



**Rural Development
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Living in the Baltic Waterscape

12

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Living by Water

Humans always settled close to water from the earliest times as evidenced by archaeological remains. It is natural. The coasts, lakes or rivers provided water, food, harbours and transport routes all essential for human society. Also today we see that not only cities have been built on coasts, river deltas, and along rivers or lakeshores, but the same is true for smaller towns and villages in the rural communities. It is clear that almost everyone appreciate the sight of a water surface or access to a shore. Properties on such sites have a higher financial value, both for year around farms or living houses, and for dachas and summerhouses. Compared to the south of Europe and to many other continents the Baltic Sea region is rich in waterfronts and many of us can enjoy life by water.

It needs to be kept in mind that there are some responsibilities connected to living by water. Wastewater should be treated before entering a recipient water body, a collective responsibility in a city or town. In individual farms or houses wastewater may be treated before entering a water outlet but alternatively, as is often done today, collected in a special tank and picked up and taken to a treatment plant. One also needs to be careful with all kinds of waste, including solid waste, as it is very destructive in a water body where it may spread over large areas. Construction of beaches, porches or larger arrangements

such as marinas needs to include proper arrangements for waste management.

In some countries new buildings close to water shores are not allowed any longer, as the shore is considered an area, which should be accessible to everyone. There are also regulations, mainly in North Europe, stating that a person always has the right to walk along the shore of a lake, even passing a private property. Some local authorities have stopped constructions closer to the water line as an adaptation to climate change and predicted increase of surface levels and flood risks.

This chapter was based on texts and information in the Baltic University course on Sustainable Water Management, Volume I The Waterscape with chapters The Baltic Basin – rivers, lakes and climate by Sten Bergström, Nicolai Filatov, Dimitrij Pozdnjakov, Artur Magnuszewski and Hans Bergström; Wetlands in the Baltic Sea region by Lars Lundin; and Volume III River Basin Management with chapters Shipping - boats, harbours and people by Peter Norberg, Allan Nilsson, Pia Westfjord, Yngve Malmquist and Lars Rydén; Fishing and aquaculture; Tourism and recreation by Ebbe Adolfsson, Chatarina Holmberg and Beatriz Brena; Water regulation and water infrastructure by Lars Rydén, Inger Brinkman and Yngve Malmquist; as well as Chapter 5 The Baltic Sea in the Baltic University book Environmental Science. The original chapters are fully referenced.

Water Resources

Water is a most important resource for all humans. We need it for drinking, cooking, cleaning ourselves and for growing our crops. After the systems change in 1989-91 all former communist countries focused their environmental concern firstly on fresh water provision and wastewater treatment. Also in the poorest of municipalities this work was started.

Fortunately the Baltic Sea region is well provided with water. The annual average runoff for the Baltic Sea region as a whole is estimated at 5,000 m³/per capita, per year (very close to European average). This is the water available for all purposes and needs. Most of it stays in the landscape, the so-called green water, and some is lost through evaporation, that is, is constantly transported into the atmosphere in the form of mist or vapour. The green water is necessary and most often sufficient for agriculture. The degree of irrigation in the Baltic Sea region is small compared to e.g. Southern Europe or the southern hemisphere.

The water extracted for society – industry, households and urban areas etc – is from the blue water running in lakes, rivers, canals, groundwater aquifers etc. In households it is typically 100-400 litres per day and capita or 40-150 m³/per capita per year. It is clear that on the average society uses only a few percent of the water resources available. In general, 53% of the abstracted water (surface and groundwater) is used for industrial purposes, 26% is used in agriculture and only 19% is used for domestic purposes. Industrial water use is decreasing.

The water resources per capita show very large variations between different geographical regions. Low water availabilities are found in densely populated western countries with moderate precipitation (e.g. Germany and Denmark) and some eastern countries (Poland, Ukraine), mainly due to low precipitation. Water is plentiful in sparsely populated countries where precipitation is high, like the Nordic countries, and in countries with large trans-boundary rivers running through them. Latvia, Ukraine and the Czech Republic receive between 50 and 75% of their renewable water resources from abroad through such rivers.

Rivers and other surface bodies provide 70% of the water for all utilisation sectors, but groundwater is also an

important fresh water source. In countries with extensive groundwater reservoirs, more than 75% is drawn from groundwater. Finland, with insufficient groundwater supplies, abstract more than 90% from surface water sources. For Europe as a whole, about 65% of the public supply is provided from groundwater which normally is of a better quality than surface water.

The degree of water use is critical. Thus while Sweden uses about 3% of its water resources, this figure is closer to 16% for Poland. At this degree of water use we start to see some recirculation of water in the society, that is, used water entering a river at some point is being recuperated at another point downstream. This reuse of water requires careful wastewater purification and management.

It is possible to indicate the amount of water needed for an item produced by its water footprint, meaning all water needed during the life cycle of the product. The water footprint for a kg of meat is typically 15 thousand litres, while it is ten times less for a kg of bread. Also industrial products have water footprints; high footprints occur for e.g. 1 kg cotton has a footprint of 10 thousand litres. In the Baltic Sea region water availability is, in a global comparison, large. We do not need to be too concerned about water footprints, while lack of fresh water resources is a growing problem in e.g. many Asian countries.

Shipping

The waters in the Baltic Sea region have been trafficked since the earliest of times. The Viking ships and Hanseatic cogs are part of our common history. But these were very few compared to our contemporary boat and ship traffic. Today both boating for pleasure with many tens of thousands of sailing and motorboats and trade with freight ships is enormously much bigger. The great majority of transport to, from and within countries occurs on ships. As an example in Sweden the share of freight on ship corresponds to 80% of all transport, a figure which increases even more if transport on trucks and trains which are carried by ferries is included. In addition there is considerable passenger traffic on ferries over the Baltic Sea, especially after the systems change in 1989-91.

Also on inland water ways there is an important traffic. The large rivers of Wisla, Odra, Neva, Daugava and Elbe are used by smaller ships and barges. The larger lakes, such as Vänern, Mälaren, Ladoga and Onega, have its transport including the adjoining waterways out to the larger seas. The fairly few large canals, e.g. Kiel Kanal in Germany and Göta Kanal in Sweden, also harbours boat traffic.

The intense boat traffic constitutes a real environmental danger. So far there has not been any main oil disaster in the Baltic Sea. However, the risk for such an event has increased significantly the last few years with the expansion of oil tanker traffic to and from Russian ports in the St Petersburg area. Recently the Baltic Sea was labelled a Particularly Sensitive Sea Area (PSSA) by the International Maritime Organisation (IMO), the UN body for Sea Security. This requires that oil tankers should be

equipped with double hull. It remains to be seen if the Russian ships will adapt to this requirement.

But already today pollution from ships is considerable. About 400 oil spills are registered each year in the Baltic Sea. Only few of these can be linked to a specific ship so that its captain could be taken to court. Many private boats are less careful with the management of toilet and household waste. The last few years cruiser with thousands of tourists are increasingly often visiting Baltic Sea ports, such as Visby, Stockholm, Helsinki, St Petersburg, Tallinn and Riga. Many of them empty toilet waste into the Baltic without acceptable treatment. Marinas are requested to have facilities for emptying toilet tanks on board small boats and a slow change is taking place.

With the use of modern information technologies sea traffic is better regulated. Main shipping routes are established in the Baltic Sea for larger ships. It is possible to have immediate information on all neighbouring ship traffic. These are part of several aids to avoid serious accidents.



Figure 12.1. Containership. Photo: Niklas Liljegren. Courtesy of Sjöfartsverket. <http://www.sjofartsverket.se>.

Fishing

Fishing always was of great importance to the people living near the Baltic Sea. At one time it contributed a fair share to the protein intake. Today the large production of fish in the Baltic Sea itself is complemented with fish from aquaculture, especially in Norway, and inland fishing, not the least in the north. Both subsistence fishing and recreational fishing are performed in the Baltic Sea, along the whole Baltic Sea coastline, from the Bothnian Bay to the Atlantic environment in Kattegat and Skagerrak and in many different types of inland waters, lakes and rivers.

When compared to most other areas in Europe, the Baltic region provides very rich and variable possibilities for fishing. Commercial fishing is mainly performed in the open sea, with some taking place in the larger lakes, in mouths of rivers and along the coasts. The most important species for commercial fishing are cod, herring, and sprat. In the Baltic Sea these account for 90% of all catches. Other economically important species are salmon, sea trout, plaice and turbot. Coastal commercial fishing includes vendance and whitefish in the Bothnian Bay,

perch, pike and pikeperch, along the entire Baltic Sea coast and flounder and eel along the southern coasts.

The fish stock varies considerably. During the peak period of 1973-1995 the average catch in the Baltic Sea was 760,000 tonnes with a maximum of 940,000 tonnes in the early 1980s. Today, however, the cod population is small. The decrease is due both to over-fishing and to low reproduction caused by oxygen deficiency and low salinity in the reproduction areas. Herring and sprat populations, conversely, have increased, helped by eutrophication. Environmental impacts have negatively influenced eel, flounder and salmon. Moreover the disease M74 casts a shadow over the future of the salmon in the Baltic.

In inland waters, commercial fishing is mainly focused on the large lakes, but also occurs in the mountain lakes of Lapland and in rivers in the southern Baltic regions. Important species include salmon, char, pikeperch, perch, pike, eel, vendace and whitefish. In Sweden alone the total commercial catch in inland waters amounts to approximately 2,000 tonnes annually.

Recreational fishing in inland waters aims at the same species as commercial fishing, although with a greater focus on perch and pike. Recreational fishing has grown strong over the last few years, and hundreds of thousands of fishing amateurs are found in every country. Anglers' associations are among the largest NGOs in our countries.

Trolling for salmon and pike as well as more advanced angling for species of no commercial value are newly introduced fast-growing fishing methods. The annual catches within subsistence and sport fishing, dominated by perch and pike, are estimated at 40,000 tonnes in Sweden alone. The economic importance of recreational fishing cannot be calculated as precisely as the yield of commercial fishing. The recreational value itself, however, justifies a high price per kilo, especially when more desirable species like trout, char, salmon and pike are considered.

The bottleneck for many fish stocks is the availability of suitable spawning areas. This is especially valid for salmon, trout, grayling and whitefish spawning in running waters but also for many marine species that utilise shallow water areas. Shallow and protected areas with stable temperature and nutrient conditions form the most important environments, i.e. shallow bays in the sea and in inland waters. Small running-waters are often very important, especially for salmonids, and in exposed coastal areas they constitute the dominating production areas for fish fry. Care should be taken to protect spawning and growth areas since they are already so affected that the production of species of importance to fishing is limited. Many times streams and rivers have been restored by anglers associations to ensure the right conditions for fish reproduction.

Table 12.1. The Baltic fish catch (tonnes) by every country and main species in 2006 (source: ICES and Finnish Game and Fisheries Research Institute). From http://www.helcom.fi/environment2/biodiv/fish/en_GB/commercial_fisheries/.

	Sprat	Herring	Cod	Flounder	Other	ICES 22-28 Southern Baltic	ICES 29-32 Northern Baltic	Total
Sweden	97,584	53,166	12,252	169	2,767	144,415	21,523	165,938
Finland	19,020	79,955	673	99	10,036	8,474	101,306	109,783
Poland	55,890	20,544	15,080	9,428	3,686	104,628	0	104,628
Latvia	54,638	21,762	4,567	1,163	631	82,465	296	82,761
Denmark	42,323	6,989	21,425	2,839	4,573	76,530	1,619	78,149
Estonia	46,689	23,192	703	352	2,104	21,778	51,262	73,040
Germany	30,779	26,206	9,558	1,017	4,400	68,258	3,707	71,960
Russia	28,324	9,780	3,747	1,237	4,271	43,702	3,657	47,359
Lithuania	10,814	1,172	3,301	376	158	-	15,821	15,821
Total	386,061	242,766	71,306	16,680	32,626	550,250	199,191	749,439

Tourism and Recreation Services

The great importance to us of water is demonstrated more clearly than ever in our free time. During vacations and in general during leisure time, boats, beaches and baths are more popular than ever. On sunny summer days the coasts of the Baltic Sea and many of the lakes in its basin are lined with millions of happy people enjoying water or being close to water.

Today, tourism and recreation form a dominating part of the service sector, worth billions of Euros annually in the Swedish economy alone. The use of water by tourism and recreation is fully comparable to other uses of water, such as fishing, shipping, etc., in pure economic terms. The tourism and recreation sector clearly contributes to the well being of people and as such deserves as much care as the other sectors when planning for the best management of water and river basins.

Tourism, recreation and outdoor activities may also have more or less serious impacts on the living environment. Walking along the shoreline, swimming in the sea and skating on the lake in the winter normally have no negative effects on the environment. Facilities used in connection with these activities, such as roads, parking lots and overnight cabins, might, however, disturb nature and cause damage. These facilities, especially if inadequately designed or misplaced, most often have considerably more environmental impact than the simple activity itself. This may include severe impacts on water resources.

Public beaches must meet certain criteria of water quality so as not to risk the health of the visitors, in particular children. Such beaches should not be situated close to sewage effluents and the risk of contamination of the water from restaurants, cafes and toilets should be taken into consideration. Microbiological tests should be carried out regularly as required by EU directives. The eutrophication of the Baltic Sea and its shallow bays is a special problem, as algal blooms typically appear during the warmer periods in the summer. Some of the algae, such as cyanobacteria, are slightly toxic. If these algae appear in large quantities, the beach has to close. Public beaches give rise to disturbances of plant and animal life and should not be located too close to sensitive shallow waters. Conflicts between visitors, local residents and



Figure 12.2. Discovering the waterscape by paddling a canoe along the small Ljustorp river in northern Sweden. Photo: Leonard Broman.

plant and animal life are commonplace, especially concerning loud music, boating, water-skiing, etc.

Visiting nature protection areas, nature reserves or national parks when so allowed is a special kind of tourism dependent on the beauty and protection of the landscape and its waters and wildlife. Both in the protected and the everyday landscape, including the waters, environmental care and good natural resource management should be applied in all activities, such as forestry and agriculture. Environmentally attuned working methods and natural consideration should achieve this. Especially in the north a strong nature interest makes this an important concern for nature lovers and bird watchers, and in general what is today called eco-tourism.

Use and Restoration of Wetlands

Several hundred years ago, the first thought to enter the mind of a settler or farmer when he saw a suitable wetland was, 'How should this be drained?' This was very natural considering the more or less constant shortage of food and shortage of acreage for farming in times when harvest per ha was very low and artificial fertilizers were

The Rural Society

not yet invented. Thus, the single option for increasing food production was to increase the farmed land area. Especially in the southern Baltic Sea states and surrounding areas, at least as far up as Estonia and south Finland, agriculture has taken over large wetland areas. Many wetlands were found especially suitable to farming, including cattle grazing and cultivation of grain. Later, in the late 1800s, forestry on wetlands, mainly peatlands, attracted increasing interest. In Finland, Estonia and Sweden, forested peatlands are very productive and cover major areas. In this way the wetlands have been utilized for human activities, mostly agriculture, forestry and peat extraction in almost all the countries in the region. Peat has proved to be outstanding as a growing substrate and provides important material in horticulture.

More recently the natural values of wetlands have gained an upper hand and the focus has changed towards conservation and preservation. Natural wetlands have large biological and water storage values, which are now more appreciated, and food can anyway be imported from elsewhere. Naturally, wetlands with open water are of considerable importance to fishery in both inland and coastal waters. Wetlands are of considerable value for wildlife and game, recreation, berry picking, mushrooms and special vegetation. In modern agriculture with considerable leaching of nutrients, and a current desire

to put a limit to it, wetlands are being recreated to act as retention areas, especially for nitrogen and phosphorus. Large drained and channelled areas have in this way been restored to a more diversified landscape with meandering watercourses and a frequency of wetland ponds. This natural cleaning of man-made nutrient runoff is gaining increasing interest.

Hydro, Wind and Wave Power

The rural landscape is an important provider of renewable energy and the waterscape is not an exception. On the contrary hydropower is the most important source of renewable electricity in the region.

The best sites for hydropower in the Baltic Sea region are found in the mountainous northern areas. The first hydroelectric power stations in the region were built on the rivers in northern Sweden and Norway at the end of the 19th century, when the technology for the transfer of electricity over large distances developed. The development of large-scale hydropower stations continued in these areas up to the 1980s. In comparison, the landscape in the south, where large geologically “older” rivers are found, is very flat. The Wisla River in Poland has thus



Figure 12.3. Since the beginning of the 19th century about 3 million hectares of wetland has disappeared in the Baltic Sea region mainly because of drainage to create farmland. In recent years however some wetlands have been recreated such as this one in Dalarna, Southern Sweden. The photos show Ansta before (left) and after restoration (right). Photo: Peter Sennblad(left) and Kajsa Andersson (right). Courtesy of Länsstyrelsen in Dalarna.

only one large power station at Plotsk, while the Daugava River has two power stations, one in Salaspils, Latvia, and a small one in Belarus. As the result of a century of exploitation of large rivers, Norway has the world's largest production of hydropower electricity per capita. In Sweden, 50% of all electricity comes from hydropower plants. Also in Finland hydropower is an important energy provider.

Wind power has increased dramatically over the last decades. Maps of average wind speed demonstrate clearly that normally the best places for wind power are found outside the coasts. Especially northern Germany and Denmark has been pioneering this technology and today more than 25% of Denmark's energy needs are covered by wind power electricity. Large wind power fields with hundreds of units are found in the Baltic Sea south of Öland, south of Gotland and east of Uppland between Sweden and Åland. Wind power is in a phase of expansion to meet the increased demands for renewable electricity.

Wave power is a more recent addition to the technologies of producing renewable electricity. Here a float on the surface of the sea is connected to a generator on the bottom by a cable. As the waves moves the float up and down electricity is generated. The technology is under

development and presently for the first time a several hundred-unit wave power field is built on the Swedish west coast.

There are also small-scale technologies adapted to smaller streams. Small-scale hydropower may be installed in rivers e.g. at traditional dams and streams used earlier for mills. A small hydropower installation is only serving a few households or a small industry but is still valuable. A technology under development intends to use the energy in streaming water by a rotating device on the bottom; also this is a small-scale device.

Equally solar power is installed in the region at a rapidly increasing rate.

While solar, wind and wave power are intermittent sources of energy, hydropower is not. In fact the large dams and reservoirs of the large hydropower stations have an enormous value as "batteries" of the national energy system and may compensate for moments when the wind is not blowing and waves are small.

Especially wind and hydropower intervene in the landscape in a way that not always is accepted by the local population. In these cases a compromise has to be made to balance the requests of renewable energy and preserved natural environment.

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Chapter 12

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Chapter 13

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