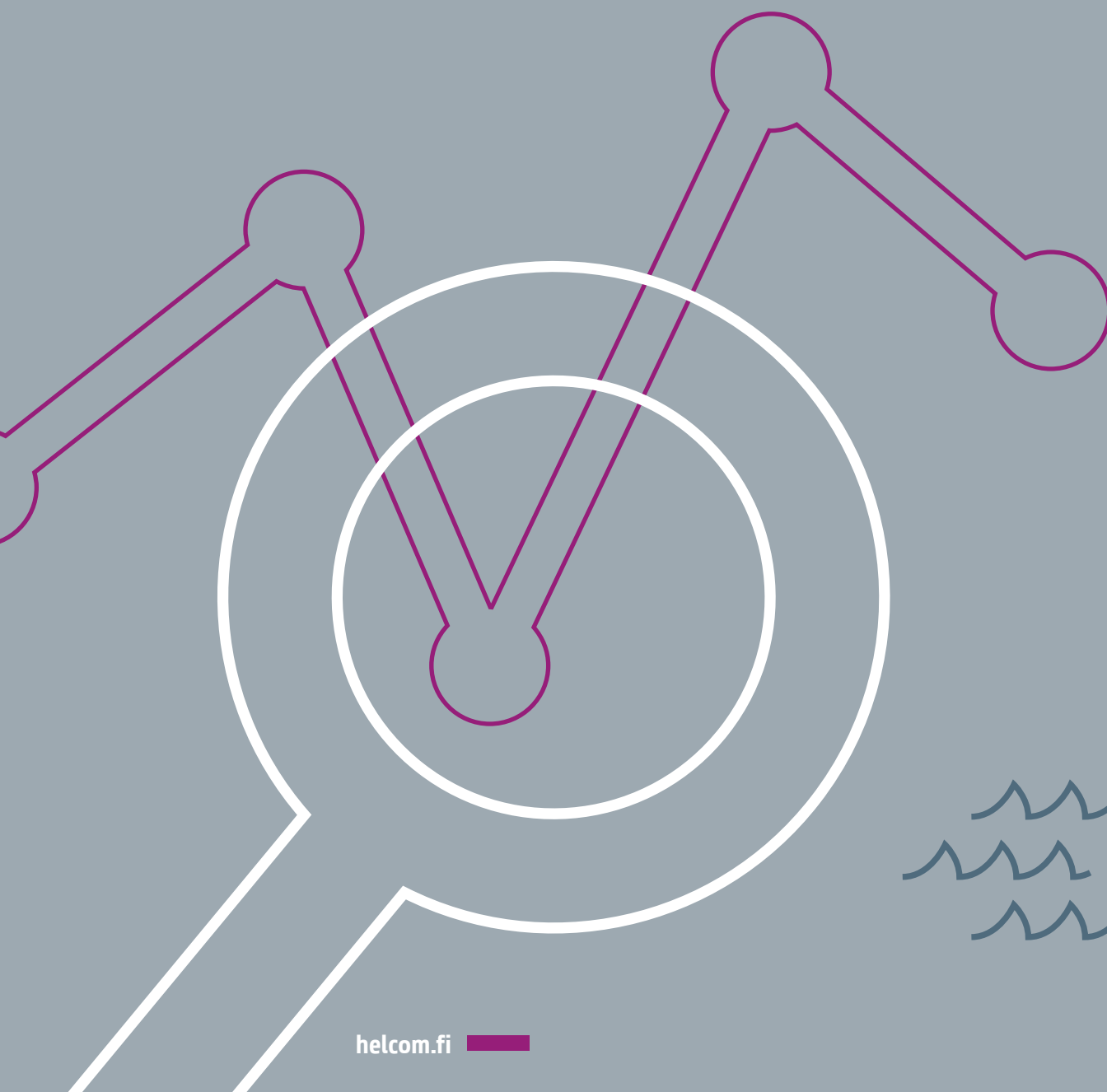




Background information on the Baltic Sea catchment area for the Sixth Baltic Sea Pollution load compilation (PLC-6)


Baltic Marine Environment
Protection Commission

Monitoring & assessment



Background information on the Baltic Sea catchment area for the Sixth Baltic Sea Pollution load compilation (PLC-6)

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1 – Division of the Baltic Sea

The total Baltic Sea catchment area comprises 1,729,500 km² being more than four times larger than the surface area of the Baltic Sea. For PLC-water the sea is divided into nine sub-regions (Fig. 1). Nearly 93% of the catchment area belongs to the nine coastal HELCOM Contracting Parties and the remaining 7% lies within the territories of Non-Contracting Parties (Norway, Ukraine, Belarus, Slovakia and Czech Republic).

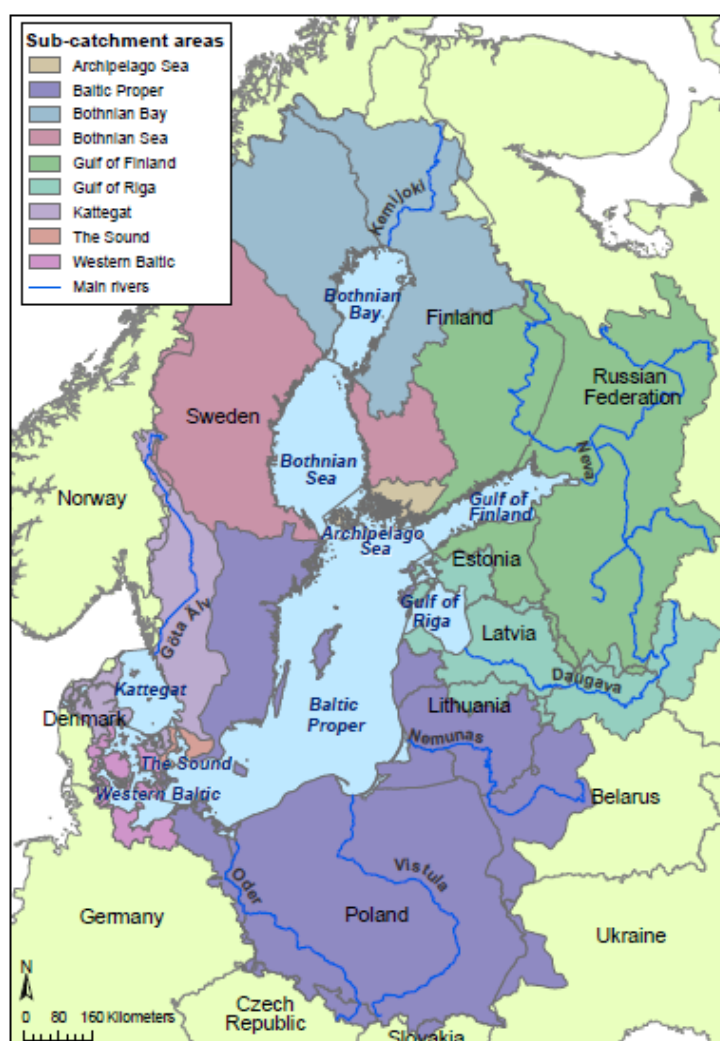


Figure 1. The Baltic Sea catchment area, the sub-basins as defined for PLC-Water and the seven largest rivers discharging into the Baltic Sea.

The Baltic Proper and the Gulf of Finland are the largest sub-basin catchment areas of the Baltic Sea, covering 572,050 km² (33%) and 422,580 km² (24%), respectively (Table 1), whereas the Archipelago Sea and the Sound have the smallest catchment areas. Sweden possesses the largest portion of the Baltic Sea catchment area, 440,050 km² (25%) and the next largest national catchment areas are those of Russia, Poland and Finland, all of which are larger than 300,000 km². Germany has the smallest proportion of the catchment area of all the HELCOM countries, at 28,600 km² (1.7%). The total catchment area outside the borders of the Contracting Parties is 125,030 km², mostly within Belarus.

Table 1. Division of the Baltic Sea catchment area between Contracting Parties and non-Contracting Parties for each sub-basin (km²).

Sub-basins/ country	Gulf of Bothnia			Gulf of Finland	Gulf of Riga	Baltic Proper	Belt Sea		The Kattegat	Total
	Bothnian Bay	Bothnian Sea	Archi- pelago Sea				Western Baltic	The Sound		
Contracting Parties										
Finland	146,000	39,300	8,950	107,000	-	-	-	-	-	301,250
Russia	-	-	-	285,580	18,500	12,500	-	-	-	316,580
Estonia	-	-	-	26,400	17,600	1,100	-	-	-	45,100
Latvia	-	-	-	3,600	49,600	11,400	-	-	-	64,600
Lithuania	-	-	-		11,140	54,160	-	-	-	65,300
Poland	-	-	-	-	-	311,900	-	-	-	311,900
Germany	-	-	-	-	-	18,200	10,400	-	-	28,600
Denmark	-	-	-	-	-	1,200	12,340	1,740	15,830	31,110
Sweden	113,620	176,610	-	-	-	83,230	-	2,890	63,700	440,050
Total	259,620	215,910	8,950	422,580	96,840	493,690	22,740	4,630	79,530	1,604,490
Non-Contracting Parties										
Belarus					33,300	58,050				91,350
Ukraine						11,170				11,170
Czech Republic						7,190				7,190
Slovakia						1,950				1,950
Norway	1,060	4,860							7,430	13,350
Total Baltic Sea catchment areas including Contracting Parties and Non-Contracting Parties										
Total	260,680	220,770	8,950	422,580	130,140	572,050	22,740	4,630	86,960	1,729,500

2 – Climate and hydrology

2.1 Climate in the Baltic Sea catchment area

The sub-areas of the Baltic Sea vary considerably in respect of climatological conditions: The climate is Atlantic-temperate in the south-western part, more continental temperate in the eastern part, boreal in the northern parts and arctic in the very northernmost part. Long winters in the northern parts, with snow cover and soil frost, decreases nutrient leaching from soils and the major share of annual riverine material export occurs during the spring thaw. Topography also plays an important role especially for precipitation amounts, which tend to be greater at high altitudes. In addition, there are land-sea contrasts in temperature and precipitation. This aspect is illustrated on figure 2 by average monthly normal precipitation and monthly temperature from several climate monitoring stations in the Baltic Sea catchment area. The location of these climate monitoring stations is shown on figure 3 and the detailed data in annex 1.

The input of nutrients to the marine environment is largely dependent on human activities in the catchment area, but variations in meteorological and hydrographical conditions also have a significant impact on the amount of nutrients entering the sea. Increased precipitation increases runoff from land, and wet years generally result in increased nutrient losses and inputs from diffuse sources to surface waters, including marine waters. Overall, runoff is governed by precipitation and evaporation over land and inland water bodies as well as changes in stored precipitation as snow and ice on land and in lakes and groundwater.

The total long-term mean flow rate via all rivers discharging into the Baltic Sea is about $15,200 \text{ m}^3 \text{ s}^{-1}$ ($480 \text{ km}^3 \text{ a}^{-1}$ or $8,8 \text{ l s}^{-1} \text{ km}^{-2}$), of which nearly half drains into the Baltic Sea via the seven largest rivers, namely the Neva, the Vistula, the Daugava the Nemunas, the Kemijoki, the Oder and the Göta Älv (HELCOM 2015).

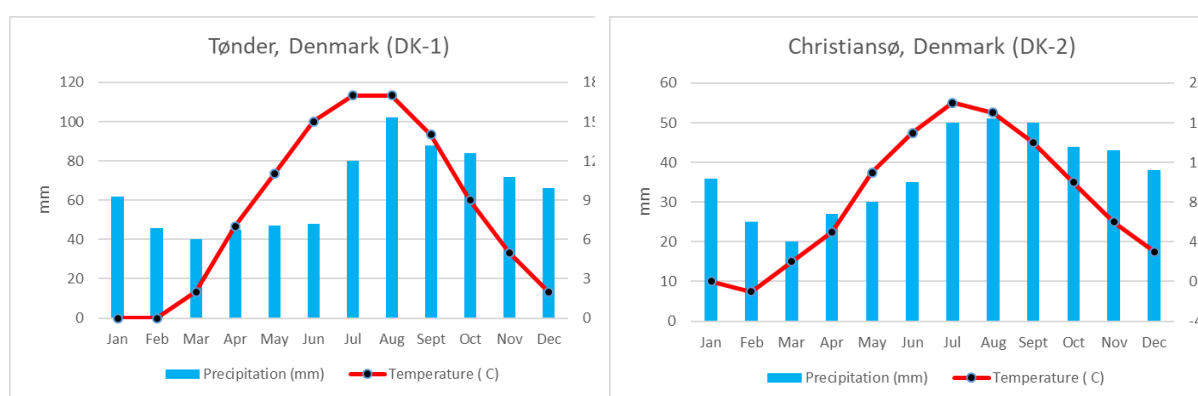












Figure 2. Monthly normal average temperature and precipitation from selected climate monitoring stations within the Baltic Sea catchment area (normal period is mainly 1961-1990). The location of these stations are shown in figure 3. The detailed data are in annex 1 together with data on monthly sunshine hours. Main source: Cappelen, J. & Jensen J.J: (2017): "Earth Climate - Guide on weather and climate in 156 countries (update). Technical Report (ONLINE) 01-17: https://www.dmi.dk/fileadmin/user_upload/Rapporter/TR/2001/tr01-17.pdf

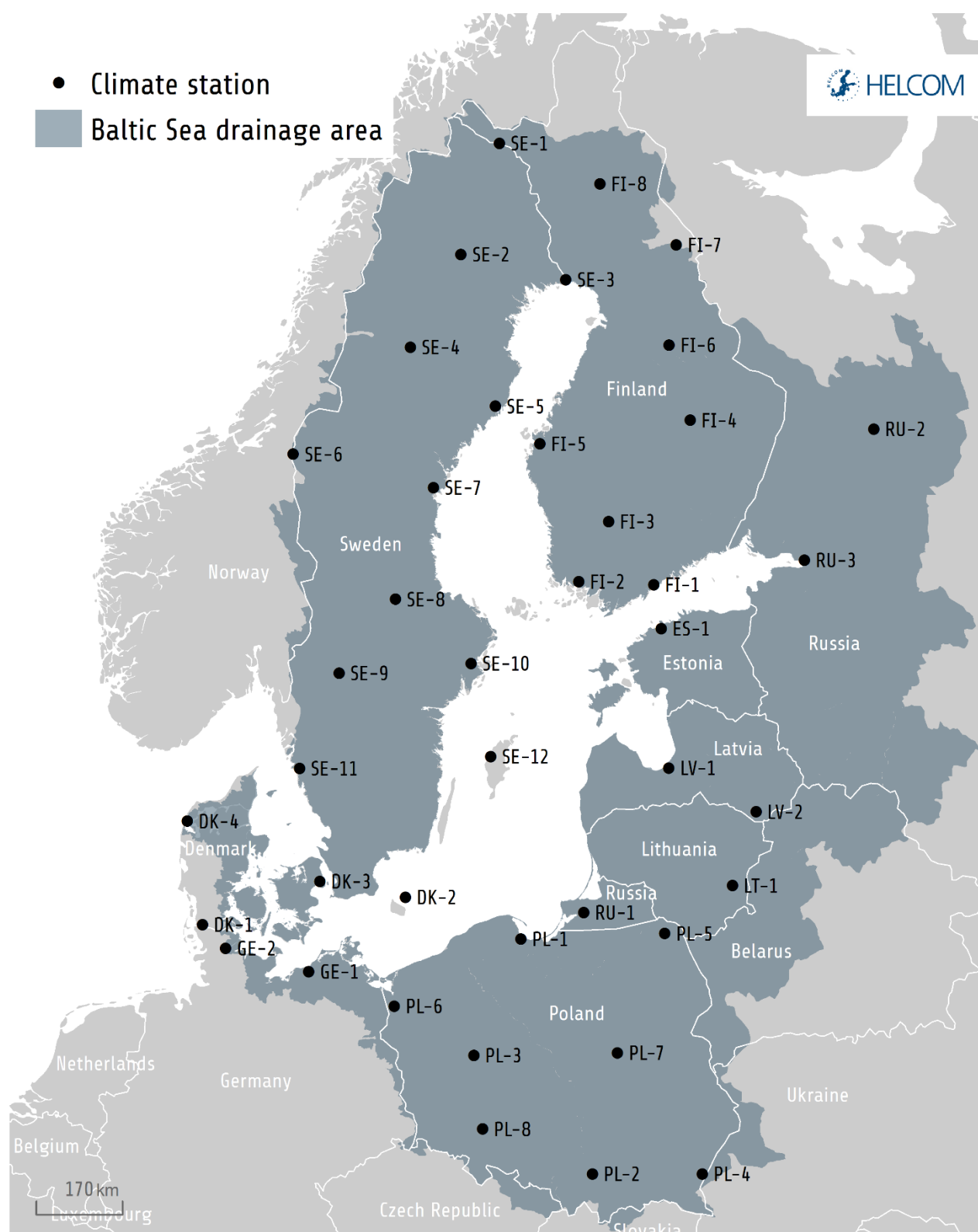


Figure 3. Location of the climate monitoring station from figure 2.

2.2 Climate change

In the Baltic Sea region climate change has been reflected in a decrease in the number of very cold days during winter as well as a decrease in the duration of the ice cover and its thickness in many rivers and lakes, particularly in the eastern and south-eastern Baltic Sea basin (HELCOM 2007). In addition, the length of the frost-free season has increased and an increasing length of the growing season in the Baltic Sea basin has been observed during this period, especially during the past 30 years. Scientists predict that in association with further warming, there would be changes in precipitation patterns, both geographically and seasonally (Fig .4). A general increase in annual precipitation is projected for the whole Baltic Sea basin, especially the northern parts. Seasonally, the increase in precipitation mainly would occur in winter. Regionally, the southern areas of the basin would be drier than northern areas, particularly during summer. These changes in precipitation will affect the runoff into the Baltic Sea, with potential increases in mean annual river flow in the northern catchments and decreases in the southernmost ones (HELCOM 2007). Furthermore, there is a risk that more extreme precipitation events will create a higher frequency of, and more extreme, flooding and more soil and river bank erosion. Higher temperatures and longer growing seasons may further induce new or modified practices in agriculture and forestry and extend agricultural areas to the north, but the effects of such changes are generally difficult to predict.

In the northern Baltic Sea region, soil frost and snow cover help to reduce leaching of pollutants during a large part of the year, and therefore warmer winters with less snow and soil frost will likely result in greater runoff and consequently higher nutrient loads. Furthermore, with more extreme rainfall events, more erosion will take place and enhance particulate inputs to surface waters. The change in the seasonal distribution of the discharge regime of major boreal rivers has potentially large impacts on the redistribution of organically bound carbon and nutrients from land to sea. Areas with a mean annual temperature around 0 °C (i.e. around 61°N) are most sensitive to further warming (Storch et al. 2015).

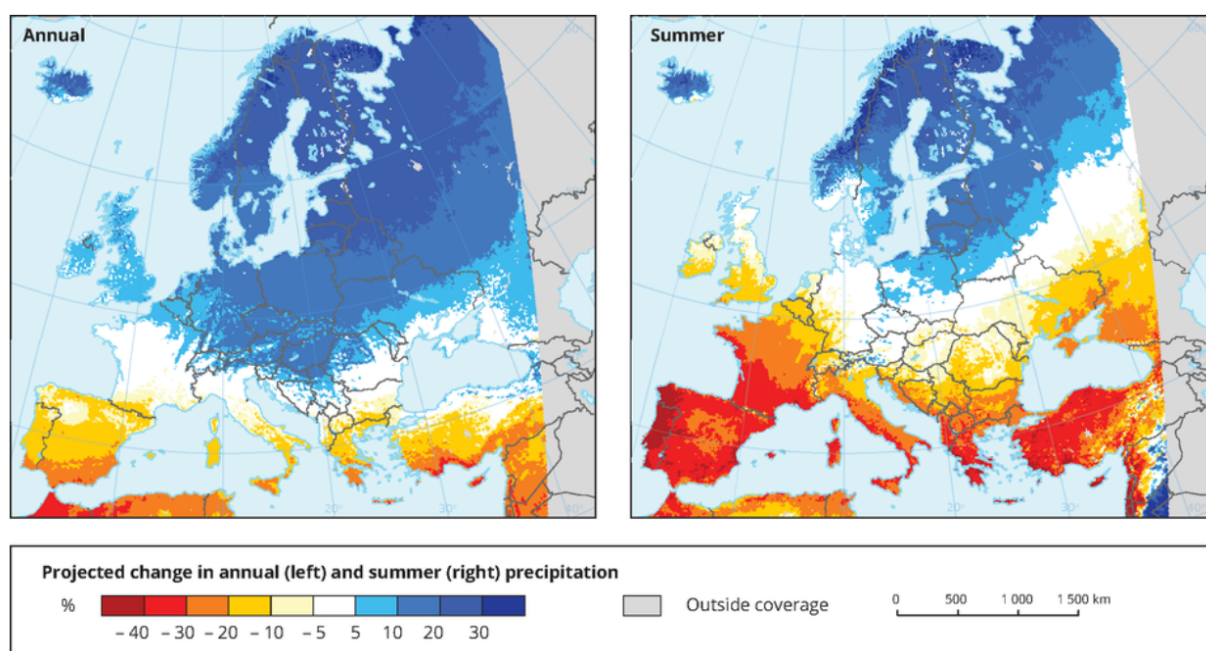


Figure 4. Projected changes in annual (left) and summer (right) precipitation (%) in the period 2071-2100 compared to the baseline period 1971-2000. Source: EEA (<https://www.eea.europa.eu/data-and-maps/indicators/european-precipitation-2/assessment>).

3 – Catchment properties and land use

The northern parts of the Baltic Sea catchment area are dominated by forests and peatlands, whereas southern and south-western parts of the catchment are dominated by cultivated areas (Fig. 5). Forests cover over half of the land area in Finland (72%), Sweden (69%), Estonia (58%), Russia (55%), and Latvia (52%). Cultivated areas cover over half of the Danish (61%) and Polish (60%) land area (Table 2). In the Gulf of Finland catchment area, like in south-western Sweden, lakes cover large parts of the drainage basin retaining part of pollution load.



Fig. 5. Land cover in the Baltic Sea catchment area. (Source: CORINE land cover 2006).

Table 2. Land cover and land use of the Baltic Sea catchment by countries (%) and total areas by classes (km²). Source Corine land cover 2012; Federal State Statistics Service of Russia 2009.

	DK	EE	FI	DE	LV	LT	PL	RU	SE	Total
	%	%	%	%	%	%	%	%	%	%
Year of data	2012	2012	2012	2012	2012	2012	2012	2009	2014	
Cultivated areas	61	21	7	46	29	37	60	12	7	22
Forests	13	58	72	27	52	34	31	55	69	53
Surface waters	2	5	10	4	2	2	2	17	9	8
Paved (urban) areas	14	2	2	9	2	3	5	2	3	3
Others	10	14	9	14	16	24	2	14	12	13

4 – Human pressures

4.1 Population

Over 84 million people live in the Baltic Sea catchment area, of which 64% are in the catchment of the Baltic Proper sub-basin. Forty-five percent of the total population living in the entire Baltic Sea catchment area live in Poland. The highest population densities are in the southern parts of the catchment area (Fig. 6, and Table 3). Cities with large human populations and intense industrial activities are considered major point sources, although effective wastewater treatment can significantly reduce pollution inputs. Rural populations, with little or no treatment of sewage discharges can also have a significant impact on nutrient inputs.

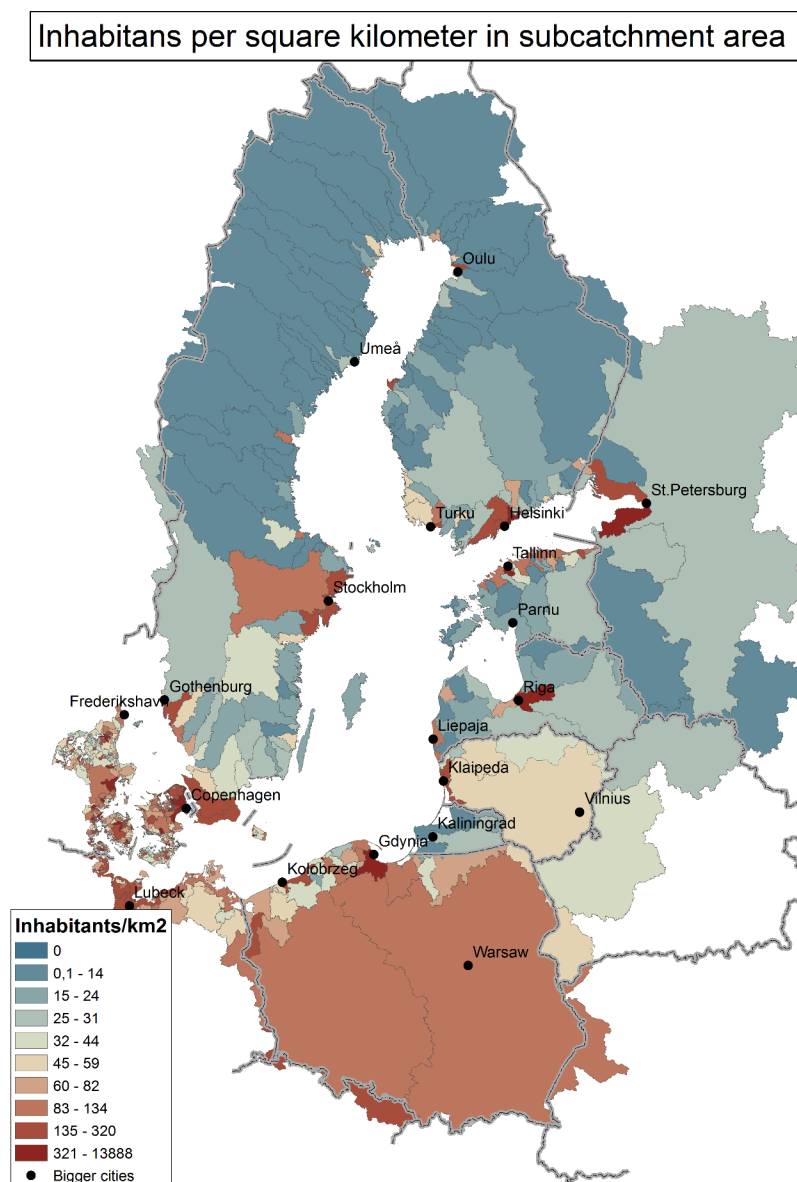


Figure 6. Population density (inhabitants km⁻²) within the Baltic Sea catchment area. Source: Census 2001 (EUROSTAT), Russia: NASA Socioeconomic Data and Applications Center (SEDAC) Gridded Population of the World version 4.

Table 3. Population and surface areas of the Baltic Sea catchment area and sub-regions in 2010.

Country	Country area (km ²)	Baltic Sea catchment area (km ²)	Total population in the catchment (in thousands) *	Catchment population density (persons km ⁻²)
Contracting Parties				
Poland	312 700	311 900	38 500	123
Russia	17 098 200	304 080	8 400	28
Sweden	450 300	440 050	9 500	22
Finland	338 400	301 400	5 500	18
Denmark	43 100	31 100	5 100	164
Lithuania	65 300	65 300	2 900	44
Germany	357 100	28 600	4 400	154
Latvia	64 600	64 600	2 200	34
Estonia	45 100	45 100	1 300	29
Non Contracting Parties**				
Belarus	207 600	91 350	4 000	44
Ukraine	603 700	11 170	1 800	161
Czech Republic	78 900	7 190	1 600	223
Slovakia	4 900	1 950	200	103
Norway	323 900	13 370	20	1

* In 2014

**In 2010

4.2 Municipal wastewaters and scattered dwellings

In 2014 loads from altogether 5922 municipal wastewater treatment plants were reported to the HELCOM PLC database (Table 4). The clear majority (92%) of the plants were discharging wastewaters into inland waters (i.e. indirectly) and 43% of the plants were situated in Poland.

Phosphorus removal from municipal wastewaters in the Baltic Sea catchment has improved considerably during the last decade. By contrast, efficient N removal is a more recent development, and there are several wastewater treatment plants (WWTPs) that still require upgrading. St Petersburg is a good example of improved wastewater treatment: Before 1978, almost all wastewaters from St Petersburg were discharged untreated into the GOF or the River Neva, but nowadays the capacity has increased to 98.5% (Vodokanal, 2015) and the nitrogen load has decreased by 60% and the phosphorus load by 90% (Knuuttila et al. 2017).

Table 4. Direct and indirect Municipal wastewater treatment plants in 2014 reported to the HELCOM PLC database.

Country	Direct	Indirect	Total
DE ¹	29	87	30
DK ²	208	501	709
EE ¹	14	15	29
FI ³	47	337	384
LT ³	7	677	684
LV	5	26	31
PL ¹	29	2533	2562
RU ^{4*}	13	7	20
SE ⁵	135	47	182
Total	487	4143	4630

¹ Reported for plants > 2,000 PE

² Reported for plants > 30 PE

³ Reported for plants > 200 PE

⁴ Reported aggregated per river per Baltic sub-basin

⁵ Reported for plants > 2,000 PE, and aggregated pr. river basin for plants 200-2,000 PE

* Russia reported quantity for indirect sources as a sum by catchment. Number of indirect WWTP 236 (in 2014). Number of direct WWTP 15 (in 2014).

There has been a steady increase in the percentage of the population connected to secondary and tertiary wastewater treatment systems (Table 5). Connectivity to wastewater treatment plants has especially increased in Lithuania, Poland and Russia, which has been reflected in a decreased P load from scattered dwellings.

Table 5. Percentage of population connected to urban wastewater collection and treatment systems. Source of the data for the year 2004: PLC-5 Report.

Country	2004	2014
Denmark	89	85
Estonia	72	82
Finland	81	82
Germany	94	92
Latvia	70	76
Lithuania	59	80
Poland	58	72
Russia	60	83
Sweden	86	87

4.3 Industrial wastewaters

In 2014 loads from altogether 1983 industrial wastewater treatment plants were reported to the HELCOM PLC database (Table 6). Most of them (91%) were discharging their wastewaters into inland waters. Finland had the largest share of industrial plants (43%), many of them being peat production areas, which are included in industrial point sources. Russia did not report any industrial plants discharging wastewaters into inland waters.

Table 6. Direct and indirect Industrial plants in 2014 reported to the HELCOM PLC database. Russia report aggregated per river per Baltic Sea catchment. For direct industry also some other countries has reported industrial inputs aggregated.

Country	Direct	Indirect	Total
DE	6	1	7
DK	42	77	119
EE	4	10	14
FI	60	864	924
LT	8	53	61
LV	9	19	28
PL	1	570	571
RU'	2	7	9
SE	52	29	81
Total	184	1630	1814

' Russia reported quantity for indirect sources as a sum by catchment. Number of indirect industrial sources 736 (in 2014). Number of direct industrial sources 37 (in 2014).

4.4 Aquaculture

In 2014 loads from altogether 382 aquaculture plants were reported to the HELCOM PLC database (Fig. 7A). Inland plants were more common as they comprised 57% of the plants. Nearly half of the plants were in Finland and around 30% in Denmark. There was a clear difference between these two countries: Danish aquaculture plants are situated in inland waters (Fig. 7B), whereas Finnish plants are in coastal waters, especially in the Archipelago Sea region (Fig. 7C).

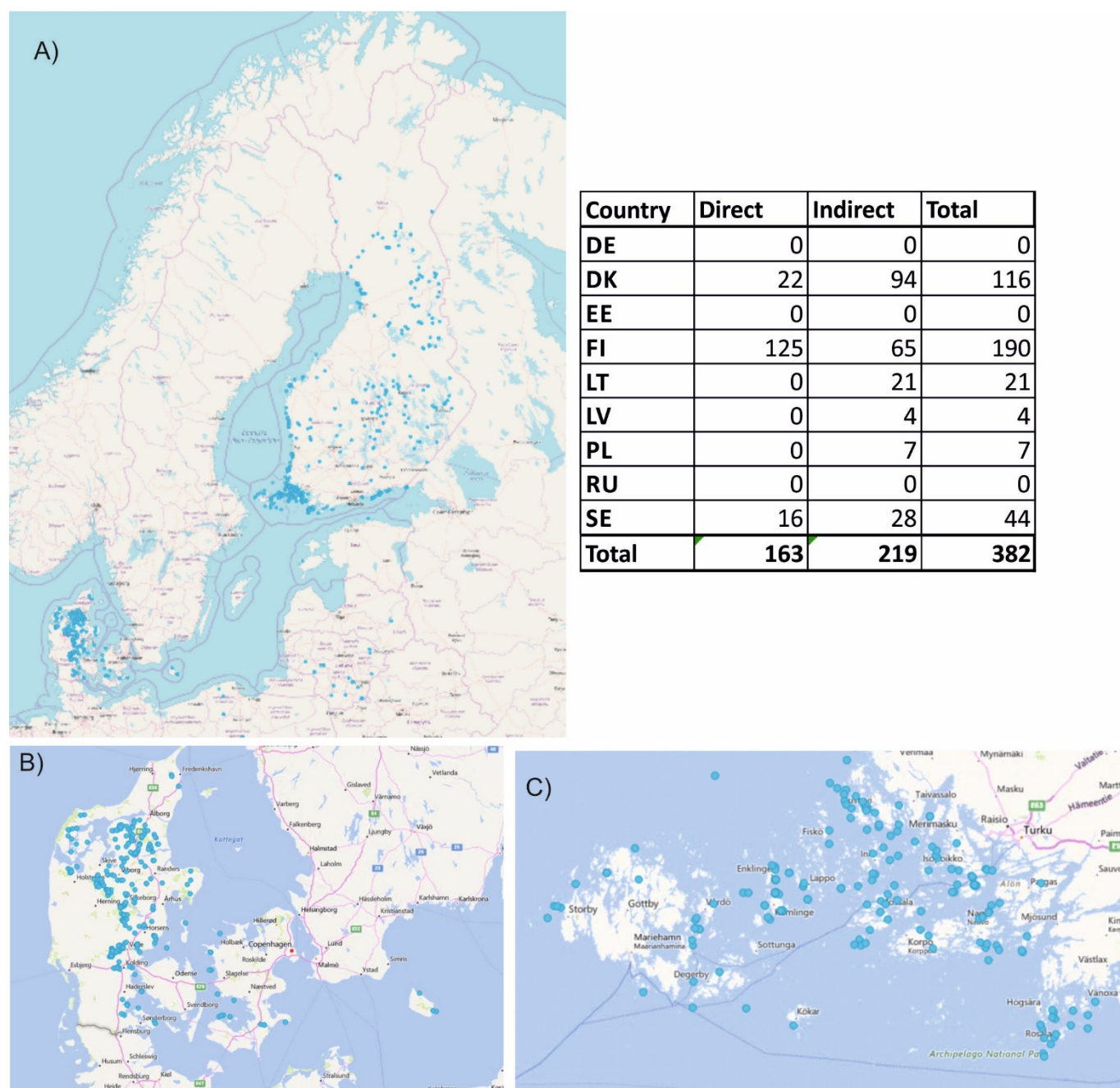


Figure 7. Aquaculture plants in 2014 reported to the HELCOM PLC database (blue spots), A) in the Baltic Sea's coastal waters and its catchment, B) in Denmark, and C) in the Archipelago Sea. Note: Russian and Swedish plants were aggregated and therefore they are not shown on the map.

4.5 Agriculture

Agriculture is a major source of nutrient inputs to the Baltic Sea. Reducing nutrient loads from agriculture is more complicated than cutting loads from point sources, because leaching of nutrients may continue to be at a high level for decades after the reduction of fertilisation usage. Although the implementation of agri-environmental measures is expected to promote reductions in nutrient loads from agriculture, there is evidently a considerable time lag between the implementation of agricultural water protection measures and visible effects in waterbodies. Denmark, Germany, Poland and Lithuania have the highest proportion of agricultural areas of the total land area (Fig. 8). Poland has clearly the highest cultivated land area (187,000 km²) followed Sweden (30,400 km²) and Lithuania (24,292 km²) (Table 7).

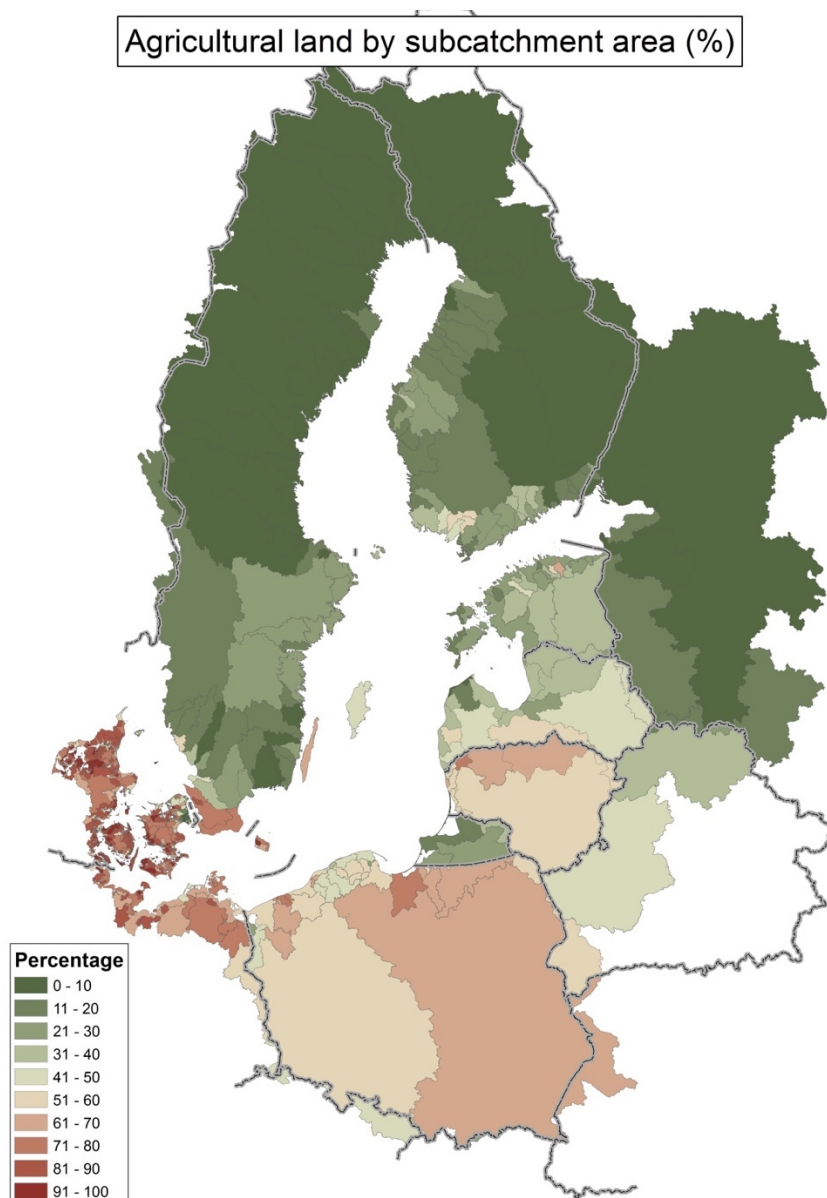


Figure 8. Proportion of agricultural land area by sub-catchments. Source: Corine 2012, Russia: NASA Global Land Cover Facility (GLCF).

4.5.1 Cultivation and fertiliser usage

Agricultural land area covered 358 000 km² (e.g. 21%) of the Baltic Sea catchment area (based on 2014 data). The countries with the most intensively cultivated areas were Denmark (61% of the land area under cultivation), Poland (60%) and Germany (46%), whereas Sweden (7%) and Finland (7%) had the lowest proportion of arable land. There were no extensive changes in the agricultural land area since 1995 except the increase in Lithuania. The cultivated area has slightly increased in Finland, Germany and Poland, whereas it faintly decreased in Denmark and Sweden (Fig. 10).

Approximately half of the phosphorus fertilisers were in organic form and respective portion of nitrogen fertilisers was 30% in 2014. Poland had the highest amount of fertiliser usage: 247 00 t of applied phosphorus fertiliser (organic & mineral) and 1.6 Mt applied nitrogen fertiliser, but Germany and Denmark had the highest application rates per cultivated land area (Table 7). Livestock intensity, expressed in life stock units per square kilometre, was highest in Denmark and Germany and lowest in Estonia, Latvia and Lithuania (Table 7 and Figure 9).

Table 7. Agricultural area, fertiliser usage per agricultural land and livestock units per agricultural land in 2014.

	DE	DK	EE ^{1), 2)}	FI	LT	LV	PL	RU ³⁾	SE
Agricultural area (km²)	14 297	19150	9709	22297	24292	18725	187170	8053,2	30361
Nitrogen kg ha⁻¹ agricultural land									
Mineral fertiliser	107	84	25	66	67	39	59	106	60
Organic fertiliser	85	73	13	45	22	n.a.	27	54	40
Total fertiliser	192	156	38	111			86		99
Phosphorus kg ha⁻¹ agricultural land									
Mineral fertiliser	8	5,8	8,9	5,3	8,0	5,5	8,0	19,9	4,0
Organic fertiliser	17	13	5,2	7,8	4,0	n.a.	5,8	14,2	6,4
Total fertiliser	25	19	14	13			14		10
Livestock units km⁻² agricultural land									
Poultry	31	27	13	27	20	21	39	46	32
Cattle	90	40	20	30	20	24	23	29	34
Pigs	55	169	11	17	9	6	19	35	14
Others	26	7	10	7	6	6	2	2	29
Total livestock units	202	243	54	82	55	57	83	112	109

¹⁾ Agricultural area from the year 2013.

²⁾ Organic fertiliser data from the year 2011.

³⁾ Utilized agricultural area, fertiliser application rates, as well as livestock density assessed based on the official statistics data.

The usage of fertilisers has been gradually decreasing in Denmark, Finland, Sweden and Germany (only phosphorus fertilisers) since 1995 (Fig. 10 and 11). The decrease has been more evident in the application of phosphorus fertilisers compared to nitrogen fertilisers. In Latvia and Lithuania the application of mineral fertilisers have remarkably increased from 2006 to 2014.

Livestock units per sq. km of agricultural land

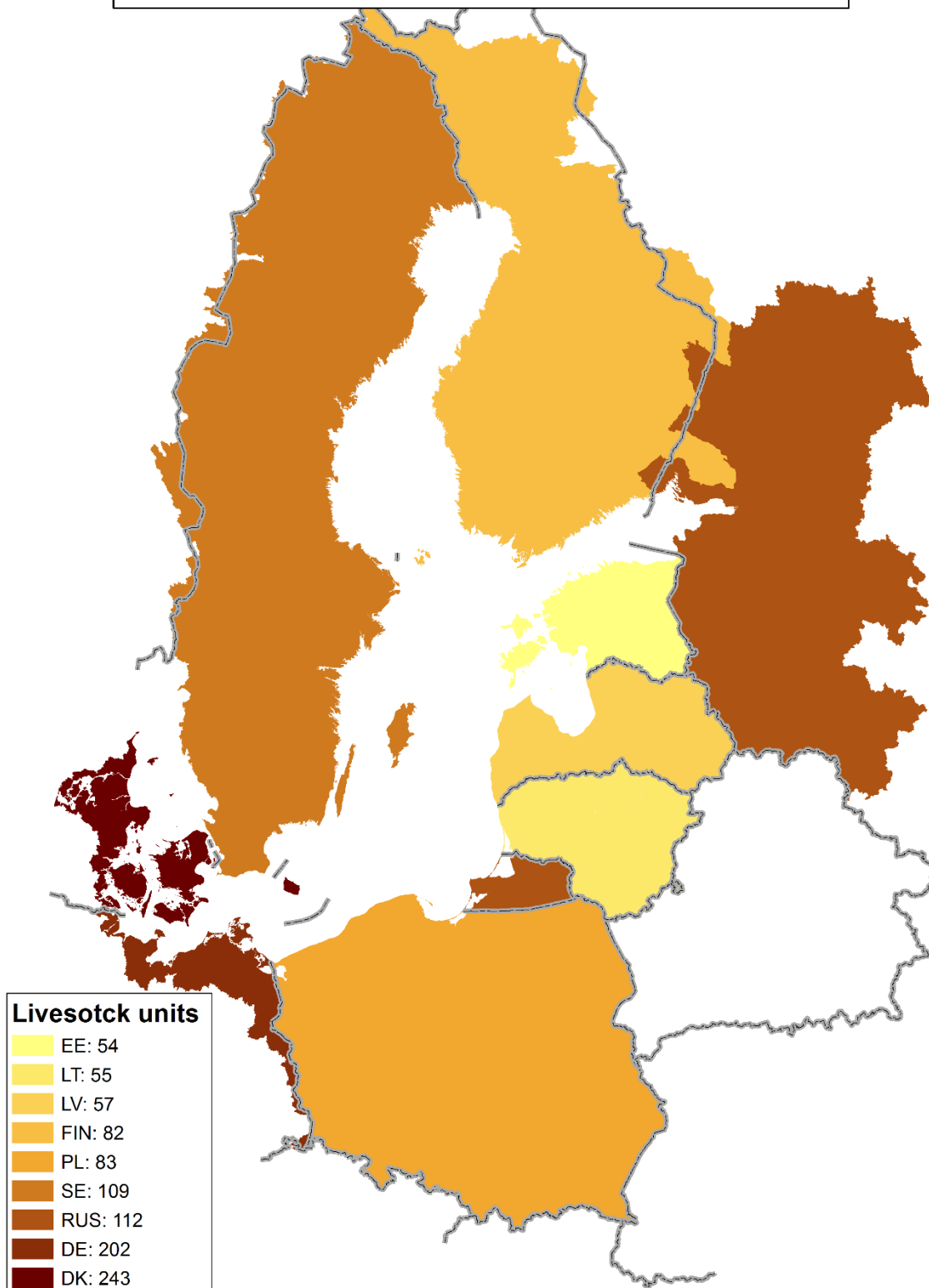


Figure 9. Livestock units per agricultural area in 2014



Figure 10. Agricultural land area and nitrogen in applied mineral and organic fertilisers.



Figure 11. Agricultural land area and phosphorus in applied mineral and organic fertilisers.

4.5.2 Animal husbandry

In 2014 the total number of animals in different animal husbandry classes in the Baltic Sea area was: 201 million poultry, 28.2 million pigs, 12.1 million cattle and 2.6 million animals belonging to the class others (etc. horses, sheep, goats) (Fig. 12). Even if poultry clearly dominated the total number of animals, their respective proportion of the livestock units was only little bit higher than the respective proportions of cattle and pigs (Fig. 12). The livestock unit (LSU) is a reference unit, which aggregates livestock from various species via the use of specific coefficients established on the basis of the nutritional requirement of different animal species. It can also be used to compare different animal husbandry classes as a potential source of nutrient load.

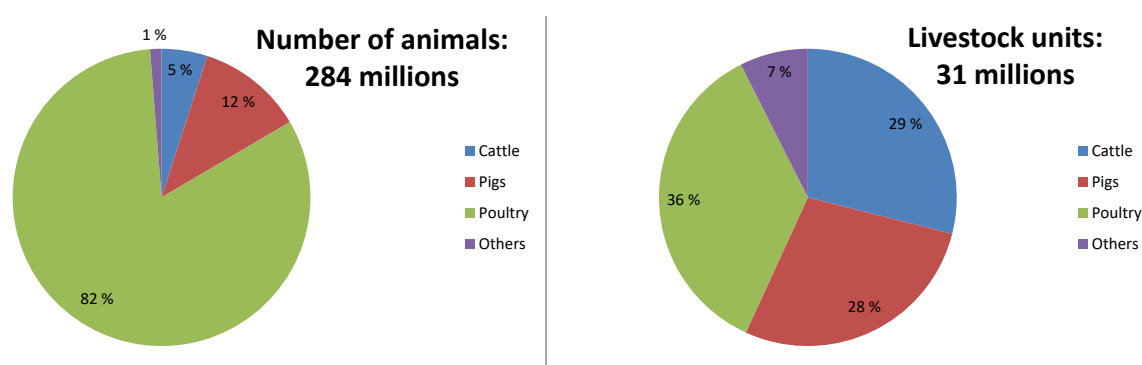


Figure 12. Number of animals in the Baltic Sea catchment and the respective livestock units in 2014.

Poland has the largest number of animals: 55% of poultry (Fig. 13), 45% of cattle (Fig. 14) and 39% of pigs (Fig. 15) in 2014. Denmark had a big share (36%) of pigs and Russia of poultry (17%). The Baltic States had the lowest number of animals. The most dense husbandry number (domestic animals per catchment area) was found in Germany and Denmark.

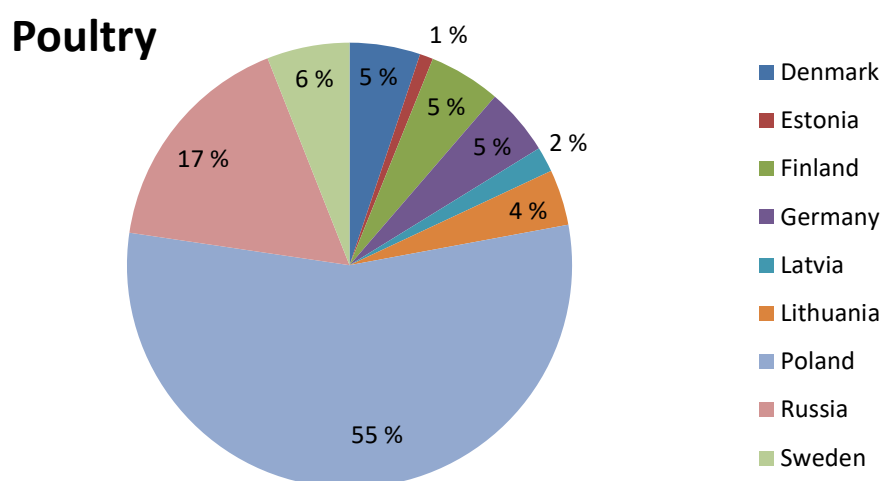


Figure 13. Proportions (%) of poultry in the Baltic Sea catchment divided by countries in 2014.

Cattle

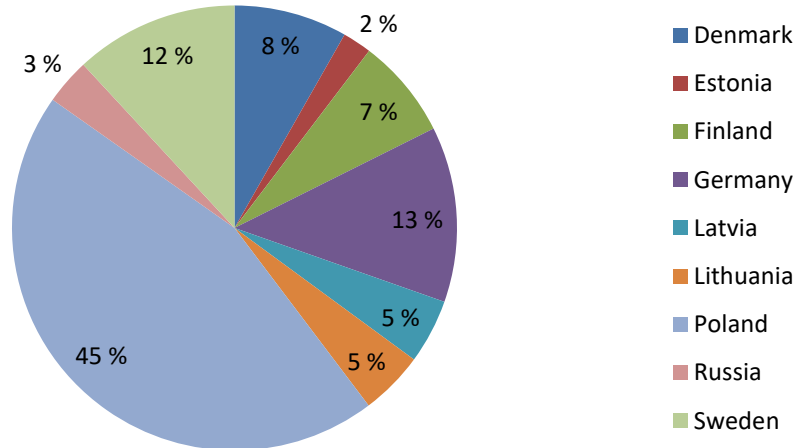


Figure 14. Proportions (%) of cattle in the Baltic Sea catchment divided by countries in 2014.

Pigs

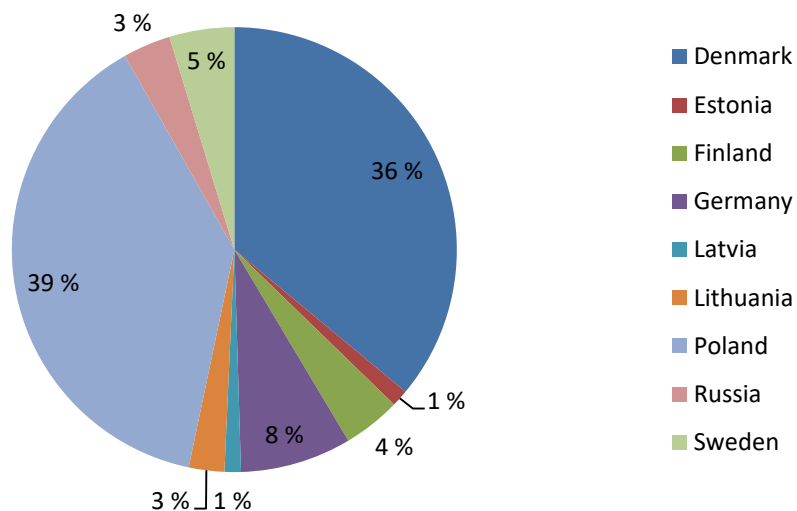


Figure 15. Number of pigs in the Baltic Sea catchment divided by countries in 2014.

There were gaps in the annual coverage of the animal number data, but for the years 1995 and 2014 the datasets were complete making it possible to estimate trends in animal numbers for the whole Baltic Sea. The most remarkable changes were an increase by 14% percent in the number of poultry and 20% decrease in the pig number (Fig. 16). These tendencies were valid for most of the countries except for Russia and Germany where the number of pigs did increase from 1995 to 2014 (Fig. 17).

Livestock numbers in the Baltic Sea region

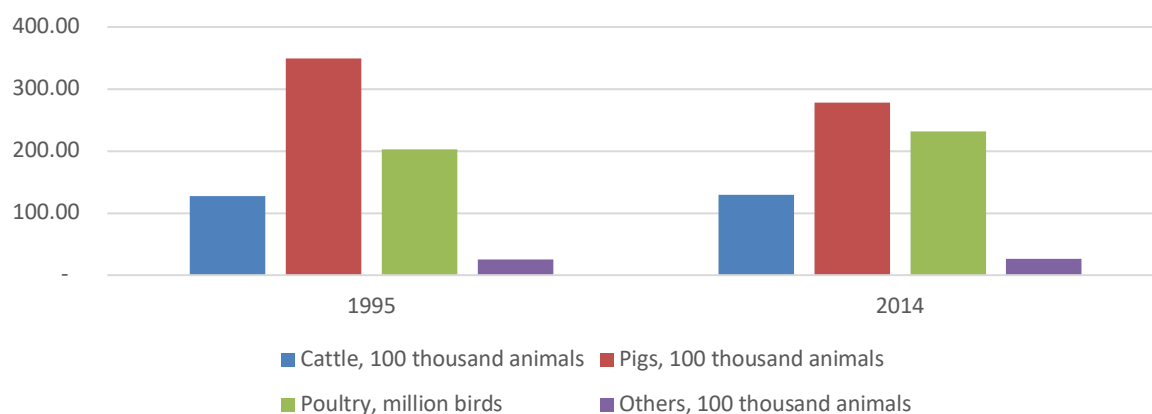
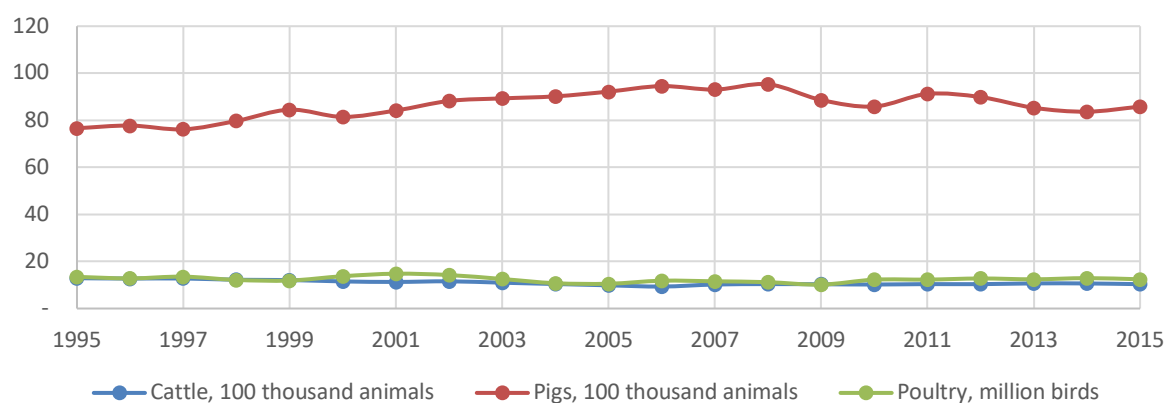
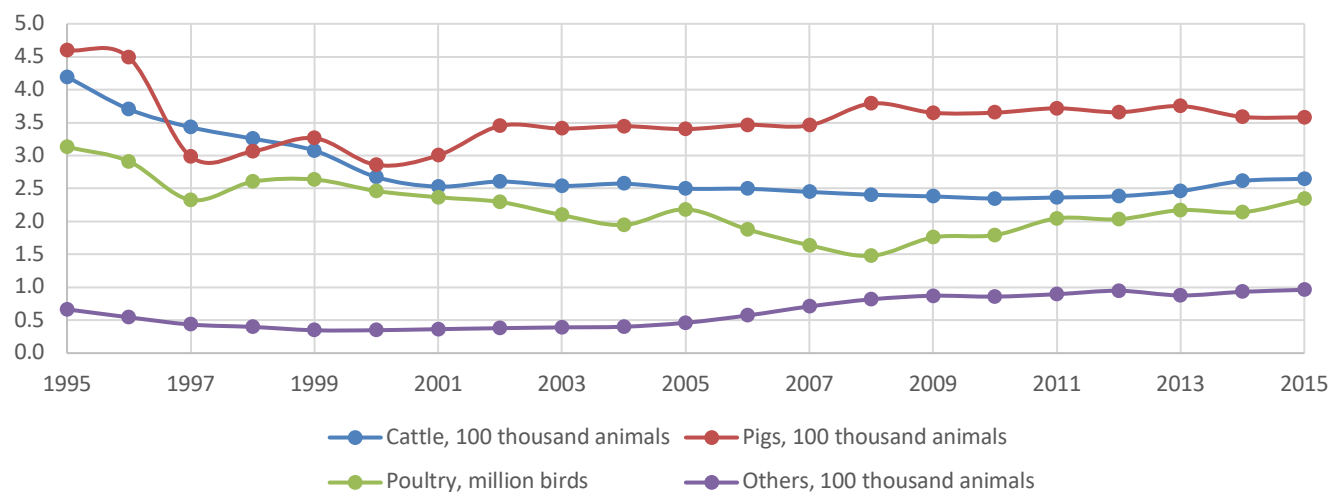


Figure 16. Total animal numbers in the Baltic Sea catchment in 1995 and 2014.

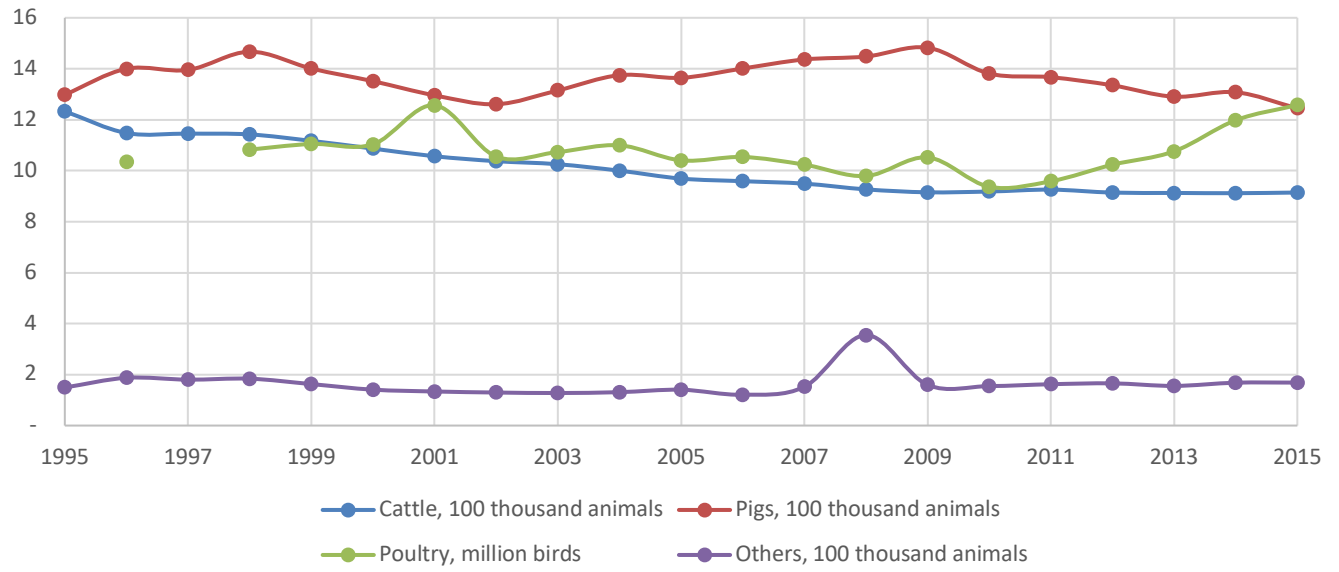
Denmark



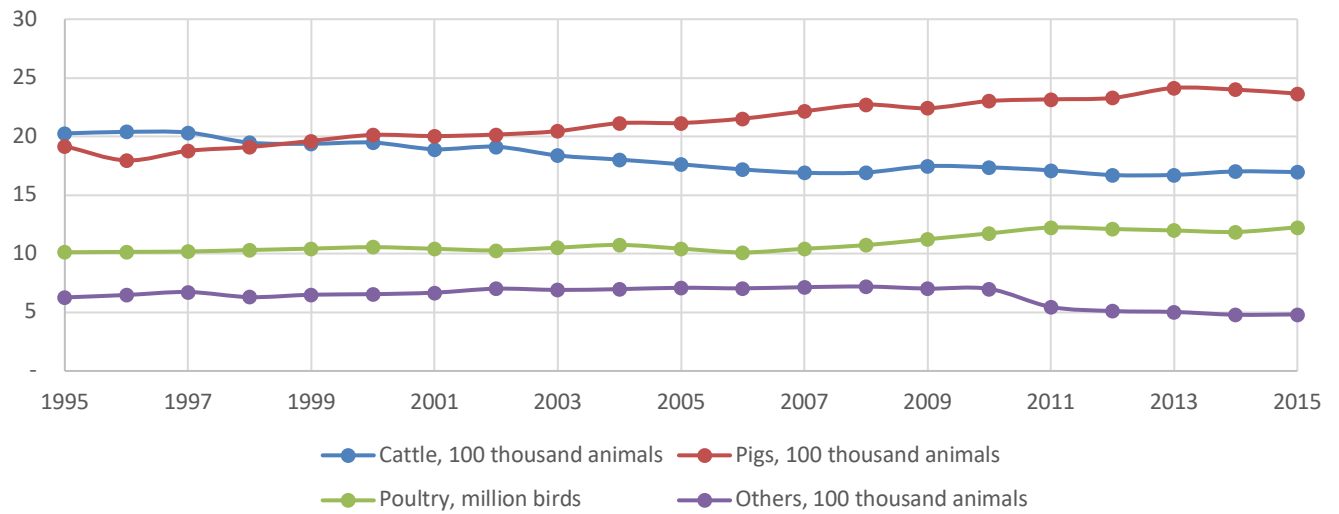
Estonia



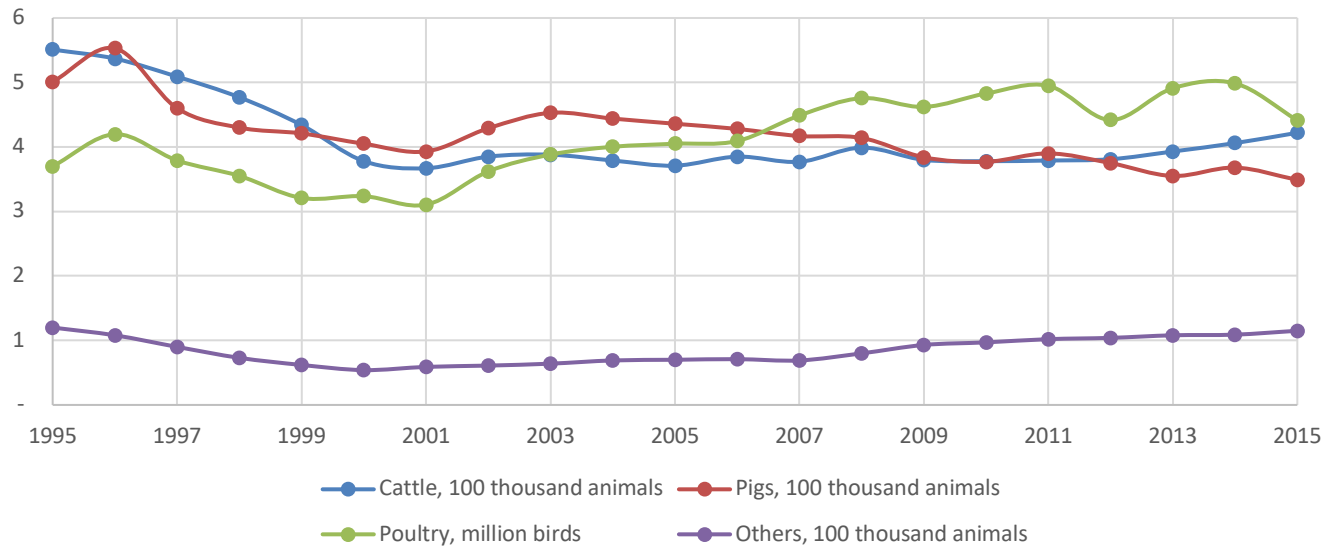
Finland



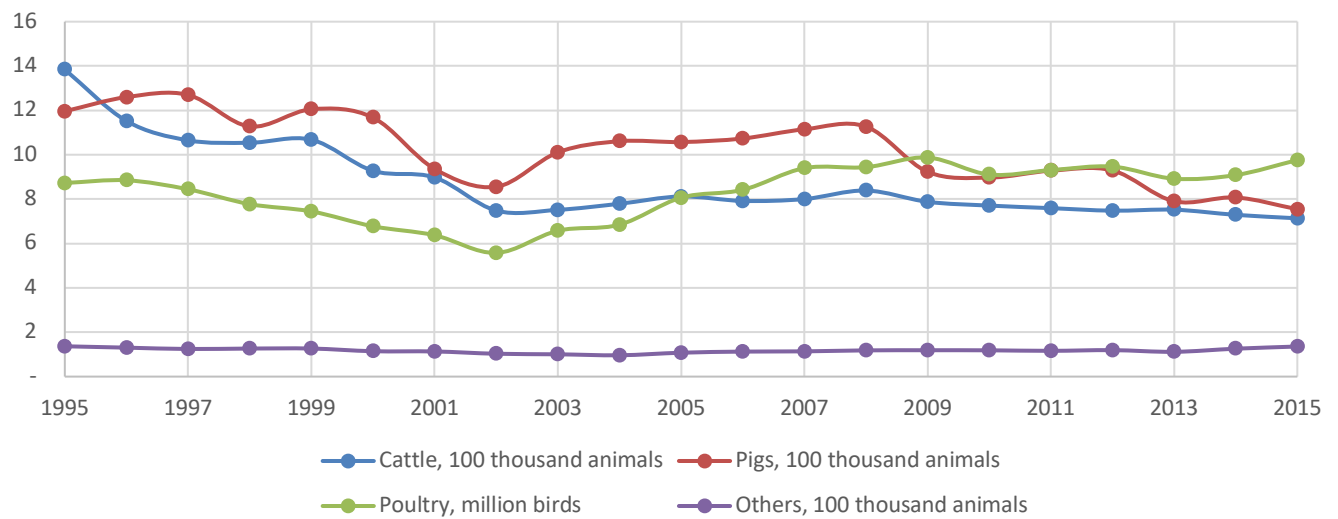
Germany within BS catchment



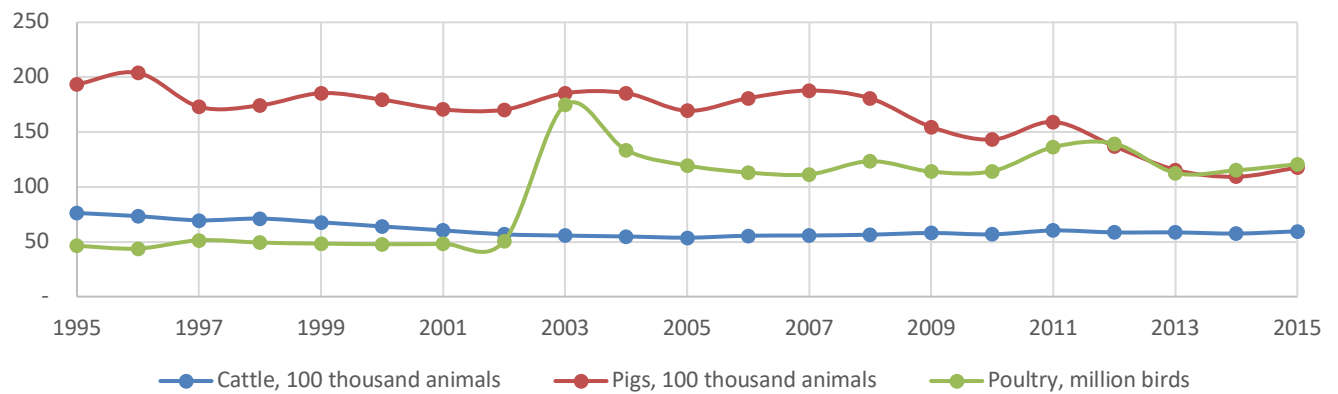
Latvia



Lithuania



Poland



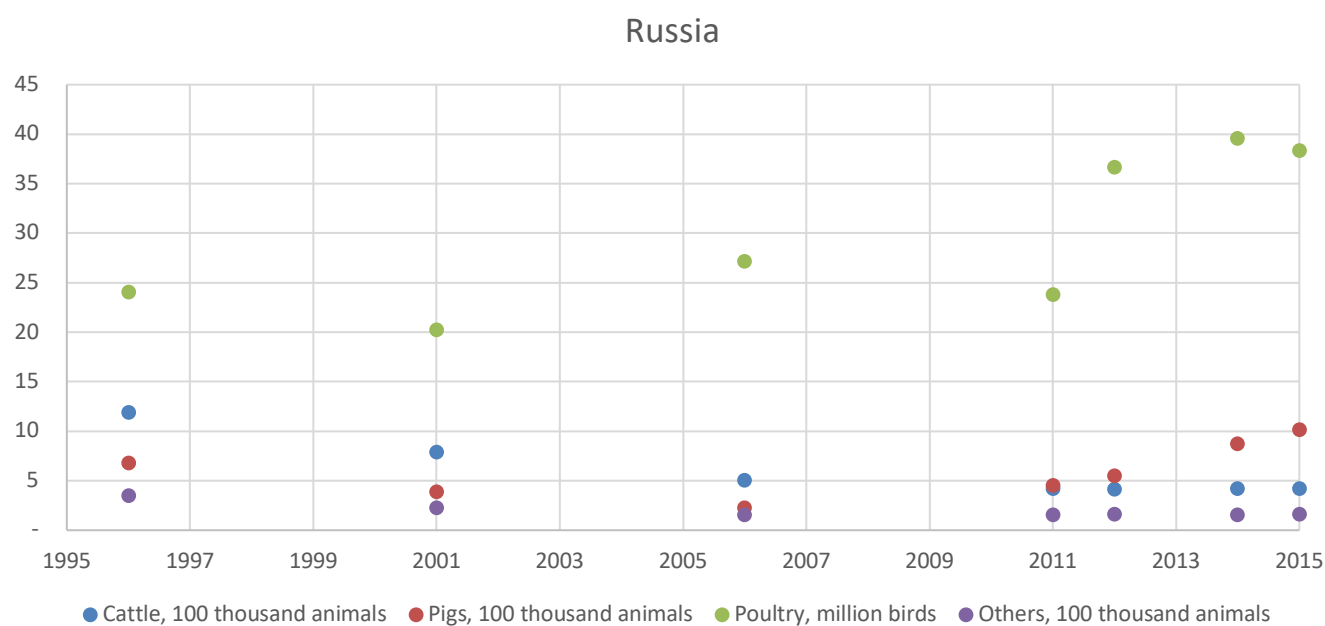
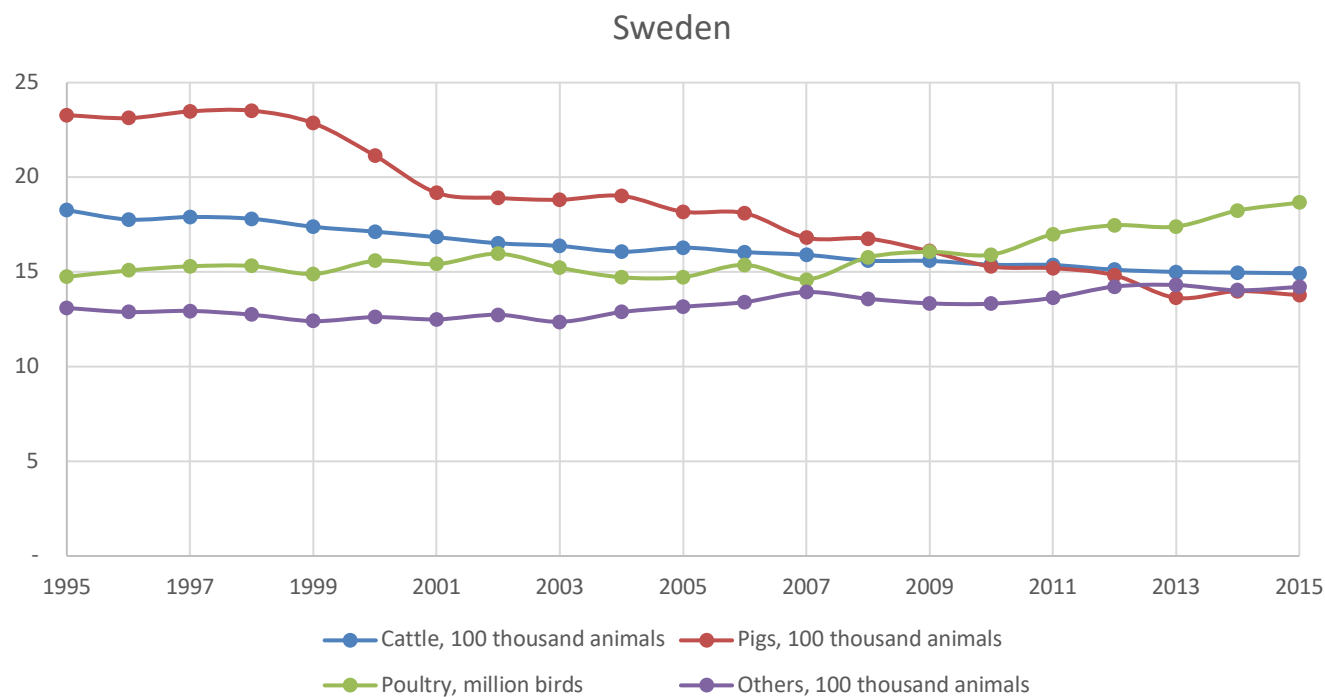


Figure 17. Total animal numbers in the Baltic Sea catchment in different countries from 1995 to 2015.

4.6 Other human pressures

No reduction potentials have been calculated for storm water constructions or managed forestry, because statistics and data on those sources are poor in many countries.

Stormwater or surface runoff of rainwater from urban areas is a major source of flooding and water pollution by nutrients and hazardous substances in urban communities. Consistent monitoring data on these diffuse nutrient loads from urban areas to the Baltic Sea is still lacking from HELCOM member states. Climate change-driven urban planning and stormwater management is becoming of particular interest today and results in increased share of impervious surfaces that demand efficient stormwater systems to prevent flooding and pollution runoff. Historically, many Baltic Sea Region cities with combined sewage and stormwater sewer systems are not capable of receiving large volumes of wastewater during severe rainfalls and allow an overflow of untreated sewage and polluted stormwaters into receiving surface waters (e.g. Coalition Clean Baltic, 2017; HELCOM, 2018)

Forest fertilisation has been reduced considerably since the 1980s. Diffuse nutrient loss from managed forest areas to water recipients deviate from large scale changes in land use, such as clear-cuttings. Nutrient loss from commercially managed forests have declined in recent decades due to a decline in forest drainage schemes and water protection measures taken in forestry, such as buffer strips along streams and lakes and modified clear-cutting methods. Statistics and data on those sources are poor in the HELCOM member states (Kiedrzyńska et al., 2014)).

5. References

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Annex 1. Average normal (1961-1990) monthly temperature, precipitation and hours of sunshine for selected climate monitoring stations within the Baltic Sea Catchment area

For each climate monitoring station is included:

Station: "Name of the station"
Country: "Helcom member country"
Position: "Geographical coordinates"
Hight (m): "Location above sea level in meter of the monitoring station"

The positions of the climate monitoring stations can be found on figure 3.

Data based (mainly) on:

Cappelen, J. & Jensen J.J: (2017): "Earth Climate - Guide on weather and climate in 156 countries (update). Technical Report (ONLINE) 01-17:

https://www.dmi.dk/fileadmin/user_upload/Rapporter/TR/2001/tr01-17.pdf

n.i. = no. information

DK-1

Station: Tønder
Country: Denmark
Position: 54 56 N 8 52 E
Hight (m): 2

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	0	0	2	7	11	15	17	17	14	9	5	2	8,3
Precipitation (mm)	62	46	40	45	47	48	80	102	88	84	72	66	780
Sunshine (hours)	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.

DK-2

Station: Christiansø
Country: Denmark
Position: 55 19 N 15 11 E
Hight (m): 3

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	0	-1	2	5	11	15	18	17	14	10	6	3	8,3
Precipitation (mm)	36	25	20	27	30	35	50	51	50	44	43	38	449
Sunshine (hours)	44	63	134	174	270	297	267	235	204	99	38	30	1855

DK-3

Station: Copenhagen, Agricultural University
Country: Denmark
Position: 55 41 N 12 32 E
Hight (m): 9

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	0	0	2	7	12	16	18	17	14	9	5	3	8,6
Precipitation (mm)	49	39	32	38	40	47	71	66	62	59	48	49	600
Sunshine (hours)	35	55	118	161	245	245	239	207	157	87	34	19	1602

DK-4

Station: Vestervig
Country: Denmark
Position: 56 46N 8 19 E
Hight (m): 18

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	0	0	2	6	10	14	16	16	13	9	5	3	7,8
Precipitation (mm)	69	45	38	39	37	46	71	84	81	89	82	71	752
Sunshine (hours)	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.

ES-1

Station: Tallin
Country: Estonia
Position: 59 25 N 24 48 E
Hight (m): 44

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-5	-6	-3	3	8	13	16	15	11	6	1	-3	4,7
Precipitation (mm)	36	26	24	32	41	49	71	68	75	65	45	39	571
Sunshine (hours)	23	51	148	192	262	287	281	234	156	75	28	16	1753

FI-1

Station: Helsinki
Country: Finland
Position: 60 10 N 24 37 E
Hight (m): 51

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-6	-7	-4	3	9	14	18	16	12	6	1	-3	4,9
Precipitation (mm)	56	42	36	44	41	51	68	72	71	73	68	66	688
Sunshine (hours)	34	63	135	184	270	294	295	251	152	76	30	18	1802

FI-2

Station: Turku
Country: Finland
Position: 60 31 N 22 16 E
Hight (m): 49

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-6	-7	-4	3	8	13	17	16	11	6	1	-3	4,6
Precipitation (mm)	43	27	23	33	30	40	67	77	65	64	58	49	576
Sunshine (hours)	38	76	173	187	258	290	254	208	141	85	37	23	1770

FI-3

Station: Tampere
Country: Finland
Position: 61 28 N 23 46 E
Hight (m): 84

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-8	-7	-5	2	8	14	17	16	10	5	0	-4	4,0
Precipitation (mm)	38	30	25	35	42	48	76	75	57	57	49	41	573
Sunshine (hours)	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.

FI-4

Station: Kuupio
Country: Finland
Position: 62 54 N 27 41 E
Hight (m): 110

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-10	-11	-6	1	8	14	17	15	10	3	-2	-7	2,7
Precipitation (mm)	33	20	19	24	33	60	72	59	56	47	36	39	498
Sunshine (hours)	22	52	155	165	225	259	253	181	113	65	20	8	1518

FI-5

Station: Vaasa
Country: Finland
Position: 63 03 N 21 46 E
Hight (m): 5

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-8	-7	-5	1	8	13	16	15	9	4	0	-4	3,5
Precipitation (mm)	35	21	20	31	30	48	62	65	66	52	50	38	518
Sunshine (hours)	30	77	168	194	267	312	272	206	141	82	35	18	1802

FI-6

Station: Kajaani
Country: Finland
Position: 64 17 N 27 41 E
Hight (m): 143

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-10	-11	-6	0	6	13	16	14	9	2	-2	-7	2,0
Precipitation (mm)	34	27	24	35	38	67	72	72	63	53	43	36	564
Sunshine (hours)	18	58	157	186	237	272	269	188	112	56	17	6	1576

FI-7

Station: Kuusamo
Country: Finland
Position: 65 58 N 29 10 E
Hight (m): 260

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-13	-13	-10	-3	4	13	15	12	7	0	-6	-10	-0,3
Precipitation (mm)	31	27	35	25	32	35	61	71	57	48	40	31	493
Sunshine (hours)	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.

FI-8

Station: Sodankylä
Country: Finland
Position: 67 22 N 26 39 E
Hight (m): 180

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-14	-14	-10	-3	4	11	15	14	6	-1	-6	-10	-0,7
Precipitation (mm)	27	26	20	32	31	56	74	71	57	43	39	31	507
Sunshine (hours)	8	48	132	195	221	281	289	198	99	66	23	1	1561

GE-1

Station: Rostock
Country: Germany
Position: 54 05 N 12 06 E
Hight (m): 20

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	0	-1	3	7	12	15	18	17	13	9	5	1	8,3
Precipitation (mm)	46	36	30	42	48	60	79	74	69	65	39	45	633
Sunshine (hours)	43	62	127	165	227	253	231	214	171	90	47	33	1663

GE-2

Station: Schleswig
Country: Germany
Position: 54 31 N 9 35 E
Hight (m): 22

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	0	-1	3	7	11	14	16	17	14	9	5	2	8,1
Precipitation (mm)	73	58	44	57	59	60	93	103	86	89	70	68	860
Sunshine (hours)	49	66	128	191	249	248	238	187	175	102	46	32	1711

LT-1

Station: Vilnius
Country: Lithuania
Position: 54 42 N 25 16 E
Hight (m): 110

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-6	-5	-1	6	13	16	17	17	12	7	2	-3	6,3
Precipitation (mm)	41	38	39	46	62	77	78	72	65	53	57	55	683
Sunshine (hours)	36	71	117	164	241	231	219	217	140	94	33	25	1588

LV-1

Station: Riga
Country: Latvia
Position: 56 58 N 24 04 E
Hight (m): 3

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-5	-5	-2	5	10	14	17	16	12	7	1	-3	5,6
Precipitation (mm)	32	28	24	33	42	60	78	71	60	53	47	38	566
Sunshine (hours)	36	61	140	197	268	282	276	235	166	91	35	25	1812

LV-2

Station: Daugavpils
Country: Latvia
Position: 55 53 N 26 30 E
Hight (m): 93

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-7	-6	-2	5	12	16	17	16	12	7	1	-4	5,6
Precipitation (mm)	36	27	34	40	51	73	83	74	66	52	52	46	634
Sunshine (hours)	34	61	123	170	250	259	255	226	151	90	33	22	1674

PL-1

Station: Gdansk
Country: Poland
Position: 54 23 N 18 36 E
Hight (m): 12

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	0	1	4	8	13	17	20	20	16	11	5	2	9,8
Precipitation (mm)	31	24	19	32	33	58	73	70	53	38	29	39	499
Sunshine (hours)	39	70	135	163	244	259	236	225	174	105	45	32	1727

PL-2

Station: Krakow
Country: Poland
Position: 50 05 N 19 48 E
Hight (m): 237

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-2	-2	4	10	17	19	21	20	16	11	5	2	10,1
Precipitation (mm)	33	30	31	45	62	80	95	78	43	34	34	35	600
Sunshine (hours)	47	56	114	139	203	197	208	183	152	106	53	31	1489

PL-3

Station: Poznan
Country: Poland
Position: 52 25 N 16 50 E
Hight (m): 86

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-1	-1	4	9	17	20	22	21	16	11	5	2	10,4
Precipitation (mm)	26	27	29	34	38	62	85	55	40	29	27	37	489
Sunshine (hours)	51	64	142	168	255	241	221	218	184	112	55	40	1751

PI-4

Station: Przemysl
Country: Poland
Position: 49 47 N 22 48 E
Hight (m): 201

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-4	-3	3	8	13	17	19	18	14	10	4	0	8,3
Precipitation (mm)	27	24	25	43	57	88	105	93	58	50	43	43	656
Sunshine (hours)	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.

PL-5

Station: Suwlaki
Country: Poland
Position: 54 06 N 22 57 E
Hight (m): 165

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-5	-6	-1	5	12	16	17	17	13	7	2	-2	6,3
Precipitation (mm)	28	32	27	37	43	78	96	104	55	61	34	48	643
Sunshine (hours)	24	60	146	139	226	250	218	207	162	85	29	22	1568

PL-6

Station: Szczecin
Country: Poland
Position: 53 24 N 14 37 E
Hight (m): 7

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	1	0	4	10	15	19	21	20	16	11	6	2	10,4
Precipitation (mm)	33	26	26	31	38	65	83	57	46	35	30	41	511
Sunshine (hours)	45	53	119	166	229	253	243	224	175	105	43	35	1690

PL-7

Station: Warszawa
Country: Poland
Position: 52 09 N 20 59 E
Hight (m): 105

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-4	-3	3	8	14	17	19	18	13	8	2	-2	7,8
Precipitation (mm)	25	28	20	32	40	60	79	47	41	31	31	37	471
Sunshine (hours)	53	55	115	158	252	244	219	215	158	119	49	39	1676

PL-8

Station: Wroclaw
Country: Poland
Position: 51 06 N 16 53 E
Hight (m): 120

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-1	-2	2	8	13	17	19	18	14	9	4	1	8,5
Precipitation (mm)	24	23	27	42	50	61	100	57	41	33	28	33	519
Sunshine (hours)	45	70	122	145	227	232	221	216	179	115	54	39	1665

RU-1

Station: Kaliningrad
Country: Russia
Position: 54 42 N 20 37 E
Hight (m): 27

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-3	-2	1	6	12	15	17	16	13	8	3	-1	7,1
Precipitation (mm)	56	40	27	43	39	55	90	84	83	70	52	59	698
Sunshine (hours)	42	59	130	184	256	276	252	230	180	107	39	31	1786

RU-2

Station: Petrozavodsk
Country: Russia
Position: 61 49 N 34 16 E
Hight (m): 40

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-10	-10	-6	-1	8	13	17	14	9	3	-2	-7	2,3
Precipitation (mm)	35	25	17	27	51	54	77	73	74	58	39	30	560
Sunshine (hours)	19	52	162	200	249	300	294	219	128	58	26	12	1719

RU-3

Station: Sct. Peterburg
Country: Russia
Position: 59 58 N 30 18 E
Hight (m): 4

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-8	-8	-4	3	10	15	18	16	11	5	0	-4	4,5
Precipitation (mm)	36	32	25	34	41	54	69	77	58	52	45	46	569
Sunshine (hours)	17	38	111	166	253	263	277	212	130	66	21	9	1563

SE-1

Station: Karesuando
Country: Sweden
Position: 68 27 N 22 30 E
Hight (m): 327

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-15	-14	-10	-4	3	11	14	12	6	-2	-8	-12	-1,6
Precipitation (mm)	19	18	17	19	26	46	63	57	41	25	26	23	380
Sunshine (hours)	2	46	137	201	225	272	287	155	134	87	22	0	1568

SE-2

Station: Jokkmokk
Country: Sweden
Position: 66 36 N 19 51 E
Hight (m): 257

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-15	-13	-8	-2	5	11	15	12	6	-1	-7	-11	-0,7
Precipitation (mm)	29	27	21	29	30	57	77	63	49	40	36	35	493
Sunshine (hours)	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.

SE-3

Station: Haparanda
Country: Sweden
Position: 65 50 N 24 09 E
Hight (m): 5

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-11	-11	-7	-1	6	12	16	14	8	2	-3	-7	1,5
Precipitation (mm)	40	37	24	34	29	41	54	71	65	53	58	46	552
Sunshine (hours)	24	50	151	206	269	299	308	214	154	98	34	8	1815

SE-4

Station: Stensele
Country: Sweden
Position: 65 04 N 17 10 E
Hight (m): 330

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-12	-11	-6	0	6	12	14	12	7	2	-6	-10	0
Precipitation (mm)	35	26	27	27	36	55	90	67	52	42	43	37	537
Sunshine (hours)	41	76	151	208	292	318	295	248	174	103	41	26	1973

SE-5

Station: Umeå
Country: Sweden
Position: 63 50 N 20 17 E
Hight (m): 11

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-8	-8	-5	1	7	12	16	15	9	3	-1	-5	3,0
Precipitation (mm)	49	30	27	34	28	49	63	77	61	59	67	57	601
Sunshine (hours)	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.

SE-6

Station: Storlien
Country: Sweden
Position: 63 18 N 12 07 E
Hight (m): 642

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-7	-6	-3	1	6	12	14	13	8	3	-1	-4	3,0
Precipitation (mm)	73	76	69	65	55	93	105	110	111	98	76	71	1002
Sunshine (hours)	19	54	116	129	210	177	203	182	116	67	32	19	1324

SE-7

Station: Sundsvall
Country: Sweden
Position: 62 32 N 17 27 E
Hight (m): 4

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-6	-6	0	3	8	13	16	15	10	5	0	-3	4,6
Precipitation (mm)	51	36	29	47	33	50	53	76	54	52	63	60	604
Sunshine (hours)	58	70	143	204	266	261	273	239	148	102	59	27	1850

SE-8

Station: Falun
Country: Sweden
Position: 60 37 N 15 38 E
Hight (m): 122

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-7	-6	-3	4	10	14	16	15	11	5	1	-3	4,8
Precipitation (mm)	36	24	20	31	40	59	73	83	59	45	50	41	561
Sunshine (hours)	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.

SE-9

Station: Karlstad
Country: Sweden
Position: 59 22 N 13 28 E
Hight (m): 46

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-5	-4	-1	4	10	15	17	16	12	7	2	1	6,2
Precipitation (mm)	47	31	25	38	38	49	64	81	70	61	69	51	624
Sunshine (hours)	49	70	141	189	272	299	290	237	162	84	44	25	1862

SE-10

Station: Stockholm
Country: Sweden
Position: 59 21 N 18 04 E
Hight (m): 44

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-3	-3	-1	4	10	15	18	17	12	7	3	0	6,6
Precipitation (mm)	43	30	25	31	34	45	61	76	60	48	53	48	554
Sunshine (hours)	41	76	151	208	292	318	295	248	174	103	41	26	1973

SE-11

Station: Göteborg
Country: Sweden
Position: 57 42 N 12 00 E
Hight (m): 5

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-1	-2	1	6	12	15	18	17	13	8	5	2	7,8
Precipitation (mm)	51	34	29	39	34	54	86	84	75	65	62	57	670
Sunshine (hours)	48	76	151	201	274	286	285	245	178	108	47	29	1928

SE-12

Station: Visby, Gotland
Country: Sweden
Position: 57 40 N 18 21 E
Hight (m): 51

Normal	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Temperature (C)	-1	-1	0	4	9	14	17	17	13	8	4	2	7,2
Precipitation (mm)	53	44	29	31	30	32	51	56	51	51	48	53	529
Sunshine (hours)	28	56	128	208	292	317	302	255	186	108	30	22	1932