



## **Natural and human-induced impacts addressed in coastal management practice in Pärnu Bay region, SW Estonia.**

Hannes Tõnisson, Are Kont, Kaarel Orviku, and Valdeko Palginõmm  
Tallinn University, Institute of Ecology, Tallinn, Estonia (hannes.tonisson@tlu.ee)

Extensive inundations are increasing and affecting coastal urban settlements in many parts of the world. Due to changes in atmospheric circulation and warmer winters, the frequency of strong westerly storms associated with high sea level in ice-free sea conditions has increased over the last half-century on the western coast of Estonia including in Pärnu City. Pärnu is an important fishing and harbour city, and a popular seaside summer resort. In 2016, the population of Pärnu was 40,890 inhabitants but the number nearly doubles during summer months. There can be over 50 000 tourists on the beach on one nice summer day according to the official record. A long and broad sandy beach exposed to the south, long duration of sunshine, and quickly warming water of the shallow bay make the city very special in Estonia. Due to the opening of the Pärnu Bay to the SW, the city is well exposed to westerly winds, frequent cyclones and concurrent storms. Therefore, Pärnu is highly vulnerable to storm surges with associated extensive inundations.

During the last 50 years Pärnu has suffered from two remarkably high storm surges (Kont et al., 2011) and associated inundations – in 1967 (2.53m a.s.l) and in 2005 (2.75m). This research addresses the problem of coastal floods in Pärnu, analyzing different action plans in order to protect the city against floods, which may get even more disastrous due to climate change induced sea level rise. The current study is based on the results and outputs of BONUS Program project “A Systems Approach Framework for Coastal Research and Management in the Baltic.” We are using a System Framework Approach (SAF) method, which is a holistic approach for the integrated assessment of coastal systems worked out by over 50 research institutes and universities across European Union. We analysed number of different future scenarios, including dissipation of surge water, building a dike, managed retreat, beach nourishment and adaptation scenarios.

It was found that the expenses on building a protective dam exceeds the potentially avoidable losses. A managed retreat was not acceptable either because the city would lose its identity as a famous summer resort with excellent sandy beaches. Dissipation of storm surge water over adjacent low-lying uninhabited territories would not give any clear effect reducing the high water level only by 5 centimetres as maximum. Our study showed that adaptation scenario, combined with beach nourishment in nearby beaches is the only realistic scenario. We may conclude that in case of adapting to temporary extensive floods, a more efficient warning system and better communication between the authorities and the local people are needed.

### Literature cited:

Kont, A., Jaagus, J., Orviku, K., Palginõmm, V., Ratas, U., Ravis, R., Suursaar, Ü., Tõnisson, H. 2011. Natural Development and Human Activities on Saaremaa Island (Estonia) in the Context of Climate Change and Integrated Coastal Zone Management. In: Schernewski, G., Hofstede, J., Neumann, T. (eds) *Global Change and Baltic Coastal Zones*. Coastal Research Library, vol 1. Springer, Dordrecht. 117-134.