

Healthy living, nutrition and food waste in the Barents region

Arja Rautio, Sari Piippo, Eva Pongràcz, Elena Golubeva, Andrey Soloviev, Ida S. Grini, Themistoklis Altintzoglou and Hilde Helgesen





Nofima is a business oriented research institute working in research and development for aquaculture, fisheries and food industry in Norway.

Nofima has about 350 employees.

The main office is located in Tromsø, and the research divisions are located in Bergen, Stavanger, Sunndalsøra, Tromsø and Ås.

Main office in Tromsø:

Muninbakken 9–13
P.O.box 6122 Langnes
NO-9291 Tromsø

Ås:

Osloveien 1
P.O.box 210
NO-1433 ÅS

Stavanger:

Måltidets hus, Richard Johnsen gate 4
P.O.box 8034
NO-4068 Stavanger

Bergen:

Kjerreidviken 16
P.O.box 1425 Oasen
NO-5844 Bergen

Sunndalsøra:

Sjølseng
NO-6600 Sunndalsøra

Alta:

Kunnskapsparken, Markedsgata 3
NO-9510 Alta

Company contact information:

Tel: +47 77 62 90 00

E-mail: post@nofima.no

Internet: www.nofima.no

Business reg.no.:

NO 989 278 835 VAT

Report

<p><i>Title:</i> Healthy living, nutrition and food waste in the Barents region</p>	<p>ISBN: 978-82-8296-485-2 (printed) ISBN: 978-82-8296-486-9 (pdf) ISSN 1890-579X</p>
<p><i>Tittel:</i> Sunn livsstil, kosthold og matsvinn i Barentsregionen</p>	<p><i>Report No.:</i> 5/2017</p>
<p><i>Author(s)/Project manager:</i> Arja Rautio, Sari Piippo, Eva Pongràcz, Elena Golubeva, Andrey Soloviev, Ida S. Grini, Themistoklis Altintzoglou, Hilde Helgesen (project leader)</p>	<p><i>Accessibility:</i> Open</p> <p><i>Date:</i> 20 February 2017</p>
<p><i>Department:</i> Sensorikk, forbruker og innovasjon, Næring og bedrift</p>	<p><i>Number of pages and appendixes:</i> 32 + 4</p>
<p><i>Client:</i> Nordic Council of Ministers Arctic cooperation Programme</p>	<p><i>Client's ref.:</i></p>
<p><i>Keywords:</i> Public health, Russia, Finland, Norway, diet, nutrition, alcohol consumption, food waste</p>	<p><i>Project No.:</i> 11385</p>
<p><i>Summary/recommendation:</i></p> <p>The Nordic Council of Ministers through the Arctic Co-operation Programme 2015-2017, funds «Healthy food and lifestyle in the Arctic». Researchers at NIBIO - Department of Economy and Society, and Nofima has collaborated with researchers from the University of Oulu in Finland and two universities in Arkhangelsk in Russia.</p> <p>An important part of the project is that researchers from Norway, Finland and Russia share knowledge and learn from each other about what a sustainable and healthy diet is and how it affects public health in the three countries.</p> <p>The project's overall goal has been to contribute to documenting some key trends in diet and alcohol consumption, and how these affect people's health in the Barents Region. Moreover, the project aims to provide a brief description of some key aspects related to food waste and what role food waste has, or may have a sustainable and healthy diet. This report, which points to large inequalities in health in the three countries, is based on work done in the project's first year. The theme food waste in this report is limited to pointing out differences in the three countries in terms of legislation and some measures to reduce the amount food waste. The report relates to the work done in one of the project's work packages, and was conducted during the period September 2015 to August 2016.</p>	
<p><i>Summary/recommendation in Norwegian:</i></p> <p>«Sunn mat og livsstil i de arktiske områdene», er finansiert av Nordisk Ministerråd gjennom det Arktiske samarbeidsprogrammet 2015-2017. Forskere ved NIBIOs avdeling for økonomi og samfunn og Nofima har samarbeidet med forskere fra universitetet i Oulu i Finland og to universiteter i Arkhangelsk i Russland.</p> <p>En viktig del av prosjektet er at forskere fra Norge, Finland og Russland deler kunnskap og lærer av hverandre om hva som er et bærekraftig og sunt kosthold og hvordan dette virker inn på folkehelsen i de tre landene.</p> <p>Prosjektets overordnede mål har vært å bidra til å dokumentere noen sentrale utviklingstrekk i kosthold og alkoholforbruk, og hvordan disse påvirker folks helse i Barentsregionen. Videre har prosjektet som mål å gi en kort beskrivelse av en del viktige forhold knyttet til matsvinn og hvilken rolle matsvinn har eller kan ha for et bærekraftig og sunt kosthold. Denne rapporten, som peker på store ulikheter i folkehelse i de tre landene, er basert på arbeid gjort i prosjektets første år. Temaet matsvinn er i denne rapporten begrenset til å peke på ulikheter i de tre landene når det gjelder regelverk og noen tiltak for å redusere mengden matsvinn. Rapporten forholder seg til arbeidet gjort i en av prosjektets arbeidspakker og ble gjennomført i perioden september 2015 til og med august 2016.</p>	

Arja Rautio, Sari Piippo, Eva Pongràcz (University of Oulu, Oulu, Finland)



Elena Golubeva (Northern Arctic Federal University, Arkhangelsk, Russia)



Andrey Soloviev (Northern State Medical University, Arkhangelsk, Russia)



Ida S. Grini and Themistoklis Altintzoglou (Nofima, Norway)



Hilde Helgesen (Norwegian Institute of Bioeconomy Research, Norway)



Table of Contents

1	Background	1
1.1	Populations and living conditions in Barents region	1
1.2	Sami in Finland, Norway and Russia	2
1.3	Social change and influence on indigenous health.....	3
1.4	Health parameters.....	3
1.5	Clean water and wildlife food	4
2	Nutrition and food recommendations in Finland, Russia and Norway	6
2.1	Finland	7
2.2	Russia.....	8
2.3	Norway	9
2.3.1	Recipe for a Healthier diet – Norwegian Action Plan in Nutrition	9
2.3.2	Dietary advice to promote public health and prevent chronic disease	10
2.3.3	Keyhole for better health	10
3	Alcohol consumption in Finland, Russia and Norway	12
3.1	Russia.....	12
3.1.1	The Russian territory of the Barents region – the drinking part of the country	13
3.2	Finland	16
3.3	Norway	19
4	Food waste	22
4.1	Food waste in the EU.....	22
4.2	Food waste in Finland.....	23
4.2.1	Legislation and regulations.....	23
4.2.2	Food waste studies.....	23
4.2.3	Food loss.....	24
4.2.4	Prevention of food loss.....	24
4.3	Food waste management in Finland	24
4.3.1	Food waste management in the Oulo Region.....	25
4.3.2	Food waste management in Lapland	26
4.4	Food waste in Russia	27
4.4.1	Food waste management in the Arkhangelsk Region.....	27
4.5	Food waste in Norway.....	27
4.6	Summary/conclusions on food waste prevention	29
5	References	30

1 Background

In the Arctic, over the last 60 to 70 years, there has been a marked decline in infectious diseases, mainly tuberculosis, and a marked increase of chronic lifestyle diseases (such as obesity, diabetes and cardiovascular diseases) have taken place. The decline in infectious diseases are mainly due to better housing and improved hygienic conditions. The rise in chronic lifestyle diseases is partly due to a shift to a more Western diet with hints of more junk food, less physical activity and high proportion of smokers, alcohol and drug abuse (Rautio et al., 2014).

Rapid societal, environmental and climate changes are happening all over the Arctic, seen as risks for human health and well-being both in rural and urban communities. Demographic changes, like population aging and migration, and urbanization challenge the human development in the Arctic. The increasing economical interest towards Arctic brings also new “population” groups, which work short periods in the industries, mining or sailing, and will not stay in the Arctic. All this is true in the Barents region and we need to focus on following the trends of parameters of well-being, environment and healthy lifestyle.

For the sustainable development it is important to understand the needs of Arctic youth and elderly; gendered dimensions of Arctic change; securities of food, water and energy; economical role of Arctic settlements, cities, and communities (see more AHDR II, 2014). All this is affecting the food choices and lifestyles in different parts of the Barents region. Our project is focusing on the healthy lifestyle in a sustainable way and we will introduce some national and local good practices of every three countries, in Russia, Norway and Finland. This report gives the baseline information about the healthy living, nutrition and food waste in these three areas.

1.1 Populations and living conditions in Barents region

There are around five million people living in the Barents region. Growing awareness of the wide variations in demographic trends and migration at the sub-national level has an impact on labor markets, social services and the agenda of regional politics.

Analysis of the research on socio-demographic changes in the Arctic shows that one important factor in this region is aging and migration. However, there are big differences in the mortality and life expectancy between countries. The death rates in the Barents Euro-Arctic Region varies from Oulu 7.6 (total deaths, promil) to Arkhangelsk region 14.4 (Emelyanova 2015). The lowest values of life expectancy at birth for males/females were in Nenets Autonomous Area 57/72 years, and highest in Vesterbotten 79/83 years (Fig 1, Danilova et al, 2011). The Barents population aged over 60 years reaches up 20 % by 2009, and the highest degree of aging is in the northern parts of Norway, Sweden and Finland. The aging status of populations in the territories of Barents region differs, and it means that the population aged over 60/64 years is not having same kind of health conditions. It means, that if the life expectancy is around 20 years higher, the persons at the age of 60/64 don't have the same health in Russia compared to Norway and Finland, and new type of prospective indicators are needed (Emelyanova, 2015).

Golubeva (2012) identified the major risk factors, which reduce the quality of life of elderly people in the Russian part of the Arctic regions. They were: 1) micro-level environment, alcohol dependence and loneliness; 2) identified gender aspects of aging, the influence of social services for the quality of life;

3) family and close microenvironment of older adults were a significant resource that enhanced the quality of life; and 4) an accelerated decline in functional systems of persons residing in nursing homes, and speeding of a biological aging among men, compared to women (Golubeva, 2014).

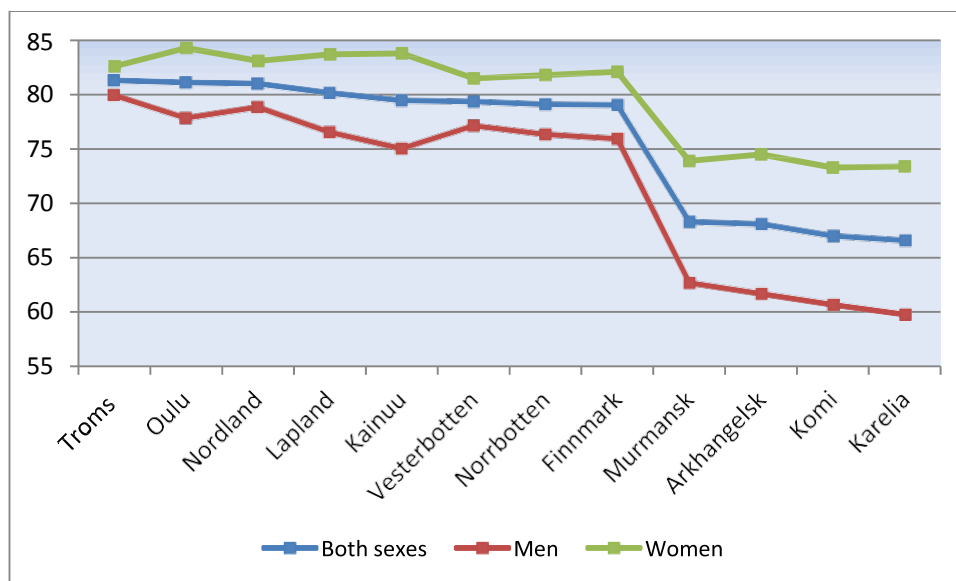


Figure 1 Life expectancy at birth of the Barents region's populations by gender, 2010. Sources: National statbanks

1.2 Sami in Finland, Norway and Russia

The only indigenous people living in the European Union area are Sami. It is difficult to estimate how large the Sami population is in Finland and Norway, but judging from past historical census estimates there are currently a number between 40 000 to 80 000 individuals with Sami origins in Norway and around 8000-10 000 Sami in Finland. There are no registers in Norway, Sweden and Finland according the ethnicity, but in Russia those are existing. In the Nordic countries the Sami census is an electoral roll where people who want to vote in Sami parliamentary elections can join in these counties, and these electoral rolls should not be used for other purposes, e.g. for research. It is not possible to give a definitive answer to who is a sami and who is not. Sami, Finns and Norwegians coexist together with Sami, and are influenced by each other's culture and language. Many have both Sami, Kven and Norwegian/Finnish ancestors, and thus have multiethnic background. As a direct consequence of the former policy in Norway and Finland to transform the sami to Norwegian/Finnish culture and language, many fail to report their Sami or Kven background or this is kept hidden for them within the family (Brustad et al 2014, Soininen 2015), and consequences of structural racism are seen in both countries (Juutilainen and Heikkilä, 2016). The Sami of Russia are one of the indigenous peoples of the Russian Federation. Until 1930 in the passports of the Russian Sami their nationality was recorded as "Lopar", and in 1930 as "the Sami". The number of Russian Sami is less than two thousand people. The Sami population of modern Russia is engaged in traditional crafts (reindeer breeding, fishing, hunting), and modern activities, like in Norway, Finland and Sweden. According to the census 2010 population the Sami population in Russia was 1771 people (urban population of 787 people, rural — 984), and it has been at same level over 100 years. The majority of the Sami is living in the Murmansk region. The highest density of Sami

people live in the Lovozero district, including the large village — the regional center Lovozero, informally referred to as the cultural capital of the Sami (the village is also called the capital of Russian Lapland)¹.

1.3 Social change and influence on indigenous health

On top of having experienced a rapid and efficient modernization, most indigenous peoples in the world, Inuit and Sami included, have been subjected to a long involuntary assimilation process. Assimilation implies that individuals or groups are being taken up in mainstream society at large community premises; it is a one-way process in which those who assimilated must change their fundamental cultural values. By including the church and the school system the indigenous language and culture was suppressed. The prevailing view was that the road to prosperity and a good life went through the majority population language and way of life. Assimilation of the Sami in Norway was hardest in the period from 1850 to 1959, and the same was happening in Finland. Because of this process numerous Sami stopped to use the Sami language and began to conceal, suppress and deliberately hide their Sami background. Even today this most likely has a negative impact on Sami health since each one experience a feeling of being lonely with the shame and pain (Nergård, 2014, Juutilainen et al 2014; Juutilainen & Heikkilä 2016).

1.4 Health parameters

Rapid social change has influenced health among all Arctic indigenous peoples, and this has been found in studies of the Sami population in Norway (Eliassen, 2013). The study indicates that chronic stress as result of marginalization can be a contributory cause of the predominance of cardiovascular disease among Sami in districts in Northern Norway. He concluded that rapid modernization and colonization history is an important factor in many health conditions.

SAMINOR studies are the only recent population surveys in Norway and Lapland that contribute to increased knowledge of the health and living conditions of the Sami. This indigenous perspective does SAMINOR a unique databank nationally and internationally. Two health and living conditions surveys have been conducted; SAMINOR 1 from 2003 to 2004, and SAMINOR 2 from 2012 to 2014.

One of the research about iron status in northern Norway based on three different health surveys (Health and lifestyle survey SAMINOR 1, the Norwegian - Russian health study of Sør-Varanger and the Tromsø 5 survey) showed that the lowest proportion of iron deficiency was found in rural population in northern Norway (Broderstad et al 2007). Population residing in inland regions of Finnmark had a very low incidence of iron deficiency, and this was connected with the consumption of a lot of reindeer meat. In the populations of the coastal areas and Tromsø the incidence of iron deficiency was more prevalent. Traditional diets with easily bioavailable iron, such as reindeer meat, is therefore a good protection against iron deficiency.

Health and disease mortality of Finnish Sami have been lower than non-Sami at 1980's, but during the last 30 years it has reached the national and regional values (Soininen 2015). Especially cancer incidence has been low, but now it is equal with the average values in Finland and Lapland. This may be caused by the changes

¹ See more information in Russian: Association of the Kola Saami: Association of Sámi in Murmansk oblast https://en.wikipedia.org/wiki/Association_of_S%C3%A1mi_in_Murmansk_Oblast (lyhenne: "OOSMO"). Sami Parliament of Russia https://en.wikipedia.org/wiki/Sami_Parliament_of_Russia

of the living habits and environment of Sami which are now similar with the majority of Finnish and western populations. The traditional Sami living is a good example of a healthy way of living.

Mortality from accidents and violence was significantly higher in Sami when compared to national values. Non-fatal accidents and suicide attempts are also more common in Sami males. In Finland and Norway the incidence ratio of all cancers were lower in Sami females when compared to national level, but Swedish Sami women were at the national Swedish level. Also the survival of Sami cancer patients did not differ from that of cancer in national level. (Soininen, 2015)

There are a lot research papers about the traditional arctic food and food safety and Sami nutrition in Norway.²

1.5 Clean water and wildlife food

The healthy living means at least clean water, food and air but also the safety and security life for the individuals, groups and communities. Changes in climate, environmental and land use together with socioeconomic factors have impact on food and water security also in the Arctic region (FAO 2012, Nilsson et al, 2013). However, e.g. quality of tap or well water is not monitored regularly in all municipalities in Barents region. Metal levels in household water in six cities of Murmansk region (Nikel, Zapolyarny, Olenegorsk, Montchegorsk, Apatity, Kirovsk) showed that some cities lack sanitary protection zones for water sources, most cities require preliminary water processing, water disinfection involves only chlorination (Dushkina et al, 2015). High levels of aluminum in Kirovsk and nickel in Zapolyarny and Nikel cities were found. Water taken from Petchenga region springs demonstrated relatively low levels of metals, except those of strontium and barium (Dushkina et al., 2015).

The Arctic populations are using the traditional and local food items which may be exposed to pollutants released into the environment of remote and local sources (Donaldson et al, 2010). For example, Arkhangelsk region is an industrially developed region, where large pulp and paper and woodworking industries. Emissions from industrial facilities have a high content of sulfur dioxide (50.0 %), and various kinds of dust (16.5 %), carbon monoxide (10.6 %), hydrocarbons (12.6 %), nitrogen oxides (9.35 %). Over the last 5 years in the cities of Arkhangelsk region there is a tendency to increase the level of air pollution with nitrogen dioxide, and particulate matter (Bogdanov et al, 2011).

Food costs in the Arctic are high, comprising e.g. 23-43 % of household income in the Russian Arctic (Dudarev et al 2013a), and due to the climate change many wildlife species consumed as country foods have been disappeared, and shortening snow-covered period in winter influence on human travel and transportation. Recent studies indicate elevated rates of household food insecurity in many places in the Arctic, e.g. in Nunavut Canada, nearly 70 % of the Inuit preschoolers have been hungry during the last year (Egeland et al. 2010), and 45 % of the indigenous people in Chukotka (Russia). Community remoteness and northern latitude often restrict the access to fresh and nutritious market foods. It is important to make adaptation strategies based on the understanding the determinants of food and water security and cultural factors. The

² See more: https://en.uit.no/om/enhet/ansatte/person?p_document_id=42107&p_dimension_id=88111).

There have been published popular booklets "How is your health" (2015), "Reindeer as food" and "Survey of living conditions in the Arctic – SliCA (see more

https://intranett.uit.no/Content/432492/Popul%C3%A6rvitenskapelig%20tidsskrift%20_%20Senter%20for%20samisk%20helseforskning%202015.pdf, and

https://en.uit.no/forskning/forskningsgrupper/nyheter/artikkel?p_document_id=425187&sub_id=425508

interactions between environment, wildlife and human health must be taken better into account (One health concept), since many water, air and food borne diseases have already increased in the Arctic (see www.circhnet.org).

Fennoscandia is an area with good collected databases of human and animal infectious diseases, the longest ecological time series data and climate data which all affect wellbeing and health of humans, livestock, fish and wildlife of these regions. The main reservoir hosts of zoonotic pathogens are small mammals, mainly voles and lemmings (Henttonen et al., 2000) and important vectors are ticks, mosquitoes, fleas, like Puumala infections. Especially the health of reindeer and moose is important also for local economy. The climate warming and tourists will change and bring new species and possibilities for new infections in Barents region.

There have also been high levels of biological and chemical contamination of food in many regions (Dudarev et al 2013a). Within international "Food safety and health in borders of Russia, Finland and Norway" Kolarctic research project the toxic metals were studied from the local food items, like fish, mushrooms, berries and game in Pechenga district (Dudarev et al, 2015b). There were high cadmium, nickel and copper concentrations in mushrooms, and nickel levels in wild berries. The information about the exceeded levels of heavy metals in food items help the authorities to give recommendations on restricting some food items for reducing the health risks. In this Kolarctic-ENPI project there have been made food questionnaires in all three countries, collection of samples from food items and blood from pregnant women for measurements of environmental contaminants and toxic metals. The radioactivity levels were also measured from the food items from Northern Norway and Finland.

Incidences of infectious and parasitic food- and waterborne diseases in the general population in the Russian Arctic, Siberia and the Far East are very high (Dudarev et al 2013b). The authors concluded that improvement of the food supply and food accessibility in the regions of the Russian Arctic, Siberia and the Far East is the most important task of the food and water security issues. There is a need to monitor measurable quantitative indicators of food and water security in the Arctic regions over time, especially when climate change together with increase industrial activities, especially mining and shipping, will be big challenges for human health (Nilsson et al, 2013). In the Nordic regions of Barents area the biggest worries have been the increase of the water-borne infections (Nilsson et al, 2013).

Products from reindeer (meat, liver, tallow and bone marrow) is a good source of a number of essential nutrients. Rein meat is lean (2 % fat) and is a good source of omega 3-fatty acids. Levels of B12, E vitamins, iron, zinc and selenium in meat and liver are more than twice in meat and liver from other animals (Hassan et al, 2012). However, nowadays there have been found rather high levels of dioxins in reindeer and moose Finland, and these levels have decreased during the follow-up period (see Holma-Suutari, 2015). Reindeer liver, for its part, had quite a lot of dioxin-like compounds that may compromise its safety as food, at least on a regular basis (Finnish recommendations). The consumption of reindeer meat and other products from reindeer can contribute significantly to the recommended intake of several important nutrients according to the recommendations in Norway.

Furthermore, meat, liver, tallow and bone marrow from reindeer are safe to eat in terms of heavy metals, also from reindeer stemming from grazing districts close to the Russian border and grazing districts with mining activities and military activity. In conclusions, there is no need to be concerned with the animal's origin in terms of nutrients when buying reindeer meat.

2 Nutrition and food recommendations in Finland, Russia and Norway

Nutrition is a physiologically balanced diet of healthy people based on their sex, age, nature of work and other factors that contribute to high physical and mental capacity of human resistance, the emergence of disease, and prolong life. Scientific substantiation and practical proof of the vital importance of the principles of good nutrition have allowed the United States to offer national nutritional "strategy", so-called Harvard pyramid, has been further research and application development and wider revitalizing (preventive) sense (Baranovsky 2012).

Requirements for a balanced diet composed of the requirements to diet and meal conditions. With regard to the elderly people group and persons with high risk of premature aging, these claims amounted to a practical framework supply of older persons, adopted by WHO in 1988 (WHO, 1998). The principles are:

1. Compliance with caloric diet actual energy consumption of the body;
2. Preventative direction of nutrition;
3. Compliance with the chemical composition of the diet of age-related changes of metabolism and function of organs and systems;
4. The diversity of the food basket for the providing balanced content in the diet of all essential food substances;
5. The use of products and dishes that have fairly easy digestibility combined with food, moderately stimulate secretory and motor function of the digestive system, normalizes the composition of intestinal microflora;
6. Correct diet with more uniform compared to the young age distribution of food for separate intakes;
7. The individualization of nutrition taking into account peculiarities of the metabolism and the state of individual organs and systems in particular older people and many years of eating habits.

Reasons contributing to the development of malnutrition in older people can be divided into primary and secondary (Savchenkov and Sosedova, 2016). The primary reasons include:

1. Lack of awareness of older persons about the rules of a balanced diet;
2. Social isolation, loneliness;
3. Incompetent recommendations both specialists and doctors;
4. Low financial status.
5. The secondary may include:
6. Violation of appetite;
7. Violation of the functions of chewing, as a rule, due to the loss of teeth;
8. The prolonged use of drugs;
9. An increased need for nutrients.

Malnutrition in older adults can provoke an aggravation of chronic diseases, weakening of the immune system, reduced ability to self-care, as well as affect the quality and duration of life.

Table 1 Approximate daily set of products (grams) for elderly people by WHO (1998)

Products	Before 65 y		After 65 y	
	Men	Women	Men	Women
Rye bread	100	100	100	100
Wheat flour bread	200	150	150	120
Wheat flour	10-20	10-20	10-20	10-20
Pasta	10	10	10	10
Grains and legumes	30	30	25	25
Potato	250	200	200	150
Vegetables and melons	400	400	350	350
Fruits and fresh berries	300	300	250	250
Dried fruits	25	25	25	25
Sugar	50	50	50	50
Low fat meat	100	75	100	75
Low fat fish	75	75	60	60
Milk	150	150	150	150
Kefir	150	150	150	150
Cottage cheese	100	100	100	100
Oil	20-30	20-30	20-30	20-30
Dairy butter	10	10	10	10
Eggs	2-3 times per week			

2.1 Finland

General, in Finland there are a lot recommendations about the healthy food³, and there are also separate beverages recommendations for the children and young, adults and elderly and also from energy contents and acidity of beverages. In these recommendations, there are also maximum amount of alcohol, one portion per day for adult women and two portions per day for men. The new nutrition recommendations by the National Nutrition Council were given in 2014. The recommendations target all Finns, and as a rule they follow the Nordic recommendations published in autumn 2013 (NNR2012). The focus is on a comprehensive idea of

³ See: <http://www.ravitsemusneuvottelukunta.fi/porta/en/>

a health-promoting diet, composed of the quality, quantity and role as source of nutrients of various kinds of foods and their link to human health.

Finnish Food Safety Authorities (Evira) gives more specific food recommendations, like dietary advice on fish consumption. Fish should be eaten twice per week and different fish species should be varied in the diet. However, there are several exceptions⁴. For these reasons the Finnish Food Safety Authority Evira has issued the following exceptions to the general dietary advice on fish consumption:

- Children, young people and persons of fertile age may not eat large herring, which are longer than 17 cm, or alternatively salmon or trout caught in the Baltic Sea more often than once or twice a month.
- Children, young people and persons of fertile age may not eat pike caught in a lake or in the sea more often than once or twice a month.
- Pregnant women and nursing mothers should not eat pike at all due to the mercury accumulated in pike.
- Persons who eat fish from inland waters on a daily basis are advised to reduce their consumption of also other predatory fish that accumulate mercury. Apart from pike, these include large perch, pike perch and burbot.

There are also several research and follow-up monitoring projects going on, like the cumulative exposure of children for the toxic metals, and Finland is participating in the data collected at the EU level and Food Barometry 2010. These results showed the Finnish are trusting on the whole food producing chain more than the Europeans, food authorities (Finland 84 % versus 64 % EU), supermarkets and food stores (Finland 57 % vs EU 36 %) and food producers (65 % Finland vs 35 % EU).

2.2 Russia

Russia have adopted the Conception of state policy of the healthy nutrition (1998 – 2005), and there is no other documents in this sphere after 2005⁵. The objectives of the state policy in the field of healthy eating are the preservation and strengthening of health, prevention of diseases related to malnutrition of children and adults. Some researches give us facts and recommendations for Russian Arctic population. The daily ration of Russian northern inhabitants with an average physical activity should be 4500 kcal (Eganyan, 2005). It should receive per day, about 150 grams of protein (this is 15 % of the caloric value), of which at least 60 % should be animal proteins. Those who live in the High North also require increased amounts of fat - up to 150 grams per day (30 % of the caloric content), and 60-90 % of them should be fat of animal origin, taking into account the specificity of the northern sources of animal protein and fat. The need for carbohydrates is about 600 g per day, and the diet should include more carbohydrate (like sugar, confectionery). Thus, a ratio is 1: 1: 4, meaning 15 % protein, 30 % fat and 55 % carbohydrate, as recommended by the WHO (James, 1993). The need for a variety of vitamins in the High North is estimated to increase almost 2 times. The recommended intakes of vitamins for those of physical labor, working mostly outdoors in cold climates are: 2.5-3 mg vitamin A; Vitamin B1 5 mg; Vitamin B2 5 mg; 100-150 mg of vitamin C, and for lactating women 200 mg; 30-40 mg of vitamin E; Vitamin D (for children and young people aged 18-21 years) 0,0012-0,025 mg.

⁴ See:

<http://www.evira.fi/portal/en/food/information+on+food/food+ hazards/restriction+on+the+use+of+foodstuffs/dietary+advice+on+fish+consumption/>

⁵ See: <http://www.medicus.ru/handbook/legal/document24054.phtml>

If we compare regulated subsistence food rations in areas with a temperate climate, and in the High North, the differences are obvious. Thus, the rate of meat products in temperate areas is 167 g / day or 61 kg / g, and for the Far North - 250 g / day or 91 kg / g, ie 1.5 times more. Dairy products, respectively, 486 and 1747 g / day - 3.6 times. The energy value generally, respectively, 3517 and 5120 kcal, i.e. for northerners - 1.45 times more (Buganov et al, 2003). On fact, the majority of the population of the North found a violation of nutrition due to both inadequate intake of nutrients, especially vitamins, macro- and microelements and complete proteins. Currently, the consumption of meat and meat products is 81.9 % from the physiological norm, dairy products - 62.9 %, eggs - 68.9 %, vegetables - 45 %, fruits - 64 %, fresh fish and fish products - 38.9 %.

2.3 Norway

Norway follows almost the same as Finland in general as we are a part of the National Nutrition Council. A working group under the Nordic Council of Ministers has led the Nordic Nutrition Recommendations (NNR 2012) and it has been published every eight years since 1980. The recommendations give a scientific basis for formulating dietary guidelines and The NNR are the main reference point for the various national dietary recommendations in the Nordic countries, and the major tool to evaluate the adequacy of dietary intakes in the population. It is also basis for the Nordic Keyhole.

The NNR focuses on dietary patterns and sets recommended nutrient intakes, with an emphasis on the quality of food that provide fats and carbohydrates. It also include plenty of vegetables, fruit and berries, regular intake of fish, vegetable oils, wholegrain, low-fat alternatives of dairy and meat, and limited intake of red and processed meat, sugar, salt and alcohol. It also gives recommendations for adequate physical activity that will contribute to the prevention of lifestyle-related diseases. In the 5th edition, the NNR 2012, there are recommendations on physical activity included. For physical activity, recommendations are given for time spent at moderate-intensity (>150 min/week) or vigorous intensity (> 75 min/week) for adults and at least 60 min/day moderate- and vigorous intensity, equally distributed, for children.

There are also separate beverages recommendations for children, young adults and elderly and from energy contents and acidity of beverages. In the recommendations, there are also maximum amount of alcohol, one portion per day for adult women and two portions per day for men.

The recommendations has been changed over the last decade in especially fat and carbohydrates, in line with studies on dietary patterns and health outcomes. For protein the recommendation have different levels for intake on elderly.

A chapter on sustainable food consumption has also been added. For food consumption to be sustainable it has to be safe and healthy in both amount and quality, and this has to be achieved through means that are economically, socially, culturally, and environmentally sustainable. In addition, waste and pollution need to be reduced. See more: www.norden.org/nnr for all information on the Nordic Nutrition Recommendations.

2.3.1 Recipe for a Healthier diet – Norwegian Action Plan in Nutrition

The Action Plan Recipe for a healthier diet is made as a toolbox for decision makers, professionals, researchers, food industry, NGOs and others in the public and private sectors that play a role in the

population's diet (Ministry of Health and Care Services, 2007). Main goals are to change the diet in line with the recommendations and to reduce social inequalities in diet:

- Improve the availability of healthy food products to choose healthy foods
- Consumer knowledge
- Qualifications of key personnel. Policy makers and occupational groups who directly or indirectly contribute to nutrition-related activities
- Local basis of nutrition-related activities; Strengthen focus on nutrition in health care services
- There is now working on a follow-up action plan led by the Norwegian government. This is also based on valuation that The WHO Regional Office for Europe (WHO). It has done in the document
- Evaluation of the Norwegian nutrition policy with a focus on the Action Plan on Nutrition 2007–2011 (The WHO Regional Office for Europe, The World Health Organization (WHO, 2012)).

2.3.2 Dietary advice to promote public health and prevent chronic disease

The goal of dietary advice is that societal-based measures make it easy for everyone. People should have a good basis for putting together a diet that can prevent chronic diseases such as cardiovascular disease, some cancers, type 2 diabetes, overweight and obesity. The report "Dietary advice to promote public health and prevent chronic disease" from the Norwegian National Nutrition Council, is the basis for the government's dietary advice to the population. Instead of only looking at the individual nutrients such as vitamins, minerals and fats, it is the connection between food and health that have formed the basis for dietary advice (Nasjonalt råd for ernæring, 2011).

10 Key-advice for a healthy diet

1. Eat at least five servings of vegetables, fruits and berries every day.
2. Eat whole grain products each day.
3. Leave low-fat dairy products can be a part of the daily diet.
4. Eat fish for dinner two to three times a week. Use also like fish topping.
5. Choose lean meats and low-fat meat products. Limit the amount of processed meat and red meat.
6. Select edible oils, liquid margarine and soft margarine, rather than hard margarine and butter.
7. Choose foods with little salt and limit the use of salt in cooking and on food.
8. Avoid foods and drinks with lots of sugar every day.
9. Choose water as a thirst quencher.
10. Have a good balance between how much energy you ingest through food and drink, and how much you consume through activity.

2.3.3 Keyhole for better health



The Keyhole symbol is a Nordic labelling on food products in Norway, Denmark and Sweden.

The Directorate of Health and the Norwegian Food Safety Authority determine which food product groups that can be labelled with the Keyhole symbol and the criteria the products must meet. Using the Keyhole symbol is voluntary, and it is the food industry responsibility to follow up.

There are 33 food product groups, which can use the Keyhole. Within each product group, the focus is on the amount of fiber, fat, sugar and salt. For example, a Keyhole-labelled breakfast cereal will contain more fiber

and less sugar than a breakfast cereal without the symbol. In meat products, the proportion of saturated fats and salt is considered most important, while a Keyhole-labelled bread on the other hand must meet the criteria for fiber, fat, sugar and salt. In certain product groups, such as soda, candy and chocolate, cakes and biscuits, no products can be labelled with the Keyhole symbol (The Norwegian Directorate of Health, 2015).⁶

⁶ See more:

Ministry of Health and Care Services. (2007). *Recipe for a Healthier diet – Norwegian Action Plan in Nutrition* Oslo: Ministry of Health and Care Services. Nasjonalt råd for ernæring. (2011). *Kostråd for å fremme folkehelsen og forebygge kroniske sykdommer. Metologi og vitenskapelig kunnskapsgrunnlag.*

The Norwegian Directorate of Health. (2015). The Keyhole – for healthier food. Retrieved from <https://helsenorge.no/other-languages/english/keyhole-healthy-food>.

The WHO Regional Office for Europe, The World Health Organization (WHO). (2012). *Evaluation of the Norwegian nutrition policy with a focus on the Action Plan on Nutrition 2007–2011.* World Health Organization Regional Office for Europe Retrieved from http://www.euro.who.int/data/assets/pdf_file/0003/192882/Evaluation-of-the-Norwegian-nutrition-policy-with-a-focus-on-the-Action-Plan-on-Nutrition-20072011.pdf

3 Alcohol consumption in Finland, Russia and Norway

3.1 Russia⁷

High levels of alcohol consumption in Russia remain an urgent problem on a national scale, making a significant contribution to the development of serious social risks, reducing social capacity of the family and human development in general. The National Security Strategy of the Russian Federation to 2020 approved by the Presidential Decree of 12.05.2009 № 537, the mass distribution of alcohol abuse as one of the main threats to national security in the nation's health. The structure of substance abuse disorders, the incidence of alcohol abuse in the Arkhangelsk region is gradually increasing: in 2011, it was 1 303.1 per 100 thousand people (55.3 % of the total amount of substance abuse), then in 2013 - 1 319.0 (57.7 % of substance abuse). Among the female population, this figure is growing faster pace: if the incidence of alcoholism in general increased over the period 2011-2013 by 1.2 %, while among women it increased by 6.7 %.

The indicators characterizing the spread in the Russian Federation, North-West Federal District of Russia in the Arkhangelsk region of alcohol abuse (Report of the Human Rights Commissioner in Arkhangelsk regions Spread of Alcohol Abuse as a Threat to the Constitutional Right to Life, 2014). The most common indicators of alcohol consumption has official statistics showing the level of sales of alcoholic beverages as a whole, and individual types of alcoholic beverages.

Table 2 Alcohol consumption in Russia

Indicator	Russian Federation	North-West Federal District of Russia	Arkhangelsk region
The incidence of alcoholism per 100 thousand population	1 283.4	1 065.0	1 330.5
The number of alcohol psychosis per 100 thousand population	60.7	64.6	102.5
Number of crimes committed while intoxicated, 10 thousand people	22.0	–	38.6
The proportion of persons in a state of intoxication among committed crimes %	23.1	28.9	38.7

⁷ Data sources: The population of Russia, Rosstat (2012-2014):

http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/afc8ea004d56a39ab251f2bafc3a6fce

Data on volumes of sale of alcohol by region:

2012 r.: http://www.gks.ru/free_doc/doc_2012/bul_dr/mun_obr2012.rar

2013 r.: http://www.gks.ru/free_doc/doc_2013/bul_dr/mun_obr2013.rar

2014 r.: http://www.gks.ru/free_doc/doc_2014/bul_dr/mun_obr2014.rar

3.1.1 The Russian territory of the Barents region – the drinking part of the country

All five regions of the Russian part of the Barents Euro-Arctic region (BEAR) were in the top 10 of most drinking regions of Russia in 2015 (Fig.2). According to official sales statistics of alcohol volumes, purchased alcoholic beverages in any of the five regions are significantly higher than the national average.

A leader in the consumption of strong alcohol has been consistently the Nenets Autonomous Okrug (NAO) where the average is 11 liters per person per year was exceeded 4 times (45.4 l/person per year), see Fig X. Behind NAO followed by Karelia Republic (19 liters), Arkhangelsk oblast (18.5 liters), Komi Republic (17.7 liters) and Murmansk oblast (17.5 liters). At the same time Karelia was the only region where the consumption of hard liquor over the past year has increased, though insignificantly. In other regions, as in the whole country, it went down.

Residents of the Northern regions of Russia traditionally preference to give vodka and various alcoholic liquors, with a huge gap between them are cognac and brandy and whiskey closes the list. Interestingly, the northerners more than the average Russian love brandy (the national average is 0.8 liters per person per year, and in BEAR regions ranges are from 1.2 liters in the Arkhangelsk region to 1.6 in Murmansk).

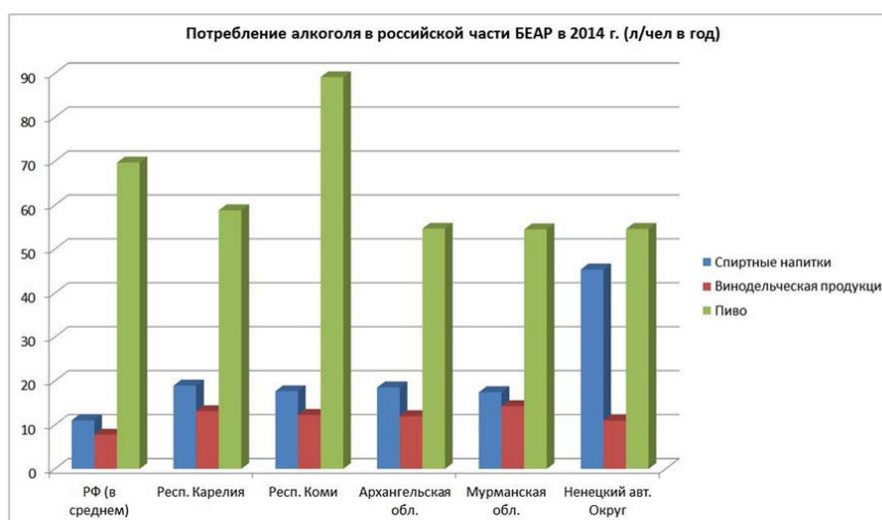


Figure 2 Alcohol consumption in Russian part of the BEAR region (L/person/year) 2014. On the left there is mean values of the Russian Federation. Spirit (blue), wine (red) and beer (green) in different regions

The consumption of wine and wine products in the Northern regions is around twice as high AS the national average (7.8 liters of alcohol, which concentration of not more than 25 %). The main wine lovers were residents of Murmansk (14.3 liters per year), followed by the citizens of Karelia (13.1 liters), Komi (12.2 liters) and Arkhangelsk region (12 liters), and closes the list of the NAO with the rate of 11 liters medium strength of alcohol per person per year.






In Karelia and Komi Republic wine beverages consume significantly less at 1.9 liters, and even less in the Arkhangelsk region (1.3 liters), and in the NAO such beverages generally averse, the amount of alcohol drunk does not exceed 0.6 liters per person per year. It is noteworthy that in a number of Northern regions the consumption of "wine drinks" compared with 2012 increased four to five times (Karelia, Murmansk), and

NAO — slightly decreased. In the whole country in the period increased consumption by two times. On a "normal" wine, apparently, not enough money, so you have to settle for "wine drinks".

The cold climate is not conducive to the appearance of thirst. Apparently, it is no need to cool the body "a bottle of cold beer" leads to the fact that beer was the only type of alcohol, consumption of which in most regions of the Russian part of BEAR is lower than average in Russia. On average, this indicator in the country (almost) 7 liters, in the Arkhangelsk and Murmansk regions and NAO beer consuming only 5.5 liters per person per year, in Karelia - almost 6 liters. Only on average, each inhabitant of the Komi Republic drinks nearly 9 liters of beer per year.

Traditionally, the North has always been ahead of the South in terms of consumption of alcohol. In different years, the situation tried to fight in different ways: by introducing a state monopoly on the sale of alcohol or even declaring "prohibition". Current government policy in respect of alcohol consumption also is reduced mainly to prohibitive measures: a ban on sales during nighttime, the prohibition of sales on certain days (e.g., September 1, Knowledge Day, which in itself is a telling fact). Ban the sale of alcohol in buildings of educational institutions, ban advertising in media (in early 2015, the advertising of beer and wine Russian production has returned on TV and radio), the establishment of minimum prices on alcoholic products, etc. However, in some cases, as statistics show, these measures do not work, or insufficient: there is an increase in alcohol consumption, despite the population decline.

Table 3 Comparison of alcohol consumption (liters of pure ethanol per capita, aged 15 years and older)

Country	Accounted for consumption	Unaccounted for consumption	Total consumption	Beer	Wine	Strong spirits	Other
 Russia	11.03	4.73	15.76	3.65	0.10	6.88	0.34
 Denmark	11.37	2.00	13.37	5.06	4.43	1.78	0.00
 Finland	9.72	2.80	12.52	4.59	2.24	2.82	0.31
 Sweden	6.70	3.60	10.30	2.60	2.90	1.10	0.00
 Norway	6.21	1.60	7.81	2.98	2.00	1.28	0.11

Orjasniemi and Soloviev (2014) made a comparative analysis of major alcohol problems in Russia and Finland – “Wet Drinking Cultures - Wet Problems”. The risk of spread of alcohol abuse and its consequences include the features:

- Extremely high per capita alcohol consumption. According to the WHO, Russia consumed 15.1 liters of pure alcohol per year, which far exceeds the threshold of danger, the level of 8 liters. At the same time

11.5 liters of metered consumption and 3.6 liters - unaccounted alcohol. In 2016, WHO experts predict per capita consumption of alcohol in Russia in the volume of 14.5 liters, and 2020 15.0 liters.⁸

- "Vodka" model of alcohol consumption at which the structure of their consumption is dominated by spirits (in particular, in 2010 in Russia, this part of the total consumption was 51 %). (<http://fsrar.ru>). They are the main cause of mortality of alcohol, including relatively small volume causes dangerous side effects
- The availability of illegal alcohol;
- Affordability of alcohol. Despite the planned annual increase of excise rates, the prices of alcohol, especially on spirits, still not a significant obstacle for its excessive consumption;
- Territorial accessibility of alcohol. Despite certain restrictions imposed by the federal and regional legislation, it remains relatively high. For example, in Russia one outlet that implements alcoholic beverages accounted for 518 people, while the Nordic countries - Sweden and Norway - 4 500 people in Finland - 6 300 people, and in Iceland 15 900.

In the Arkhangelsk region, one retail outlet dedicated to retail sale of alcoholic beverages accounted for 343 people, while in the North-West Federal District the number is 414 people, while the level recommendation one outlet should serve 5 000 inhabitants (<http://fsrar.ru>). Thus, the availability of alcohol in the Arkhangelsk region exceeded the corresponding figure for the Northwestern Federal District by 21 % in Russia as a whole 53 %, as compared to that in recommendation it is 14.5 times higher.

Around the 30's of the last century, alcohol began to move to the level of food. This happened not without the participation of the leading manufacturers and suppliers of alcohol, because of their big- budget marketing strategy. Since the population with the support of the relevant PR companies lost a landmark, and counted "heavy water" in the foods that are known to be necessary for normal functioning of the body (<http://site-zdorovie.ru/statji/alkogol-ne-produkt-pitaniya.htm>). Since alcoholic beverages relates to food products, an important consideration is the proportion of its turnover in the total weight of the goods turnover. In the commodity non-food, items dominate structure of the retail market in Russia. It is estimated to be almost 55 % of the total Russian retail market. The share of food products is 45 %. The largest share in the turnover of food products accounted for alcoholic beverages is about 19 % (<http://www.adme.ru/research/v-strukture-prodazh-prodovolstvennyh-tovarov-19-alkogol-10-30431>).

The second largest category in the structure of market is a meat and poultry 16.3 %. The combined share of the confectionery and sugar is 7.8 %. The five largest categories in total sales of food products include milk, bread and pasta products; from 3 % to 5 % are the share of fish and seafood products, edible oils and fats, fresh fruits (<http://newsland.com/news/detail/id/725208/>). In the rest of the products account for up to 47 % of total turnover. In the structure of sales of goods remained stable. The largest share in the volume of sales still take alcoholic beverages (<http://www.roslegprom.ru/Go/ViewArticle/id=1122&printer=1>).

Trying to reduce the proportion of alcohol in the population structure of the food, it has led to the fact that in 2012 the Arkhangelsk region, being the first region in Russia, tried to introduce a complete ban on the implementation of the stores alcoholic beverages (containing ethyl alcohol from 0.5 % to 9 %, wine beverages with from 1.5 to 9 %, as well as beer cocktails). The relevant provisions have been established by the regional law of 04.06.2012 № 487-31-OZ "On making amendments and additions to Article 7 of the regional law". On implementation of state authority of the Arkhangelsk region in the sphere of production and turnover of

⁸ http://www.who.int/substance_abuse/publications/global_alcohol_report/msb_gsr_2014_3.pdf

ethyl alcohol and alcohol products, and limit consumption (drinking) alcohol products." However, these rules have been challenged by the regional law in the Arkhangelsk regional court, which recognized (the decision of 07.08.2012) that the regional "anti- alcohol" law was contrary to federal law as "*a ban on the retail sale of certain types of alcoholic beverages with the restriction on the content of ethanol does not meet the requirements of the federal legislation, excess is granted to public authorities of the Russian Federation powers in this sphere of government regulation*". According to the court, enshrined in paragraph 5 of Article 16 of the Federal Law № 171-FZ rule allowing a subject of the Russian Federation to establish additional limitations of time, the conditions and locations of retail sale of alcoholic beverages, and even a total ban on it, does not allow for the possibility of introducing in the Russian Federation ban on the retail sale of certain beverages relating to alcoholic beverages.

It should be noted that the limited time, the conditions and locations of retail sale of alcoholic beverages in the territory of the Arkhangelsk region is given special attention. With this purpose was accepted by the Government of the Arkhangelsk region from 05.06.2012 № 222-pp "*On the establishment of additional constraints of time, place and conditions of retail sale of alcoholic beverages in the Arkhangelsk region.*" This Resolution in the Arkhangelsk region was established a general prohibition of retail sale of alcoholic beverages from evening 21 to morning 10 hours (at the federal level, a ban on the retail sale of alcoholic beverages is valid from 23 to 8 hours). In separate specific days - the days of the final events in educational institutions, the Knowledge Day, International Children's Day, Youth Day - is an additional ban on the retail sale of alcoholic beverages for 13 hours afternoon.

Our further research in Arkhangelsk will include the assessments for the regional, interregional and international levels:

- To assess the social, hygienic, psychological, biological, etc. the importance of alcohol in the diet of the population of the northern territories;
- To seek opportunities to reduce "alcohol load" in the style of life, in general, and in the structure of power, in particular, those living in northern conditions;
- Systematization attempts to restrict alcohol consumption in the population of certain areas;
- Study on reducing the consumption of illegal (including the most toxic - surrogate) alcohol;
- To analyze the possibilities of using local herbs in alcohol production (to reduce the toxicity of alcoholic beverages);
- To provide guidance on the use of herbal products and food products in primary and secondary prevention of alcohol abuse.

3.2 Finland

Many of factors included in the Russian part are also true in Finland. Alcohol consumption in Finland has increased three times from 1960 up to 2015 (from 4 liters to 10.8 liters of pure alcohol per person aged 15 or older), and at that time the alcohol related diseases have increased. Now they are the main causes of the death in working age women. In 2015, the total consumption of alcoholic beverages equaled 10.8 liters of pure alcohol consumed per person aged 15 years or older (Fig.3). Total consumption fell by 3.6 per cent compared with 2014. In total, Finns consumed 49.6 million liters of pure alcohol. It is not allowed to sell alcohol beverages in markets between 9 pm and 9 am, and taxes have been higher since beginning of 2014.

In 2015, recorded consumption of alcoholic beverages equaled 8.5 liters of pure alcohol consumed per person aged 15 years or older. Unrecorded consumption of alcoholic beverages was estimated to be 2.3 liters. Recorded consumption fell by 3.4 per cent and unrecorded consumption by 4.2 per cent compared with the previous year. In 2015, alcohol sales fell in all regions compared with the previous year. Moreover, recorded consumption fell for all the beverage types compared with 2014.

Some minor changes have taken place in the structure of the recorded consumption of alcoholic beverages in recent years: the proportion of beer and light wines has increased, while at the same time the proportion of strong alcoholic beverages has decreased (Fig.4).

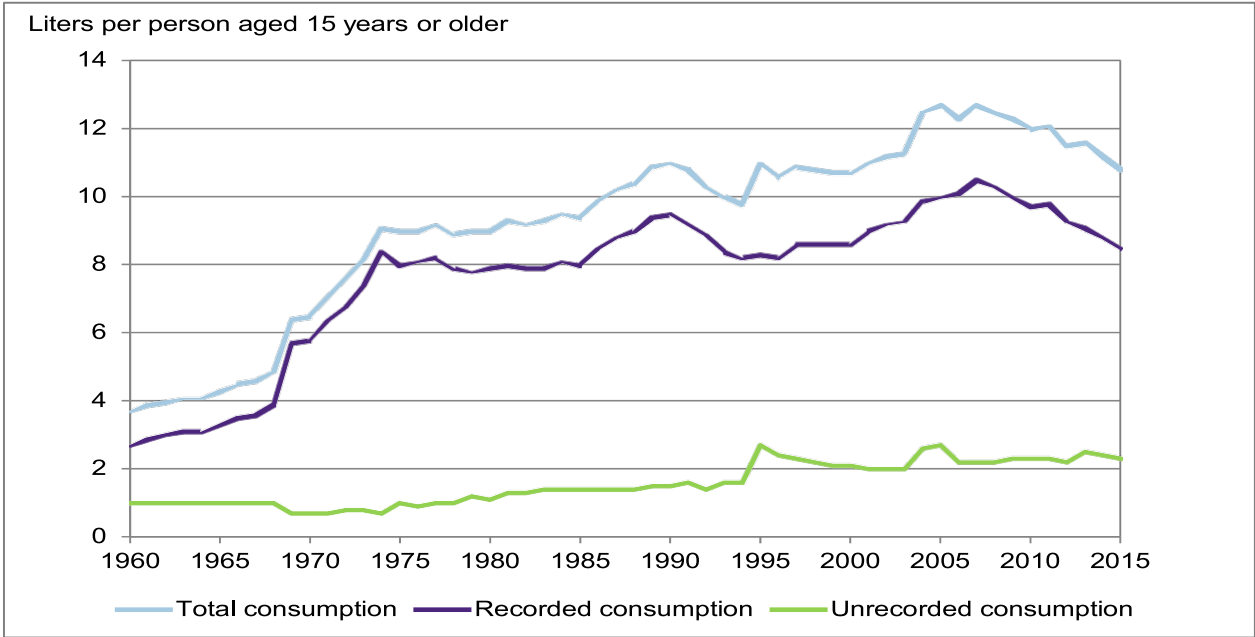


Figure 3 Recorded consumption of alcoholic beverages as pure alcohol per person aged 15 years or older, 1960–2015. Source: Alcohol beverage consumption, National Institute for health and welfare, 2016

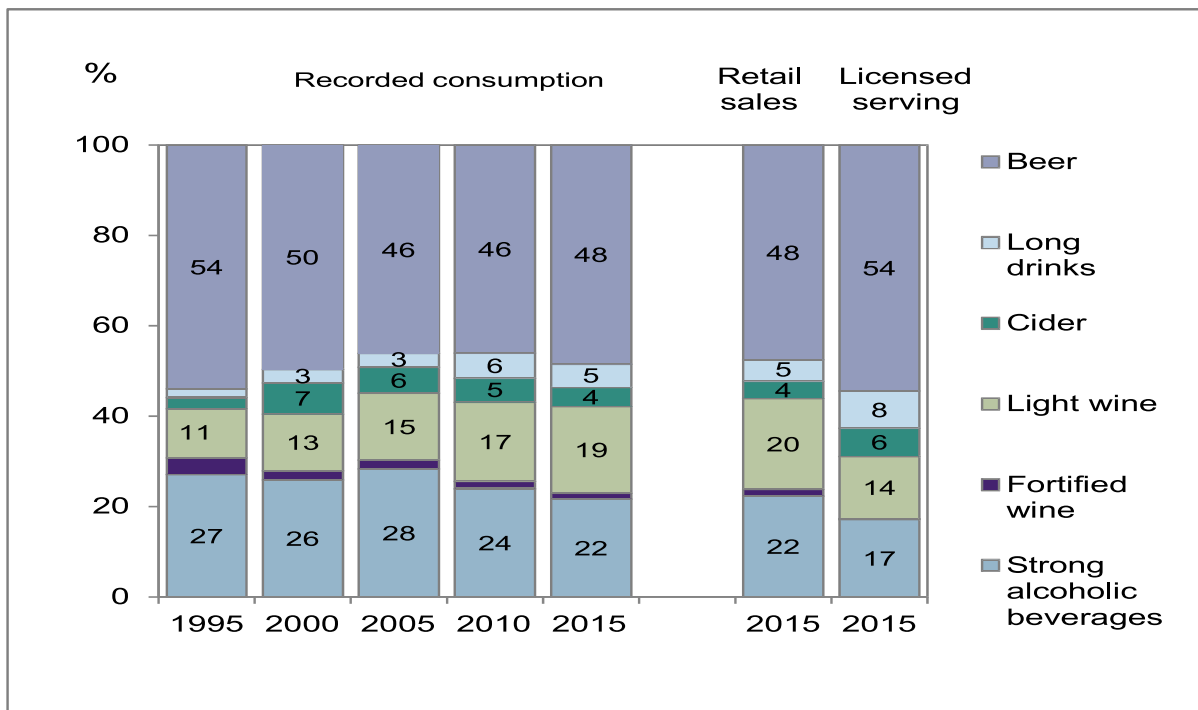


Figure 4 The pattern of recorded consumption of alcoholic beverages by type of beverage in pure alcohol, 1995–2015.

Source: Alcohol beverage consumption, National Institute for health and welfare, 2016

It is also possible to find the data of the alcohol consumption at regional level. Lapland is a leader in this list, Kainuu on the 4th place, both of them are tourism resorts, and Pohjois-Pohjanmaa is below the mean value of Finland (Fig.5). National Institute for Health and Welfare collects and publishes regularly about the consumption of alcohol.⁹

⁹ See: (<https://www.thl.fi/en/web/thlfi-en/statistics/statistics-by-topic/alcohol-drugs-and-addiction/alcohol/alcoholic-beverage-consumption>)

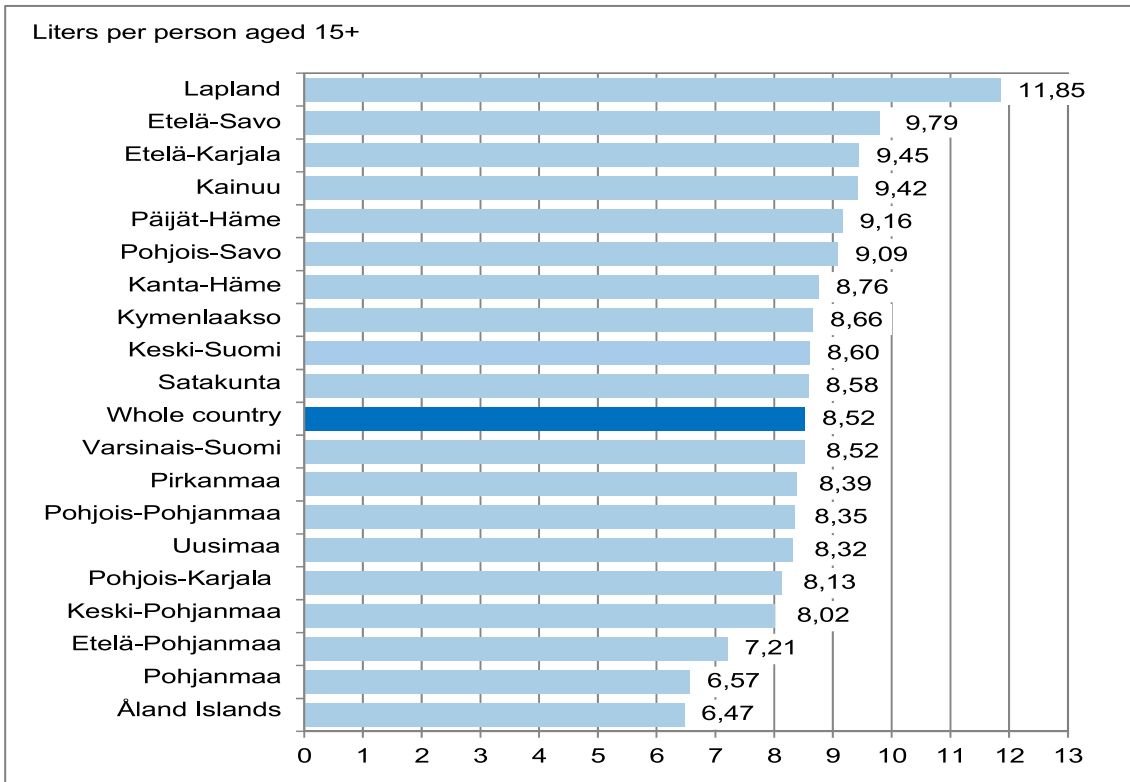
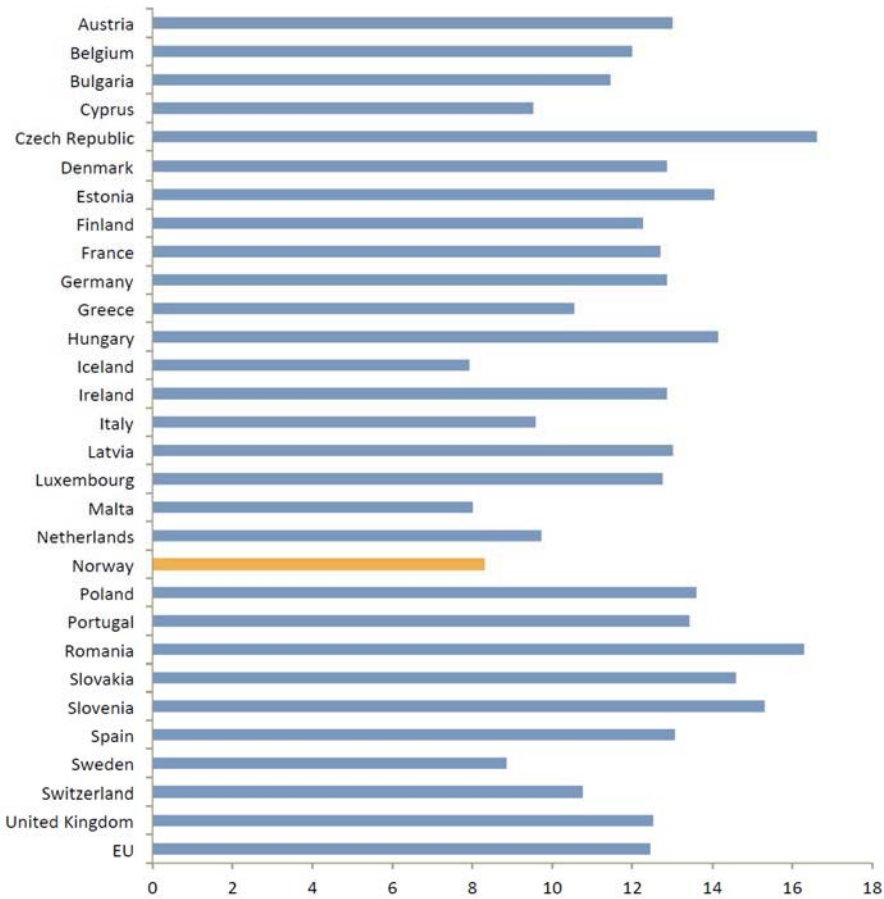


Figure 5 Recorded sale of alcoholic beverages as pure alcohol per person aged 15 years or older by region in 2015. Source: Alcohol beverage consumption, National Institute for health and welfare, 2016

3.3 Norway¹⁰

The total per capita consumption of pure alcohol is lower in Norway than in most other European countries. Statistics from 2009 show that it is only Iceland and Malta that have a lower per capita consumption level. The countries with the highest per capita level of consumption are the Czech Republic and Romania (Fig.6).

¹⁰ The reference for the text is from the report: "Alcohol in Norway: Use, Consequences and Costs" by Lundbeck. https://www.lundbeck.com/upload/no/files/pdf/Alcohol%20in%20Norway%20-%20Use%20Consequences%20and%20Costs%202013_FINAL.pdf



Source: Rehm et al. (2012)

Figure 6 Per capita consumption of pure alcohol

The consumption level in Norway has changed over time, and the development from 1850 to today in the per capita consumption level is U-shaped. Today, most of the consumed alcohol comes from beer drinking. The drinking culture in Norway is characterized by relatively high consumption of alcohol during holidays, festivities and weekends, and low consumption during the rest of the week. Over the last couple of decades it has become more common in Norway to consume alcohol on weekdays as well, but the majority of the alcohol is still consumed during weekends and holidays. Horverak and Bye (2007) sums up the Norwegian drinking culture using six characteristics:

- Norwegian men and women drink relatively large amounts of alcohol when they drink,
- They drink on weekends and during holidays and festivities,
- They usually drink together with other people,
- They have traditionally preferred beer and spirits over wine,
- Women have been, and still are, expected to drink less than men.

Data on alcohol sales, or the registered consumption, for different types of alcohol has been published in Norway every year since 1851. The registered consumption does not include smuggling, legal imports and homemade alcohol. Figure 7 shows sales of different types of alcohol per capita in the period 1851-2011.

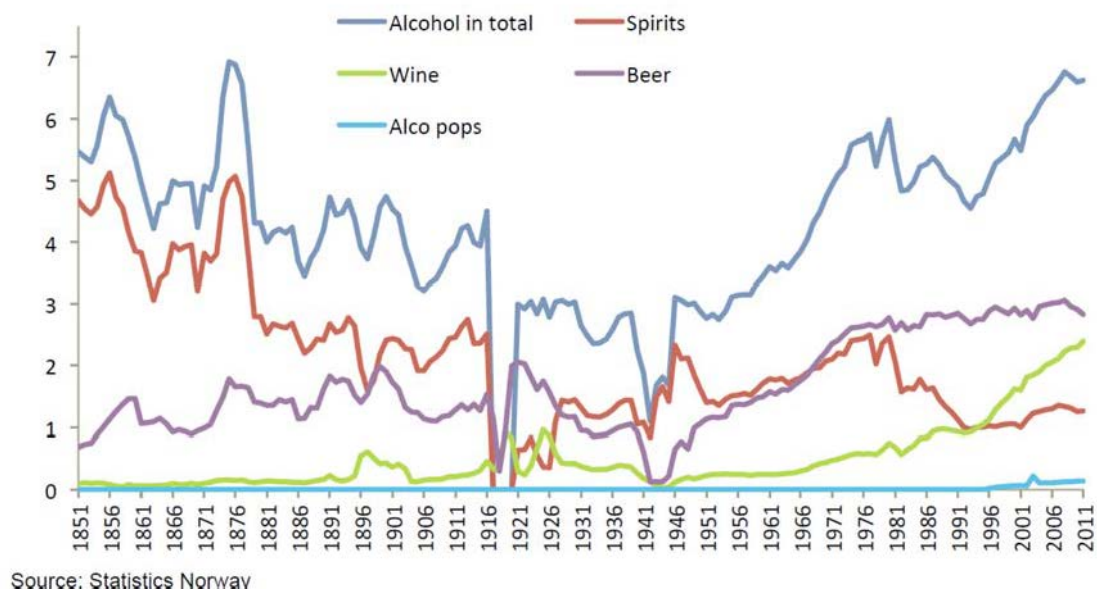


Figure 7 Alcohol sales in Norway, liters of pure alcohol per capita

We see that the curve showing alcohol sales per capita is U-shaped. The average Norwegian’s consumption of alcohol today is about the same as the level at the end of the 19th century. In the beginning of the 20th century, interest groups for abstinence were prominent, and alcohol consumption was reduced. It remained relatively low until the 1960s, when it again started to increase. In 2011, the per capita sales figure was 6.6 liters of pure alcohol. Furthermore, Norwegian’s preferences have changed over time.

There has been a shift from sales of alcohol from spirits to sales of alcohol from beer and wine. Up until the mid-1960s, the average Norwegian drank more liters of alcohol from spirits than any other type of alcohol. Beer was the second most important source of alcohol. This changed in the mid-1960 – sale of alcohol from beer rose above the sale of alcohol from spirits. As mentioned, wine has not been as popular as beer and spirits in Norway. The sale of wine has grown more rapidly than the sale of beer since the beginning of the 1990’s, and is now close to catching up with the sale of beer. Alcohol sales does not tell the full story about how much alcohol Norwegians drink, as all of the consumed alcohol is not purchased and registered within Norway. Some of the alcohol consumed is for example brought into the country illegally, purchased abroad and legally brought into the country, or produced in private homes. In order to give a more correct number for how much alcohol Norwegians consume, it is thus necessary to find an estimate for the total consumption of alcohol.¹¹

¹¹ Reports on alcohol consumption in Norway, see here: *Alcohol in Norway: Use, Consequences and Costs*. https://www.lundbeck.com/upload/no/files/pdf/Alcohol%20in%20Norway%20-%20Use%20Consequences%20and%20Costs%202013_FINAL.pdf

Trends in alcohol consumption and alcohol related harms in Norway around the turn of the millennium. <http://www.nordicwelfare.org/PageFiles/29201/Trends%20in%20alcohol%20consumption%20and%20alcohol%20related%20harms%20in%20Norway%20around%20the%20turn%20of%20the%20millennium.pdf>

4 Food waste

Close to one-third of the food produced globally will become waste, totalling 1.3 billion tons per year (Gustavsson et al. 2011, FAO 2013). This is unsustainable, and wasting of food will have serious social, environmental and economic impacts. Food wastage also entails the waste of resources used to produce the food, such as water, energy, land for agricultural production, and other inputs. In addition, the environmental impacts of the food chain would have been meaningless if the produced goods became waste.

A distinction is to be made whether the loss of resources happens in the early stages of the food supply chains (FSC) or the resource was wasted by the action of the retail sector or consumers. In the first case, we speak about food losses, while in the latter case about food waste.

Food loss should mean the decrease in *edible food mass* throughout the food chain. Food losses take place in production, postharvest and processing stages in the FSC (Parfitt et al. 2010). Based on this definition, food losses do not include the parts of the goods not intended for human consumption such as the peels or seeds of fruits, bones of animal origin products, etc. Food losses can be avoided by a correct action, e.g. by maintaining the cold supply chain or ensuring correct storage conditions for products. Based on this definition, food loss also occurs if the product that was originally intended for human consumption is recovered in the form of feed, fertilizer or energy.

On the other hand, the term **food waste** is more comprehensive and it includes all resources that are lost in the different sectors of the food supply chain, and will include also those parts that were originally not intended for human consumption. Food is wasted throughout the FSC, from initial agricultural production down to final household consumption.

Food losses in industrialized countries are as high as in developing countries, but in developing countries more than 40 % of the food losses occur at postharvest and processing levels, while in industrialized countries, more than 40 % of the food losses occur at retail and consumer levels. Food waste at consumer level in industrialized countries (222 million tons) is almost as high as the total net food production in sub-Saharan Africa (230 million tons) (Gustavsson et al. 2011).

4.1 Food waste in the EU

Within EU legislation, food waste is managed as part of biodegradable waste, or **bio-waste** for short. The *Waste Framework Directive* 2008/98/EC defines bio-waste as biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants (European Commission 2014). Currently the main environmental threat from food waste (and other biodegradable waste) is the production of methane from food waste decomposing in landfills, which accounted for some 3 % of total greenhouse gas emissions in the EU-15 in 1995.

Around 88 million tons of food are wasted annually in the EU, with associated costs estimated at 143 billion euros. The FUSION report (Stenmarck et al. 2016) estimates that up to 60 % of the food waste of households is still edible. The EU and Member States are committed to meeting the Sustainable Development Goals (SDG), adopted in September 2015, including a target to halve per capita food waste at the retail and consumer level by 2030, and reduce food losses along the food production and supply chains.

To support this the Commission will:

- Elaborate a common EU methodology to measure food waste consistently
- Create a new *EU Platform on Food Losses and Food Waste* to help define measures needed to achieve the food waste SDG
- Clarify EU legislation related to waste, food and feed and facilitate food donation and the use of former foodstuffs and by-products from the food chain for feed production, without compromising food and feed safety
- Examine ways to improve the use of date marking by actors in the food chain and its understanding by consumers, in particular "best before" labelling

In order to ensure that national food waste prevention programs are informed by a solid evidence base and support sharing of innovation and best practice, the EU needs to augment and improve the quantification of food waste levels. The revised waste legislative proposal calls on Member States to take action to reduce food waste at each stage of the food supply chain, monitor food waste levels and report back regarding progress made.

4.2 Food waste in Finland

4.2.1 Legislation and regulations

In Finland, there is no specific regulation on food waste or food waste management in environmental or waste management legislation. Laws, degrees and instructions related to food waste management are the Environmental Protection Act 86/2000, 527/2014, the Government Degree on landfill 331/2013, the Waste Act (646/2011), the Waste Decree (179/2012), and the Degree for food hygiene of food premises 1367/2011, the Act on Food Hygiene of Foodstuffs of Animal Origin (1195/1996). The laws concerning food waste reduction are the Government Degree on landfill 331/2013, the Waste Decree (179/2012), the Evira Instructions 16035/1. The Food Act (23/2006, amendments up to 352/2011 included) is a food codex considering food and the conditions in which it is handled. It covers food business operators and food control at all stages in the production, processing and distribution of food. (Vittuari et al. 2015).

4.2.2 Food waste studies

Finnish Foodspill study researched the amount and quality of food waste and its sources, its environmental impacts and means to reduce waste. The focus was on Finnish food chain starting from food industry to consumers and catering companies, and it also included food industry, transport, storing, distribution and retail. The main purpose of Foodspill was to decrease the amount of food waste, to produce new knowledge and to support better information and communication. (Silvennoinen & Korhonen 2013) The KULTU Sustainable consumption and production programme (Kestävän kulutuksen ja tuotannon ohjelma) by the Ministry of the Environment (2012) aimed to reduce the environmental impacts and greenhouse gas emissions of households and the public sector. The programme aimed to promote energy smart and comfortable living, high-quality food without waste and environmental friendly transport. Project "License to Eat" project aims to reduce food waste. (Ministry of Environment 2012) In Ecopaf research both the amount of food waste and the amount of bought food in the households was studied. (Hartikainen et al. 2013).

4.2.3 Food loss

About one third of the food going to waste would still be edible but it has been expired or it just has not been eaten. (HSY 2013). The average amount of avoidable food waste was 18 kg/person annually and unavoidable 26 kg/person. (Silvennoinen et al. 2013). According to Katajajuuri et al. (2014) altogether 335-460 million kilos of food (62-86 kg/person) is wasted in the Finnish food chain annually (excluding primary production). About 130 million kilos (23 kg/person) of food waste is generated in the households, of which most is fresh and perishable, or leftovers from cooking and dining. In the food service sector, from 7 % to 28 % of cooked food (75 to 85 million kg per year) will end up as waste. The annual amount of food loss was estimated to be 65-75 million kg in the retail sector and around 75-140 million kg in the entire food industry. (Katajajuuri et al. 2014).

According to Food spill, the amount of avoidable food waste was 23 kg/person/year. The largest food waste amounts were generated in the houses with 2-9 apartments and the smallest amount in the houses with more than 20 apartments. The largest food group wasted (25 %) was the group "other" (i.e. ready-made food, pastry, snack, candy), followed by bread (21 %), vegetables (16 %), meat, fish and crustaceans (14 %), potatoes (7 %), fruits and berries (7 %), cheese and dairy products (7 %), pasta and rice (2 %) and apples (1 %). The monetary value of wasted food (33 %) was the largest in the group "other" but the value of wasted meat and fish was remarkably high as well (28 %). (Silvennoinen & Korhonen 2013).

4.2.4 Prevention of food loss

The results of the KULTU program (Ministry of Environment 2012) show that the best ways to prevent food loss is to sell the food items with the lower price before the marked "best before" date. In addition, the information and/or TV programs considering the use of leftover food items to make the tasty meal were needed. According to Ecopaf, the households, which are buying excess food, are also generating much food waste. The best ways to reduce food loss would be better planning of buying and cooking, and to eat the oldest food items first. (Hartikainen et al. 2013)

The reasons for food loss is that people do not know enough about the subject or they do not know when the food has gone spoiled. Households who waste food often say that it is possible to reduce the wastage by planning the shopping more carefully, by eating first the food items that will be spoiled easily and by freezing food. The most important motivator to reduce food loss are economic reasons. Food consumption habits and wasting behavior vary in different population groups Therefore; food waste prevention requires understanding local cultures, a participation and dialogue with consumers. The role of media is also important in distributing knowhow. (Silvennoinen et al. 2013).

4.3 Food waste management in Finland

Food waste is statistically reported as part of bio-waste. Fig. 8 shows the amounts of collected bio-waste in Finland. This is the amount collected from households that enters organized waste management systems and is treated accordingly. A well-functioning food waste collection and treatment network is rather easy to establish in the large, populous cities with good infrastructure and large-scale composting or anaerobic digester (AD) plants. The challenges are more severe in Northern, sparsely populated areas, especially in winter times.

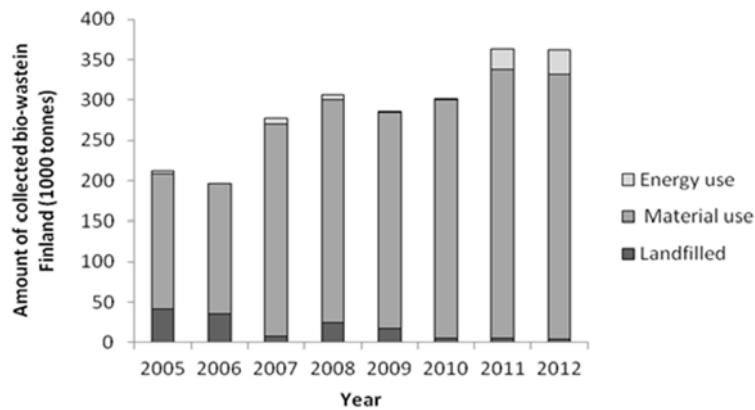


Figure 8 Amounts and treatment of collected bio-waste 2005-2012 (Statistics Finland, 2013) (from Piippo & Pongrácz 2014)

4.3.1 Food waste management in the Oulo Region

Separate collection of food waste in Oulu started in 1995. At first, food waste was composted in open stacks on the field but, since 2000, the collected food waste was treated in a composting plant.

Nowadays, about 10 000 tons of bio-waste is treated at the Rusko Waste Centre in three composting drums. The compost is used for landscaping and construction work at the waste center. (Illikainen 2009). Starting from 2015, food waste in the Oulu region is treated in a new AD plant which can receive up to 19 000 tons of feedstock. The AD plant receives also wastewater sludge and waste fat from the food industry. The plant produce annually about 15 000 MWh of energy as biogas, which would provide heating for 1 500 detached houses annually. The amount of energy is not remarkable but the AD plant is seen as a sustainable way to treat food waste. The amount of digestate to be generated in the AD plant will be enough for 2000-3000 hectares area as fertilizer (Oulu Waste Management Company 2014). Both the solid and liquid end products can be stored during the winter and utilized in the summer. The biogas to be produced by the AD plant is sold. According to the plans, half of it will be bought by the Oulu Waste Management Company. (Illikainen 2014)

The increase in the amount of collected bio-waste, as seen in Fig. 9, is caused by strict waste management regulations of the Oulu area, increased population and improved awareness of citizens. Recently, the amount of food waste received from the grocery stores has increased, as also packed foods are accepted for composting. The packages are shredded and removed from the bio-waste mass. In 2014, the fee for bio-waste removal (including VAT) has been 48.42 euro and for mixed waste 132.80 euro. Fee for combustible waste transported from properties with garbage truck is 114.07 euro. (Oulu Waste management Company, 2014) It is expected that the lower fee for bio-waste removal will further increases the willingness to sort food waste more efficiently. (Illikainen, 2014).

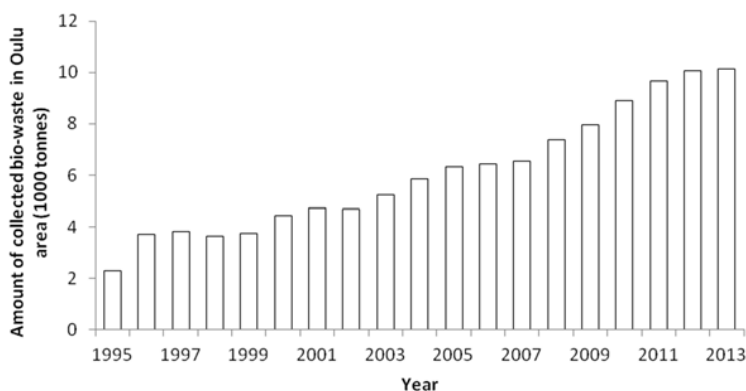


Figure 9 Amount of collected bio-waste of the Oulu Waste Management during the years 1995-2013. (Illikainen 2009, Oulu Waste Management Company, 2014)

4.3.2 Food waste management in Lapland

It is estimated that the amount of food waste produced in households is about 50–56 kg/citizen (Lapin ELY, 2012; Mattila et al., 2011). When considering the number of citizens and seasonal occupants, the estimated amount of produced food waste in Lapland is about 10 000 t/year, of which less than 50 % was collected in 2008. Food waste is collected separately in Rovaniemi, Kemi, Tornio and Ranua city centers from companies, public facilities and from the largest residential buildings. In the more sparsely populated northern areas, with low number of citizens and long transportation distances, there is no environmental or economical justification to establish large-scale food waste management solutions. In tourist areas with seasonal peaks of food waste production, the solution could be a small-scale AD plant utilizing also wastewater sludge and offal. In the most sparsely populated areas home-composting would be recommended. (Piippo et al. 2014, Piippo & Pongrácz 2014) For example in a rather small municipality, Kolari, food waste is collected for composting from hotels and restaurants and from large shopping centers, however, only during the tourist season. Therefore, the amount of collected food waste in Lapland per capita is remarkably lower than the Finnish average (Table 4). A considerable part of food waste in Lapland ends up with mixed waste. (Piippo et al. 2014, Piippo & Pongrácz 2014).

Table 4 Amount of mixed waste and collected bio-waste in Finland, Lapland and Kolari (kg/person) in 2010 (Lapin ELY 2012; Tomperi et al. 2014) (from Piippo et al. 2015)

	Finland	Lapland	Kolari
Mixed waste	282.6	362.7	364.9
Collected bio-waste	55.9	21.8	27.9
Total amount of waste	468.8	500.1	

There are 18 composting plants in Lapland. Most of them are in connection with wastewater treatment plants (Lapin ELY, 2012). A new large-scale AD plant with capacity to utilize some 4000–5000 tons of food waste, sludge and ash, and producing 5700 MWh of energy annually in the form of biogas, is under consideration in Rovaniemi (Napapiirin Residuum OY, 2013). In many municipalities throughout Finland, food waste is disposed with mixed waste, which is incinerated in Oulu, in order to comply with the Landfill Directive. (Piippo et al. 2014).

The waste management company of Lapland, Lapeco (Lapin Jätehuolto kuntayhtymä) announced that they will not organize separate food waste collection in the small municipalities in Lapland, due to the challenges of large transportation distances and the weather conditions, as the food waste may freeze during the transportation in winter seasons. Lapeco advocates home-composting and offers a lower fee for the removal of mixed waste for customers who are composting. (Lapin Kansa, 2014) It was suggested that a sustainable solution would be local treatment of food waste with sewage sludge and offal in an anaerobic digester, and utilization of digestate to revegetate worn land (Piippo et al., 2014).

4.4 Food waste in Russia

The Russian Statistical Office Gosstat recently submitted its first official figures on food waste in Russia. According to Gosstat, 56 kg of food is thrown away per person per year in the Russian Federation. (As seen earlier, food waste in Finland is 62-86 kg). According to the Russian online service Marker, experts estimate that 20-25 % of all Russian food remains unconsumed and is disposed of before use. This puts Russia below the international average in food waste and loss which, in some countries is as high as 40 per cent, according to the UN Food and Agriculture Organisation (FAO).

4.4.1 Food waste management in the Arkhangelsk Region

Food waste is not collected separately in the Arkhangelsk region. All mixed waste is disposed of in landfills. On the territory of the Arkhangelsk region, there are 7 certified landfills for municipal solid waste in the cities Koryazhma, Kotlas, Novodvinsk, Severodvinsk, Mirny and Plesetsk, Lena areas. In other settlements, the landfills for waste are not controlled or monitored. (Chulkov 2013).

4.5 Food waste in Norway

NIBIO/NILF published in 2015 a discussion paper in Norwegian which provides an overview of knowledge about food waste in Norway, based on documentation from the authorities and research studies. The paper describes the quantities of edible food wasted, reveals some of the causes of food waste and the environmental impact. The discussion covers the involvement of Norwegian authorities and industry in this area, as well as a selection of some relevant studies (Helgesen, 2015).

The FUSION report shows that although the industry and retail sector also waste a lot of edible food, it is consumers who account for the largest volume. Every fifth shopping bag Norwegians buy actually goes right in the trash. This corresponds to 46.3 kg per person per year. In addition, what is perhaps most interesting is that Norwegians think they waste a lot less food than they actually do.

Norway has not implemented a specific strategy or national plan for food waste reduction, however food waste reduction is a key element - together with biogas production from organic waste – of the **National Waste Management and Prevention Plan “From Waste To Resources”**. The Plan was launched in August 2013 by the Ministry of Climate and Environment.

The overarching element of the Plan regarding food waste is waste prevention throughout the food chain. The strategy is based on the cooperation between Governmental Authorities and the different stakeholders in the food sector especially through negotiated agreements. Considering food waste, the main elements in the strategy are two-fold:

1. Food waste prevention, where the key responsibility is on the actors in the food chain to develop and implement solutions in the food chain. A significant attention is dedicated to households where the main emphasis is information and campaigns to improve knowledge about food labelling (in particular the difference between the date of minimum durability and the “use by” date), good routines for planning of meals, storage of food etc.
2. The establishment of new biogas plants to take care of food waste and manure, to produce biogas, especially for the city transport and bio rest for fertilizing fields.

Other important objectives of the strategy include the reduction of food waste, the development of better statistics and indicators for food waste as a basis for target setting.

A voluntary agreements related to food waste was signed in May 2015 between the Government and the food sector in Norway, including food industry actors and groceries. This agreement consist of specific targets for food waste reduction, a monitoring program quantifying annually food waste, and collaborative efforts to prevent and reduce food waste in the whole food chain along with communication to consumers and the business society. A project called ForMat lead by business organizations in the food sector in Norway has since 2010 annually quantified amount and type of food waste and food losses in the food chain. The aim of this project has been to provide an overview of existing knowledge and survey citizens about Food Waste in Norway, focusing on the entire value chain from production to distribution and the sales towards consumers. It also aimed to clarify how consumer behavior and attitudes related to Food Waste change over time. In addition, the goal was to enable following up of the development in Food Waste in Norway over time in the future. A number of reports have been published and may be found at this website (in Norwegian): <http://matsvinn.no/ressurser/>

Based on the above mentioned work an even more thorough and in-depth analyzes has been carried out by a PhD student in SIFO, Tommy Ose (presented his work in our workshop in Tromsø, 30.10.2015). Meeting the ForMat’s targets and objectives was expected to lead to a reduction of Food Waste of the size of 25 %, by the end of 2015.

The latest report from Format “Food Waste in Norway 2015. Status and Trends 2009-15” published in December 2015 highlight the following:

- *Producers – business actors in the food industry.* The food groups with the highest proportion of waste are liquid dairy products (4.0 %), frozen ready-made food (3.4 %) and dry food (3.4 %). The product groups with the lowest waste percentages are fresh baked goods (1.1 %), fresh meat (1.1 %) and solid dairy products (1.3 %). A survey showed that food waste by producers fell by 4.3 % percent (measured in tons) from 2013 to 2014.
- *Wholesalers.* The survey shows that food waste at the wholesale stage has increased in value by 11 % from 2013 to 2014. The product groups with the highest percentages of waste are fresh fruit and vegetables (1.14 %), fresh fish and shellfish (0.16 %) and fresh ready-made food and delicatessen items (0.16 %). The groups with the lowest percentages are frozen ready-made food (0.03 %), dry goods (0.04 %) and fresh baked goods (0.05 %). In general, the wholesale stage has very little waste, and contributes minimally to the total wastage in the value chain.
- *Retailers.* The survey reveals that food waste at the retail stage increased in value by about 11 % from 2013 to 2014. Waste varies between the product groups; those with the highest proportion of waste are fresh baked goods (8.5 %), fresh fish (6.3 %) and fresh meat (5.9 %). The groups with the lowest percentages of waste are frozen ready-made food (0.3 %), dry goods (0.8 %) and fresh eggs (0.8 %).

The survey also showed that challenges in food waste were often related to ordering procedures, size of retail packages, badly planned promotions, poor packaging and a broad product range and variety. The respondents report that they actively cooperate with other players in the value chain to prevent food waste; here, food producers and equipment suppliers are important partners. Apart from cooperation, the introduction of better forecasting tools is an important waste reduction measure that many retailers have implemented.

- *Consumer Food Discard and Behaviour.* The questionnaire surveys of consumers and their food waste habits show a positive trend; from 2014 to 2015, the frequency of food discard by consumers decreased by 10 % or more for all product groups, except for baked goods, dry goods and mayonnaise/dressings, where the frequency is unchanged. Consumers report discarding most of pan leftovers, milk/cream and fruit and vegetables, and least of biscuits, eggs and fresh fish products. Consumer perceptions of the most important reason for discarding food varies somewhat between the different product groups, but “past its expiry date” followed by “reduced product quality” are found in most groups. Consumer attitudes to food waste also show positive results; an increasing proportion report having discarded less food and being more conscious of their own discard as a problem. However, consumers waste food also because they are not good at planning weekly grocery shopping and may have a wrong perception of quality, freshness, shape etc. of the products.

4.6 Summary/conclusions on food waste prevention

According to the Waste and Resources Action Programme (WRAP) in the UK, up to 70 % of food wasted in UK households could be prevented. Preventing food loss and changing consumer behavior is one of the focus areas of WRAP and, during autumn 2015, they conducted a food waste prevention survey in the UK (WRAP 2015). Based on the conclusions of the WRAP survey as well as of EU FUSION reports and the experiences of the partners, the following recommendation can be made in order to prevent food loss:

1. Planning meals in advance – Deciding at least for the main meals for the following week will reduce excess buying
2. Checking food stocks before shopping – especially of those with the high ecological footprint such as meat and fish, ready-made meals and imported goods, will help avoid excess food expiring
3. Shopping lists – Having a shopping lists would prevent over-buying or impulsive purchase improve the understanding of ‘best before’ vs. ‘use by’ labelling – Consumers should practice freezing food nearing its ‘use-by’ date and learn that food can be consumed after the ‘best before’ date
4. Better understanding of correct storage of food in the refrigerator, especially those of fruit and vegetables would help avoid food spoilage
5. Better portioning is the best way to avoiding food wastage. However, while storing and re-using leftovers is second best, in order to promote food safety, leftovers need to be refrigerated in small batches and airtight containers within 2 hours.

It is concluded that knowledge is the most important ingredient in preventing food loss and improving consumer behavior. Researchers, food safety and health care professionals as well as legislators shall arrive at a consensus regarding food and feed safety, and communicate this information in a clear, concise and easily understandable manner to the general public.

5 References

- Baranovsky AY, Protopopova OB, Hurtsilava OG. Gerontological dietology. Advances in gerontology. Vol. 25.- № 2.- P. 205–216 (In Russian), 2012.
- Bogdanov, EV, Ungureanu, TN, Buzinov, RV, Gudkov, AB. Morbidity of asthma population of the population in Arkhangelsk region. Human Ecology. N 12. – P. 8-13, 2011.
- Broderstad AR, Melhus M, Lund E. Iron status in a multiethnic population (age 36-80 yr) in northern Norway: the SAMINOR study. Eur.J.Haematol. 79:447-454, 2007.
- Brustad M, Hansen K L, Broderstad AR, Hansen S, Melhus M. A population-based study on health and living conditions in areas with mixed Sami and Norwegian settlements - the SAMINOR 2 questionnaire study. Int J Circumpolar Health 73: 23147 - <http://dx.doi.org/10.3402/ijch.v73.23147>, 2014.
- Buganov AA, Agbalyan AA, Ionova IE. Influence the nutrition factor to the health conditions of High North population. Labor medicine and industry ecology.- 2003.
- Chashchin VP, Gudkov AB, Popov ON, Odland JO, Kovshov AA Characteristics of the main risk factors for health problems of the population living in the territories of active nature using in the Arctic. Human Ecology. № 1.- pp 3-8, 2014.
- Danilova R. I., Golubeva E. Yu., Emelyanova A. S. Demographic Aspects of the Social Safety of the Elderly Population in the Barents EuroArctic Region Advances in Gerontology, Vol. 1, No. 3, pp. 195–202, 2011.
- Donaldson J., Van Oostdam C., Tikhonov M., Feeley, B. et al. Environmental contaminants and human health in the Canadian Arctic. Science of The Total Environment.Vol. 408: 5165–5234, 2010.
- Dudarev, A.A., Alloyarov, P.R., Chupakhin, V.S., Dushkina, E.V., Sladkova, Y.N., Dorofeyev, V.M., Kolesnikova, T.A., Fridman, K.B., Nilsson, L.M. & B. Evengård (2013a). Food and water security issues in Russia I: Food security in the general population of the Russian Arctic, Siberia and the Far East, 2000–2011. *Int J Circum Health*, 72: 21848, 2013a.
- Dudarev, A.A., Dushkina, E.V., Sladkova, Y.N., Alloyarov, P.R., Chupakhin, V.S., Dorofeyev, V.M., Kolesnikova, T.A., Fridman, K.B., Evengard, B. & L.M. Nilsson. Food and water security issues in Russia II: food and waterborne diseases in the Russian Arctic, Siberia and the Far East, 2000–2011. *Int J Circum Health*, 72: 21646, 2013b.
- Dudarev, A.A., Dushkina, E.V., Sladkova, Y.N. et al. Evaluating health risk caused by exposure to metals in local foods and drinkable water in Pechenga district of Murmansk region. *Meditisina truda i promyshlennaia ekologiia* 11:25–33. (in Russian), 2015.
- Dushkina, E.V. & A.A. Dudarev. Comparative evaluation of population morbidity in Pechenga district and in Kirovsk city of Murmansk oblast in connection with the increased exposure of residents to nickel and aluminum. *In: Modern Problems of Epidemiology and Hygiene: Materials of the VII All-Russia scientific-practical conference of young scientists and specialists of Rospotrebnadzor, St-Petersburg, December 8-10, 2015, 24–25. SPb FBUN NIIEM Pasteur. (in Russian), 2015.*
- Eganyan RA, Karamnova NS, Gambaryan MG The specific features of nutrition in the Far North of Russia// Preventive Medicine. № 4, 2015.
- Egeland, G.M., Pacey, A., Cao, Z. & I. Sobol. Food insecurity among Inuit preschoolers: Nunavut Inuit Child Health Survey, 2007–2008. *CMAJ* 182: 3, 2010.
- Eliassen, B-M. Social determinants of self-rated health and cardiovascular disease among the Sami and other Arctic indigenous peoples. The SLiCA study and the SAMINOR study, Thesis, 2013.
- Emelyanova, A. *Cross-regional analysis of population aging in the Arctic*. Acta Univ Oul. D1326, Thesis University of Oulu 2015, <http://jultika.oulu.fi/files/isbn9789526210049.pdf>. (accessed 16.5.2016), 2015.

- European Commission. Biodegradable Waste. Web pages of the European Commission. Available at: <http://ec.europa.eu/environment/waste/compost/>, 2014.
- FAO. Food wastage footprint: impacts on natural resources. Available at: <http://www.fao.org/docrep/018/i3347e/i3347e.pdf>, 2013.
- Golubeva E. Yu. The role of social-medical care in enhancing quality of life of elderly people in Russian part of Barents-Euroarctic region. *Advances in Gerontology*, Vol. 4, No. 4, pp. 264–268, 2014.
- Gustavsson, J. et al (2011) Global food losses and food waste – Extent, causes and prevention. FAO, Rome. Available at: <http://www.fao.org/docrep/014/mb060e/mb060e.pdf>
- Hassan, A.A., Sandanger, T.M., Brustad, M. Selected vitamins and essential elements in meat of semi-domesticated reindeer (*Rangifer tarandus tarandus* L.) in mid- and northern Norway: Geographical variations and effect of animal population density. *Nutrients* 4, 724-739, 2012.
- Helgesen, H. Matsvinn og matavfall i Norge. Hvor mye spiselig mat kastes? Hva er årsakene og miljøeffektene? Diskusjonsnotat, Nr. 2015-03, Norsk institutt for landbruksøkonomisk forskning, Norwegian Agricultural Economics Research Institute, 2015.
- Henttonen, H. Long-term dynamics of the bank vole at Pallasjärvi, Northern Finnish taiga. – In Bujalska, G. and Hansson, L. (eds): *Bank vole biology: Recent advances in the population biology of a model species*. Polish Journal of Ecology. 48 Suppl.: 87-96, 2000.
- Holma-Suutari, A. Harmful agent (PCDD/Fs, PCBs, and PBDEs) in Finnish reindeer (*Rangifer tarandus tarandus*) and moose (*Alces alces*). Thesis University of Oulu, 2014.
- HSY. Quality and quantity of household mixed solid waste in the Helsinki metropolitan area 2012 Helsinki. 44 s., 2013. Available at: http://www.jly.fi/2_2013_pks_kotitalouksien_sekajatteen_maaja_ja_laatu_lr.pdf.
- Illikainen M. Personal notification. Oulu Waste Management Company, 2014.
- James W. Healthy nutrition. WHO regional publications. European chapter #797. Geneva, 1993.
- Juutilainen, S.A. & Heikkilä, L. Moving forward with Sámi research ethics: how the dialogical process to policy development in Canada supports the course of action for the Nordic countries. *Ethics in Indigenous Research, Past Experiences - Future Challenges*. Drugge, Anna-Lill (ed). Vaartoe-Centre for Sami Research, Umeå University, in press, 2016.
- Juutilainen, S.A., Miller, R., Heikkilä, L., Rautio, A. Structural Racism and Indigenous Health: What Indigenous Perspectives of Residential School and Boarding School Tell Us? A Case Study of Canada and Finland. *The International Indigenous Policy Journal*, 5(3). DOI: 10.18584/iipj.2014.5.3.3, 2014.
- Katajajuuri, J., Silvennoinen, K., Hartikainen, H., Heikkilä, L., Reinikainen, A. Food waste in the Finnish food chain. *Journal of Cleaner Production* 73: 322-329, 2014.
- Lapland's Tourism Strategy 2011-2014. Regional Council of Lapland. Publication A22/2008, Rovaniemi, Finland. Available at: <http://www.lapland.fi/en/lapinliitto/en/development/travel>, 2008.
- Lapin kansa (2014). Biojäte jäätyisi kuljetuksessa. Article in the newspaper. 11.2.2104.
- Lapin ELY. (Lapin elinkeino-, liikenne- ja ympäristökeskus). Lapin alueellinen jättesuunnitelma vuoteen 2020 [Lapland's regional waste plan until 2020]. Rovaniemi, Finland. Available at: <http://urn.fi/URN:ISBN:978-952-257-518-0>, 2012.
- Larsen, J.N. & G. Fondahl (eds.). Arctic Human Development Report-II: Regional Processes and Global Linkages. 500 p. Nordic Council of Ministers, Copenhagen, 2014.
- Mattila T, Myllymaa T, Seppälä J, Mäenpää I. Materiaalitehokkuuden parantamisen ja jätteiden vähentämisen ympäristöinnovaatioiden tarpeet. In: Ympäristöministeriön raportteja 3/2011. Available at: <http://hdl.handle.net/10138/41507>, 2011.

- Nergård, J.I. Om å skamme seg over seg selv. Samiske selvbilder i fornskningspolitikkenes ånd. Seminar 2014-10-01 - 2014.
- Napapiirin Residuum OY. Kehittyvää ympäristöhuoltoa Lapissa Ajankohtaista. In: Ympäristöseminaari Luostolla 2013; Available at: http://www.pidalappisiistina.fi/uploads/files/Residuum_Luostolla_2013.pdf, 2013.
- Nilsson, L.M., Destonuni, G., Berner, J., Dudarev, A., Mulvad, G., Odland, J.O., Rautio, A., Tikhonov, C. & B. Evengård. A call for urgent monitoring of food and water security based on relevant indicators for the Arctic. *AMBIO A Journal of the Human Environment* 42: 816–822, 2013.
- Nordic Nutrition Recommendation. Norden, 2012. <https://www.norden.org/en/theme/nordic-nutrition-recommendation/nordic-nutrition-recommendations-2012> (29.8.2016).
- Orjasniemi T & Soloviev A. Barents Studies (Suppl), <http://www.barentsinfo.org/barentsstudies/English/ISSUES-2014/Barents-Studies-2014->, 2014.
- Oulu Waste Management Company. Web pages of the Oulu Waste Management Company <http://oulu.ouka.fi/jatehuolto/>, 2014.
- Parfitt, J, Barthel, M and Macnaughton S. (2016). Food waste within food supplychains: quantification and potential for change to 2050. *Phil. Trans. R. Soc. B* 2010 365 3065-3081
- Piippo, S., Pongrácz, E., Saavalainen, P. & Kaakinen J. Strategic waste management planning –the organization of municipal solid waste collection in Oulu, Finland, *Pollack Periodica* 10(2): 145-156, 2015.
- Piippo, S., Juntunen, A., Kurppa, S. & Pongrácz, E. The use of bio-waste to revegetate eroded land areas in Ylläs, Northern Finland: Toward a zero waste perspective of tourism in the Finnish Lapland. *Resources, Conservation and Recycling*, 93:9-22, 2014.
- Piippo, S. & Pongrácz, E. Sustainable bio-waste strategy in Finland: case study of Oulu in Northern Finland. *Proceedings of 2nd Symposium on Urban Mining (SUM2014):19-21 May 2014. Italy, 2014.*
- Rautio A, Poppel B, Young K (contributing authors: Emelyanova A, Juutilainen S, Sunnari V): Human Health and Well-Being. In book: *Arctic Human Development Report II - Regional Processes and Global Linkages* (eds. Larsen JN and Fondahl G). *Tema Nord*, ISSN0908-6692; 2014:567. 297-346 pp., 2014.
- Report on World Health, 1998 . *Life in the XXI century - what awaits us* (WHO Director-General's report). Geneva: Report, WHO.
- Savchenkov MF, Sosedova LM Healthy style of life as a factor of active aging. Retrieved from: <http://elibrary.ru/download/86726815.pdf> Accessed: 13 April 2015.
- Silvennoinen K, Pinolehto M, Korhonen O, Riipi I, Katajajuuri J. Kauppakassista kaatopaikalle, ruokahävikkitalouksissa. *MTT Raportti* 104. 58 s Available at: <http://urn.fi/URN:ISBN:978-952-487-464-9>, 2013.
- Soininen, L. The health of the Finnish Sami in light of mortality and cancer pattern. Thesis University of Helsinki, 2015.
- Tomperi J, Luoma T, Pongrácz E, Leiviskä K. Energy potential of biodegradable wastes in Kolari. *Pollack Periodica* 9(Suppl): 5–15, 2014.
- WRAP, Consumer behaviors, attitudes & knowledge towards food & wastes. WRAP consumer food waste prevention survey information for partner. Autumn 2015.

Appendix 1: Birth cohort studies in Finland and Norway

In **Russia** there is no specific cohort studies, but close collaboration with UiT – The Arctic University of Norway.

There are many of health and well-being studies concerning Northern part of Finland, most of them two big birth cohorts have been followed since 1966 and 1986 (see <http://www oulu.fi/nfbc/>). The Northern Finland Birth Cohort (**NFBC 1966**) based on all 12,231 births in the two northernmost provinces in Finland (Oulu and Lapland) in 1966. The cohort has been followed up on since birth, the latest data survey conducted in 2012-4. Younger Northern Finland Birth Cohort 1986 (**NFBC1986**) was established 20 years later. It comprises 9,432 live-born infants (4,567 girls and 4,865 boys) whose expected date of birth fell between 1 July 1985 and 30 June 1986. The cohort members have been prospectively followed since the prenatal period with follow-ups at ages 7–8 years (1992–4) and 15–16 years (2001–2) (Northern Finland Birth Cohorts, 2014). All the published results concerning of nutrition are from 1997, the new collection of data was done two years ago, and those results have not yet published.

The **Tromsø Study** started in 1974 and focused then on the high incidence of heart disease in Northern Norway. Tromsø Study is a public health study with 54 research projects. The purpose is to collect data for research in order to increase knowledge about health and disease, and how public health can be improved through prevention and treatment. Since then, the survey has been conducted by 6-7 year intervals and this is the seventh round (Tromsø7).

Data from the Tromsø study is included in a number of scientific works with 91 doctoral thesis. 25 master thesis, 480 scientific papers published in recognized scientific journals in the period 1975- 2012. In the period 2009-2013 more than 200 articles were published.

List of publications:

https://uit.no/forskning/forskningsgrupper/sub?p_document_id=367276&sub_id=388740

The diet is also included as a specific part of the study since 2015. See more:

https://uit.no/forskning/forskningsgrupper/sub?sub_id=407629&p_document_id=367276#kost

Other research in which include UiT – the Arctic University of Norway, is **EPINOR** consortium (five Norwegian universities and three research institutes) which is a Norwegian population based epidemiology research network. In the Department for Community Medicine there are close collaboration (education and research projects) with universities in north-west Russia. The projects have been focus on suicide among indigenous people, to the hazardous consumption of alcohol in Russia and the effect of such consumption the general health. There is also research pointed to the association between alcohol consumption and coronary heart death.

Appendix 2: Sami health issues

Centre for Sami Health Research, called **SAMINOR**, at the department for Community Medicine at UiT – the Arctic University of Norway was established in 2001. The reason for establishing the center was lack of knowledge about health conditions in the Sami population in Norway. This fall (2015) a booklet with title “How is your health” was published. Some popular articles with relevance for our Nordic project are: “Reindeer as food” and “Survey of living conditions in the Arctic – **SiICA** .

At UiT – The Arctic University of Norway there is also a **Centre for Sami Studies (SESAM)**, with Master's Programme in Indigenous Studies (MIS). The program is interdisciplinary and based on research conducted at UiT - The Arctic University of Norway regarding the Sami and other indigenous peoples within the social sciences, humanities and law. <http://septentrio.uit.no/index.php/samskrift/article/view/2546>

At the Centre for Sami Health Research, SAMINOR a list of publications and PhD thesis dated by June 2015: https://en.uit.no/forskning/forskningsgrupper/nyheter/artikkel?p_document_id=425187&sub_id=425508

Sandra Bogdanova has carried out her Master’s research on traditional Sami food (bark use in food/Skolt Sami). An presentation by Bogdanova may be seen here:

<https://prezi.com/5u5kwkw46dvv/rethinking-the-burdens-of-famine-food/>

Read more: https://en.uit.no/tavla/artikkel/423013/en_smak_av_arktisk#sthash.Ci4jLKw5.dpuf

The large nutrition and diet study; the Norwegian Women and Cancer Study (**NOWAC**, see <http://site.uit.no/nowac/>) within the European Prospective Investigation into Cancer and Nutrition (EPIC) study is a prospective questionnaire based study on diet, lifestyle, and cancer. There are altogether 103 000 women (1991–2006) and information is collected every 4–6 years. The part of the cohort included in **EPIC** (n= 37 200 women, aged 35–49 years). The EPIC study (<http://epic.iarc.fr/index.php>) is one of the largest cohort studies in the world, with more than half a million (521 000) participants recruited across 10 European countries and followed for almost 15 years. Biological samples have also been collected, with a focus on preserving gene expression.

Sámi University College

Sámi University College, established in 1989, is a leading multidisciplinary higher education and research institution in the Sámi land as well as the indigenous world. It around 150-200 students and 100 employees from whole Sami region. As the only college in the world, the north Sámi language is used in research and management. The research includes language science, culture, reindeer husbandry and other traditional industries, traditional knowledge and information, place names, the modern society and history; policy research at local, national and international levels, and many others. Some aspects of the Sámi University College’s research activity, is funded by the Nordic Council of Ministers. <http://samas.no/en/node/156>

Appendix 3: Drug and alcohol use of youth

UiT – the Arctic University of Norway conducted a project (2009-2014) named W8 [wait] which was commissioned by the Department of Health with the aim to evaluate the effectiveness of a drug prevention education program focusing on children and young people's attitudes and norms in relation to alcohol. The main part of the evaluation took part in southern Norway but two schools in Tromsø also participated.

https://en.uit.no/om/enhet/ansatte/person?p_document_id=43677&p_dimension_id=154287)

Website with some text also in English: https://uit.no/prosjekter/prosjekt?p_document_id=349391

https://en.uit.no/om/enhet/ansatte/person?p_document_id=43677&p_dimension_id=154287; and

https://uit.no/prosjekter/prosjekt?p_document_id=349391

Appendix 4: Food waste

Hilde Helgesen (2015) from NILF/NIBIO has written a report on a discussion about food waste in Norway.

The purpose of this discussion paper was to provide an overview of knowledge about food waste in Norway, based on documentation from the authorities, research and described the quantities of edible food wasted, revealed some of the causes of food waste and the environmental impact of all this. The discussion covered the involvement of Norwegian authorities and industry in this area, as well as the few existing studies. Source:

http://www.nilf.no/publikasjoner/Discussion_Papers/2015/dp_2015_3.pdf

