SUE “Vodokanal of St.Petersburg” activity aimed at reduction of negative impact on water bodies

SUE "Vodokanal of St.Petersburg" at the City Service

SUE "Vodokanal of St.Petersburg" Mission is improvement of water supply and wastewater disposal services, formation of water consumption culture and preservation of the Baltic Sea basin.

St.Petersburg water supply in the mid XIX century

St.Petersburg water supply in XXI century

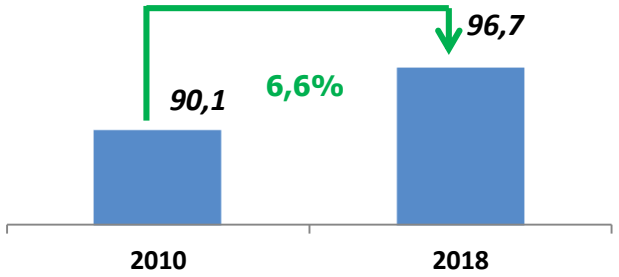
Sewerage system construction in early XX century

Sewerage system construction in early XXI century

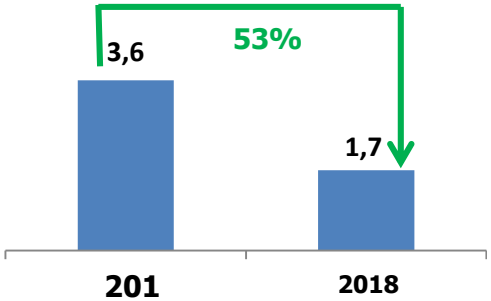
Russian President Decree N 600 dated May 7th 2012 "On Measures to Ensure Russian Citizen with Affordable and Comfortable Dwelling and Housing and Utilities Services Quality Improvement"

Water supply in St. Petersburg

Percentage of the drinking water samples taken from the distribution network, complying with regulatory requirements, %



Number of breakdowns per 10 km of water networks



- **All drinking water is treated with ultraviolet.**

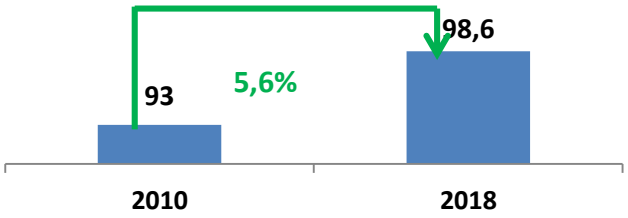
Hepatitis A morbidity is 37 times lower than in 2004.

- Environment-friendly chemicals are used for drinking water disinfection.
- **A multilevel water quality monitoring system is implemented**: instrumental / laboratory control
- biomonitoring system are used.
- **The K-6 Block at Southern WTP is put into operation –** the water treatment technology used at the K-6 Block can ensure proper quality of water whatever changes of quality in the water source (the River Neva) might occur.
- Water supply is based on GIS, hydraulic modeling, and an **automated water flow / quality measurement system**.
- **A water supply management system is implemented** in the southern districts of St. Petersburg

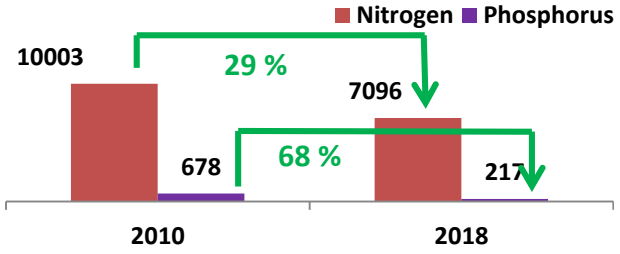
St.Petersburg Wastewater Disposal System

The Gulf of Finland is free of the blue-green algae

Share of wastewater underwent treatment at WWTP (mixed and household), %



Pollutants discharge, t/a



- **98.6% household wastewater is treated**

- **Up-to-date technologies** are implemented at wastewater treatment plants ensuring quality corresponding to Russian requirements and Helsinki Commission (HELCOM) recommendations
(South-West Wastewater Treatment Plant was commissioned)

- Sludge formed during wastewater treatment **is incinerated**.

- Landfill sludge is treated to **environmentally safe** condition.

SUE "Vodokanal of St.Petersburg" is the largest water consumer in the Baltic Sea basin

9 water treatment plants
7,414 km of water supply network

18 wastewater treatment plants
3 sludge incineration plants
271.4 km of tunnel collectors
9,093.2 km of sewerage network

- Water intake from the source exceeds 1,500 thou. m3 per day
- Wastewater treatment volume surpasses 2,200 thou. m3 per day

Improving Eco-Efficiency of Water Management

Eco-efficiency of water management to be improved by:

Reducing water volumes taken out of water supply sources for the city needs.

Mitigating the negative impact of sewage discharge on water bodies.

Organizational and technical actions

- ✓ Implementation of sustainable water recycling systems at water treatment plants.
- ✓ Reduction of water losses in water distribution networks.

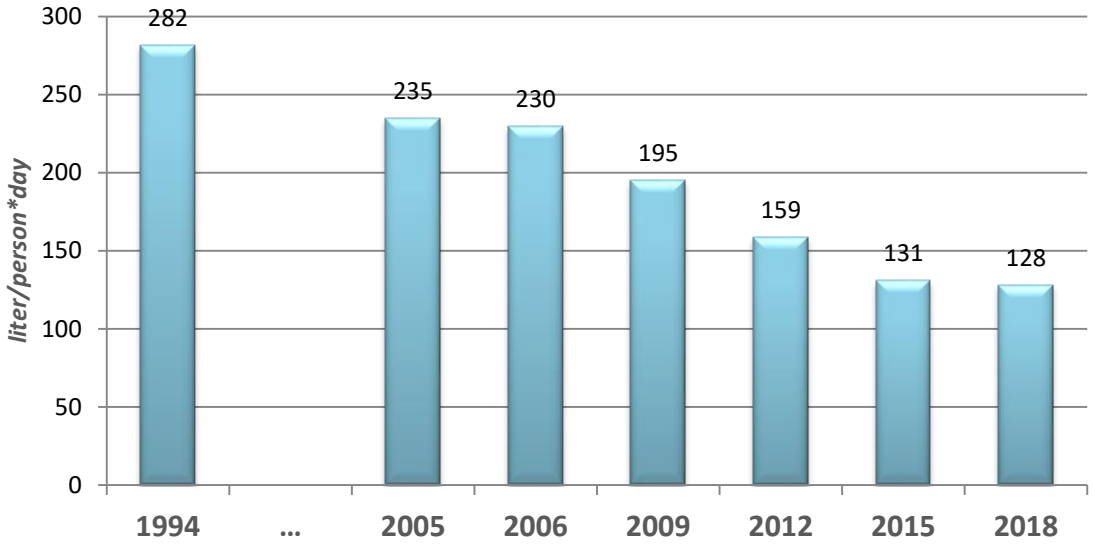
- ✓ Elimination of untreated wastewater discharge into water bodies under the Neva Untreated Wastewater Discharge Closure Programme.
- ✓ Retrofitting and modernization of wastewater treatment plants; implementation of environment protection technologies.

Outreach activities and awareness raising

- ✓ Training of water specialists, sharing practical experience in water technologies, environmental awareness raising.
- ✓ Organization of environmental workshops, learning programmes and events for schoolchildren and college students.
- ✓ The Universe of Water museum complex.

Reduction of water consumption in St. Petersburg

Specific cold water consumption in St. Petersburg in 1994-2018



Actions to reduce water consumption:

- ✓ Installation of individual cold water meters;
- ✓ Installation, modernization and operation of building-level meters; transition to actual water metering;
- ✓ Reconstruction and repairs of in-house water networks;

Implementation of water supply management system in the southern districts of St. Petersburg

Characteristics of the southern city districts

Population **1274 тыс. чел.**

Service coverage 194.7 km^2

Daily average water supply 496 000 m^3/day.

Number of residential buildings 6,498

Why implement the project?

- overpressure;
- high breakdown rate;
- big water losses;
- low efficiency of pumps;
- manual collection of meter readings on the consumer side is inconvenient, it cannot provide timely and accurate information for billing.

Project outcomes in the Southern Zone

	Before reconstruction (2010)	After reconstruction (2018)	Benefit
Non-revenue water in water distribution networks	28 544,8	14 052,4	51%

Employment of modern water-saving technologies in water treatment

K-6 new water treatment block was commissioned in 2011 at the Southern Water Treatment Plant and it encompasses state-of-the-art two-stage water treatment technology and water saving solutions

K-6 capacity is
350 thou. m3/day

Environmental efficiency improvement solutions were implemented :

- ✓ Recycling water supply system;
- ✓ Backwash water sludge disposal.

Outcome:

- Own needs water consumption reduced from **15%** to **3%**
- Backwash water direct discharge was eliminated

Stopping discharge of backwash water from water treatment plants

Diversion of untreated backwash water from WTPs to the municipal sewerage system

		Reduction of untreated backwash water discharge
2010	Sestroretsk WTP	> 300,000 m3/year
2013	Central WTP	> 20 mln. m3/year

Actions planned after 2020

Implementation of water recycling systems to stop the discharge of backwash water at:

✓ Southern WTP	> 20 mln. m3/year
✓ Northern WTP	> 40 mln. m3/yea
✓ Kolpino WTP	> 9 mln. m3/year
✓ Kronstadt WTP	> 300,000 m3/year

Key actions to stop untreated wastewater discharge in St. Petersburg

1978	Central WWTP Stage 1 with the capacity 750,000 m3/day is put into operation	27 %
2005	South-West WWTP with the capacity 330,000 m3/day is put into operation	85%
2011	Seven outdated an worn-out WWTPs are closed down with the 3,000 m3/day wastewater diverted to Northern WWTP	94%
2013	The Northern Tunnel Collector is put into operation; 76 untreated wastewater discharges equivalent to 330,000 m3/day are diverted	98,5 %
2019	An advanced 2,500 m3/day WWTP in Molodezhnoye community is put into operation	

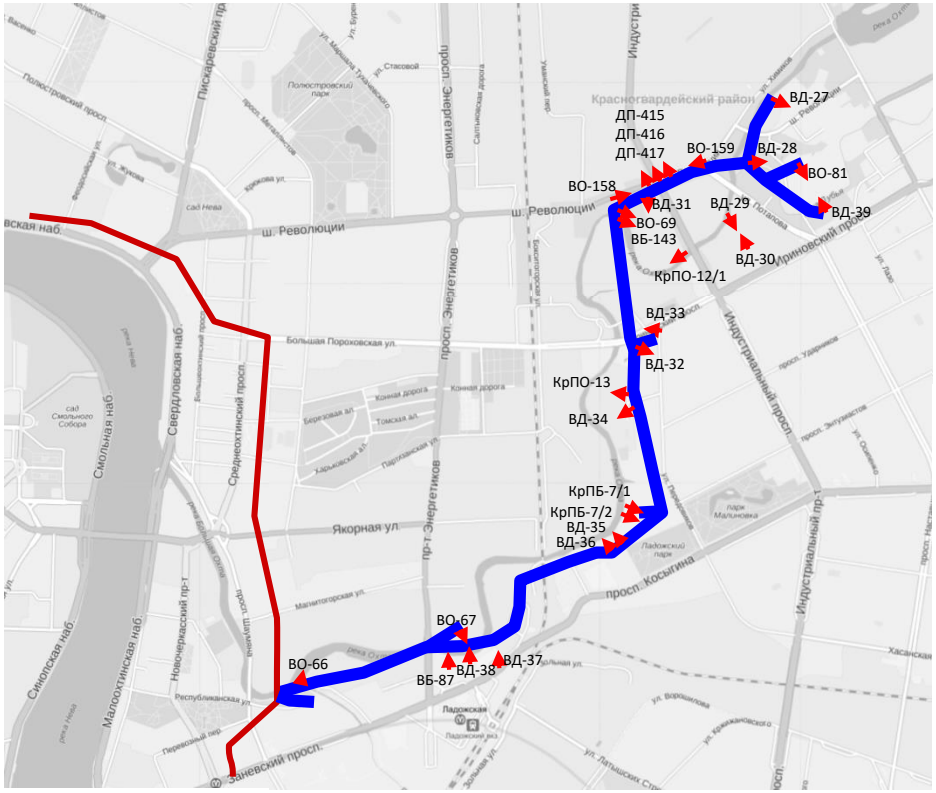
98,6 % of all wastewater in St. Petersburg has been treated at WWTPs since 2018

Untreated wastewater discharges elimination actions

Okhta tunnel collector construction

The Okhta river – is the largest tributary of the Neva river, which in turn serves as the main water supply source. It is one of the most heavily polluted rivers of St.Petersburg

The Okhta collector is designed for diversion of 59 untreated wastewater direct discharges.



The Okhta collector construction expected outcome

- Improvement of environmental state of the Okhta river and its tributaries;
- Improvement of sanitary water status in the Neva river and Gulf of Finland basins;
- Ensuring the promising urban development and development of adjacent territories of the Leningrad Region.

Clean Baltic Project, 2005 – 2011

Elimination of eutrophication, green-blue algae pollution of the Sea, is one of the principal environmental tasks of the Baltic region countries.

Clean Baltic is a joint project of Vodokanal of St.Petersburg, Finnish Ministry of Environment, Swedish international cooperation agency SIDA, and John Nurminen Foundation.

Project objective is wastewater treatment in compliance with HELCOM recommendations

Outcome:

- ✓ Enhanced phosphorus precipitation technologies are implemented at all St.Petersburg WWTPs since 2011.
- ✓ Ca. 10 tons of phosphorus are precipitated daily
- ✓ Average phosphorus content in overall discharge is less than 0.5 mg/l

Wastewater treatment technologies improvement

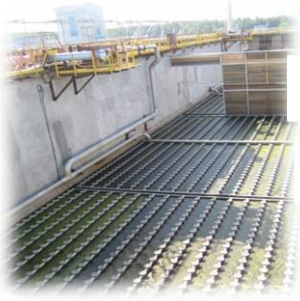
Modernization of biological systems for wastewater treatment

Kreal
1999 – 2004

Total phosphorus **1.5 mg/l**

Total nitrogen **10 mg/l**

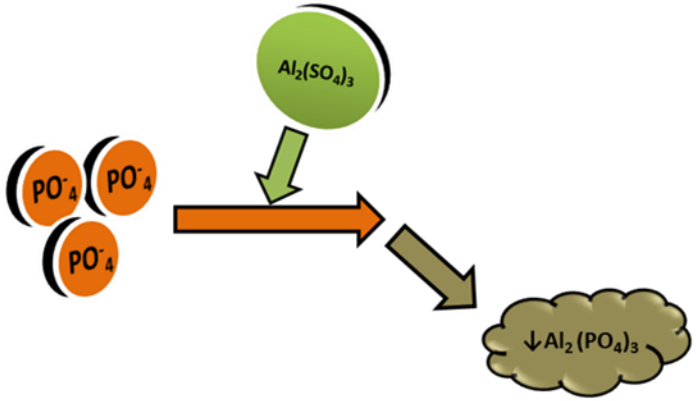
JHB and UCT
since 2005



Total phosphorus **0.5 mg/l**

Total nitrogen **8 mg/l**

Chemical precipitation of phosphorus implementation



Sustainable achievement of the established standards of the Russian Federation and international recommendations of HELCOM on the quality of wastewater treatment

South-West Wastewater Treatment Plant

Date of Commissioning
22.09.2005

WWTP Capacity is 330 000 m^3/day

The following up-to-date technologies and equipment were implemented :

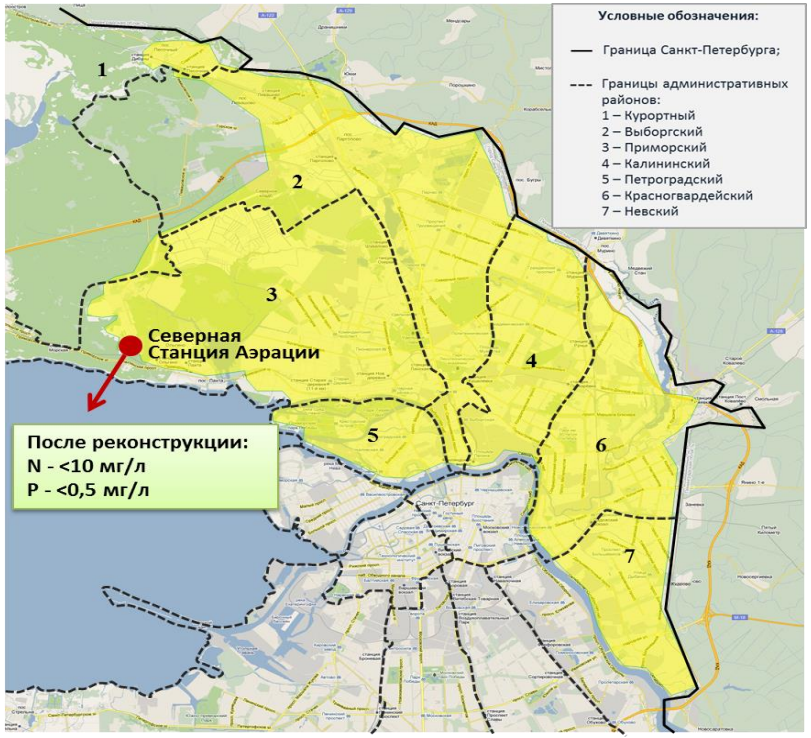
- Biological wastewater treatment with enhanced nitrogen and phosphorus removal technology implementation
- High degree of processes management automation
- UV-disinfection of effluent
- Sludge is disposed via incineration

Northern Wastewater Treatment Plant Reconstruction

Project objective – reduction of negative impact on the Baltic Sea water basin

The Northern Wastewater Treatment Plant reconstruction 1st stage was completed **in 2017**

The Northern Wastewater Treatment Plant reconstruction 2nd stage is planned **for 2018-2020**



NWWTP full reconstruction will enable:

Reduction of nutrients load on the Gulf of Finland :

- Total nitrogen by **1.8 thou. t/year**
- Total phosphorus by **360 t/year**

Enhance NWWTP performance up to **1,000 thou. m3/day**

Ensure the city northern territories promising urban development and development of adjacent territories of the Leningrad Region

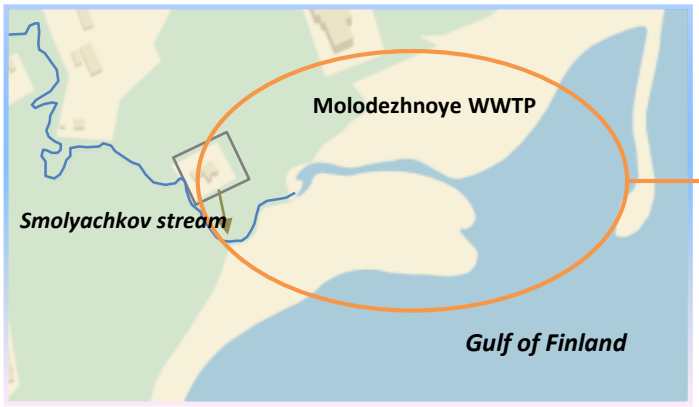
Construction of WWTP in Molodezhnoye

Project objective

Collection of 2,500 m3/day of wastewater from the settlements of Molodezhnoye, Smolyachkovo, and Serovo, and its treatment in compliance with the Russian regulations and the HELCOM Recommendations

Expected result:

- Provision of sustainable treatment quality in accordance with Russian regulations and HELCOM recommendations;
- Reduction of nutrient load of the Gulf of Finland basin with elimination of untreated wastewater discharges;
- Provision of wastewater treatment capacities for Molodezhnoye, Smolyachkovo, Serovo settlements development.



Sludge incineration plants

CWWTP SIP since 1997

SWWTP SIP since 2007

NWWTP SIP since 2007

St.Petersburg is the first city to solve the wastewater sludge utilization challenge.

Vodokanal has 3 sludge incineration plants.

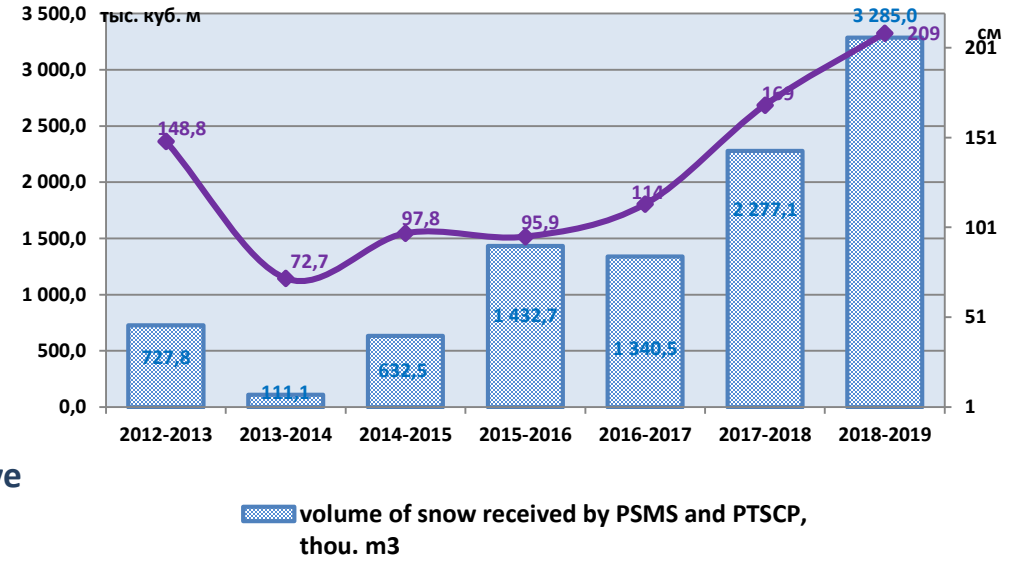
- 100% utilization of dewatered sludge;
- Sludge incineration with ash formation, 10 times reduction of sludge volume;
- Commercial use of ash is possible;
- No pathogens or unpleasant odor in the ash;
- Concentrations of hazardous substances in the cleaned flue gases produced by sludge incineration fully comply with the standards of the Russian Federation and EU
- Flue gas heat recovery for hot water supply and space heating;
- Steam utilization. Electricity production is possible.

Discharge of polluted snow into the city water bodies is stopped

In St. Petersburg, there are:

- ✓ 11 permanent snow-melting stations
- ✓ 7 permanent technically-equipped snow collection points

Snow depth in St.Petersburg and volumes of received snow in 2012-2019 winter periods



In total **3 284 870** m^3 of snow was received, incl.:

- ✓ 2,071,909 m^3 from St.Petersburg GKU "Comprehensive Landscaping Centre";
- ✓ 1,212,961 m^3 from commercial organizations

Environmental benefit

In the 2018-2019 season, the city water bodies did not receive

> 100,000 tons of sand

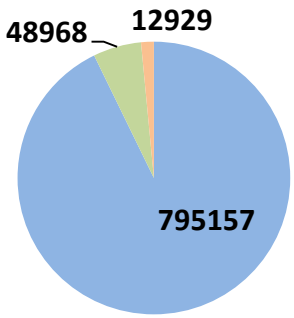
> 150 tons of litter

Surface runoff

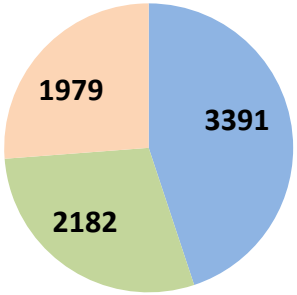
Percentage of surface runoff in the total volume of wastewater collected by the centralized wastewater system

30%

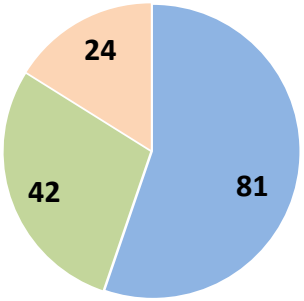
Discharge of wastewater, thou. m3/year

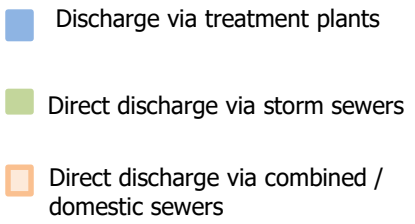


Discharge of suspended solids, t/year



Discharge of oil, t/year





Surface runoff collection and treatment actions

Atmospheric precipitation metering system is implemented

34 precipitation gauges

Search for new process solutions to treat surface runoff

Surface runoff treatment plants

Cartridge filters in stormwater sumps

Interaction with industry

Objective: compliance with regulatory requirements to the quality of wastewater drained into the municipal sewerage system

Vodokanal provides consultancy to its customers on:

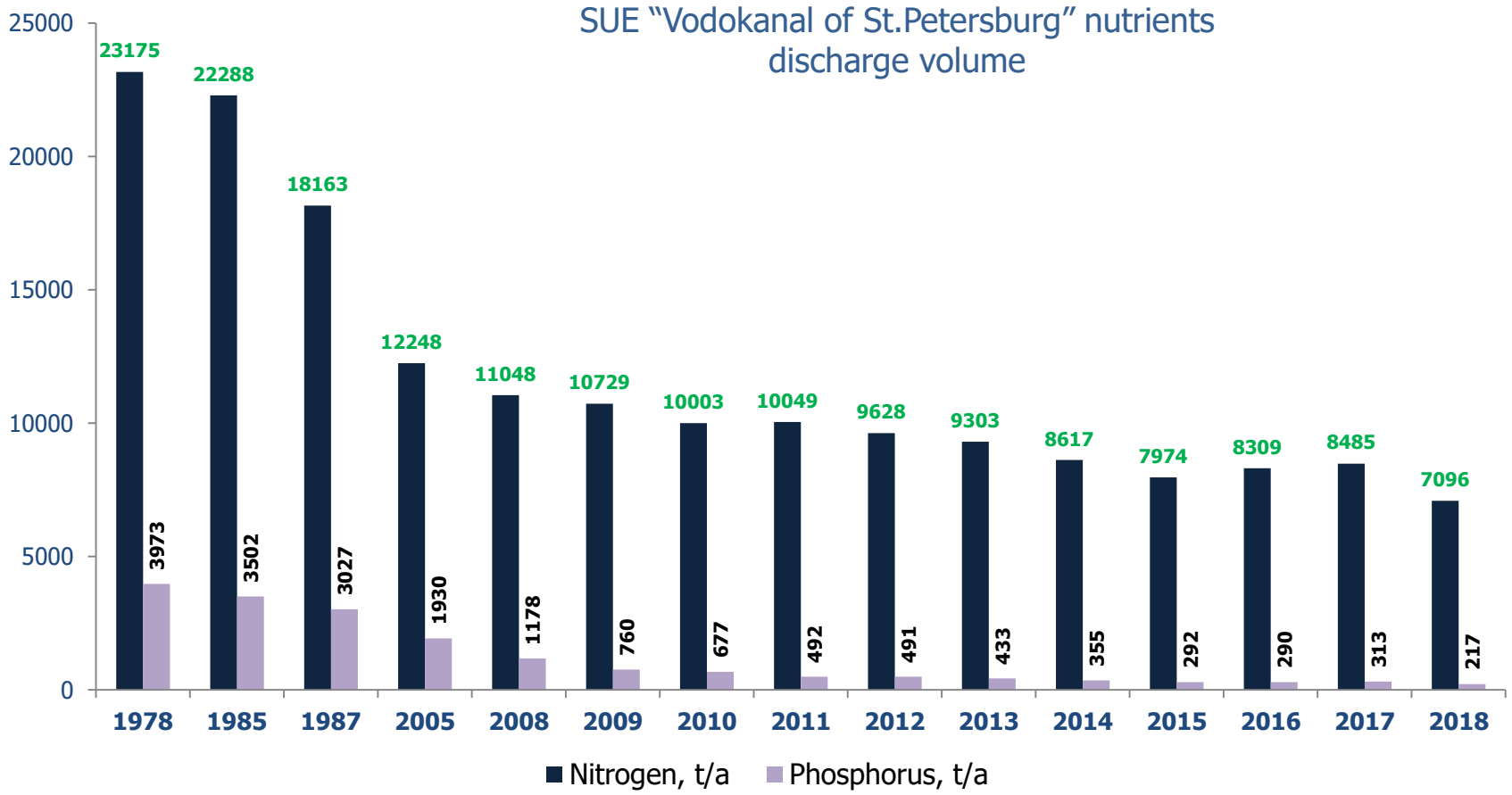
- ✓ selection of industrial wastewater treatment technologies
- ✓ preparation of an Action Plan aimed to prevent any above-limit discharge of pollutants into the centralized sewerage in St. Petersburg

In 2013-2019, over 300 consultations on how to meet wastewater quality regulations were provided to customers

The following customers got the **Crystal Drop Award** from Vodokanal in the nomination “Clean Baltic Water” for the implementation of environment / water protection actions in **2015-2018**:

- **LLC Bushe,**
- **OAO “Zavod Magneton”,**
- **PAO Svetlana, and**
- **AO “GOZ “Obokhovskiy Zavod”**

Nutrients load reduction



Awareness-Building and Education

Alongside with its organizational and technical arrangements, Vodokanal is focused on awareness-building and educational activities aimed to improve water services quality and to decrease environmental impact.

Youth Environmental Center:

- Opened in **2002**
- Over **50 projects** implemented
- **More than 350,000 students** have participated in YEC programmes, projects and classes

Universe of Water museum complex:

- Opened in **2003**,
- Three unique exhibitions
- More than **215,000** visitors per year

Marine Mammals Research and Conservation Center:

- Rescuing rare animals in the Baltic Sea region (ringed and grey seals)
- Opened in **2013**

Edicational Center of SUE "Vodokanal of St. Petersburg":

- Professional development and training of the Company employees;
- Training of specialists (Water College No. 89);
- Professional skill contests.

International Advanced Water Technologies Centre

- Opened in **2011**

St. Petersburg Water Cluster:

- Opened in **2015**

ВОДНАЯ академия

ВОДОКАНАЛ
САНКТ-ПЕТЕРБУРГА

Thank you for your attention!