' typology in two ways: the NUTS effect, due to the classification of the 39 new regions, and the grid effect, whereby some of the 1 255 unchanged regions have been reclassified as shown in Figure x. Taking into account both these effects, the updated typology now includes 7 fewer coastal regions and 2 fewer non-coastal regions, as shown in Figure x.

*Figure x: Impact_of_the_update_on_the_number_of_NUTS3_regions.png*
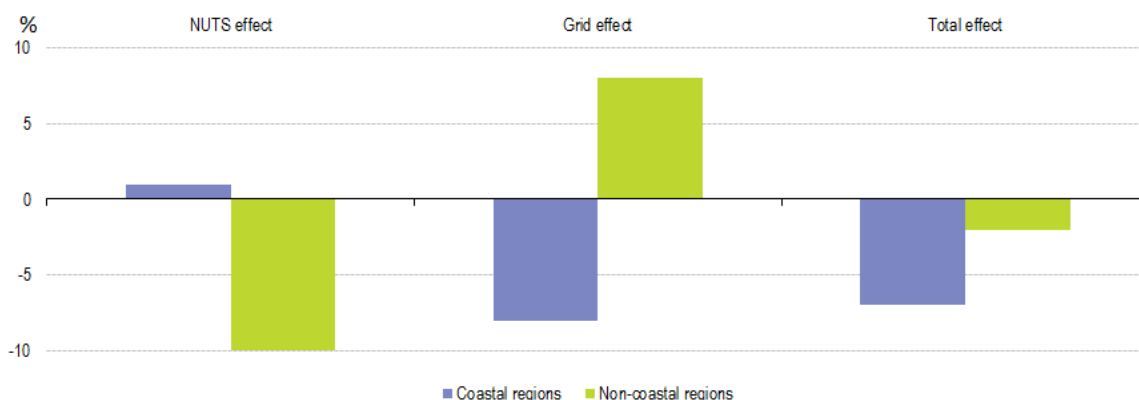
Impact of the update on the distribution of area

The update has also modified the area allocated to coastal regions. In order to evaluate the impact, the distribution of area under the updated typology can be compared with the distribution under the previous typology for a single reference year, namely 2011.

In 2011, the coastal regions covered 40.0 % of EU territory; under the former typology coastal regions accounted for 40.4 % of EU territory.

The update affects the distribution of area in only 4 Member States: Germany, the Netherlands, Poland and the United Kingdom. However, there was only a limited impact at EU level and in the Member States, except in the Netherlands.

*Figure x: Impact_of_the_update_on_area_distribution_by_coastal_region_typology.png*
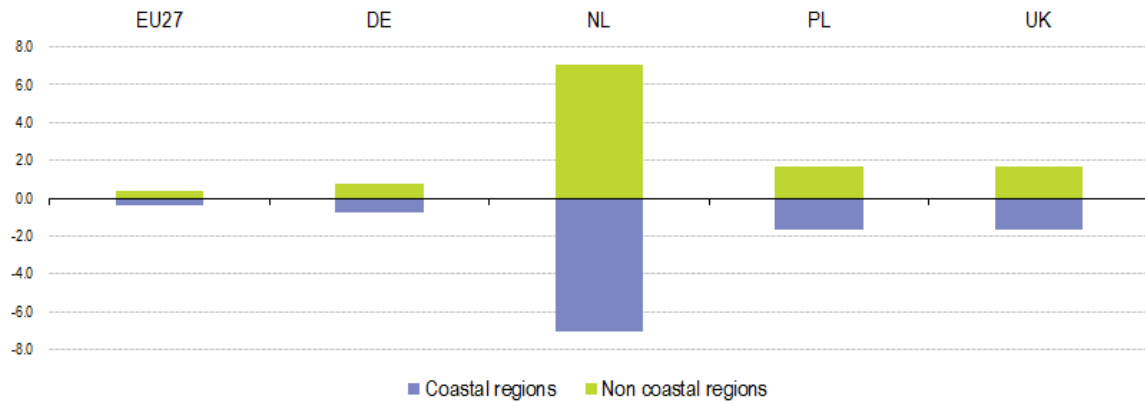
Impact of the update on the distribution of population

Concerning the area analysed in the previous paragraph, the update has also affected the proportion of the population living in coastal regions. In order to evaluate the impact, the same method of using the population for a single reference year (2011) is applied.

The distribution of the EU population by coastal region typology was only slightly affected by the update. In 2011, 502 million people lived in the EU, of which 40.8 % lived in a coastal region under the updated coastal region typology. Under the previous typology, 41.4 % of the EU population lived in a coastal region. Thus, the impact was less significant in terms of population than in terms of area, except in the United Kingdom where the population in coastal regions decreased by 3.0 percentage points while the area decreased by 1.7 percentage points, as can be seen in Figures x.

Figure x:
*Impact_of_the_update_on_population_distribution_by_coastal_region_typology.png*
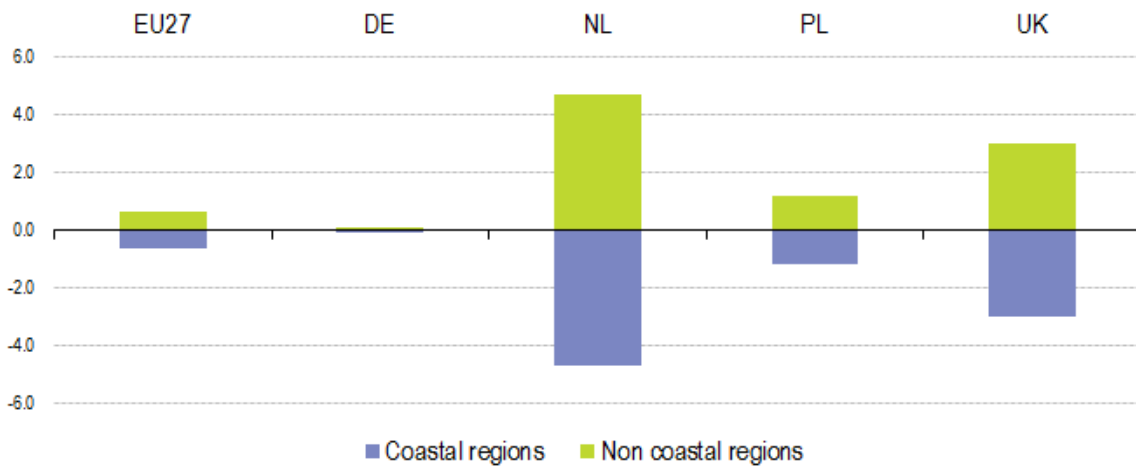
Methodology

Geo-spatial data analysis

The data created in this analysis represent the population living in coastal NUTS 3 regions, at specific distances from the coastline. The population values have been extracted from a population grid that contains population density values from 2006.

The original data was contained in the population grid file, which is a raster file containing pixel values. These values needed to be displayed on a NUTS 3 level, requiring a transition from the raster to vector format. A further requirement was that the population was to be calculated for coastal strips 5, 15 and 50 km wide.

Maps x: Map_population_to_population_within_coastal_strip.png
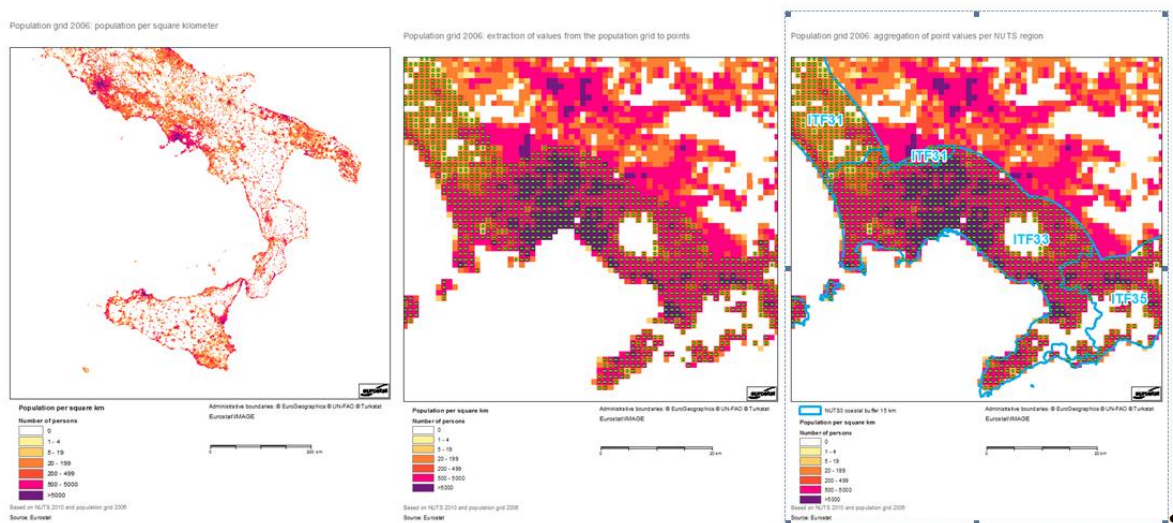
The first step was to create zones along the coastline at the specified distances (also called coastal strips). Then the coastal regions layer had to be clipped with each coastal strip, yielding four new layers for the coastal regions. From the population grid three clips were created, containing only the pixels existing within the coastal regions' 5, 15 and 50 km coastal strips.

The population density values from the grid were extracted to points, so that every point generated contained the value of the underlying one grid pixel. In order to calculate the population values per NUTS regions, the points must be associated with their respective NUTS 3 regions. This was done by performing a spatial join, which adds the appropriate NUTS code to all points.

At this point in the analysis, each point still had its own population value, so the values were summarised by NUTS code. This gave the total population per coastal NUTS 3 region in a table.

To display these total population values on a map, the values had to be joined to the coastal strips from polygons of NUTS regions. This gave the coastal strips with their population values allowing them to be displayed in the right colours on a map.

Population grid

Statistical grid data are data which are geographically referenced to a system of (usually squared) grid cells in a grid net with Cartesian coordinates. One of the first results of the GEOSTAT project has been a prototype European population grid dataset for the reference year 2006 at 1 km² resolution. The GEOSTAT 2006 dataset contains the total population of the four EFTA countries and all EU countries, with the exception of Cyprus, for which no LAU2 population data were available for the reference year 2006. 12 European countries provided national statistical grid data derived from point data sources, in most cases geo-referenced population and address registers. The remaining 18 grid datasets were produced using a spatial disaggregation model.

Population on 1 January should be based on the concept of usual resident population, and is the number of inhabitants of a given area on 1 January of the year in question (or, in some cases, on 31 December of the previous year). The population figures can be based on data from the most recent census adjusted by the components of population change produced since the last census, or based on population registers.

Total area represents the total area of the region including inland waters; it is expressed in km^2.

A **coastal strip** is a land area of x km wide along the coastline