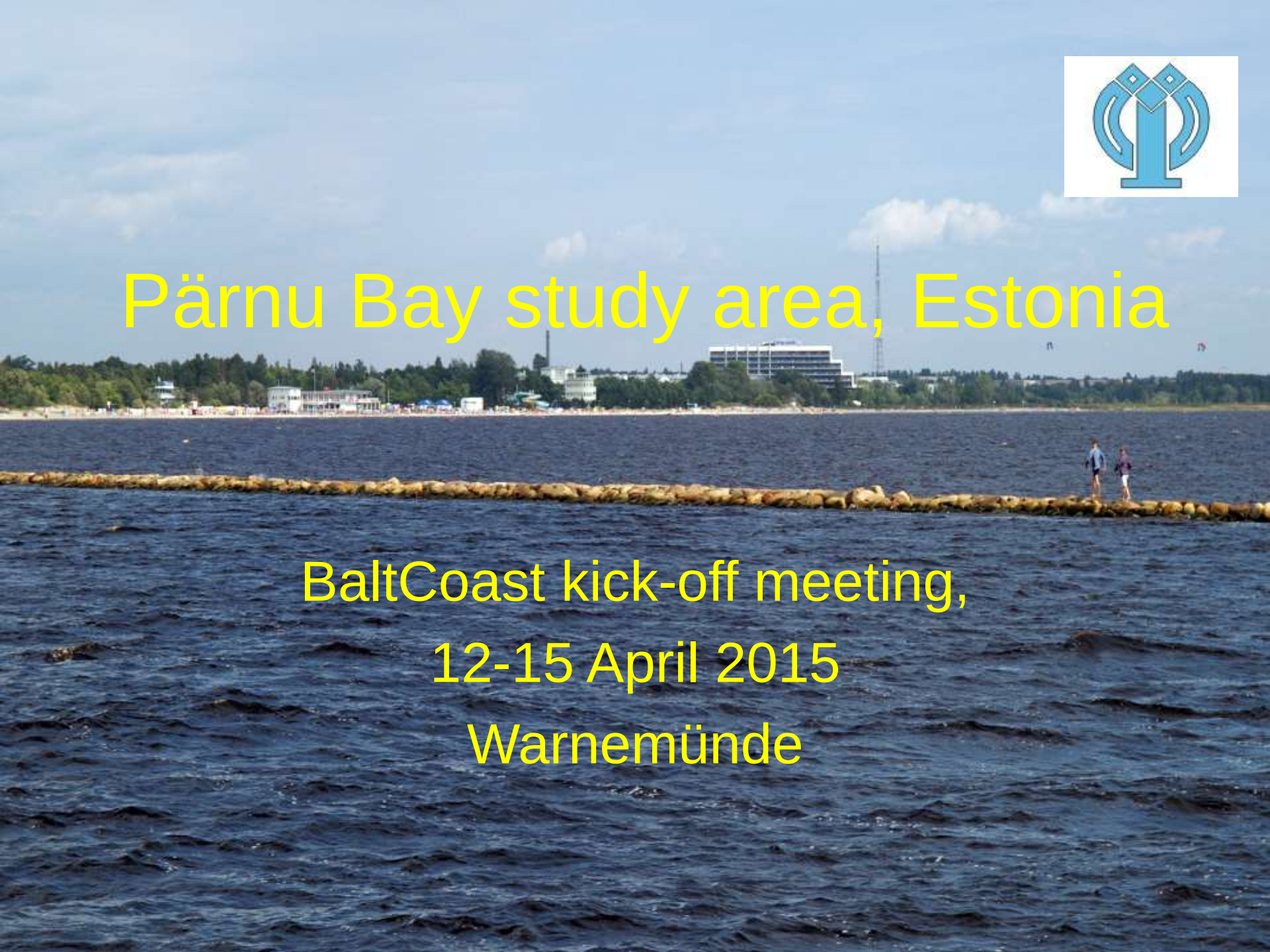
BaltCoast

12 – 15 April 2015, project kick-off meeting
Leibniz-Institute for Baltic Sea Research (IOW)
Warnemünde, Germany

WP5 Task 5.5

Pärnu Bay study area, Estonia

BONUS



Pärnu Bay study area, Estonia

BaltCoast kick-off meeting,

12-15 April 2015

Warnemünde

Location


BALTIC STATES
100 km
HELSINKI
FINLAND
Gulf of Finland
St. Petersburg
Maardu
Rakvere
Narva
Paldiski
TALLINN
Tapa
Kohtla-Järve
Narvskoye Reservoir
Hiiumaa (Dagö)
Vormsi
Kärdla
Märjamaa
Rapla
Haapsalu
ESTONIA
Mustvee
RUSSIAN FEDERATION
Muhu
Soela Väin
Lihula
Pöltsamaa
Lake Peipus (Chudskoye Ozero)
Virtsu
Kihelkonna
Saaremaa (Ösel)
Kuressaare
Pärnu
Viljandi
Tartu
Võrtsjärv
Manilaid
Kihnu
Pärnu Laht
Mõisaküla
Törva
Otepää
Lake Pskov (Pskovskoye Ozero)
Ruhnu
Ainaži
Mazsalaca
Valka
Valga
Võru
Pskov
Irves Šaurums
Kolka
Gulf of Riga
Limbaži
Valmiera
Alūksne
Ventspils
Talsi
Gulbene
Balvi
 Utroya
Velikaya
Tukums
RIGA
Sigulda
LATVIA
Kuldīga
Jūrmala
Ogre
Saldus
Dobele
Jelgava
Rēzekne
Liepāja
Jēkabpils
Daugava
Bauska
Joniškis
Biržai
Daugavpils
Kraslava
Telšiai
Šiauliai
Rokiškis
Palanga
Panevėžys
Klaipėda
LITHUANIA
Visaginas
Polatsk
Utena
Zapadnaya Dvina
Tauragė
Kėdainiai
Ukmergė
Švenčionys
Kurshskiy Zaliv
Nemunas
Neman
Kaunas
VILNIUS
BELARUS
Kaliningrad
RUSSIAN FEDERATION
Gusev
Marijampole
Alytus
Barysaw
Druskininkai
POLAND
MINSK
Olsztyn
Hrodna

Location


Eidapere
LIHULA
Vändra
Pärnu-Jaagupi
Tootsi
Lavassaare
Are
Tori
Audru
Sauga
SINDI
Paikuse
PÄRNU
Tõstamaa
PÄRNU LAHT
Manilaid
Võiste
KILINGI-
NÕMME
Tihemetsa
MÕISAKÜLA
Häädemeeste
Kihnu
L I I V I L A H T
Ramata
VÄIKE-SALATSI
(MAZSALACA)

Why is that site relevant to BaltCoast project?

- One of the most vulnerable to sea level rise coastal areas in Estonia
- Open to the most frequent winds and storm surges
- Pärnu River, one of the largest rivers in Estonia, discharges into Pärnu Bay

Why is that site relevant to BaltCoast project?

- Pärnu, the biggest city in western Estonia, (ca. 45,000 inhabitants) is located on the river banks and on the coast of the bay
- There are residential and industrial areas and a port, which are strongly affected in case of westerly storms and high sea levels as well as in case of river floodings

Why is that site relevant to BaltCoast project?

- Pärnu is a popular summer resort with many hotels, restaurants, and long beaches
- The number of population during the holiday season in summer may reach nearly 100,000 inhabitants
- The main industrial activities and pollution point-sources are also concentrated in the city

Main characteristics

- Pärnu Bay measures approximately 20 x 25 km and is a relatively shallow basin with maximum depth of about 14 m
- Over 95% of the sea level data remains within –50 and +60 cm of the Kronstadt zero
- A few catastrophically high storm surges are on record (max: +2.75 m, January 9 2005)

Main characteristics

- Pärnu River is 144 km long with a basin area of 6,920 km2 and an average discharge of 64.4 m3/s
- The difference in runoff minimum and maximum values at Pärnu city gauge is over 100 times
- Sandy beaches with dunes on both sides of the river mouth

Main characteristics

- SW orientation facilitates coastal erosion on both sides of the bay and longshore transport of sediments towards the river outlet
- To prevent sand movement into the ship channel, the river mouth is protected by two 2.2 km long jetties

Main characteristics

- Influencing shipping and fisheries, the ice cover in winter stays in the bay for about four months on average

- The average duration of ice cover has decreased from about 150 days to 80 days over the last sixty years

Main characteristics

Main characteristics

- The impact of ice on the coast is two-sided: it can protect the coast from wave activity, but in spring the ice ridging may become a geomorphic agent of its own

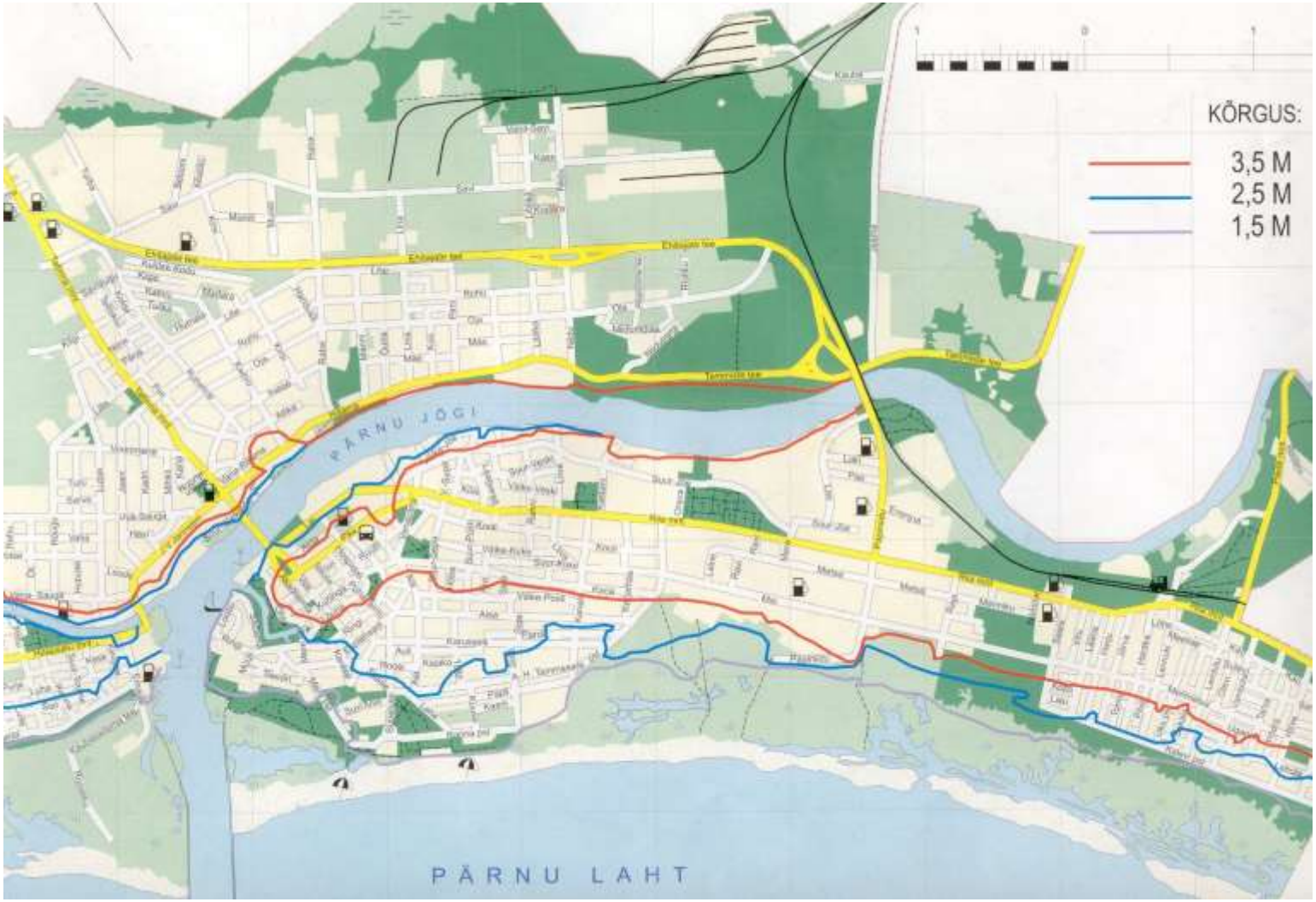
- Sea ice and river ice may also pile up near the river mouth, block the water flow and cause extensive flooding

Main characteristics

- Pärnu tide gauge records identify over 30 individual events higher than the critical value of 150 cm

- Since 1922, the two highest sea level events off the Estonian coast were both registered at Pärnu: 253 cm on 19 October 1967 and 275 cm on 9 January 2005

Vulnerability of the area to climate change



Vulnerability of the area to climate change

- About 8 km^2 of Pärnu was flooded by the storm and 400 people were evacuated
- The Audru polder dam near Pärnu was breached by storm waves and the polder was heavily flooded
- Total damage caused to homes in the country amounted to nearly 9.2 million EUR

Vulnerability of the area to climate change

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Vulnerability of the area to climate change

- The lesson learned from the huge flood caused by Gudrun in 2005 showed that the city of Pärnu is very vulnerable to such kind of extreme events
- Considering the shallow sea, low-lying coast, and virtual absence of tides, the local residents are not always sufficiently prepared for such events
- Rapid increase in coastal population and expansion of urban areas in recent decades, together with increased storm activity, create stresses on the coast of the Pärnu Bay that threaten both nature and man


Thank you!