CENTRAL BALTIC INTERREG IV A PROGRAMME 2007–2013

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The Baltic environment, food and health: from habits to awareness

Executive summary

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FOODWEB

Abstract

'The Baltic environment, food and health: from habits to awareness – FOODWEB' is a project aiming at raising public awareness about the links between food quality and its origin focusing on the Baltic Sea and its surrounding. Cultivation of food for humans and related production activities might cause negative impacts to the Baltic Sea, and aquatic food products from the Baltic Sea may cause problems to humans as a result of toxins in the marine environment. This is a circular problem in the Baltic ecosystem.

Finland, Estonia and Latvia take part to Foodweb project. In 2010 the population of the Foodweb project area was estimated to be 6 million. Population ageing is the common trend in the project area. The consumption trends are changing due to social, economic and political changes and influence eating habits, especially the consumption of meat.

Baltic Sea is generally considered one of the most polluted seas in the world. Agriculture and the food chain are largely responsible for eutrophication and pollution of waterways. Food consumption forms a significant part of the environmental load of households. In the project area we share the common concern of environment and food safety issues. Majority of the residents are concerned about toxicants found in food. Environmental aspect is coming more important when selecting the diet and increasing knowledge of food safety are taking into account in national food recommendations

The eutrophication intensity varies between different foodstuffs: The beef has the highest eutrophication intensity of all meats, about three times higher than pork, and seven times that of poultry. The eutrophication intensity of milk is relatively low. Still, the values of beef and milk are partly bound together, since a significant share of beef comes from milk cows. The eutrophication impacts of plants also vary between species: Among the plant based raw materials grain has the highest intensity.

The modelling shows that the eutrophication can be reduced about 7% by changing the food consumption habits into recommended direction, and the private food consumption is not far from recommended. The major shift, about 7 % units from protein to carbohydrates, was reached in the scenario by applying a reduction to all protein foods, and an increment in all carbohydrate foods. This is because the foods containing animal proteins are more eutrophying than carbohydrate foods, and shifting from the use of protein foods to carbohydrate foods should finally be seen in the state of eutrophication.

Key-words: Baltic Sea, Finland, Estonia, Latvia, food production, food chain, food consumption, nutrients, hazardous compounds, eutrophication.

Background

The Baltic Sea is a small and relatively shallow brackish water sea located in Northern Europe. It's the second biggest brackish water basin in the world and it's also considered to be the most polluted one. The catchment area of the sea is large, over 1 600 000 km^2, and because the volume of water is small (20 000 km^3) due to the shallowness (average depth 55 m), the sea is very sensitive to pollution. Because of the low salinity, both fresh water and marine species can adapt to live in the Baltic Sea. Low salinity also makes the Baltic's unique ecosystems sensitive to changes caused by human. One of the biggest problems is accelerating eutrophication caused by the nutrient runoff. The sea is also vulnerable to pollution caused by harmful compounds resulting from human activity. Eutrophication also increases hypoxia, the oxygen depletion, which already occurs on regular basins in the Baltic Sea bottom waters.

Food production chain is one the most resource demanding and polluting sectors and a large user of energy causing not only eutrophication, but also global warming and pollution of the sea. The whole food production chain from agriculture to preservation, distribution, preparation and waste management consumes a considerable amount of not only energy, which contributes to total CO_2 emission, but also nutrients and chemicals harmful to marine environment and species. These chemicals are accumulating in the food chain.

"The Baltic environment, food and health: from habits to awareness – FOODWEB" is a part of Central Baltic IVA Programme 2007-2013, which is funding cross-border cooperation projects with altogether 96 million Euros from the European Regional Development Fund. The duration of the Foodweb-project is from 2011 to 2013.

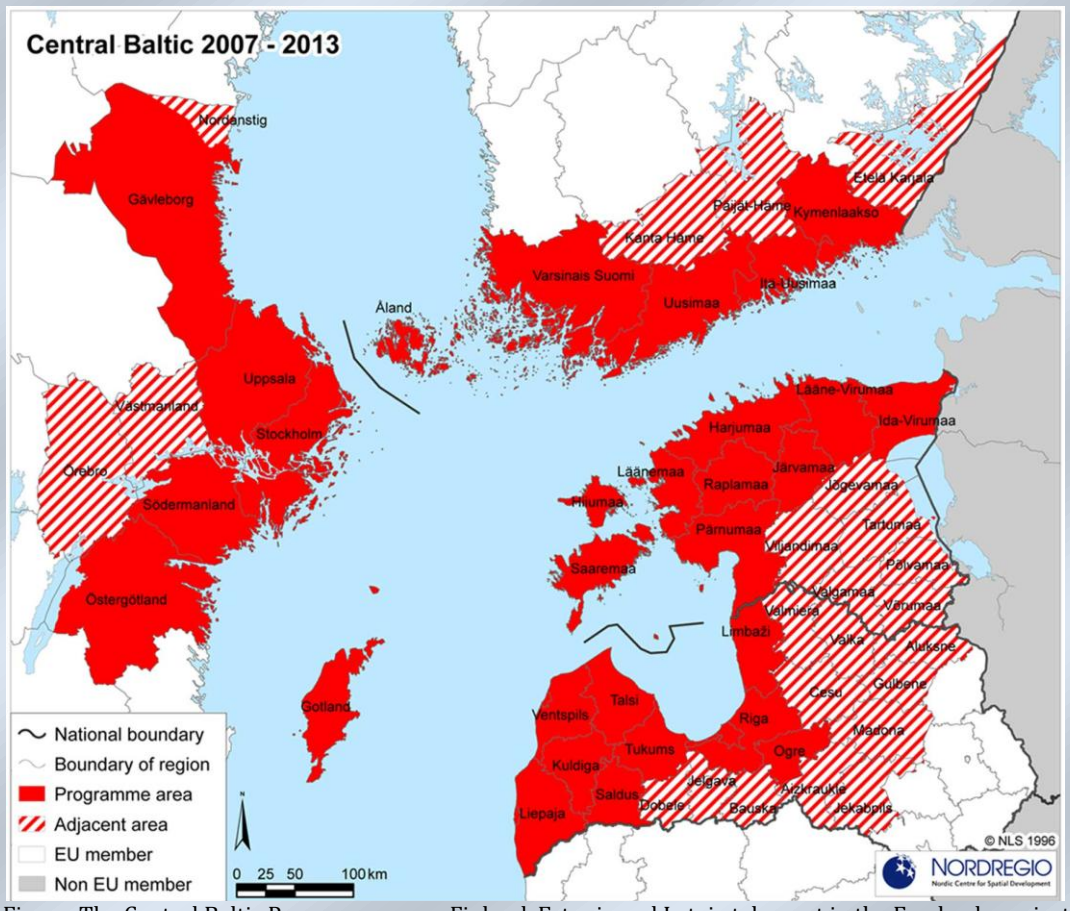

Figure. The Central Baltic Programme area. Finland, Estonia and Latvia take part in the Foodweb-project.

FOODWEB

Finland, Estonia and Latvia take part to Foodweb project in order to collect up to date, common database for sharing information about food consumption and food related risks as well as to find information about the environmental effects of food production on these areas. The information about food situation in Sweden is also collected and results of hazardous compound analysis and information about the characteristics of these compounds collected in Sweden will also be used in this project.

The partners in the Foodweb-project are MTT Agrifood Research Finland as the lead partner, the University of Tartu, The science exhibition centre AHHAA, the Finnish Environment Institute (SYKE) and the University of Latvia.

The main objective of the Foodweb-project is to raise public awareness about the links between food quality and its origin, focusing on the Baltic Sea and its surroundings. An emphasis is given to the life cycle of food and to the biological cycles: foodweb and related biogeochemical pathways. Two-way relation of people, food and environment will be made obvious and interpreted in terms of the impact of the state of the environment to our food and safety and, vice versa, human impact to environment related to production of food and in treating residues of food chain. The final aim is a mutual understanding and self-efficacy in management of the risks. Relation of extensive industrial land use, decreasing potential of ecosystem services in the project area, growing pressure to safer food production areas, food safety in terms of pollutants and related risks and challenges of responsibility in risk management set by public on food chain will be the driving forces communicated with various target groups. Through changes in land use and environmental deposition consumers can influence the quality of the Baltic watershed and they can have an impact on the environmental status of the sea. Consumers need to be aware of the risks associated with food choices and learn how to minimise them.

Data and methods

The methods are chosen to meet the challenges of linking environmental sustainability issues with the daily food choices of consumers, with particular reference to the Baltic Sea. Improving sustainability requires a thorough understanding of the relationships between the food we eat and all those activities that affect the Baltic Sea environment.

By using visual method, the food plate model, we will build up a concrete and comprehensible interface for the consumers that demonstrates the sustainability aspects associated with their food choices. The main method that will be used to link food plate models with environmental sustainability measures is life cycle assessment (LCA). Material flow analysis (MFA) will be used as a complementary tool to expand the variety of the individual plate components, and to generate information on the potential risk elements in the food chains. MFA results will also be used to describe and explain the environmental impacts of the food chains of the regions under study.

The main goal of the feasibility study is to investigate background data which is used as a foundation in the following steps of the Foodweb-project. Detailed material flow analysis for Finland, Estonia and Latvia was done to estimate eutrophication load of the food chain. The eutrophication potential values of specific foodstuffs are needed for the database in which information about food items, hazardous compounds and environmental impacts are entered. This study also forms the basis for the awareness study
This feasibility study provides answers to the following questions:

1) What are volumes of food produced and consumed in the area?
2) Which are the most important food material flows for food system sustainability and environment-based risks?
3) Which key groups of consumers are at risk?

Results

Population structure

The population is projected to become older in the project area. In Finland and in Estonia the number of people over 80 years old has been increasing during the last 40 years and in the end of 2009 there were over 195 000 persons aged 75 in Finland's project area and almost 105 000 people in Estonia. In the project area of Latvia 7.5 % of population are over 75. Clear majority of people over 75 years old is women in all countries. The population of Latvia is decreasing year by year due to the emigration and negative natural growth. Number of residents in working age is shrinking, and if this development continues, in twenty years more than 23 % of the population will be retired. The population of Estonia is also shrinking and the population of Finland increasing. In Finland the migration is a greater cause of population growth than natural increase.

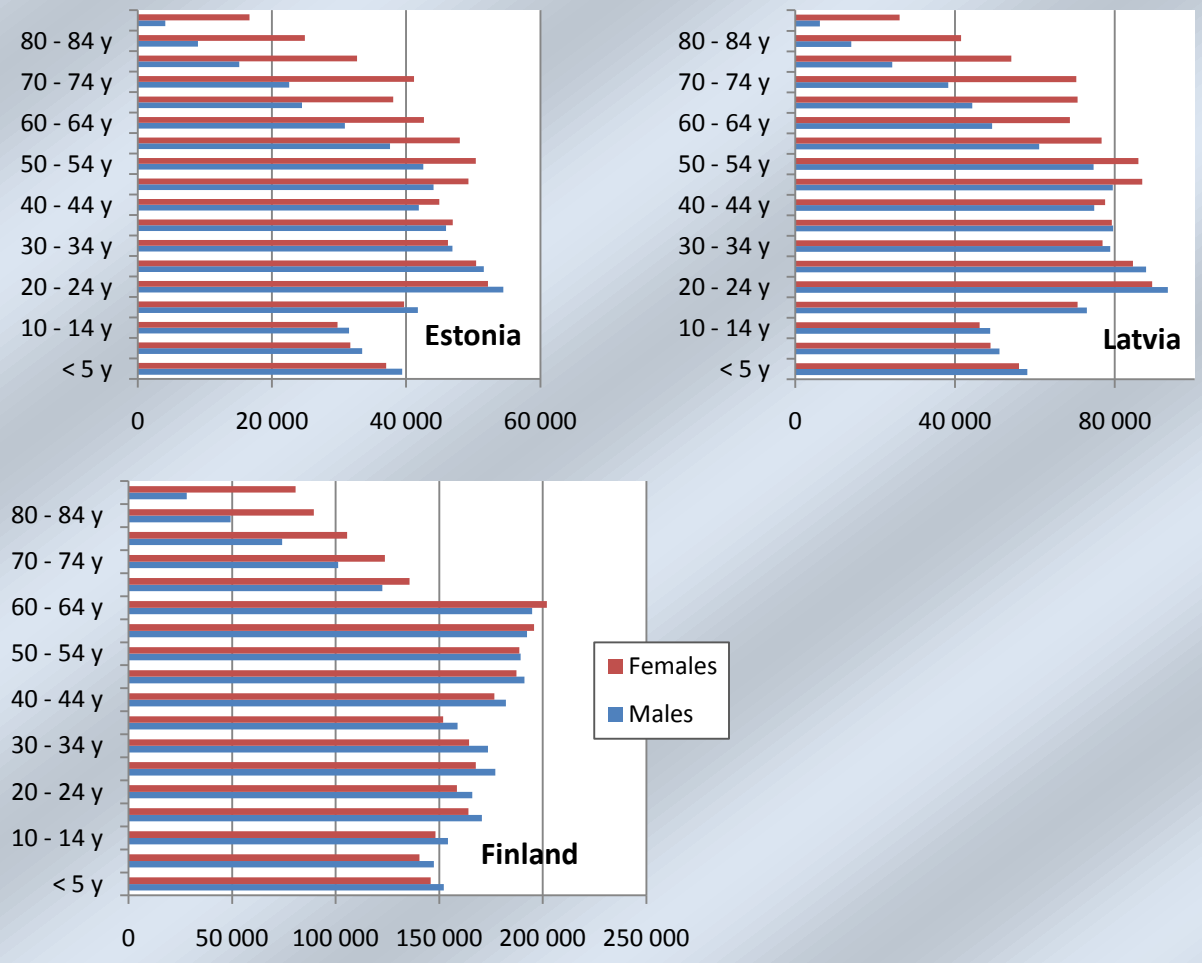

Figure. Population structure in Estonia, Latvia and Finland (OFS, Statistics Estonia, CSB).

Food production

In Finland food industry is the fourth largest branch of industry, in Latvia the second largest and in Estonia it covers about one fifth of the total production of the processing industry. Meat production as well as milk and dairy production are most important branches of industry in all three countries. In Finland baking and in Estonia

beverage industries cover a large part of production and in Latvia milk production is the largest production sector ranked by value.

Fishing is also an important branch of industry. In the Baltic Sea, fish is caught both from the open sea as well as near the coast. The most significant fish species caught from the open sea are Baltic herring and sprat. In the coastal areas pike perch, perch and white fish form a major part of the total fish catch. The most fished species vary between countries and fishing areas, but sprat and Baltic herring are both commonly fished in Latvia, Estonia and Finland. Fish stocks have been declining in the Baltic Sea, and this change can be seen in all project countries. Some fish stocks, especially of cod, are overfished and the catches of migratory species and some coastal species are low. In addition, some fish stocks have slightly increased.

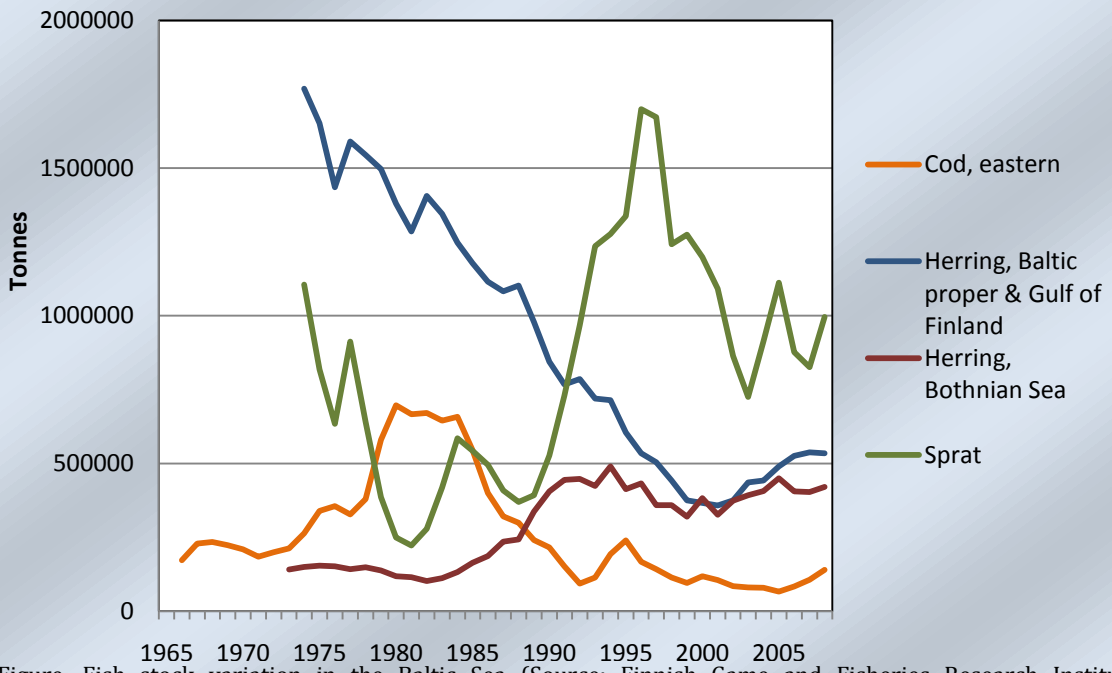

Figure. Fish stock variation in the Baltic Sea (Source: Finnish Game and Fisheries Research Institute, ICES (www.biodiversity.fi).

Over 30 % of Finland's 64 000 farms are situated in the project area, where most of them produce cereals, special crops or milk. In Latvia almost 73 900 farms are situated in the project area, which makes 65 % of all farms in the country. The majority of farms in Finland produce cultivated cereals whereas most of the farms in Latvia are engaged in crop cultivation, dairy farming and cattle breeding. Milk is produced by every fifth farm in Finland.

The structure of agriculture has been changing in recent years on the project area. In Finland, Estonia and Latvia the number of farms is decreasing, and the size of the farms is increasing. In Estonia and Latvia the total area of agricultural land has also increased.

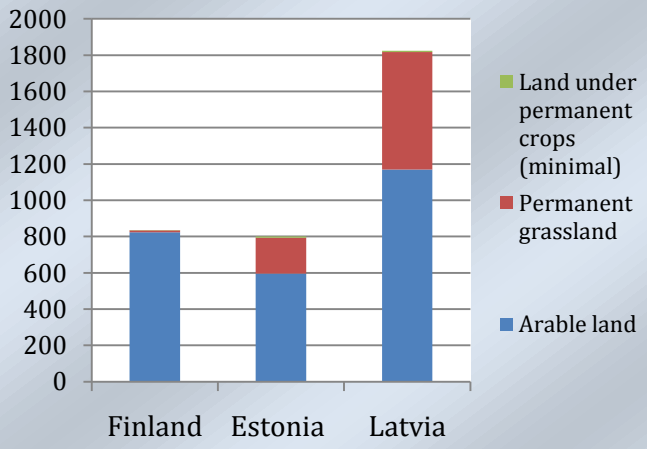

Figure. Agricultural area by main category in the project area, 2008 (Eurostat).

Organic and natural products are gaining more and more popularity and the demand

for organic food is increasing. The consumption of organic food varies between income and age groups and differs between young families and older people households.

Finland and Latvia are entirely self-sufficient in milk and milk products, as well as in meat and eggs. In Estonia self-sufficiency in milk is about 161 % and the degree in self-sufficiency in meat around 83 %. The degree of self-sufficiency in grain in all project countries varies from year to year depending on the harvest. Due to the northern location of these countries, most of the fruits and some of the vegetables are imported.

The main sector of Estonian agriculture is the production of milk, which is also the most important product from domestic animals in Finland. The selection of dairy products is wide in both countries: The selection varies from non-fat and semi-skimmed products to low-lactose and non-lactose milk products. Some of the products have been differentiated to conform to health trends: In Finland and Estonia customers can choose products that lower blood pressure and blood cholesterol, for example so called heart cheese.


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Export and import

In 2010 Finland imported over 2 015 000 tonnes and exported almost 623 000 tonnes of agricultural foodstuffs. The main export products were alcoholic beverages, frozen and fresh fish, pork, milk products, eggs, poultry and malts, whereas most imported foodstuffs included alcoholic beverages, coffee, fish conserves, fresh fish, beef and bakery products.

The import volume of agricultural products in Estonia is slightly larger than the export value, and it has increased in recent years. In 2010 agricultural and food product exports made up 10 % of the total export volume and 11 % of the total import volume. The principal import partners are Latvia, Lithuania, Finland and Sweden, which are also the main export partners, including Russia. The main export production includes milk, fish, meat and beverages.

Nowadays more than one third of food consumed in Latvia is imported, mainly from the Netherlands, Denmark and Lithuania. In Latvia the most imported vegetables and fruits are tomatoes, lettuces, pears, and plums. The most imported animal products are milk powder and canned milk, poultry and cheese. At the same time, the most important food export products are of animal origin, such as meat and meat products, and cheese, but also including cereals. In Latvia food production accounts for 26 % of total export value, and the main export countries are USA, Russia and the Netherlands. For Latvia fish is one of the most important food sector export products after cereals and beverages, and it is also an important Finnish export item.

The trade among Finland, Estonia, Latvia and Sweden is economically significant. Pork is exported from Finland to Estonia and meat products from Estonia to Finland, whereas beef is traded between Finland and Sweden. Cereal products, milk, dairy products and poultry meat are exported from Estonia to Latvia and Finland, and milk and dairy products to Estonia from Latvia and Finland. Fish products are exported from Finland to Estonia and Sweden.

Dietary habits

Dietary habits and food choices vary by gender, age, area and income. Women eat more vegetables, fruits and berries in Finland and in Estonia than men, but in Finland bread and potatoes are more often consumed by men. In Estonia potatoes are more consumed among people with lower monthly income.

In Finland low-fat milk is the most favoured milk among boys and men, whereas skim milk is preferred by girls and women. The total consumption of liquid milk products in Finland has decreased, while cheese consumption is increasing. Milk products are widely consumed by Estonians, regardless of age and sex, but 19 % of males and over 25 % of females do not normally drink milk. In 2010, the total meat consumption of Estonians was 75,4 kg/capita.

Latvians consume cereal products (mostly bread) over 37 kg, potatoes 88 kg and meat over 80 kg per year on average. Fish consumption is considerably lower, about 12 kg per year on average. Most consumed vegetables among Latvians are tomatoes, cabbage and cucumbers when most favourite fruits are apples.

In Finland the total meat consumption was 76.2 kg/capita in 2010. Pork meat was most popular, and it was consumed 34.9 kg/capita. Nearly equal amounts of beef and poultry meat was consumed, 18.6 kg and 18.2 kg/capita.

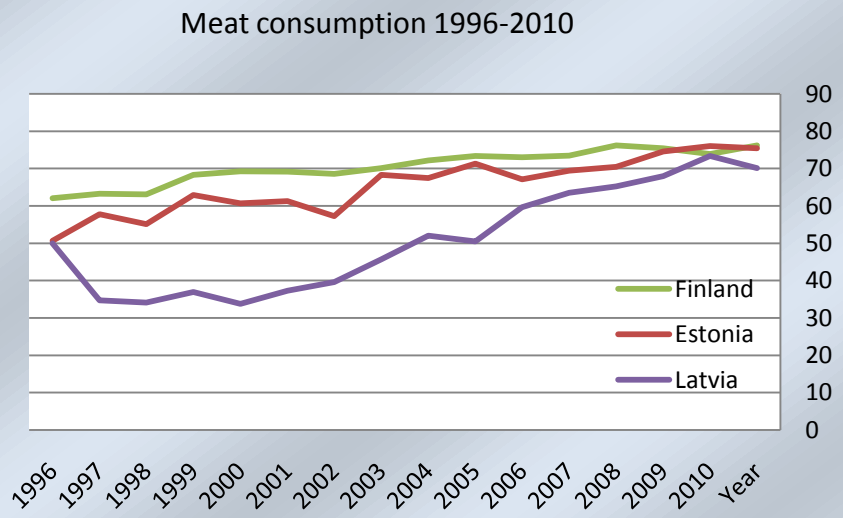

Figure. Timeline of the meat consumption in Finland, Estonia and Latvia, 1996-2010.

Current state recommendations on food

When looking at the national food recommendations in Finland, Estonia and Latvia more similarities than differences were seen between countries. The nutritional recommendations in all countries include limitation of consumption of fat, especially animal fat, meat products and promotion of vegetable consumption. Recommended share of fat, carbohydrates and proteins equal in every country. In

recommendations include specific advices for children and pregnant women. In Latvia and in Finland special dietary advice on fish consumption have been issued to children, young people and people at fertile age. In Finland and Estonia the Nutritional recommendations on food also take into account the importance of physical activity.

Table. Nordic Nutrition Recommendations for intake of macronutrients for adults and children over 2 years of age.

Macro-nutrient		Share of total energy intake (%)
Fat	Total fat	25-35 %
	Saturated + fatty acids Macro-nutrient S	approx. 10 %
	monounsaturated fatty acids	10-15 %
	polyunsaturated fatty acids	5-10 %, including 1 % n-3 FA
Carbohydrates	Total	50-60 %
	Fibre	25-35 g/d
	Refined sugars	< 10 %
Protein	Total	10-20 %

Nutrient load and emissions

Agriculture and the food chain are largely responsible for eutrophication and pollution of waterways. Food consumption forms a significant part of the environmental load of households and in addition food can contain hazardous compounds resulting for example from farming and livestock production and traces of harmful chemicals, like fertilisers. The share of agriculture in certain chemical emissions to the Baltic Sea in Finland, as well as of nitrogen and phosphorus leaching has been estimated to be over 90 %. In Latvia it is estimated that more than 70 % of the total nitrogen and more than 40 % of the total phosphorus inland load is caused by various human activities, such as waste water discharge or runoff from agricultural land and forests. In Estonia, the average contribution of agriculture to total nitrogen emissions into waters between 2004 and 2007 was 57 % and to total phosphorus emissions 25 %.

In 2008 nitrogen application through mineral fertilisers was 50 % more than the 2004-2007 average value. In 2007 herbicide application was about 2.5 times that of 2005. Most eutrophic emissions originated from food raw material production and most mineral fertiliser and herbicide applications were similarly linked. Thus, development of the flow patterns, as well as the intensities of inputs and emission outputs of the food chain, played an essential role in sustainable development, especially with respect to the aquatic environment of the Baltic Sea.

In the year 2008 the total of 580 600 tons of nitrogen and 25 300 tons of phosphorus entered the Baltic Sea through waterways and more than half of both nutrients origin from diffuse sources. In 2008, 100 000 tons of nitrogen and 5200 tons of phosphorus leached to the Baltic Sea from Finland's land area making Finland responsible for 17 % of the total nitrogen load and 21 % of the total phosphorus load. Estonia's nitrogen load was 46 230 tons covering 8 % of the total load, with phosphorus load being 1370 tons. This was 5 % of the total load to the sea. Latvia's share of the total nitrogen load was 90 000 tons, which covered 15 % of total

load, and phosphorus load 3000 tons (12 %). Both N and P fluxes vary significantly from year to year depending mainly on hydrological conditions.

Increase in nutrient and chemical concentrations causes several problems to the sea: for example eutrophication result in algal blooms, which can be harmful to other species. Water turbidity decreases the recreational value of the sea and increased vegetation difficult commercial fishing by soiling the equipment, such as nets. Eutrophication also increases hypoxia, which already is a problem of sea bottoms. Also several harmful compounds leaching from inlands accumulate to the marine food chain and exceed the maximum allowable limits in some fish species in southern coast of Finland making the frequent consumption of certain fish species unhealthy.

One of the actions aiming at improving the state of the Baltic Sea is the HELCOM Baltic Sea Action Plan. Its target is to achieve a good ecological status of the Baltic marine environment by 2021 by decreasing the amount of phosphorus and nitrogen. The phosphorus load should be decreased 150 tons in Finland, 220 tons in Estonia and 300 tons in Latvia and nitrogen load 1200 tons, 900 tons and 2560 tons, respectively.

The eutrophication intensity varies between different foodstuffs: The beef has the highest eutrophication intensity of all meats, about three times higher than pork, and seven times that of poultry. The eutrophication intensity of milk is relatively low. Still, the values of beef and milk are partly bound together, since a significant share of beef comes from milk cows. The eutrophication impacts of plants also vary between species: Among the plant based raw materials grain has the highest intensity.

The modelling shows that the eutrophication can be reduced about 7% by changing the food consumption habits into recommended direction, and the private food consumption is not far from recommended. The major shift, about 7 % units from protein to carbohydrates, was reached in the scenario by applying a reduction to all protein foods, and an increment in all carbohydrate foods. This is because the foods containing animal proteins are more eutrophic than carbohydrate foods, and shifting from the use of protein foods to carbohydrate foods should finally be seen in the state of eutrophication.

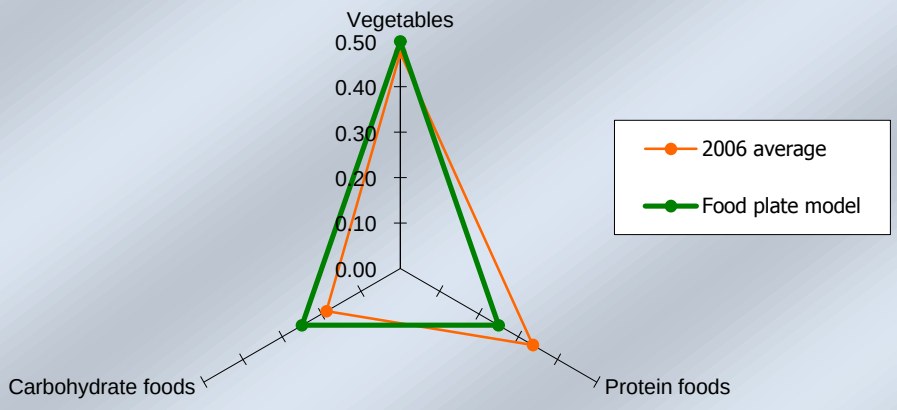

Figure. The idea of the diet scenario. The red triangle of 2006 private consumption is turned to the green triangle of recommended food plate.

Hazardous compounds in the Baltic Sea

By adopting the HELCOM Baltic Sea Action Plan (BSAP), the Baltic Sea countries committed themselves to achieving a strategic objective; "Baltic Sea with life undisturbed by hazardous compounds" order to be successful, four ecological objectives were defined:

- Concentrations of hazardous compounds close to natural levels
- All fish safe to eat
- Healthy wildlife
- Radioactivity (radionuclides) at pre-Chernobyl level

The 11 compounds/substance groups identified in the Baltic Sea Action Plan as being of special concern were:

1. Dioxins (PCDD), furans (PCDF) and dioxin-like polychlorinated biphenyls (PCBs)
2. Tributyltin compounds (TBT), triphenyltin compounds (TPhT)
3. Pentabromodiphenyl ether (pentaBDE), octabromodiphenyl ether (octaBDE), decabromodiphenyl ether (decaBDE)
4. Perfluorooctane sulfonate (PFOS), Perfluorooctanoic acid (PFOA)
5. Hexabromocyclododecane (HBCDD)
6. Nonylphenols (NP), nonyphenol ethoxylates (NPE)
7. Octylphenols (OP), octylphenol ethoxylates (OPE)
8. Short-chain chlorinated paraffins (SCCP), medium-chain chlorinated paraffins (MCCP)
9. Endosulfan
10. Mercury
11. Cadmium

In the HELCOM 2010 assessment the status of hazardous compounds was assessed and classified for 144 sites in the Baltic Sea. An integrated assessment and classification of "hazardous compounds status" was produced and used to evaluate whether the overall goal of "a Baltic Sea with life undisturbed by hazardous compounds" had been achieved. The quantification of the "hazardous compounds status" was based on a Contamination Ratio (CR), which is the ratio of the current status and a threshold level or quality criterion, which is used as an approximation for an environmental target for that particular compound or biological effect. The CRs of all compounds or indicators within an ecological objective are integrated, yielding a status classification ("high", "good", "moderate", "poor" and "bad") of that particular ecological objective.

All open sea areas of the Baltic Sea were classified as "disturbed by hazardous compounds" receiving a status classification "moderate", "poor" or "bad". The only exception was the north-western Kattegat which received a status classification "good". Open waters in the Northern Baltic Proper, Western and Eastern Gotland Basins, Gulfs of Finland and Gdansk received the worst status classifications (bad or poor) while the open sea areas in the Gulfs of Bothnia and Riga, Arkona and Bornholm Basins and Danish open waters were mainly classified as being in moderate status. Only six out of the 104 coastal assessment units were classified as "areas not disturbed by hazardous compounds", receiving a status classification good or high.

The coastal areas that received the highest status classifications were located in the Åland islands area, in Kaliningrad coastal area, on the Lithuanian coast, in the Kattegat and in the Finnish side of the Bothnian Bay. There was some tendency for the units with the poorest status to be located either near big cities or ports (Tallinn, Klaipeda) or to be estuarine areas (Kymijoki estuary in the Gulf of Finland), Kvädöfjörden in the Western Gotland Basin) or coastal sites (the Kiel bay area). Mostly, the waters near big coastal cities were classified as having "moderate" hazardous compounds status (e.g. St. Petersburg, Helsinki, Stockholm, Riga, Gdansk and Copenhagen).

Hazardous compounds in food

Food can contain hazardous compounds from various sources. They partly originate from the environment or farming and partly from food processing such as roasting or fermenting. There are also reports of soluble chemicals from packaging materials such as tin cans or plastics.

In Finland there is still large-scale use of pesticides and herbicides in farming, and in 2007 residues of 135 different compounds, including banned organophosphates and carbamate, were found (mainly from imported fruits). However, only 4-6 % of vegetables exceed the maximum stipulated limits for pesticide residues, but they can still represent a health risk, especially for three-year old children. Nitrate is a commonly used fertiliser and in addition to its eutrophication effect, its metabolite, nitrite, can be toxic for small children. Food itself can also be naturally hazardous. For example, green potatoes and tomatoes synthesise glycoalkaloids, and fresh false morel is notorious for its highly poisonous gyromitrine, which breaks down during drying or boiling. Moulds commonly spoil food by producing harmful mycotoxins, which can cause serious health problems to humans.

Hazardous compounds in food can be

-Environmental pollution
-Pesticides and herbicides
-Nitrates from fertilisers
-Biological toxins and amines
-Compounds comprised during food processing
-Solvents from packaging

In Estonia, every year daily food is becoming safer, but the food industry remains threatened from different sources (mostly environmental or industry-based risks) and food can contain hazardous compounds. Interest in food safety and healthy food has increased during last decade and information about hazardous compounds (contaminants, toxins, heavy metals etc.) in food is available from various sources: www.terviseamet.ee, www.vet.agri.ee, www.keskkonnainfo.ee, www.eria.ee. Food safety is regulated through a variety of laws, directives and regulations (EU, Food Act and Regulation (EC) No. 178/2002 of the European Parliament and of the Council) and the aim is to ensure that consumers purchase safe food, and get sufficient, factual information about food.

In Latvia The Food and Veterinary Service report details the key groups of products for which PAH (polycyclic aromatic hydrocarbons) and dioxins are taken in, and the proportion of risk-group products. Concerning hazardous compound intake through food, PAH mostly derives from cereal and cereal products, as well as marine products. Bread and its products constitute the highest proportion of the food basket in Latvia (26 %), followed by cereals and their products (18 %). The study shows that women consume 4.4 ng/kg bw PAH per day, and men 6.6 ng/kg bw. The PAH consumed in the case of the male food basket exceeds the EFSA recommendation by 0.6. The study also indicates that Latvian residents mostly consume dioxins through eating sea fish (32.4 %), including salmon and canned fish (23.2 %), and milk products (11.3 %). In Latvia, according to the study results, young people aged 7-11 with 4.28 pg TEQ/kg body weight per day exceed the permitted dioxin intake.

Conclusions

When looking at the consumption habits in the long term the result of diminished differences between the countries is seen. The result is in line with the assumption that social, economic and political changes influence eating habits. During the last decade all countries have experienced economic growth and adaptation of the national systems to the European Union, the process having however started earlier in Finland than in Estonia and Latvia. These changes might have had an effect on eating habits. Especially the increasing consumption of meat is reported to correlate with better socio-economic situation of the households.

When looking at the national food recommendations in Finland, Estonia and Latvia more similarities than differences were seen between countries. The nutritional recommendations in all countries include limitation of consumption of fat, especially animal fat, meat products and promotion of vegetable consumption. Recommended share of fat, carbohydrates and proteins equal in every country. In recommendations include specific advices for children and pregnant women. In Latvia and in Finland the consumption of fish is limited to 2-3 times a week.

In the project area we share the common concern of environment and food safety issues. Majority of the residents are concerned about toxicants found in food. Information about hazardous compounds (contaminants, toxicants, heavy metals etc.) in food is available from different sources and food safety is regulated by different laws, directives and regulations.

During the past decades variety of toxic compounds have emanated to the Baltic Sea as a result of human activity. Baltic Sea is generally considered one of the most polluted seas in the world. The notorious pesticide DDT and industrially used PCB and dioxins degrade very slowly in the nature and although their use has been banned, they still accumulate to the biota and to the top of the food chain. These compounds hinder the reproduction and preying of several animal species and cause them malformations. Heavy metals, such as mercury, copper and nickel used by industry are also found from the Baltic Sea. They accumulate to the seafloor where they can migrate back to the food chain. Also radioactive compounds have been found from the Baltic Sea.

Amount of dioxins, furans and dioxin-like PCBs in Baltic Herring can exceed the acceptable daily limit. A frequent consumption of contaminated fish can lead to intakes above maximum recommended intakes. Increasing consumption of contaminated fish among risk groups is not desirable. Risk groups include people with low body weight like children, pregnant or nursing women and the group with high consumption amounts of fish like fishermen and their families.

Environmental aspect is coming more important when selecting the diet and increasing knowledge of food safety are taking into account in national food recommendations. Consumers prefer locally produced food and amount of organic production is increasing. In spite of that, consumers do not know that cultivation of food and related production activities might cause negative impacts to the Baltic Sea.

Agriculture, transportation and wastewaters from the industry, energy production and urban areas have strongly increased the nutrient load in the sea. However, new wastewater purification systems have reduced the eutrophic impact of industry and urban areas but the agricultural impact on eutrophication is still strong due to ineffective efforts to reduce nutrient leaches from the fields.

Eutrophication of the Baltic Sea is due to the excess of nitrogen and phosphorus loads coming from land-based sources. The great majority of the nutrient load to the Baltic Sea is caused by agriculture, it is estimated that 75 % of nitrogen and 52 % of

phosphorus come from agriculture and the livestock sector. The regional concentration of agricultural production and the growth of the sizes of animal farms are increased in the project area as well as consumption of meat. Intensive farming also results in intensive fertilizing and greater nutrient leaches to the sea. In countries with nutrient-extensive agriculture, the agricultural sector need to develop without increasing nutrient surpluses.

Also climate change has its own, currently somewhat unpredictable effects on the Baltic Sea. However, the mean annual temperature will rise which means rainy and mild winters, warmer summers and changing ice conditions. Heavier rains in winter will presumably increase erosion and nutrient leaches to the Baltic Sea. These changes must be taken into account in future analysis.

An effect of consumers daily choices

Consumers can reduce the negative impact on the state of the Baltic Sea by changing their daily choices and consumption patterns. Most effective is to reduce the consumption of meat. By changing our eating habits to a healthier direction and eating by the official recommendations on food, we could reduce the agricultural nutrient load by 7 % in Finland. This is not quite sufficient to cover the total reduction need required by the BSAP but would a significant step towards reducing the nutrient load of the Baltic Sea and it is especially a good deed for our own health.

Reference:

Virpi Vorne and Lila Patrikainen (Eds.) *The Baltic environment, food and health: from habits to awareness. Feasibility study*. MTT Report series 34, 2011. Available at www.mtt.fi/mttraportti.