



About the report

„The Present and Potential Impact of Climate Change-Related Hydrological Processes on the Territory of Riga”

In 2010, within the framework of the project Nr.LIFE08 ENV/LV/000451 “Integrated Strategy for Riga City to Adapt to the Hydrological Processes Intensified by Climate Change Phenomena”, co-funded by European Union LIFE+ programme, and in compliance with the order placed by Riga City Council City Development Department, the “Centre of Process Analysis and Research” carried out research with the aim to examine and anticipate hydrological processes, related to climate change, and their impact on the territory of Riga City.

Territory flooding in Riga City is determined by various factors. The present research focused on the flooding risks that were linked with the most significant factors – spring spate and sea water surges caused by storms (further in the text – wind surges).

The tasks accomplished within the framework of the project are the following:

1. Scenarios for spring spate and wind surge situations with the likelihood of recurrence 0,5%, 1%, 5%, 10%, 20% and 50% (i. e., once in 200, 100, 20, 10, 5 and 2 years) were considered. The provided scenarios describe the present situation and climate change projections for two periods of time – the near future (from 2021 to 2050) and the distant future (from 2071 to 2100).
2. For the development of hydrodynamic model the required geospatial information from public and Riga City Council sources was gathered and summarized. The newly collected Riga City territory three-dimensional relief data, obtained by aerial laser scanning, played an important role at this stage of the research, ensuring highly accurate results.
3. With the help of hydrodynamic modelling the calculations were made, determining the borders of flooding territories in six flood risk zones that differ from each other in the likelihood of flood recurrence. As mentioned above, and according to Point 1; the research was carried out for three periods.
4. The long-term impact of hydrological processes was analysed and possible threats were identified, including:
 - a. The identification and evaluation of sites in the territory of Riga City where coastal erosion takes place due to hydrological processes. The main causes of erosion were examined and possible changes in coastline of surface-water basins were anticipated;
 - b. The evaluation and description of the territories, subjected to flood risk and coastal erosion, from social, culture-historical, economic activity and nature protection perspectives in every flood risk zone, estimating the possible flood threat and identifying and prioritizing values. Also sites that can pose potential hazard to people’s health and pollute the environment as a result of hydrological processes were identified.
 - c. The development of flood impact economic model and calculations of possible loss.

As a result of research extensive cartographic material was prepared.

The report was written in Latvian; it consists of 109 pages, 51 pictures, 15 tables, 50 citations and 10 appendices.

The most significant conclusions from the research:

1. The results of hydrodynamic modelling show that the flood threat in Riga City posed by wind surges is considerably greater than the flood threat posed by spring spate.
2. The existing counter-flood protection in Riga is sufficient to protect the city from wind surges that do not exceed 2m above the normal water level in Daugava. Due to the vegetation, temporary buildings and fences, as well as the fact that the water level in Riga during the storms remains high only for a short period of time, the existing counter-flood protection can still function with the water level lower than 2.20metres. However, Riga City has no protection against floods that cause the water level to exceed 2.20 metres.
3. The calculations show that territories suffering from flooding will increase considerably in future, mainly due to the global water level rise. It is estimated that with the flood likelihood 1% in current climate conditions the water level in Daugava rises by 2.19 m above the norm. But it is anticipated that in the second half of the century during the flood with the same likelihood the water level might reach 2.60 metres.
4. At the moment the territories most greatly affected by coastal erosion in Riga City territory is the surrounding of Lielupe estuary, Daugavgrivas beach to the west of the coast strengthenings opposite Freeport of Riga territory, Mangalsala sea coast to the east of Daugava estuary and the right bank of Daugava before the eastern pier. The coast section in the lower reaches of Daugava before the eastern pier is the only site with an increased erosion risk that poses a real threat to infrastructure, economic activity.
5. In the near future the number of sites subjected to flood risk (including social infrastructure, culture-historical and economic activity sites) slightly increases, whereas in the scenario for the distant future it grows considerably, and even doubles if compared to present situation.
6. Specially protected nature territories located in the administrative territory of Riga City are not subjected to flooding and they do not hinder the implementation of the protective measures. On the contrary – according to the existing nature protection plans, periodical flooding in these territories is even welcomed and building of counter-flood constructions that would stop flooding should not be authorized.
7. At the moment average economic loss caused by flood in Riga sustains slightly over 1,03 million lats per year. In the long term it has a tendency to increase – in the middle of the century the loss is estimated to grow by ~71% if compared to current situation, but at the end of the century even by ~2,9 times. It means the decisions how to reduce the impact of floods on Riga City have to be made in the nearest future.