



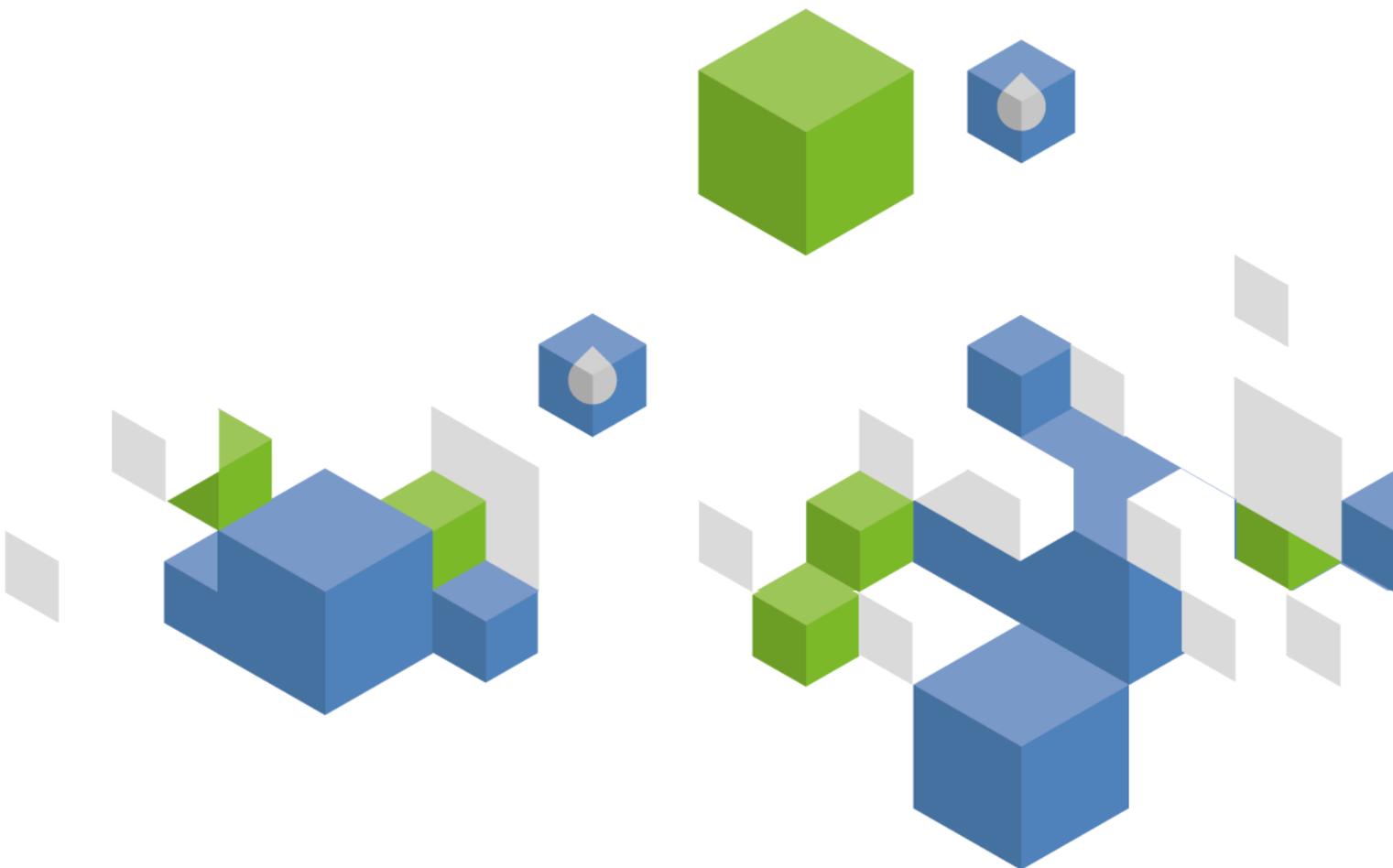
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Reports

# Country profile – Estonia

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# Estonia

## GEOGRAPHY, CLIMATE AND POPULATION

### Geography

Estonia, with a total area of 45 230 km<sup>2</sup>, is one of the three Baltic states. It is bordered in the north by the Gulf of Finland, in the east by the Russian Federation, in the south by Latvia and in the west by the Baltic Sea. Restoration of its independence from the Soviet Union took place in August 1991. Administratively, Estonia is divided into 15 counties. The capital is Tallin.

Estonia is situated on the southern slope of the Fennoscadian shield. The land rose from the sea bed and its surface is relatively flat with an average altitude of 50 m above sea level. The higher areas are the Haanja uplands in the southeast, with a peak of 318 m, and the Pandivere uplands in the northeast, with a peak of 166 m.

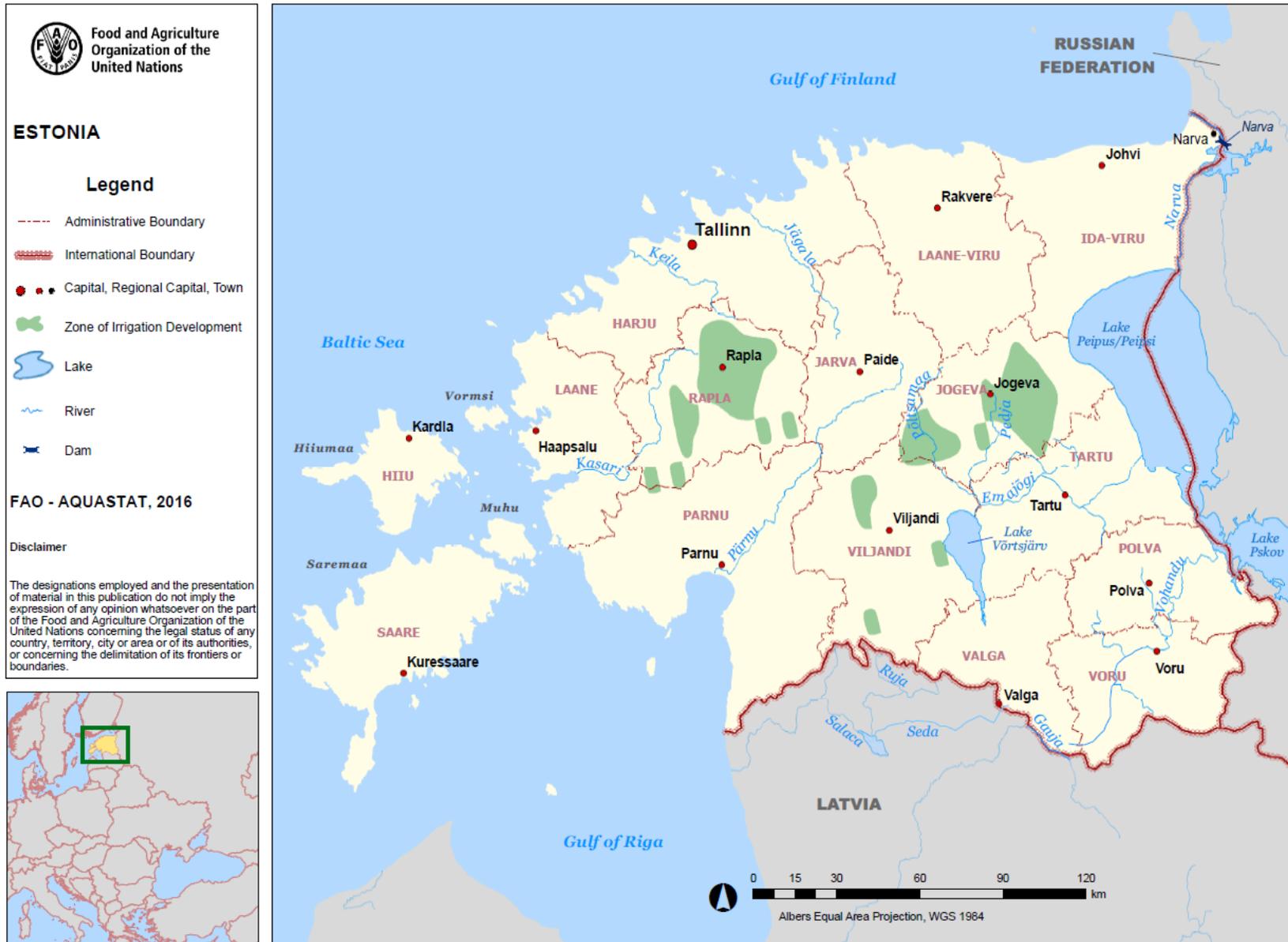
More than 1 500 islands in the Baltic Sea are part of Estonia, constituting 9 percent of the total area of the country. Approximately half of the country is covered with forests and 23 percent with wetlands and natural grasslands (Lääne and Reisner, 2011). The soils are generally heavy and stony.

The agricultural area, which is the sum of arable land, permanent crops and permanent meadows and pasture, is estimated at 966 000 ha, which is 21 percent of the total area of the country. In 2014, the total physical cultivated area was estimated at 638 000 ha, of which 99 percent (632 000 ha) consisted of temporary crops and 1 percent (6 000 ha) of permanent crops (Table 1).

TABLE 1  
Basic statistics and population

Physical areas:			
Area of the country	2013	4 523 000	ha
Agricultural land (permanent meadows and pasture + cultivated land)	2013	966 000	ha
• As % of the total area of the country	2013	21	%
• Permanent meadows and pasture	2013	328 000	ha
• Cultivated area (arable land + area under permanent crops)	2013	638 000	ha
- As % of the total area of the country	2013	14	%
- Arable land (temp. crops + temp. fallow + temp. meadows)	2013	632 000	ha
- Area under permanent crops	2013	6 000	ha
Population:			
Total population	2015	1 313 000	inhabitants
- Of which rural	2015	34	%
Population density	2015	29	inhabitants/km <sup>2</sup>
Economy and development:			
Gross Domestic Product (GDP) (current US\$)	2014	25 905	million US\$/year
• Value added in agriculture (% of GDP)	2014	4	%
• GDP per capita	2014	20 175	US\$/year
Human Development Index (highest = 1)	2014	0.861	-
Gender Inequality Index (equality = 0, inequality = 1)	2014	0.164	-
Access to improved drinking water sources:			
Total population	2015	100	%
Urban population	2015	100	%
Rural population	2015	100	%

FIGURE 1  
Map of Estonia



## Climate

Estonia lies in the transition zone between maritime and continental climate. The Baltic Sea has an impact on the climate throughout the country, warming up the coastal zone in winter and having a cooling effect especially in spring. The summers are moderately warm (average temperature in July is 15-17°C) and the winters are moderately cold (average temperature in February is between -3.5 and -7.5°C).

The average precipitation is about 550-650 mm/year, ranging from 520 mm on some islands to almost 730 mm in the uplands. The driest months are February and March. From then on, precipitation gradually increases until July and August, after which it decreases towards winter and spring (Climate Adaptation, 2015).

## Population

In 2015, the total population was about 1.3 million, of which around 34 percent was rural (Table 1). Average population density in the country is 29 inhabitants/km<sup>2</sup>, varying from 130 inhabitants/km<sup>2</sup> in the Harju county where the capital Tallin is located to 10 inhabitants/km<sup>2</sup> in Hiiumaa island, located to the west of the mainland. The average annual population growth rate in the 2005-2015 period has been estimated at minus 0.3 percent.

In 2014, the Human Development Index (HDI) ranks Estonia 30 among 188 countries, while the Gender Inequality Index (GII) ranks it 33 among 155 countries, for which information was available. Life expectancy is 76 years and the under-five mortality is 3 per 1000 births, both progressing from 67 years and 18 per 1000 in the 1990s. With no significant distinction between boys and girls, around 95 percent of the children in 2013 are enrolled in primary education, but only 89 percent in secondary education (WB, 2015). In 2015, the whole population had access to improved water sources and 97 percent had access to improved sanitation (98 and 97 percent in urban and rural areas respectively) (JMP, 2015).

## ECONOMY, AGRICULTURE AND FOOD SECURITY

In 2014, the gross domestic product (GDP) was US\$ 25 905 million and agriculture accounted for 4 percent of GDP, while in 1994 it accounted for 10 percent.

Estonia is a member of the European Union (EU) since 2004. The country has a modern market-based economy and one of the higher per capita income levels in Central Europe and the Baltic region (CIA, 2015).

The most important arable crops are temporary grasslands, cereals, oilseeds, potatoes and vegetables. The main permanent crops are berries, fruits and medicinal and aromatic plants. Milk cattle, pigs and poultry are the main farm animals. Plant products are mostly for internal use, whereas a considerable amount of meat is imported. Some dairy products and some specific products as berries, mushrooms, and ecologic products are for export (Estonica, 2016; IFOAM EU, 2015).

## WATER RESOURCES

### Surface water and groundwater resources

Estonia can be divided into four natural river basin districts: Narva-Peipus, the Gulf of Finland, the Gulf of Riga, and the islands. Most of the rivers of the mainland originate on the slopes of the extensive karst area of Pandivere upland (MoE, 2015b).

There are 7 000 rivers, brooks, and canals in Estonia. The river system is thus dense, but most rivers are characterized by short lengths, small catchment areas, and low flow rates. As many as 90 percent of the

rivers are up to 10 km long and only 1 percent are over 50 km in length. Only 10 rivers are longer than 100 km. The longest one is the Võhandu river (162 km), followed by the Pärnu river (144 km), and then the Põltsamaa, Pedja, Kasari, Keila and Jägala rivers. The Narva river is the river with the highest discharge. The catchment area of the Emajõgi river covers 22 percent of the country (MoE, 2015b).

Due to karstic features in North Estonia and islands, some rivers flow partly underground (Jõelähtme, Tuhala, Kuivajõgi and others) (MoE, 2015b).

The internal renewable surface water resources (IRSWR) are estimated at 11 712 million m<sup>3</sup>/year. A total quantity of about 96 million m<sup>3</sup>/year is estimated to flow from Latvia and the Russian Federation into Estonia. Therefore, the total RSWR are estimated at 11 808 million m<sup>3</sup>/year (Table 2). An estimated 96 million m<sup>3</sup>/year flow from Estonia into Latvia and the Russian Federation.

TABLE 2  
Renewable surface water resources (RSWR) by major river basin

Name of basin	Internal RSWR	Inflow		Total RSWR	Outflow to:
	million m <sup>3</sup> /year	million m <sup>3</sup> /year	from	million m <sup>3</sup> /year	
Lake Peipus-Narva	3 853	63 + 25	Russian F. + Latvia	3 941	Russian F. (7) + Sea
Gulf of Finland	2 730	-		2 730	Sea
Gulf of Riga (incl. 310 Muhu Sound)	3 987	8	Latvia	3 995	Latvia (89) + Sea
Islands	1 142	-		1 142	
<b>Total</b>	<b>11 712</b>	<b>96</b>		<b>11 808</b>	

Estonia is rich in groundwater resources. The internal renewable groundwater resources are estimated at 4 000 million m<sup>3</sup>/year. The main recharge area is in the Pandivere uplands, where limestone areas and sand/gravel ridges are locally important. Generally, in southern Estonia the groundwater of the Devonian aquifer is used, while in western and sporadically in central Estonia the water of the Silurian-Ordovician horizon is used. Part of the groundwater flows out to the sea and part returns to the surface water system. This latter part, which is already accounted for in the runoff (overlap), has been estimated at 3 000 million m<sup>3</sup>/year, which brings the total renewable water resources to 12 808 million m<sup>3</sup> (11 808+4 000-3 000) (Table 3).

TABLE 3  
Renewable water resources

Renewable freshwater resources:		
Precipitation (long-term average)	-	626 mm/year
	-	28 310 million m <sup>3</sup> /year
Internal renewable water resources (long-term average)	-	12 712 million m <sup>3</sup> /year
Total renewable water resources	-	12 808 million m <sup>3</sup> /year
Dependency ratio	-	0.7 %
Total renewable water resources per inhabitant	2015	9 755 m <sup>3</sup> /year
Total dam capacity	2013	182.5 million m <sup>3</sup>

Total wastewater produced in 2009 was 385 million m<sup>3</sup>, of which 307 million m<sup>3</sup> was treated.

### Lakes and dams

There are over 1 400 natural and human-made lakes, covering 6 percent of the country (Climate Adaptation, 2015b). Lake Peipus at the border with the Russian Federation and lake Võrtsjärv in the south of the country are among the largest lakes in Europe and are nationally monitored lakes, together with Nohipalu Black Lake, Nohipalu White Lake, Pühajärv, Rõuge Big Lake, Lake Uljaste, Viitna Long Lake, Lake Ähijärv, and Mullutu Suurlaht (MoE, 2015b).

The artificial Lake Narva in the Narva river in the northeast was created in 1956, when the Narva hydropower plant started operating. The reservoir is shared by the Russian Federation and Estonia, with a total area of 191 km<sup>2</sup> and a total capacity of 365 million m<sup>3</sup>. It provides water to Narva Hydroelectric Station located on the Russian side and cooling water to the Estonian Narva Power Plants. Its average depth is 1.8 m, its deepest point 15 m.

### INTERNATIONAL WATER ISSUES

In 1994 an “Agreement on the conservation and use of fish resources in Lake Peipus, Lake Lämmijärv and Lake Pihkva” was signed between Estonia and Russian Federation. The Russian-Estonian Intergovernmental Commission on Fisheries acts based on this agreement.

In 1997 an “Agreement on the protection and sustainable use of transboundary watercourses” was signed between Estonia and Russian Federation. The Agreement explicitly indicates that it applies to transboundary waters of the Narva river basin, including Peipus Lake. The Joint Russian-Estonian Commission was established based on this agreement.

Estonia and Latvia cooperate on establishing, updating and implementing the water management plans for the cross-border Gauja/Koiva river basin. The Estonian-Latvian joint project also supports the preparation of a joint water management plan (MoE, 2015). The first river basin management plans were produced separately. Arguments given for that are that the Gauja/Koiva has a small share of the catchment in Estonia and little human impact in that area (EC, 2012).

In 2003 and 2004, several seminars were held for Baltic experts to discuss identification of river basin districts, proposed typology and characteristics of surface water. Even if they have not led to a harmonized typology, experts had a regular information exchange with neighbouring colleagues. In 2003, permanent working groups were established.

### WATER USE

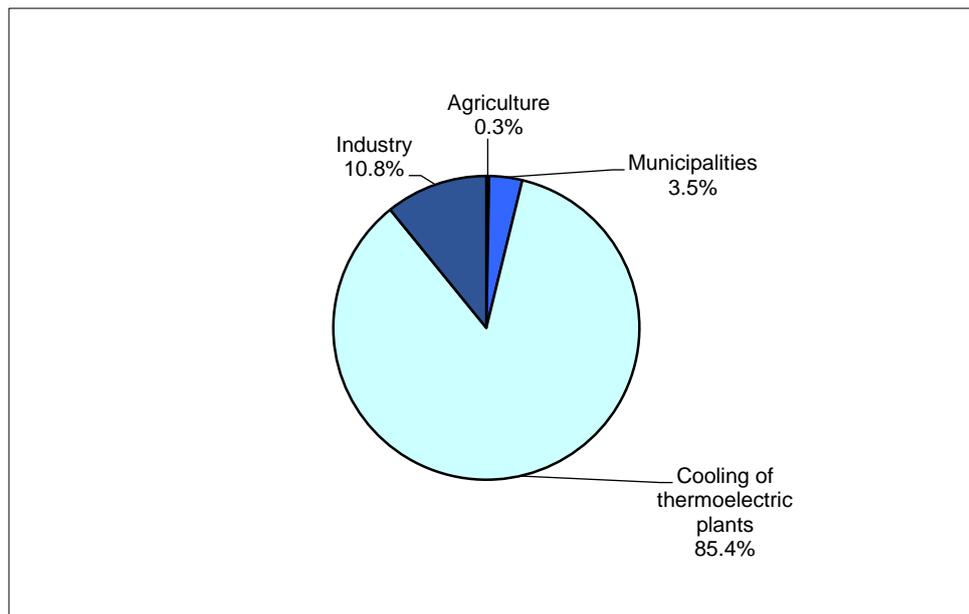
In 2014, total water withdrawal was estimated at 1 720 million m<sup>3</sup>. Of this, 1 655 million m<sup>3</sup> (96.2 percent) is withdrawn for industrial purposes, including 1 469 million m<sup>3</sup> of water for cooling of thermoelectric plants, in addition to 4 million m<sup>3</sup> of sea water. Five million m<sup>3</sup> (0.3 percent) is withdrawn for agricultural purposes – including irrigation, livestock watering and cleaning, forestry and aquaculture – and 60 million m<sup>3</sup> (3.5 percent) for municipalities (Statistics Estonia, 2015) (Table 4 and Figure 2). The amount of agricultural water has decreased in the last decades mainly caused by the decrease of agricultural activities (MoE, 2015b).

TABLE 4

#### Water use

<b>Water withdrawal:</b>			
Total water withdrawal	2014	1 720	million m <sup>3</sup> /year
- Agriculture (Irrigation + Livestock + Aquaculture)	2014	5	million m <sup>3</sup> /year
- Municipalities	2014	60	million m <sup>3</sup> /year
- Industry	2014	1 655	million m <sup>3</sup> /year
• Per inhabitant	2014	1 310	m <sup>3</sup> /year
Surface water and groundwater withdrawal (primary and secondary)	2014	1 720	million m <sup>3</sup> /year
• As % of total renewable water resources	2014	13	%
<b>Non-conventional sources of water:</b>			
Produced municipal wastewater	2009	385	million m <sup>3</sup> /year
Treated municipal wastewater	2009	307	million m <sup>3</sup> /year
Direct use of treated municipal wastewater	-	-	million m <sup>3</sup> /year
Direct use of agricultural drainage water	-	-	million m <sup>3</sup> /year
Desalinated water produced	-	-	million m <sup>3</sup> /year

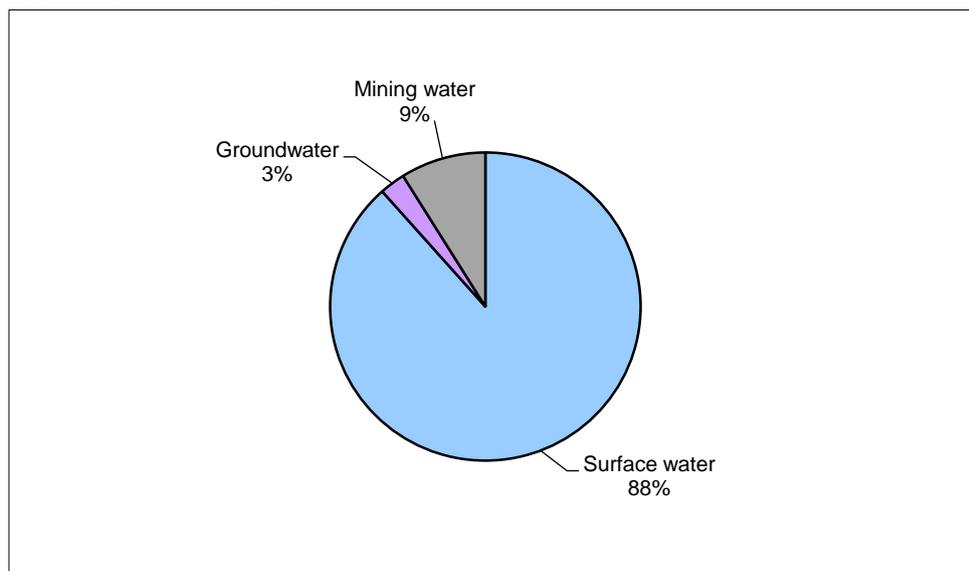
FIGURE 2

**Water withdrawal by sector**Total 1 720 million m<sup>3</sup> in 2014

Around 1 521 million m<sup>3</sup> or 88 percent of total water withdrawal is withdrawn from surface water, 46 million m<sup>3</sup> or 3 percent from groundwater and 153 million m<sup>3</sup> or 9 percent from mining water (Statistics Estonia, 2015) (Figure 3).

Groundwater is the main source of water for the majority of Estonian municipalities. However, in Tallin and Narva as well as by some industries surface water is mainly used, because groundwater resources are very limited (MoE, 2015b). Currently around 80 percent of inhabitants obtain their water from the public water supply (GWP, 2011).

FIGURE 3

**Water withdrawal by source**Total 1 720 million m<sup>3</sup> in 2014

## IRRIGATION AND DRAINAGE

### Evolution of irrigation development

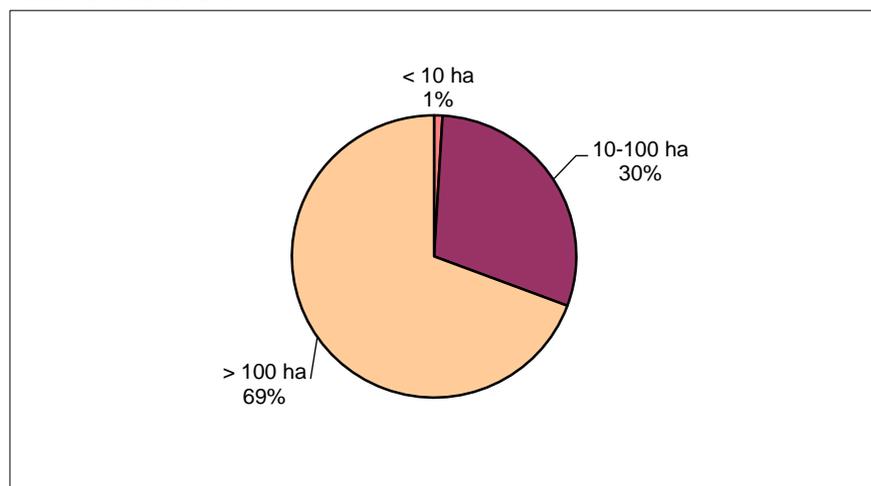
Summer runoff constitutes around 10 percent of the annual runoff. In order to preserve the aquatic environment, it is estimated that not more than 0.5 litres/sec per km<sup>2</sup> should be taken from the dry season discharge. Considering these water resources, the irrigation potential is estimated at 150 000 ha. In the coastal areas it is not possible to irrigate without the construction of reservoirs.

The irrigation areas are mainly located in the north and east of the country. The area equipped for irrigation reached almost 14 000 ha by the end of the 1970s, but was reduced to 3 680 ha in 1995 due to the liquidation of the kolkhoz and sovkhoz. The large irrigation systems were generally of poor quality and soon abandoned. During the 1980s, only draghose sprinkler irrigation systems were used and only surface water was used, of which 80 percent by pumping in rivers and 20 percent from reservoirs. Almost 70 percent of the irrigated areas were found in large-scale schemes, with areas between 100 and 300 ha each, while less than 1 percent of the irrigated areas were in schemes of less than 10 ha each (Figure 4).

FIGURE 4

#### Type of full control irrigation schemes

Total 3 680 ha in 1995



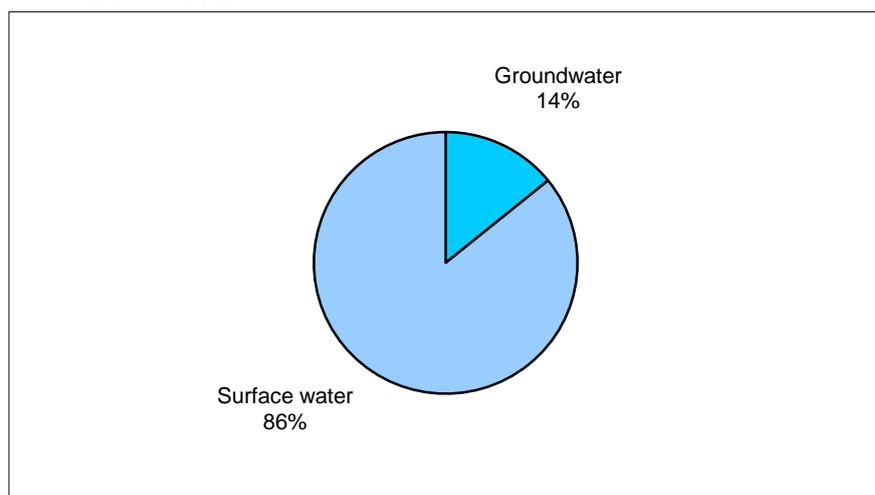
In 2010, the total area equipped for irrigation was estimated at only 458 ha, of which 326 ha were actually irrigated. In 2005 it was reported that 86 percent of the irrigation area was irrigated by surface water and 14 percent by groundwater (Table 5 and Figure 5).

TABLE 5

## Irrigation and drainage

Irrigation potential		-	150 000	ha
<b>Irrigation:</b>				
1. Full control irrigation: equipped area	2010		458	ha
- Surface irrigation	-		-	ha
- Sprinkler irrigation	-		-	ha
- Localized irrigation	-		-	ha
• Area equipped for full control irrigation actually irrigated	2010		326	ha
- As % of area equipped for full control irrigation	2010		71	%
2. Equipped lowlands (wetland, ivb, flood plains, mangroves)	-		0	ha
3. Spate irrigation	-		0	ha
<b>Total area equipped for irrigation (1+2+3)</b>	<b>2010</b>		<b>458</b>	<b>ha</b>
• As % of cultivated area	2010		0.1	%
• % of area irrigated from surface water	2005		86	%
• % of area irrigated from groundwater	2005		14	%
• % of area irrigated from mixed surface water and groundwater	-		-	%
• % of area irrigated from non-conventional sources of water	-		-	%
• Area equipped for irrigation actually irrigated	2010		326	ha
- As % of total area equipped for irrigation	2010		71	%
• Average increase per year	1995-2010		-13	%
• Power irrigated area as % of total area equipped for irrigation	-		-	%
4. Non-equipped cultivated wetlands and inland valley bottoms	-		-	ha
5. Non-equipped flood recession cropping area	-		-	ha
<b>Total agricultural water managed area (1+2+3+4+5)</b>	<b>2010</b>		<b>458</b>	<b>ha</b>
• As % of cultivated area	2010		0.1	%
<b>Size of full control irrigation schemes:</b>		<b>Criteria:</b>		
Small schemes	< 10 ha	1995	35	ha
Medium schemes	> 10 ha and < 100 ha	1995	1 094	ha
Large schemes	> 100 ha	1995	2 551	ha
Total number of households in irrigation	-		-	
<b>Irrigated crops in full control irrigation schemes:</b>				
Total irrigated grain production	-			metric tons
• As % of total grain production	-			%
<b>Harvested crops:</b>				
Total harvested irrigated cropped area	2010		326	ha
• Temporary crops: total	2010		254	ha
- Potatoes	2010		25	ha
- Other temporary crops	2010		229	ha
• Permanent crops: total	2010		71	ha
- Fruit trees	2010		71	ha
• Permanent meadows and pastures irrigated	2010		1	ha
Irrigated cropping intensity (on full control area actually irrigated)	2010		100	%
<b>Drainage - Environment:</b>				
Total cultivated area drained	1995		732 400	ha
• Non-irrigated cultivated area drained	-		-	ha
• Area equipped for irrigation drained	-		-	ha
- As % of total area equipped for irrigation	-		-	%
Area salinized by irrigation	-		-	ha
Area waterlogged by irrigation	-		-	ha

**FIGURE 5**  
**Source of irrigation water on area equipped for irrigation**  
Total 1 363 ha in 2005

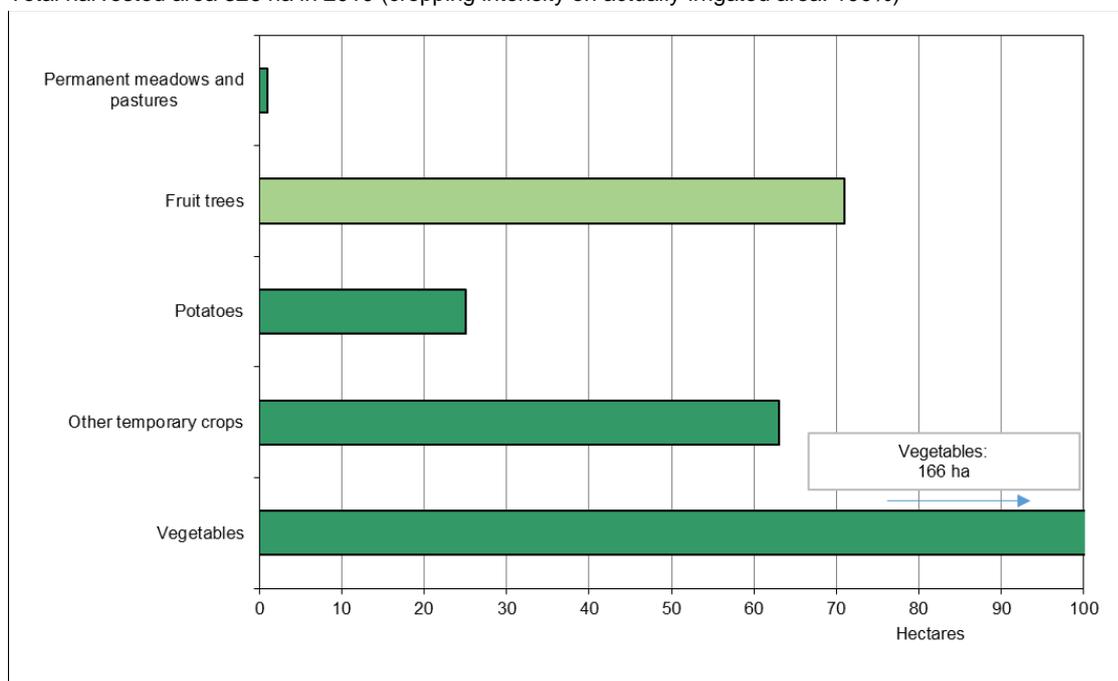


### Role of irrigation in agricultural production, the economy and society

In 2010, the total harvested irrigated crop area was 326 ha, of which 254 ha or 78 percent temporary crops (of which 166 ha vegetables and 25 ha potatoes), 71 ha or 21.7 percent fruit trees and 1 ha or 0.3 percent permanent meadows and pastures (Table 5 and Figure 6).

The climatological conditions allow the cultivation of one crop per year during summer with irrigation possibly needed in May and June. In dry years, it is necessary to irrigate in July and August as well.

**FIGURE 6**  
**Irrigated crops on area equipped for full control irrigation**  
Total harvested area 326 ha in 2010 (cropping intensity on actually irrigated area: 100%)



## Status and evolution of drainage systems

More important than irrigation in Estonia is drainage. It is estimated, that without drainage about two-thirds of the land for agricultural production would suffer from waterlogging.

Drainage of agricultural land in Estonia dates back to the 17th century, when the first areas of pasture land were drained artificially. The first drainage bureau was established in 1897 and the first Baltic Marsh Improvement Society in 1906. By 1939, there were 779 land reclamation societies for the operation and maintenance of the drainage canals. In 1957, Land Improvement Bureaux were established to expand, operate and maintain the drainage systems. During the 1970s, around 40 000 ha/year were equipped with subsurface drains. In 1975, about 390 000 ha of agricultural land were drained. In 1995, about 732 400 ha, or almost 85 percent of the cultivated land, are drained, of which 650 000 ha, or 89 percent, are equipped with subsurface drainage systems. In addition, an estimated 560 600 ha of forests, or 13 percent of the total forest area, were said to be drained in that year.

## WATER MANAGEMENT, POLICIES AND LEGISLATION RELATED TO WATER USE IN AGRICULTURE

### Institutions

The main institutions involved in water resources management are:

- The Ministry of the Environment (MoE), with the Water Department, is responsible for the development of water legislation, the setting of water quality standards, the development of groundwater and surface water resources, and the management of water resources and water use. The MoE is the competent authority in all river basin districts on the Estonian territory (MoE, 2015b).
- The Water Management Commission, established in 2011 by the MoE for coordination purposes, deals with preparation and implementation of the river basin management plans. This commission consists of appointed representatives of other authorities, research institutions and some stakeholders (EC, 2012).
- The National Environmental Board is responsible for the permits for water abstraction and for the monitoring of drinking water.
- The National Health Board is responsible for the drinking water quality monitoring.
- The Ministry of Rural Affairs is responsible of different activities related to water as agriculture, animal farming, fishing industry and rural entrepreneurship and rural life.

### Water management

There have been two major reforms of Estonian water management during the past decades. The first one took place in the beginning of the 1990s soon after independence. Estonia went through major political reforms by regaining independence and shifting from a centrally planned economy to market economy. The main focus of these reforms in the water sector was on the regulation of public and private ownership, on the privatization of infrastructure and on the introduction of the polluter pays principle in the water sector. As part of the agrarian reform, the former kolkhoz and sovkhoz were liquidated after 1 April 1993. They were replaced by around 1 200 joint stock companies, 700 cooperatives and private farms. The second reform took place prior to and after becoming an EU member state, in the late 1990s and in the beginning of the 2000s and was mainly driven by the EU accession process. The focus of the reforms was on upgrading and enforcing the existing legislation, upgrading and reorganizing the existing infrastructure and ensuring the sustainability of water services (Lääne and Reisner, 2011).

The primary goal of the Water Department is to ensure the good condition and sustainable exploitation of Estonia's water resources. These objectives are achieved through (UN, undated):

- Reduction of the pollution load.

- Reduction of water withdrawal and leakage through special use permits and water fees.
- Limiting the use of wastewater disposal into specific water bodies or soil.
- Implementing rehabilitation projects.
- Preparation and implementation of plans and programmes for long-term sustainable management.
- Supervision of the implementation of international agreements and conventions by different bodies and organizations.
- Development of legal acts enabling continuous sustainable use of water resources

For each river basin, a river basin management plan is established for a duration of six years and then updated.

The hydrology monitoring network on Estonian rivers and lakes was created in the 1920s and therefore long-term observation data is available. Currently, 40 observation stations are being used (MoE, 2015b).

### Finances

The investments in the country from 1990-1995 were mainly from foreign grants. From 1995 to 2004 there were bilateral and multilateral agreements to provide grants to certain objects and pre-accession EU funds. Since 2004, the government, the Environmental Investment Centre and local budgets support the investment programmes. There have also been EU Cohesion Funds in the periods 2004-2006 and 2007-2013.

From 1995, the price for water service must guarantee the sustainability of water infrastructure, but should not be more than 4 percent of the household net income per month. Fifty percent of the environmental charges go to the state budget and fifty percent to the municipality budget (Tooming, 2011).

### Policies and legislation

The national water policy follows the EU water policy. Estonian water policy is based on the national Water Act (1994) which specifies the main legal obligations and regulation areas for the water protection and use (UN, Undated).

In addition to the Water Act there are some specific acts:

- The Public Health Act specifies the duties and requirements to guarantee the safety of water that is used or planned to be used as drinking water, together with the obligations for supervision.
- The Public Water Supply and Sewerage Act regulates cooperation between the water users, water companies and local governments.
- The Pollution Charge Act sets pollution charges for soil, air or water pollution as well as the ways to determine the pollution charge.

### ENVIRONMENT AND HEALTH

In the 1970s and 1980s, Estonian lakes were polluted by fertilizers and sewage, which caused quick eutrophication. The surface water pollution load has been decreasing since 1992 due to a decrease in discharges related to reduction of industrial output and an increase in treatment efficiency, new water treatment plants, renovation of old ones, and decrease in agricultural production. The water quality of rivers and lakes is satisfactory. Due to chemicals, the overall status is bad only in four watercourses. The qualitative general status of groundwater bodies may be considered good (MoE, 2015b).

The impact of climate change is relatively small compared with other countries of Europe. The rise in temperature and precipitation is expected to have a positive rather than negative effect on the economy (Climate Adaptation, 2015b).

### PROSPECTS FOR AGRICULTURAL WATER MANAGEMENT

The government has three main directions in the water management sector (Tooming, 2011), referring to investments:

- in common water and wastewater infrastructure
- to achieve better condition of surface water bodies
- to eliminate past pollution

The groundwater resources can guarantee a sufficient supply of good quality domestic water in all regions of the country (Climate Adaptation, 2015b).

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