UBC Commission on Energy, Environment and Transportation Joint Meeting

CLIMATE CHANGE - A THREAT FOR THE CITY OF GDANSK

– SOLUTIONS FOR COMBATING STORM WATER IN GDANSK

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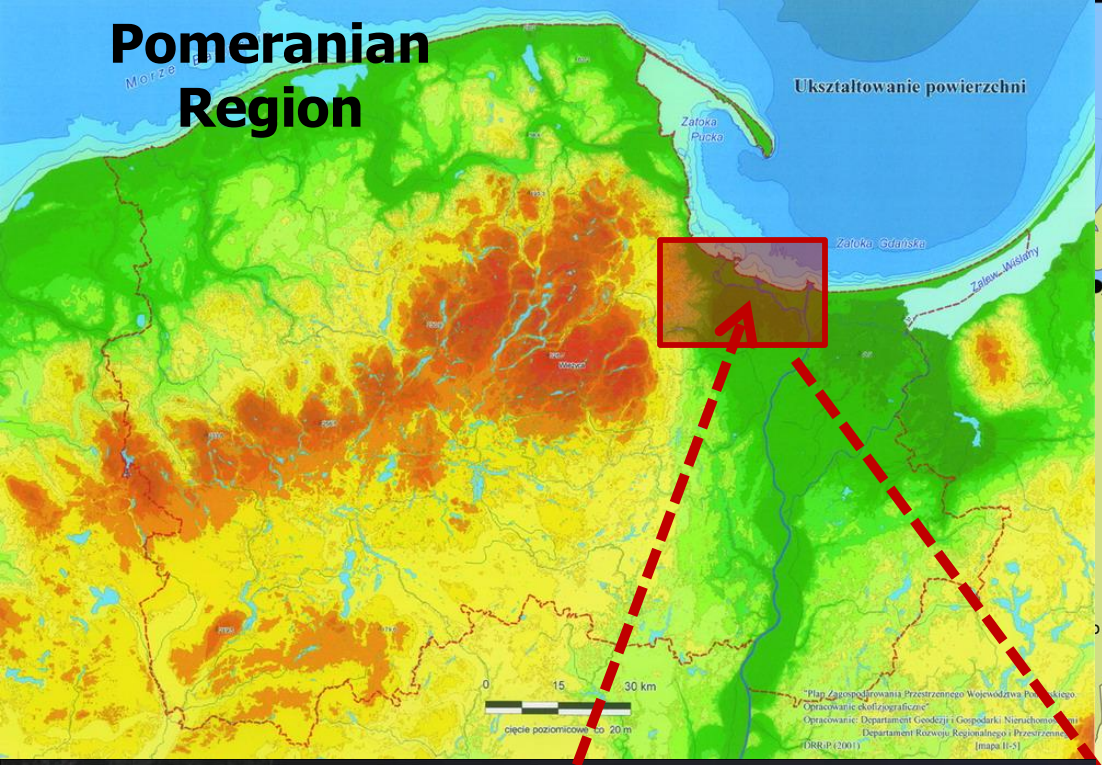
Department for Environement

UBC meeting, Gdynia March 2010


Pomeranian Region
Ukształtowanie powierzchni
Zatoka Pucka
Zatoka Gdańska
Zalew Wiślany
0 15 30 km
cięcie poziomicowe co 20 m


City of Gdansk

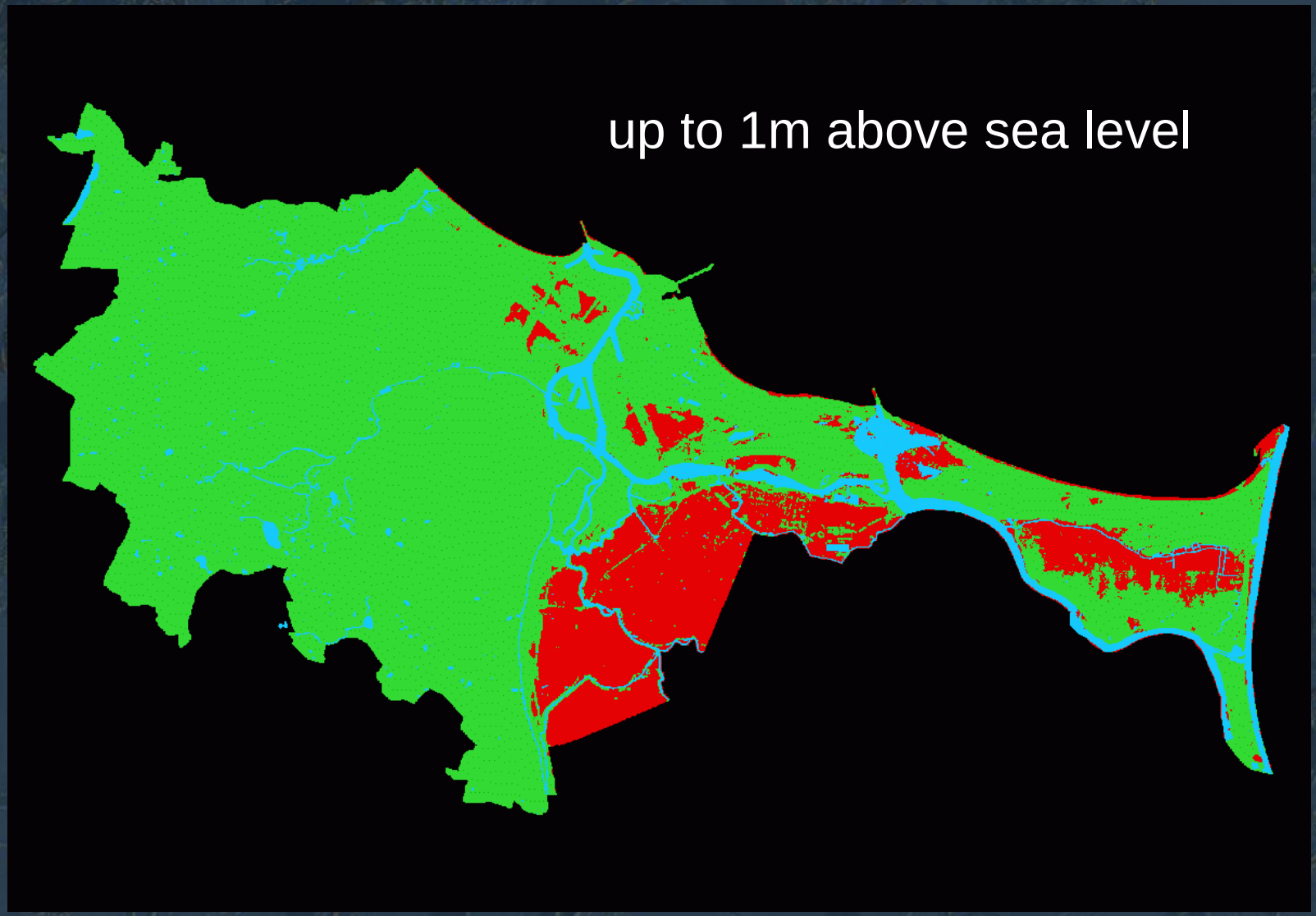

Luleå
Hailuoto
Oulu
Trondheim
Vaasa
FINLAND
Sundsvall
Gulf of Bothnia
SWEDEN
Turku
Helsinki
Åland Islands
Gulf of Finland
Stockholm
Tallinn
Hiiumaa
ESTONIA
Saaremaa
Gulf of Riga
Gotland
Baltic Sea
Riga
LATVIA
Öland
Malmö
Bornholm
LITHUANIA
Vilnius
Rügen
Kaliningrad (RUSSIA)
Gdansk
POLAND

1. Nature and urban factors with the impact on flood risk in Gdansk -Vistula River, depression areas

Various topographic features – result of the geographic location of Gdansk.

- The city is located in the area of Vistula River delta and moraine plateau.
- Natural fall of land with terrain elevations from 0m up to 2m above sea level and depressions up to 0,70m below sea level are typical for the Vistula river delta.

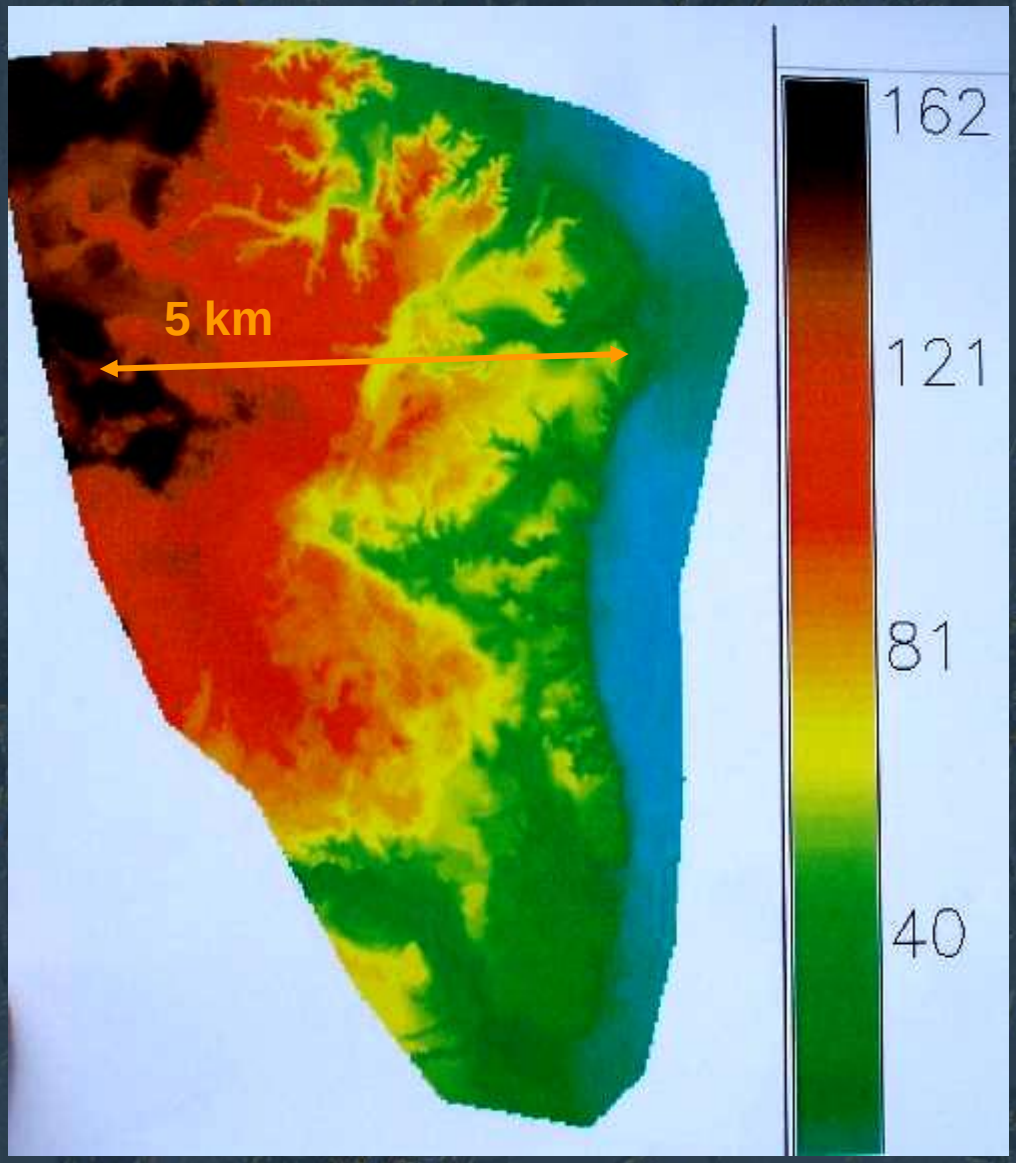
The ground and storm water in depression areas need mechanical drainage. These areas should be additionally protected against river water flowing down from the plateau (construction of flood embankments)


up to 1m above sea level

1. Nature and urban factors with the impact on flood risk in Gdansk

The Western part of the city is located on the Gdansk plateau with the terrain elevation up to 160.00m above sea level. A high density of buildings on the upper terrace reduces natural retention.

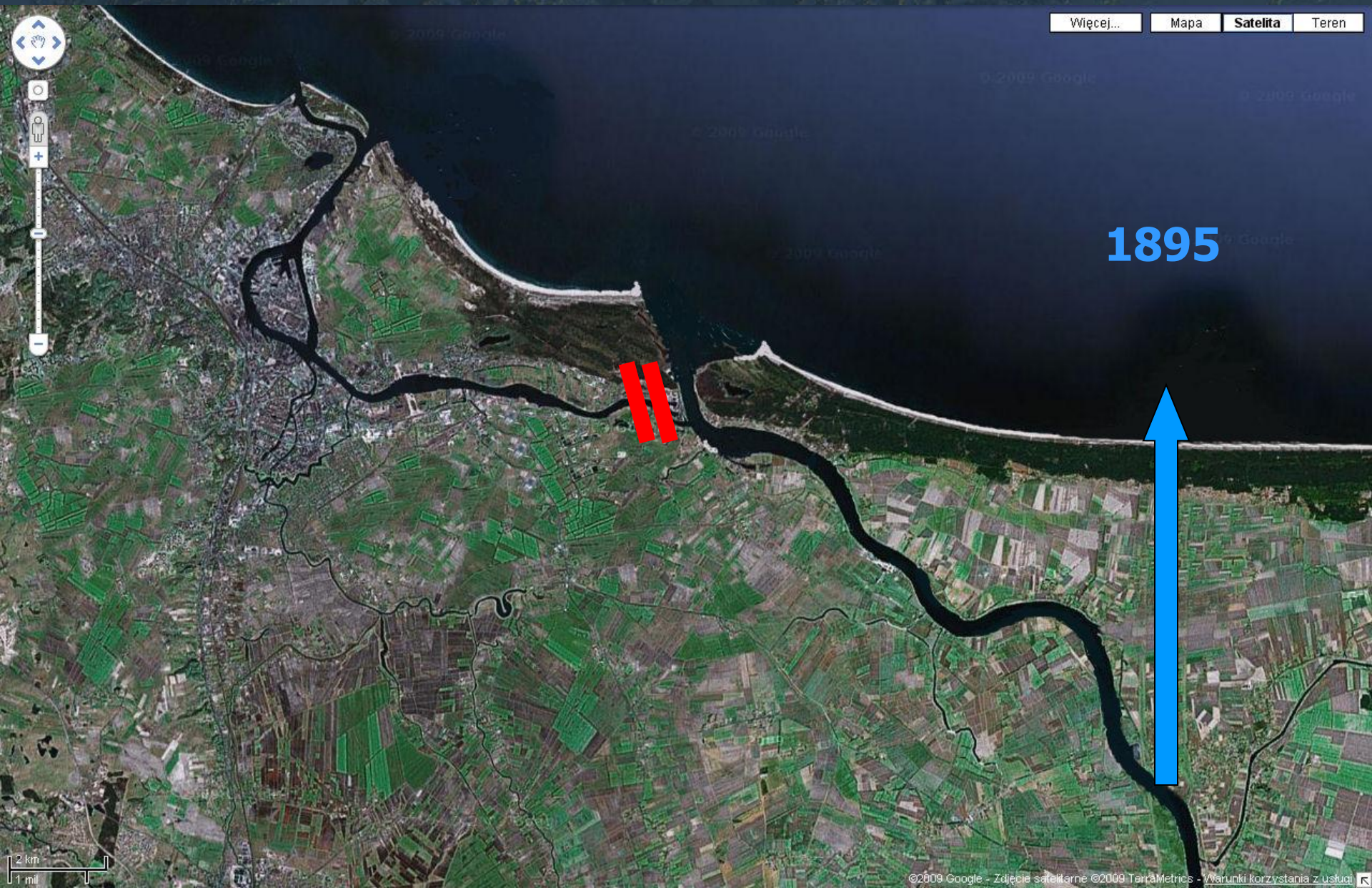
Significant fall of land causes rapid water fall (character of „mountain streams”) from the plateau. In case of heavy rains the falling water poses a flood risk for the city’s lowlands. The streams, existing canals and storm water collectors lack the capacity to collect all the storm waters which results in local flooding.


5 km
162
121
81
40

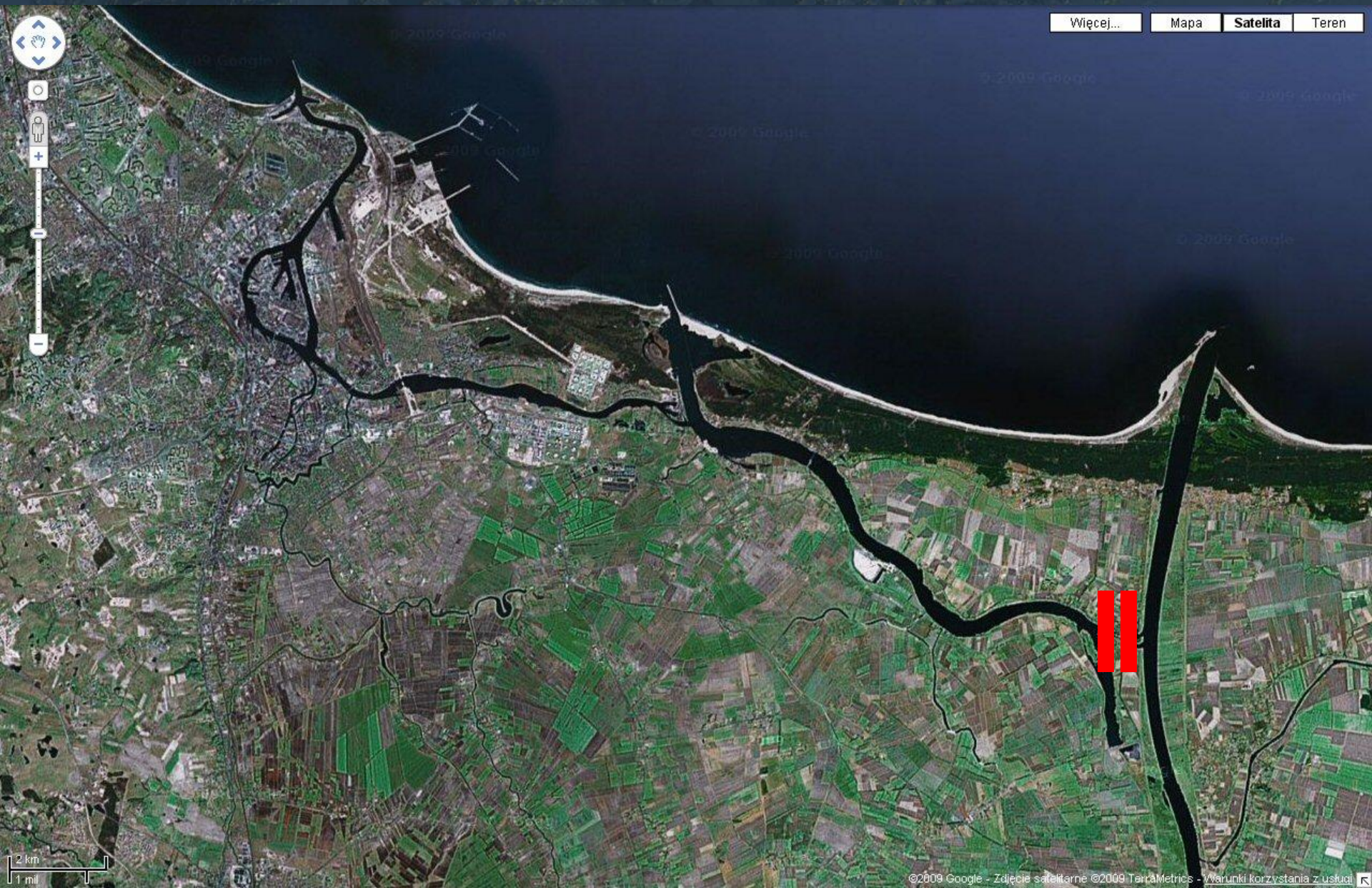
Flood types in Gdansk

Riverine flooding – Vistula River in the past

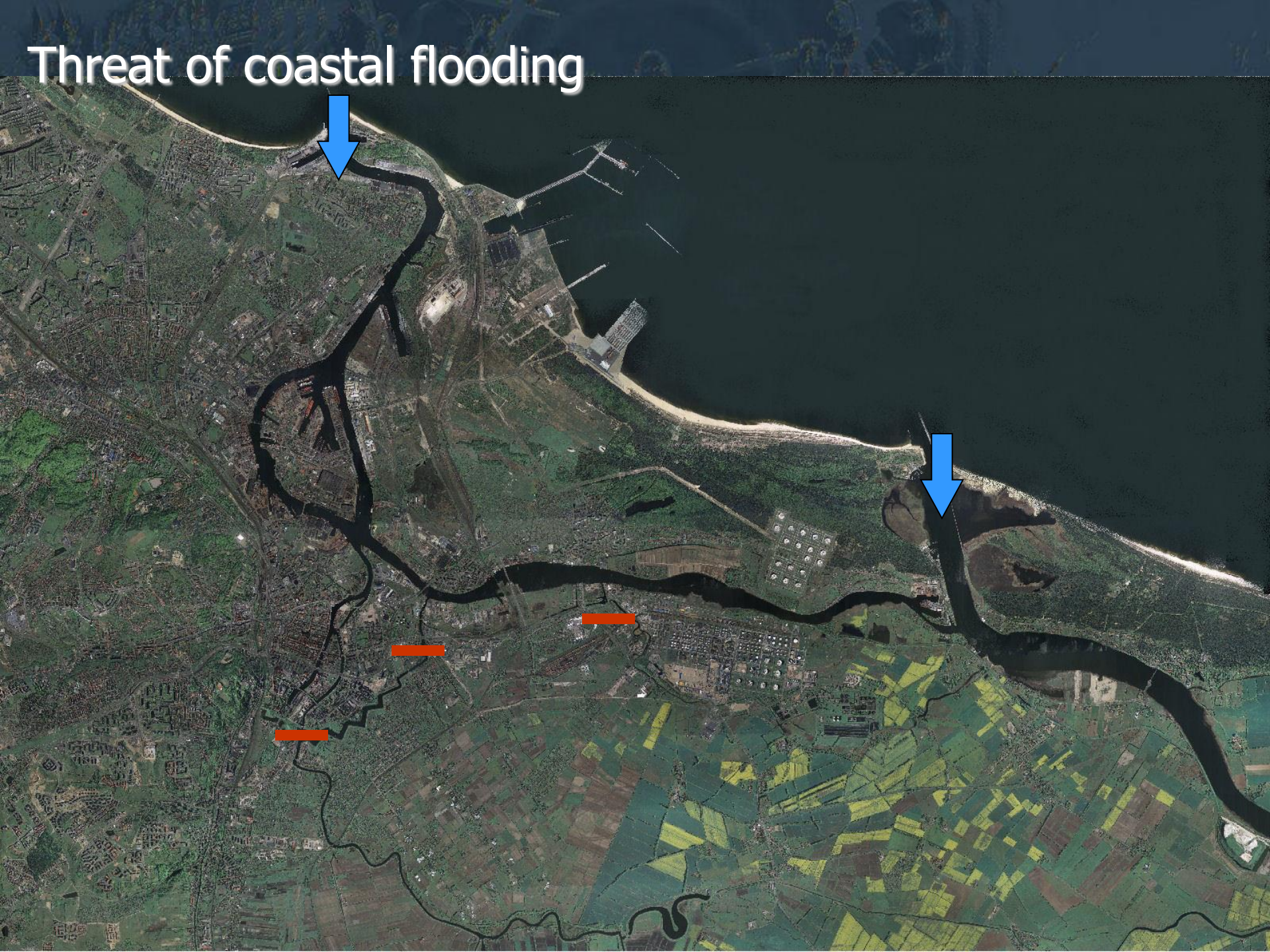
Riverine flooding – Vistula River in the past



Riverine flooding – Vistula River in the past



Threat of coastal flooding

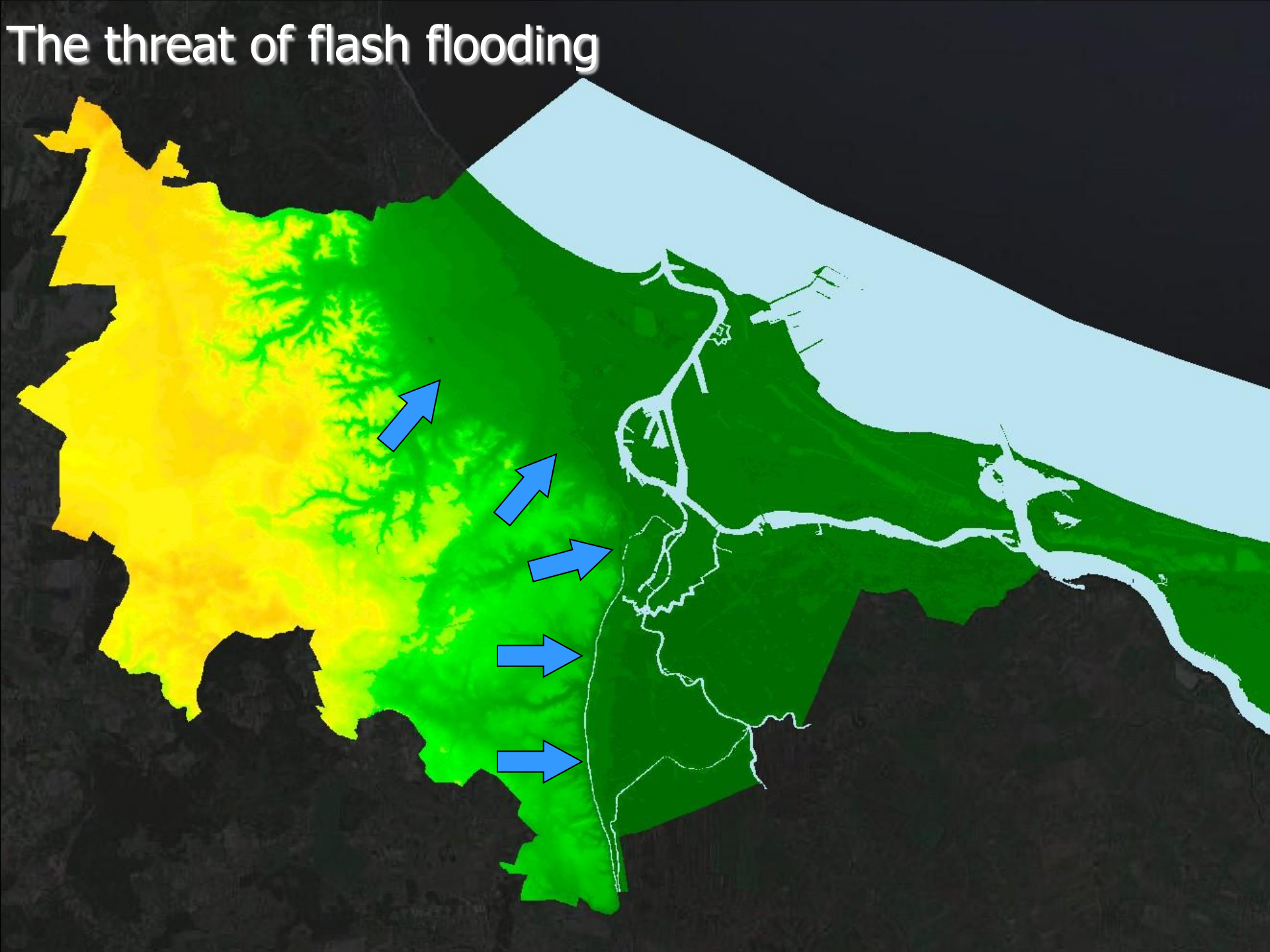


2. Intensive urban development of the moraine plateau area – former agricultural land

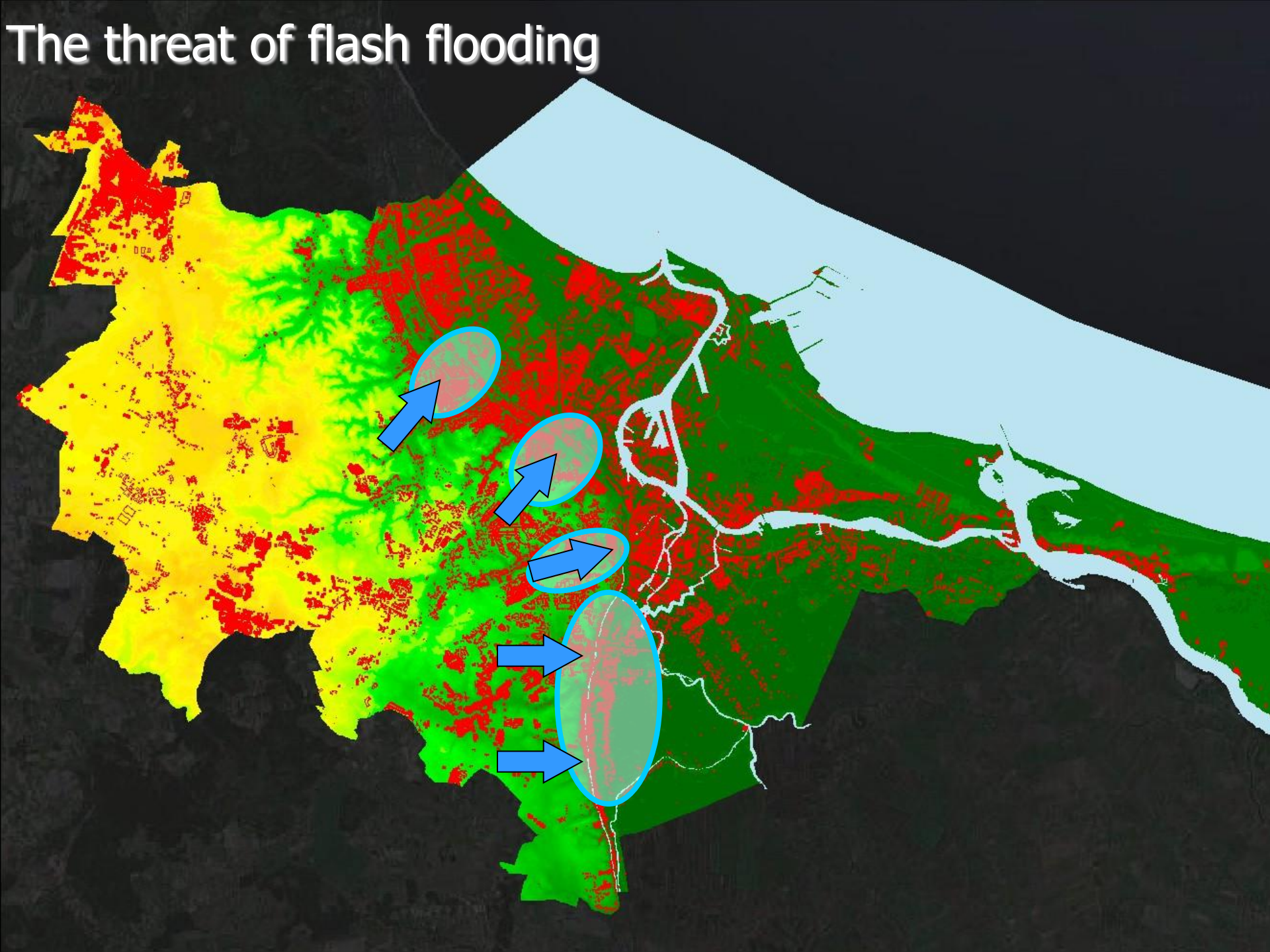
- Loss of natural water retention:
  - ✓ Waterproof surfaces - (roofs, concrete constructions, asphalt roads and car parks),
  - ✓ Destruction of small local ponds and wastelands
- Increased rainfalls:
  - ✓ Increased water fall from the waterproof surfaces,
  - ✓ Decreased time of rainwater inflow to the receiver,
  - ✓ Transformation of some natural stream channels into pipelines.

The construction of drainage infrastructure does not keep up with the urban development of the city.

The threat of flash flooding



The threat of flash flooding



2001

Flash flood

Rainfall: 90 l/m2 in 3 hours

Likelihood: circa 0.3%

Measures adopted by the local authorities to reduce the storm water flood risk

Storm and snowmelt water management in Gdansk takes place on three levels :

1. Planning
2. Investing
3. Exploitation of the existing sewage systems

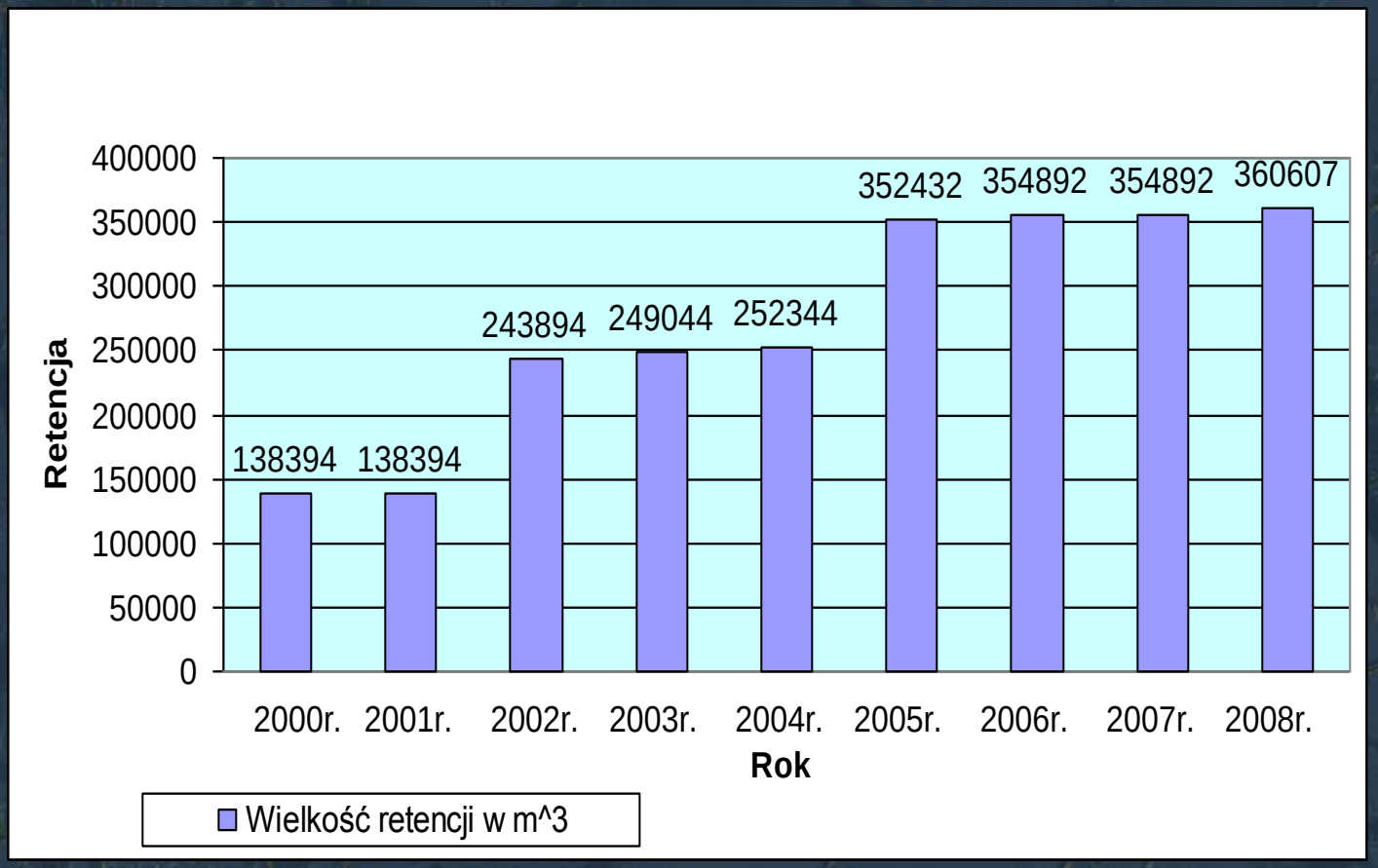
Future policy

- ✓ Increase of the retention capacity – construction of retention tanks and water collectors
- ✓ Reduction of the storm water flaw to the receivers – spatial planning policy
- ✓ Recommendations for investors:
  - runoff coefficient,
  - storm water to be managed within the property – reduction of waterproof surfaces, use of drain wells and drainage systems
- ✓ Protecting water and waste lands for the future construction of retention tanks

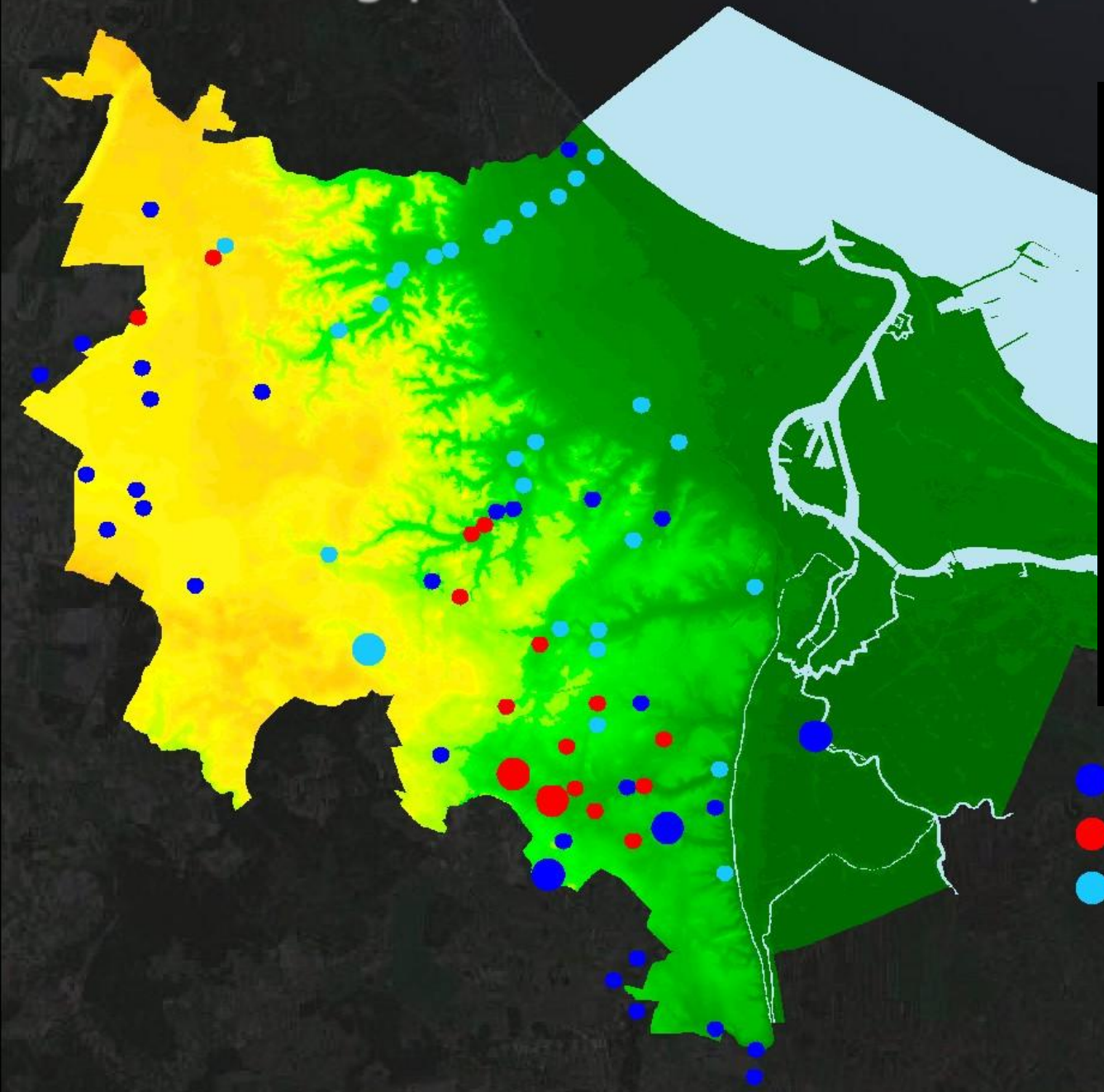
Future policy

- ✓ Increasing the budget for the construction and development of storm water collectors
- ✓ Adjusting the collecting capacity of streams and channels to gather the increasing amount of waterfall
- ✓ Improving the effectiveness of the existing drainage and flood control equipment – ongoing maintenance

RETENTION TANKS CAPACITY



Flash flooding prevention – retentive ponds



Retentive ponds

Built before 2001: 27

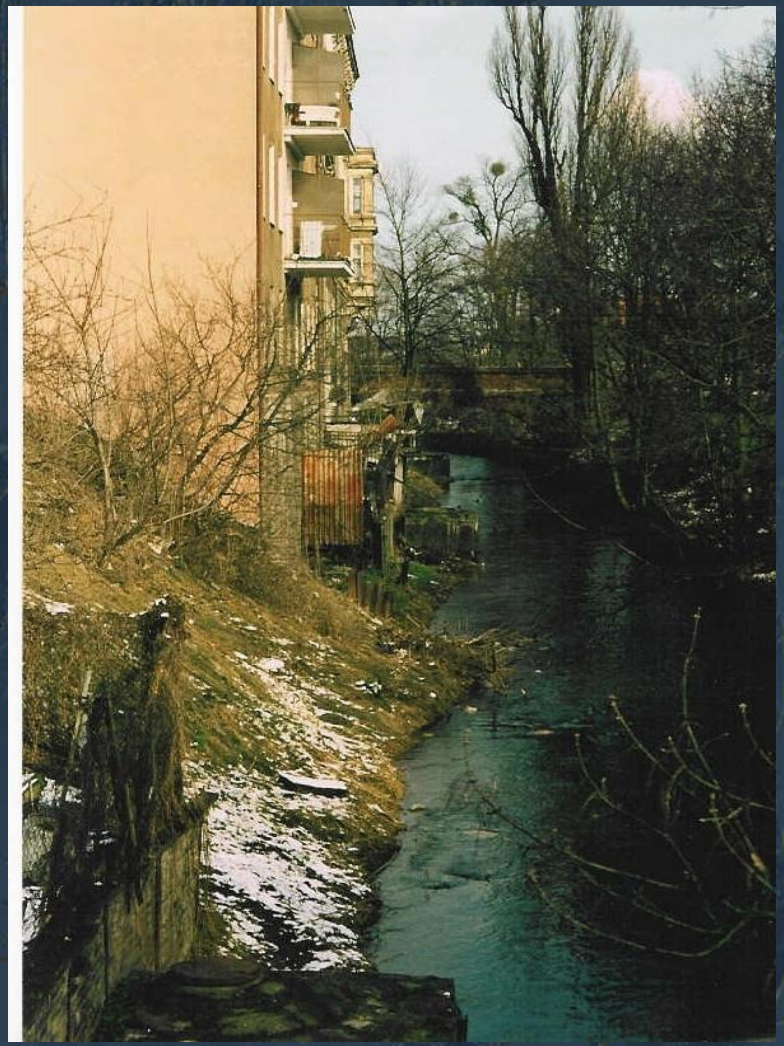
Built after 2001: 16
Planned: 30

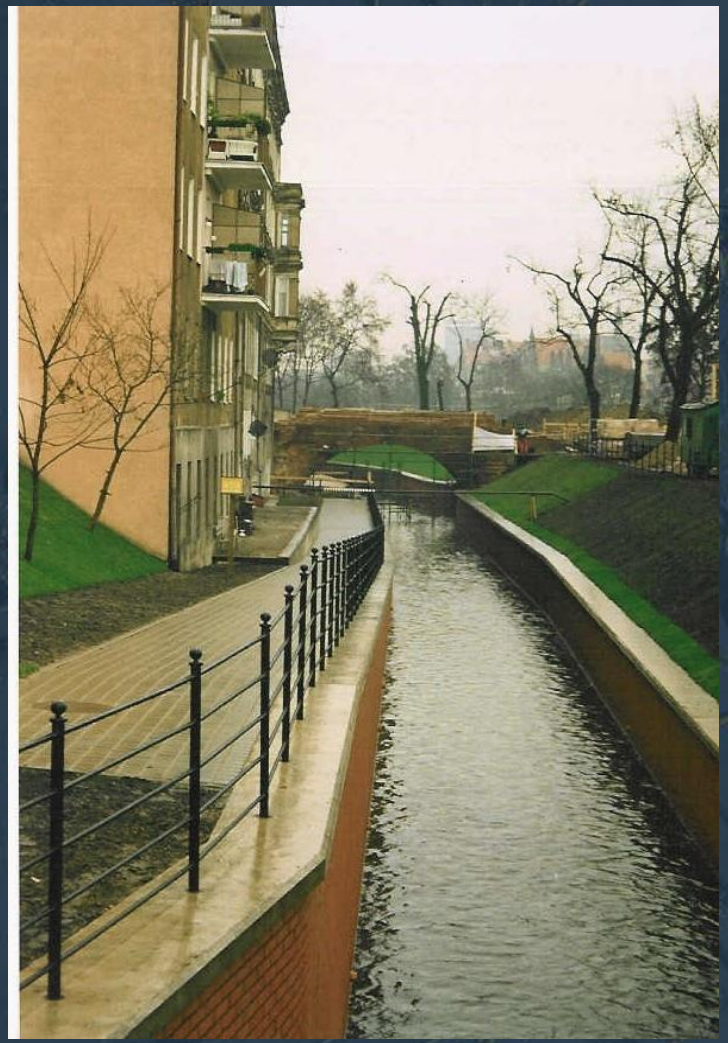
Canals, streams control

Law regulations

planned
built after 2001
built before 2001

Radunia River





Motława River by-pass

Two streams – Radunski and Kowalski

Artificial retention tank

3. Climate changes

CLIMATE CHANGES = INCREASED FLOOD RISK FOR THE CITY OF GDANSK

increased amount of heavy rainfalls and storms

rise of the Baltic sea level

- increasing process of sea shore erosion (demages to marine infrastructure and beaches
- reduction of drinking water supplies (salt pollution)

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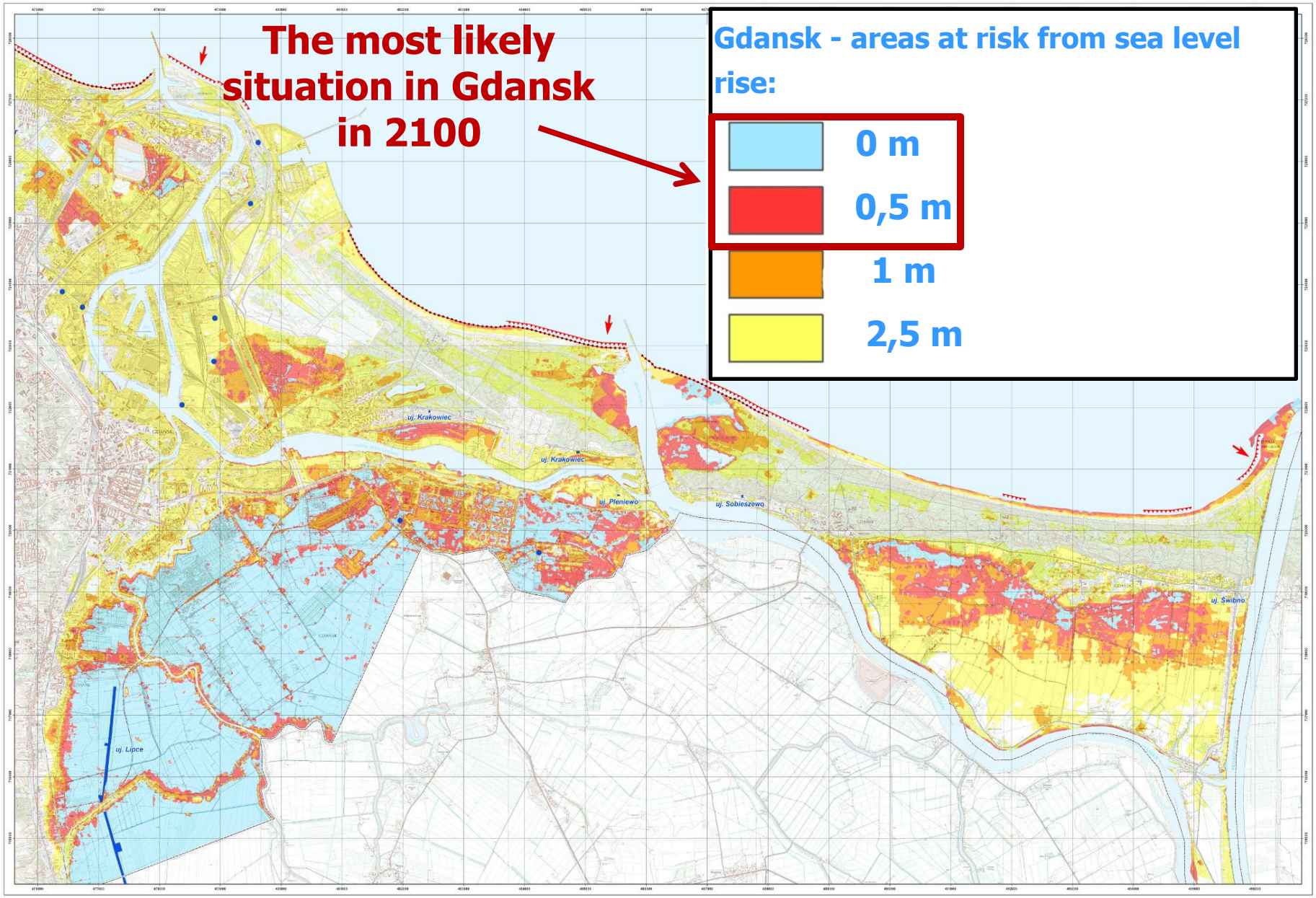
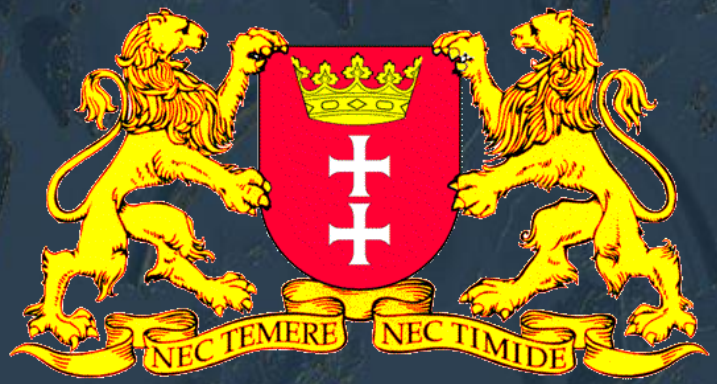
AstrA

The most likely situation in Gdansk in 2100



Future policy

- ✓ Observation of weather phenomena and climate changes
- ✓ Baltic countries co-operation to create the effective and reliable climate change models for the Baltic sea area
- ✓ Need for further development of predicative tools and measures to overcome the natural threats
- ✓ Legislation – at all levels
- ✓ Popularization of research concerning climate change and its consequence.



Thank you for your attention!

Department for Environment
in co-operation with the
Gdansk Development Agency