# Ecological adapted stormwater treatment in Kretinga town, Lithuania

### Year of issue

2025

### Summary

Kretinga is located 12 km east of the popular Baltic Sea resort town of Palanga, and about 25 km north of Lithuania's 3rd largest city and principal seaport, Klaipėda. The Stormwater Special Plan developed introduces a new approach towards more sustainable stormwater solution from an environmental perspective. This type of ecologically adapted stormwater investments have been implemented in Lithuania for the first time. If they function as well as predicted and can be disseminated through appropriate channels, there should be good possibilities to introduce similar investments in other Lithuanian towns.

### Photo Gallery



### Location

55.8897, 21.24267

### Project

NWRM

### National ID

Lithuania_02

### Sector

Hydromorphology

### Installation Date

2013

# Overview

### Location of the project

In the southern part of Kretinga town, Lithuania, near the Akmena-Danė River, close to the main road Šiauliai–Palanga (Route A11).

### Country

Lithuania

### NUTS2 Code

Latvija

### Sponge measures implemented in the case study

Basins

### Objectives

1) reduction of formation and collection of stormwater;
2) reduction of the amounts of stormwater, centrally discharged into the environment;
3) reduction of pollution levels in stormwater;
4) ensure that stormwater is managed separately form domestic, industrial.

### Involved partners

| Authority type | Authority name | Authority role | Comments | Authority responsibility |
|---|---|---|---|---|
| Local water authority | Kretinga town municipality | Initiation of the measure | — | Responsible |
| Research institute / University | Baltic Coastal Research and Planning Institute | Monitoring | Baltic Coastal Research and Planning Institute is a division of Klaipėdos university | Supporting |
| Local water authority | Kretinga WWTP | — | — | — |
| National water authority | Environmental Protection Agency of Lithuania (AAP / AAD) | Monitoring | Carries out inspections and environmental quality assessments (e.g. after overflows or pollution incidents). | Supporting |

# Site Information

### Climate Zone

Cool temperate moist

### Temperature (°C)

8.90 °C

### Elevation range

27

### WFD Ecological status

Moderate

### WFD Chemical status

Unknown

## Design and Implementation

### Project scale

Micro

### Project scale specifications

This project is implemented at the city-district level within Kretinga town and focuses on the treatment of stormwater from a specific urban catchment (18 ha) using ecological infrastructure such as retention ponds and vegetated zones. It addresses localised water quality and urban runoff issues and does not extend to a regional or river basin scale.

### Project area

18

### Area subject to Land use change or Management/Practice change (ha)

18.00 ha

### Size

100.00

### Size unit

m

### Basis of design

Planned water retention time in the ponds is ~ 48 hours; under heavy rains, the time can be ~ 24 hours.

### Constraints

1) some planning constrains regardin local cultural ceritage, but problem solved; 2) there were some problems with planning paths for leasure zone near retention ponds, as there are building restrictions in such wastewater treatment areas, but the problem was successfully solved.

## Financing

### Costs investment

188000.00 €

### Costs investment information

Cost effectiveness estimations have not been calculated. It would be interesting to compare e.g. construction and operation costs of wetland/retention pond (such stormwater treatment facilities are under construction in Kretinga town) with conventional oil-sludge separator, taking into account removal of pollutants per unit costs. Evaluations will be carried out of the decrease of nutrients (P and N), hazardous substances, suspended solids and BOD from stormwater outlets after the construction of the treatment facilities.

### Financing authorities

| Authority name | Type of funding | Comments |
|---|---|---|
| European Union | EU-funds: Rural development funds | EU structural support according to the objectives provided in Cohesion Promotion Operational Programme |
| Municipality of Kretinga | — | Municipal budget |
| Various companies | Private funds | budget of municipal enterprises, providing services of stormwater management. |

### Compensations

No

## Policy and Governance

### Policy description

The measure was designed to address the problem of untreated urban stormwater runoff being discharged directly into the Akmena-Danė River, carrying high loads of pollutants such as sediments, nutrients, heavy metals, and pathogens. Rapid urban development in Kretinga had increased impermeable surfaces, leading to higher runoff volumes, reduced infiltration, and elevated risks of water pollution and ecological degradation in the river system. The project aimed to reduce these impacts through nature-based stormwater treatment solutions.

### Land ownership

The land used for the stormwater treatment system in Kretinga is publicly owned, under the authority of the Municipality of Kretinga.

### Policy targets

Oher Societal Benefits

Runoff control

Peak-flow reduction

Pollutants Removal

### Part of a wider plan

Yes

### Wider plan

| Name | Comments |
|---|---|
| Kretinga town special plan | Local scale plan, including all the town focuses |

### Public consultation

Yes

### Has contractual arrangements

Yes

### Contractual arrangements

| Arrangement type | Responsibility | Name | Role | Comments |
|---|---|---|---|---|
| Contractual agreement | Supporting | SWECO | Implementation | Technical project |
| Contractual agreement | Supporting | GreenWorks Indusrty | Implementation | Construction |

## Impacts and Monitoring

## Monitoring System

### Monitoring requirements

The system is subject to monitoring by Kretingos Vandenys and national environmental authorities to ensure compliance with pollutant reduction goals and regulatory standards.

### Monitoring parameters

The monitored parameters focus on water quality and pollution control, including suspended solids, total phosphorus, total nitrogen, and heavy metals such as cadmium, copper, lead, and zinc. Microbiological indicators like pathogenic bacteria (e.g., E. coli) are also monitored. During overflow or pollution incidents, additional parameters such as biological oxygen demand (BOD), chemical oxygen demand (COD), and ammonium nitrogen are assessed to evaluate environmental impact. These data help guide both routine maintenance and responses to extreme weather events or illegal discharges.

## Maintenance

### Maintenance requirements

Regular maintenance is carried out by Kretingos Vandenys, including sediment removal, vegetation management, and inspection of stormwater infrastructure.

## Impact Assessment Methodology

### Performance impact assessment method

Edge of Field/Plot

### Performance impact estimation information

Estimated reduction of contaminants in the designed and constructed facilities:
1) SS 80 percent.
2) Total phosphorus 50 percent.
3) Total nitrogen 30 percent.
4) Metals cadmium, copper, lead and zinc †“ 50 percent.
5)Pathogenic bacteria 70 percent.

## Socio-economic Impacts

### Direct benefits information

Improved public health and safety

Enhanced aesthetic and recreational value

Cost-effective pollution reduction

Increased local awareness and institutional capacity

## Biophysical impacts: Hydrology

### Retained water

7776.00

### Retained water unit

m3/day

### Information on retained water

90 l/s in total (40 l/s in one and 50 l/s in another retention pond)

### Information on increased water storage

The design mimics natural wetland processes, creating small aquatic zones and vegetated basins that act as temporary storage.

## Biophysical impacts: Biodiversity

### Improved biodiversity

Yes

### Information on improved biodiversity

The project created new vegetated and aquatic habitats in a previously sealed urban environmentHowever, no quantitative data on flora or fauna diversity, abundance, or ecological indices is available.

## Biophysical impacts: Water & Soil Quality

### Water quality overall improvements

Positive impact-WQ improvement

### Information on water quality overall

Due to natural sedimentation, filtration, and biological processes in the retention ponds and vegetated treatment areas.

**Water quality improvements - Phosphorus (P) - Unit**

% reduction pf pollutant

**Water quality improvements - Nitrogen (N)**

30.00

**Water quality improvements - Nitrogen (N) - Unit**

% reduction pf pollutant

**Water quality improvements - Total Suspended Solid (TSS)**

80.00

**Water quality improvements - Total Suspended Solid (TSS) - Unit**

% reduction pf pollutant

**Water quality improvements - Copper (Cu)**

50.00

**Water quality improvements - Copper (Cu) - Unit**

% reduction pf pollutant

**Water quality improvements - Zinc (Zn)**

50.00

**Water quality improvements - Zinc (Zn) - Unit**

% reduction pf pollutant

**Water quality improvements - Escherichia Coli (E.coli)**

70.00

**Water quality improvements - Escherichia Coli (E.coli) - Unit**

% reduction pf pollutant

**Water quality improvements - Faecal Coli (F.coli)**

70.00

**Water quality improvements - Faecal Coli (F.coli) - Unit**

% reduction pf pollutant

## Biophysical impacts: Others

### Information on ecosystem impact climate regulation

The vegetated stormwater system contributes to urban cooling, carbon capture (vegetation), and increased evapotranspiration, but again, no quantified estimates are available.
These impacts are assumed as typical co-benefits of nature-based stormwater solutions, but not specifically measured here.

## Lessons Learned

### Key lessons

1) reduction of formation and collection of stormwater, for example installation of impervious surfaces shall be avoided (except in potentially polluted territories), clean stormwater absorbing soil facilities should be installed, projected areas of potentially polluted territories shall be as small as possible, etc.,
2) reduction of the amounts of stormwater, centrally discharged into the environment, e. g. allow utilization of stormwater in the production process, watering of green areas, fire extinguishing, etc., and
3) reduction of pollution levels in stormwater, e.g. implement dry cleaning of potentially polluted territories, construct sheds in most hazardous areas.
4) Capacity must be resilient to extreme weather events. An overflow incident in 2023, due to intense rainfall, resulted in the discharge of untreated water. While no major environmental damage was reported, it highlighted the vulnerability of even ecological systems under climate-induced extreme events, and the need for emergency capacity and adaptive infrastructure.

### Barriers

| Barrier type | Barrier role | Comments |
|---|---|---|
| Legal obligations / restrictions | Secondary barrier | There were some problems with planning paths for leasure zone near retention ponds, as there are building restrictions in such wastewater treatment areas, but the problem was successfully solved. |
| Attitude of the public | Main barrier | Illegal stormwater connections: Widespread unlawful drainage into the wastewater system (≈ 60 % of inspected properties in 2024) undermines proper system functioning and could impact the efficacy of pollutant removal. |

### Drivers

| Driver type | Comments |
|---|---|

| | |
|---|---|
| Legal obligations | Might be also other reasons, but the stormwater discharge in Kretinga town did not in some parameters comply with the pollution requirements before the construction of the two retention ponds |

### Success factors

| Success factor type | Success factor role | Comments |
|---|---|---|
| Attitude of decision makers | Main factor | — |
| Financing possibilities | Main factor | EU funding was a big help. |
| Available support tools | Main factor | During the MOMENT project, it was possible to gain knowledge about the similar retention ponds in Sweden. As this was one of the first (pilot) retention ponds in Lithuania, therefore, knowhow was very usefull. |
| Legal obligations | Main factor | — |

### Transferability

This measure is highly transferable to other urban areas facing stormwater pollution, especially in small to mid-sized towns. Its success depends on strong local governance, public utility involvement, and integration with land use planning. Key aspects to watch include illegal drainage connections, maintenance capacity, and resilience to extreme rainfall, which can undermine system performance if not properly addressed.

## Sources

### Sources


Kretinga Special plan and Stormwater Treatment, Akmena-Dane, Lithuania, Report 4.3.3.

Iš UAB „Kretingos vandenys“ išleistos nevalytos nuotekos reikšmingo poveikio vandens telkiniams nepadarė

BIGDATA4RIVERS Newsletter / Report

Kretingos rajono savivaldybė

Aplinkos apsaugos departamentas prie Aplinkos ministerijos

Gyventojų prašoma savanoriškai panaikinti nelegalius lietaus nuotekų prisijungimus