

Expert Seminar “Methodological approaches to risk and
vulnerability assessment for adaptation to climate change”
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Sea coastal erosion risk management: Jūrmala example



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Is coastal erosion an issue in Latvia?

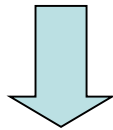
- Almost all coastal areas are consisting of easily erodible Quaternary sediments.
- Substantial changes in coastal “shape” (retreat, destruction of dunes, migration of sediments etc.) are occurring only during relatively rare severe storm events with “appropriate” wind direction.
 - Depending on the exact location, there can be even more than 10 years in between such events.
- The total length of the coastal sections, where the coastline is retreating during several last decades is:
 - 0.1–0.5 m/year ~ 120 km;
 - 0.6–1.5 m/year ~ 50 km;
 - 1.6–3.5 m/year ~10 km.

Coastline of Latvia – 496 km



Is coastal erosion an issue in Latvia? II

- Common trends over the last 20-30 years refers to the increase in activity of the coastal processes – there are both increase in the length of coastal sections subjected to erosion and increase in overall retreat rate.
- There are two main reasons for this:
 - the coastal system is experiencing growing deficit of sediment supply (mostly due to anthropogenic intervention);
 - climate change related stressors in the system.



1. the average sea level rise;
2. warmer and shorter winters (less ice);
3. more frequent and intense westerly storms.

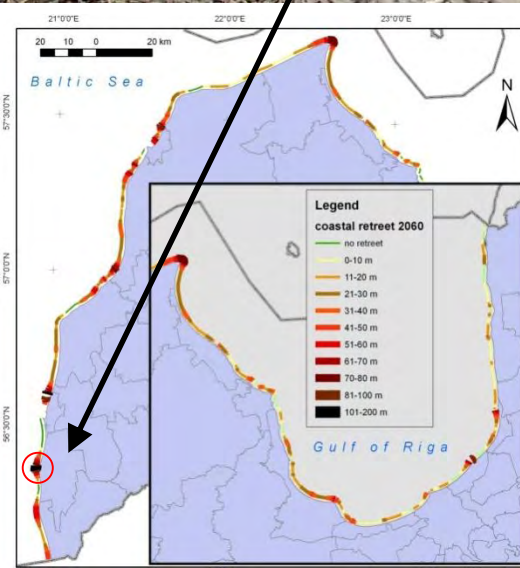


2005.



Bernāti,
Nīca municipality.

2015.

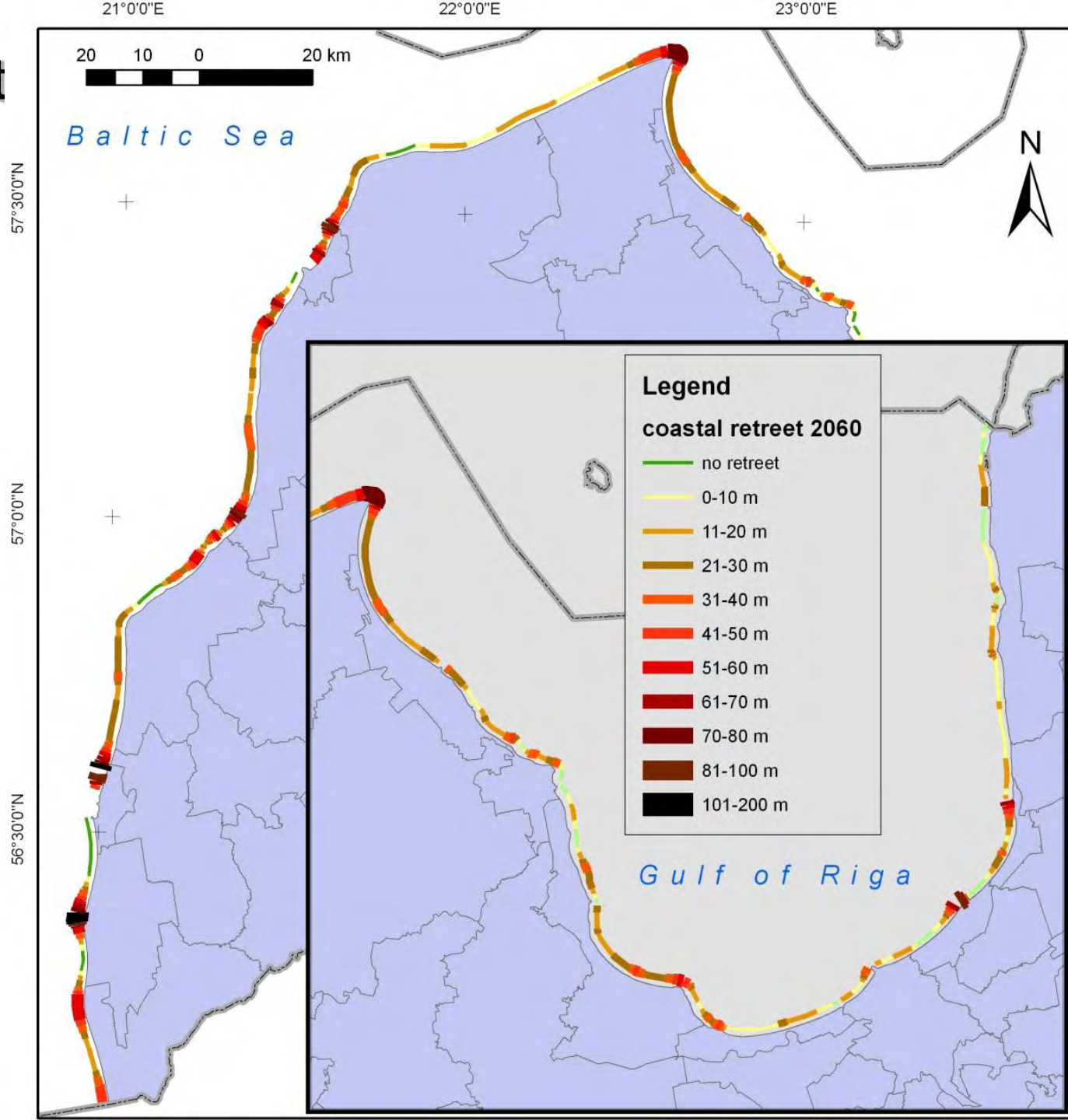


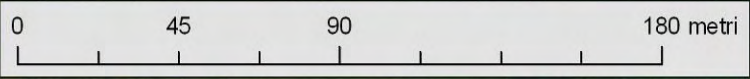
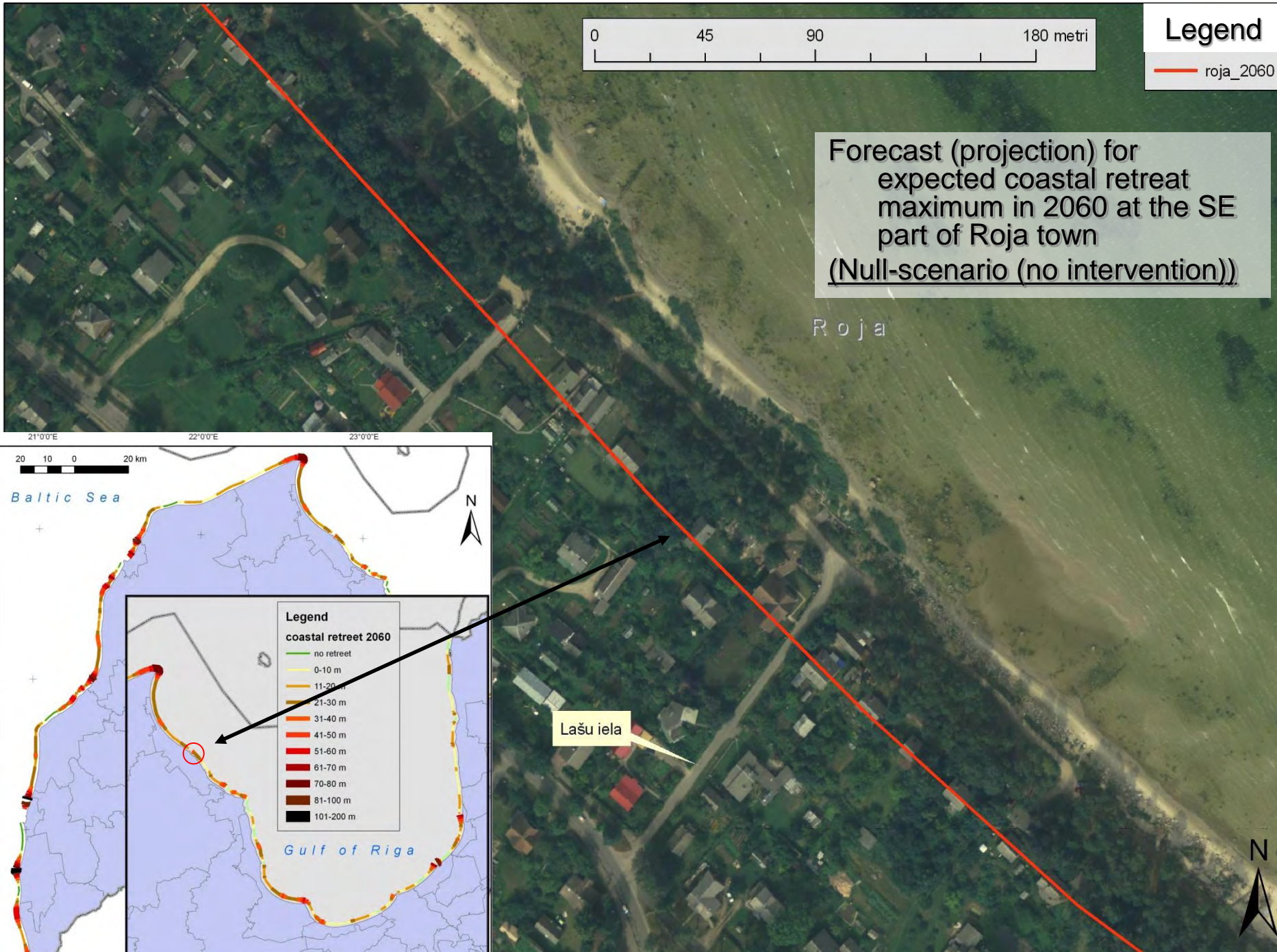
Legend
coastal retreat 2060

- no retreat
- 0-10 m
- 11-20 m
- 21-30 m
- 31-40 m
- 41-50 m
- 51-60 m
- 61-70 m
- 70-80 m
- 81-100 m
- 101-200 m

Coastal retreat forecast 2060

- Increase in the total length of coastal sections affected by retreat by 17.8 % ($\Sigma=331$ km) by the year 2060.
- Maximum expected coastal retreat (in separate, short sections) – 150-200 m until the year 2060.
- Territory of Latvia will be reduced by approx. 9.2 km² by the year 2060.

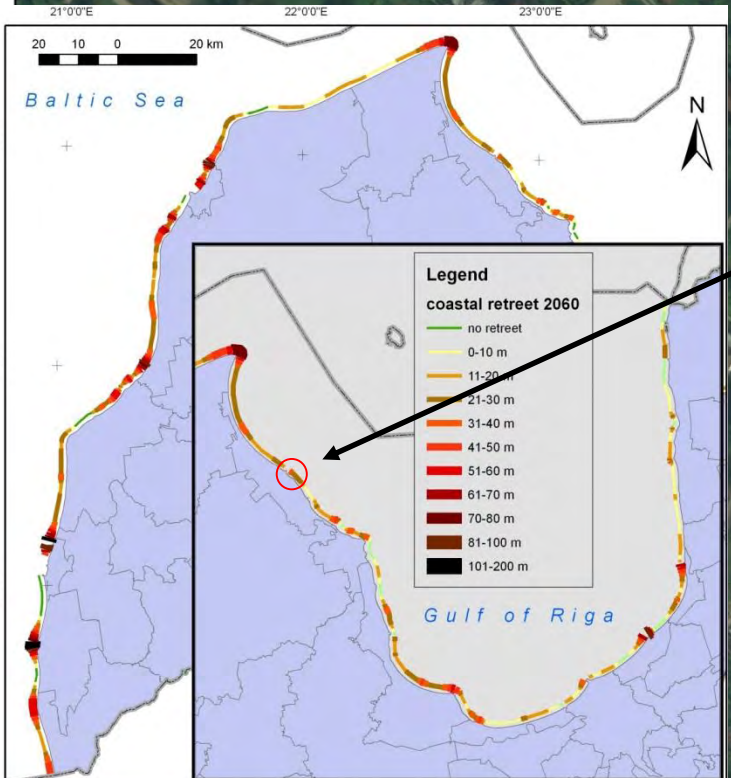




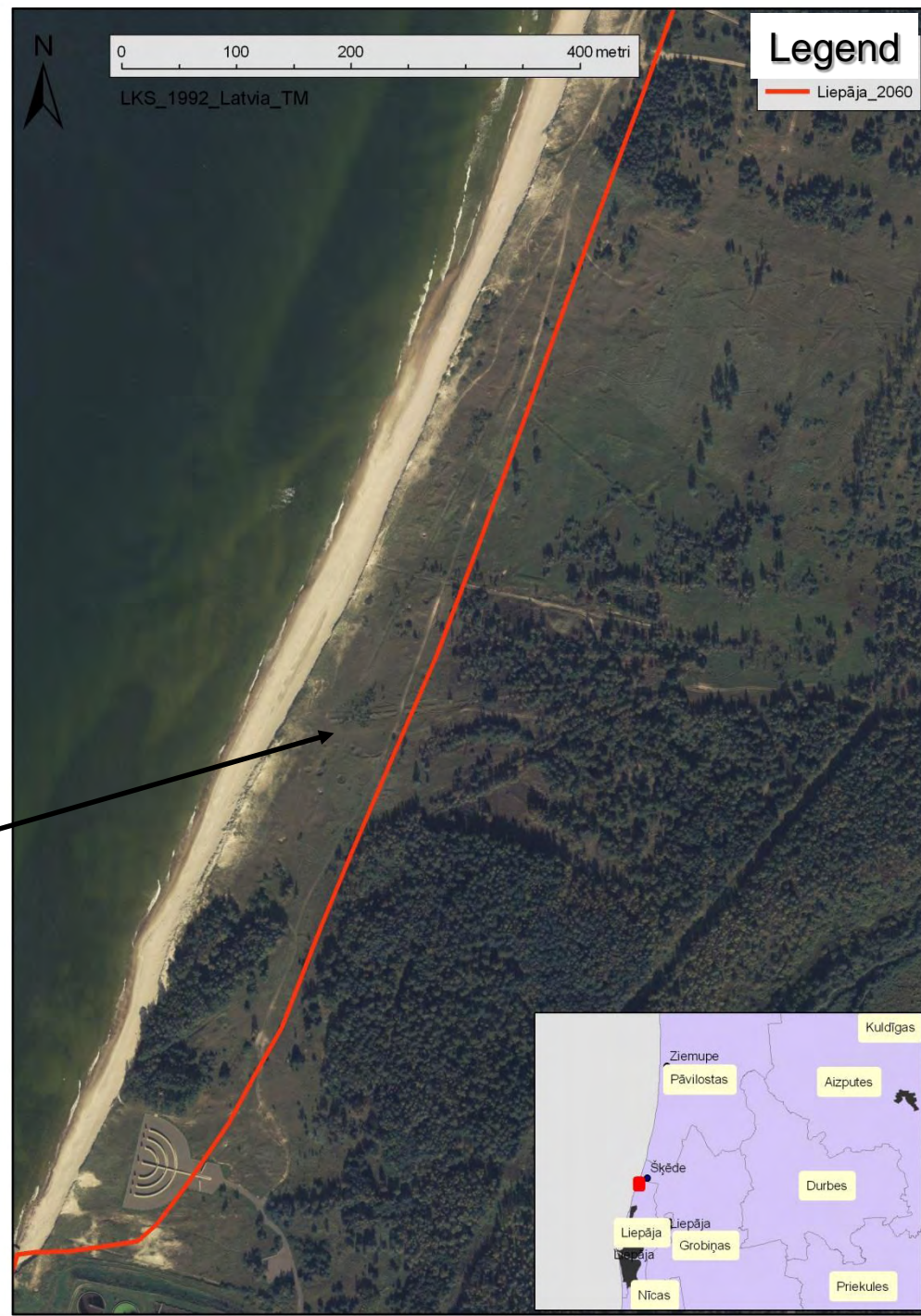
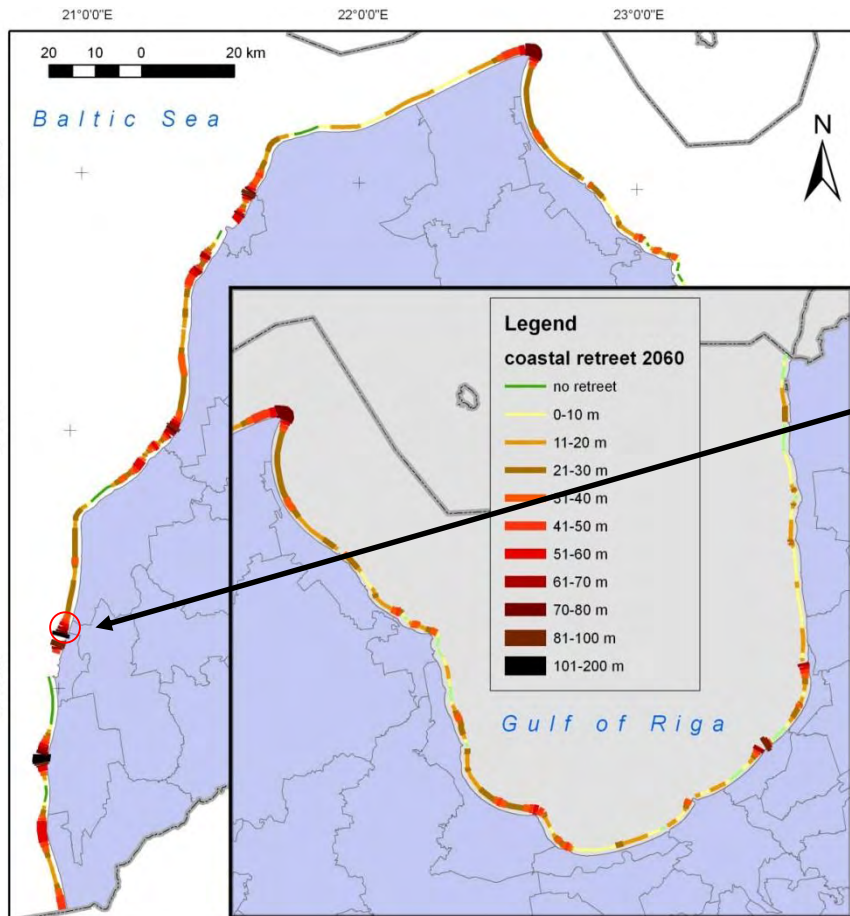
Forecast (projection) for expected coastal retreat maximum in 2060 at the SE part of Roja town
(Null-scenario (no intervention))

Roja

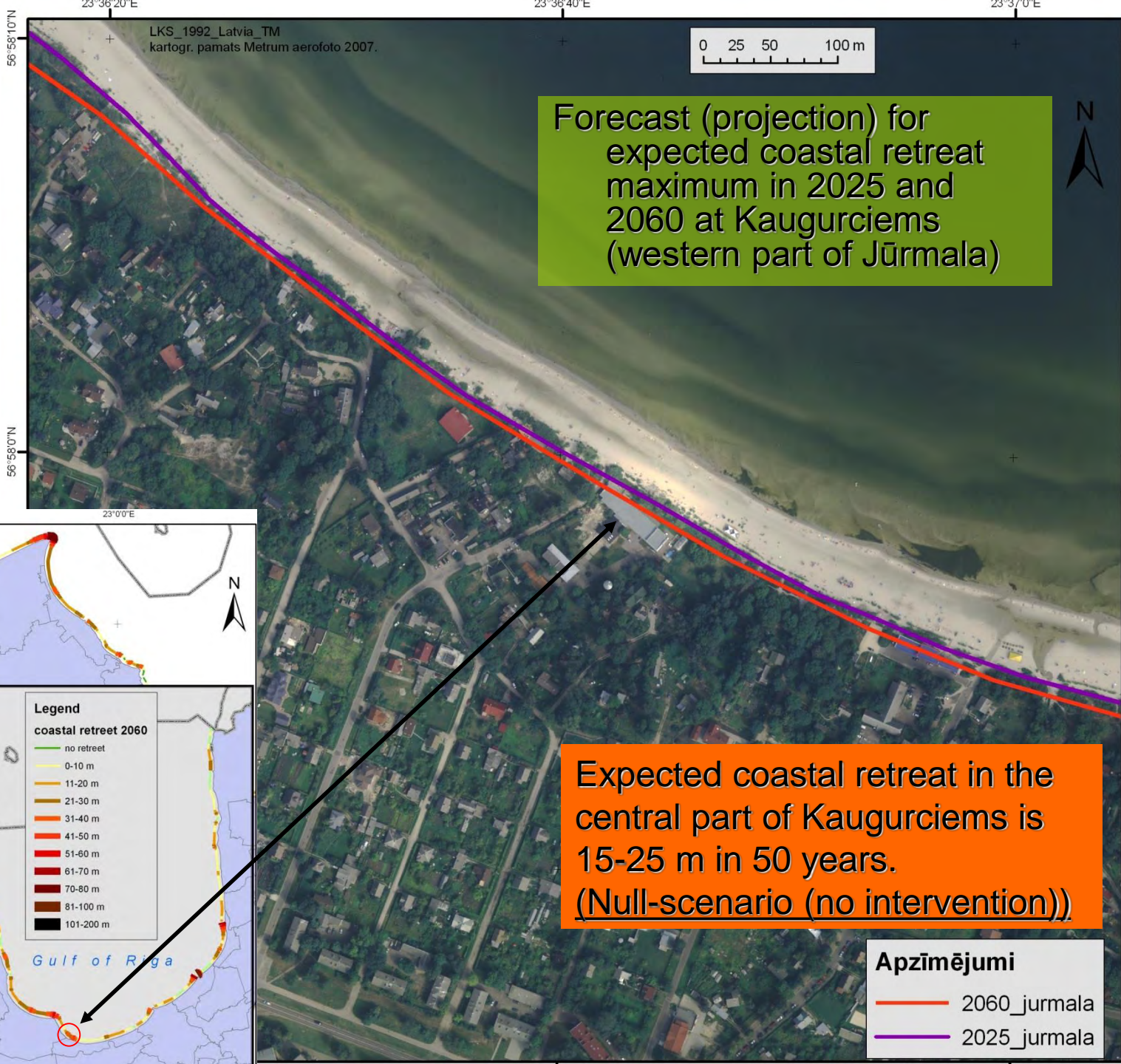
Lašu iela



Forecast (projection) for expected coastal retreat maximum in 2060 to the N from Liepāja
(Null-scenario (no intervention))



Jūrmala case of coastal erosion risk mitigation and management



Conditions at erosion site

- Coastal area is very low and consisting of very fine sand.
- Beach face narrow and low, bounded by poorly developed and fragmented fore-dune.
- No ports or other major hydrotechnical structures are affecting the coastal stability.
- Area is actively used for recreational purposes. Jūrmala is the most popular seaside resort in Latvia, partly due to the beaches composed of fine and light colored quartz sand found here.
- There are several buildings and other facilities located in the immediate vicinity of the coast.
- **Severity of each erosion event usually is not particularly high, but there is almost no “natural recovery” of coastal slope during the time periods between storms.**



Beach nourishment. Why?

Various “traditional” coastal protection approaches were practiced in Latvia in effort to “fight” erosion and satisfy mostly economic needs. Often these approaches have led to undesired long-term consequences, lowering the quality of the environment.

Among the main prerequisites for management of coastal erosion the most important should be the **restoration of sediment balance and providing of space for coastal processes.**

Non-intervention strategy should be **considered as the highest priority** from all the possible coastal erosion management strategies. Therefore prioritization should be as follows:

1. **No intervention (adaptation);**
2. **Non-invasive or minimally invasive anti-erosion measures (dune planting, beach nourishment and other “soft” measures);**
3. **“Aggressive” anti-erosion measures (structures) with relatively short service life and short “covered” length of the coastline;**
4. **Highly “aggressive” measures (seawalls, impermeable groins) with long lifetime and high level of coastal alteration.**

Beach nourishment. Why? II

Beach nourishment is being a priority tool for coastal management applied in the EU countries.

Main benefits of this coastal stabilization method are considered as follows:

- no contribution to erosion in adjacent coastal sections,
- almost full integration into the landscape,
- improvement of quality of recreational areas.



“Traditional” coastal protection structures at the Liepāja WWTP site.

Photography by: Vilmārs Bogovičs

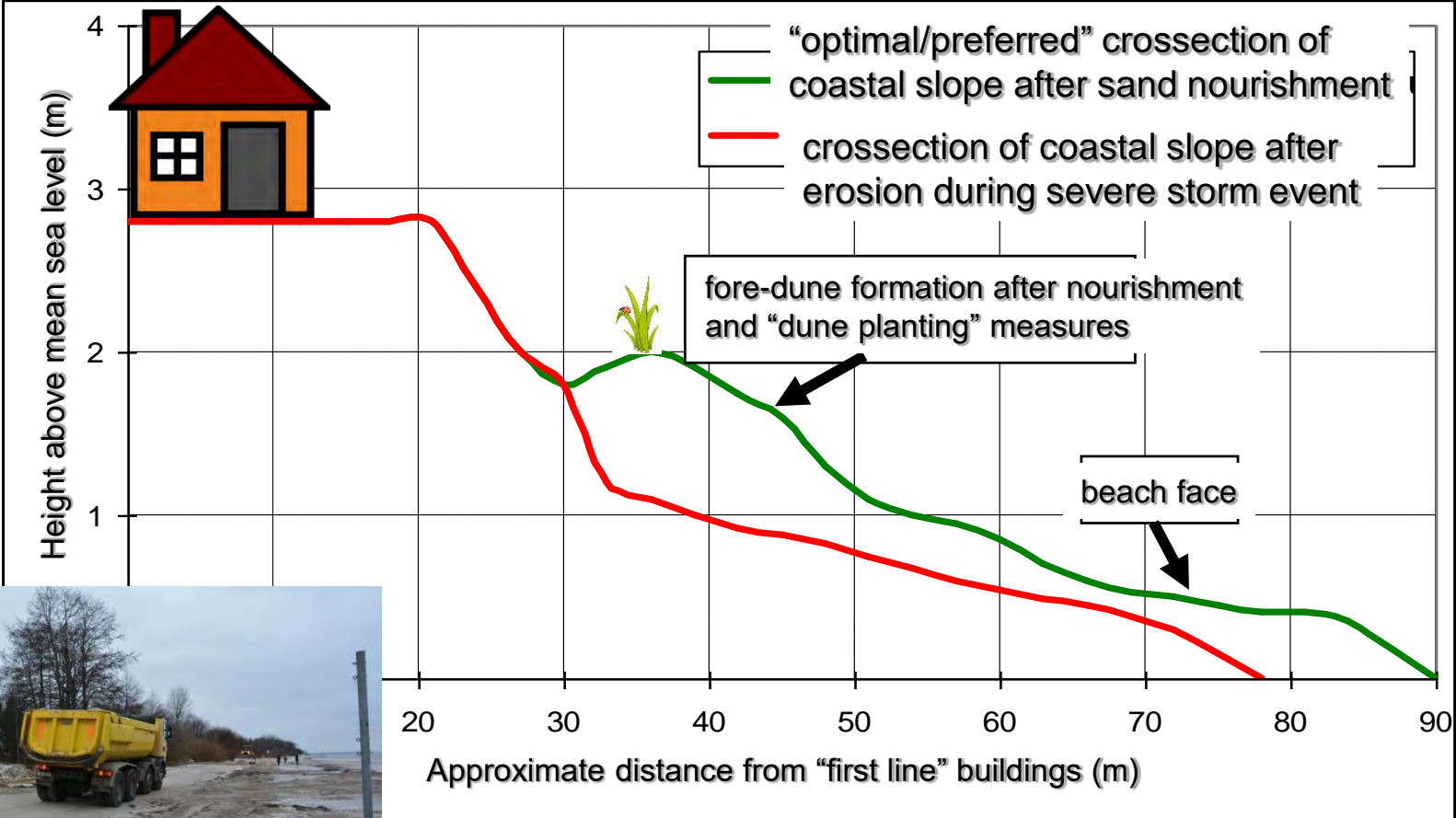
Measures taken on the beach of Kaugurciems In January 2015



Nourishment with imported sand was carried out for the first time in January 2015, when 3700 cubic meters of sand was refilled along a 500 m long stretch of beach.

Sand was acquired in the Gulf of Riga during dredging of the Lielupe port access channel at the depth of 2.0-4.0 m.

Measures taken on the beach of Kaugurciems In January 2015



Short-term results

- The beach nourishment provided a more enjoyable recreational conditions by making the beach wider and dryer.
- The increased volume of sand and the widening of beach created favorable conditions for the aeolian processes (fore-dune growth). In places where the willow cuttings were planted (“dune planting”) accumulation of wind blow sand is very successful.
- Share (10-20%) of fine grained sand is blown away along the coast eastwards.
- The beach in Kaugurciems after nourishment has become relatively stable.
- The amount of sand eroded from the beach depends in part on the nourished sand volume and severity of existing sand deficit on the coastal slope. Yet still, lasting ability (expected longevity) of nourished sand is largely determined by the hydrometeorological conditions.
- **However, despite the ongoing success, it must be recognized, that beach nourishment has not changed the coastal dynamic patterns. Nourishment will have to be repeated, otherwise the erosion will continue.**



There are no such thing like “ideal cure to coastal erosion problems”.
The choice has to be made between a variety of possible negative effects,
minimizing those that in each case are assessed as the most significant.

Thank You!



Baltic Ice Lake
(approx. 11500 BP).