



**Basin approach to the flood
protection in Poland – Program for
the Odra River - 2006**

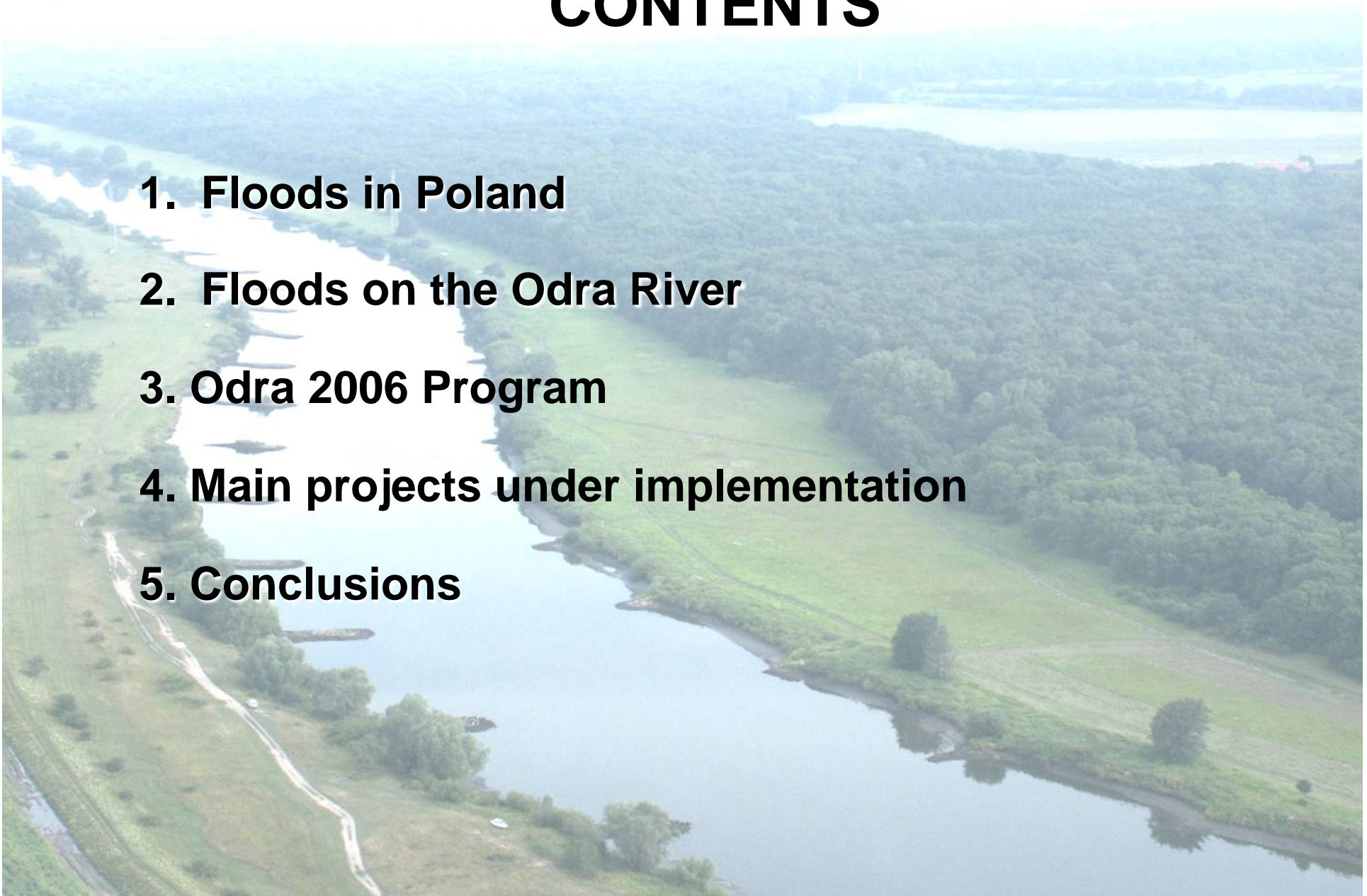
JANUSZ ZALESKI

**Institute of Meteorology and Water Management
Author of Programme for the Odra River – 2006”
Odra River Basin Flood Protection Project**

**4th Meeting of the EUROSAI
Task Force on the Audit of Funds Allocated to Disasters and Catastrophes
Wrocław, 21-23 March 2012**

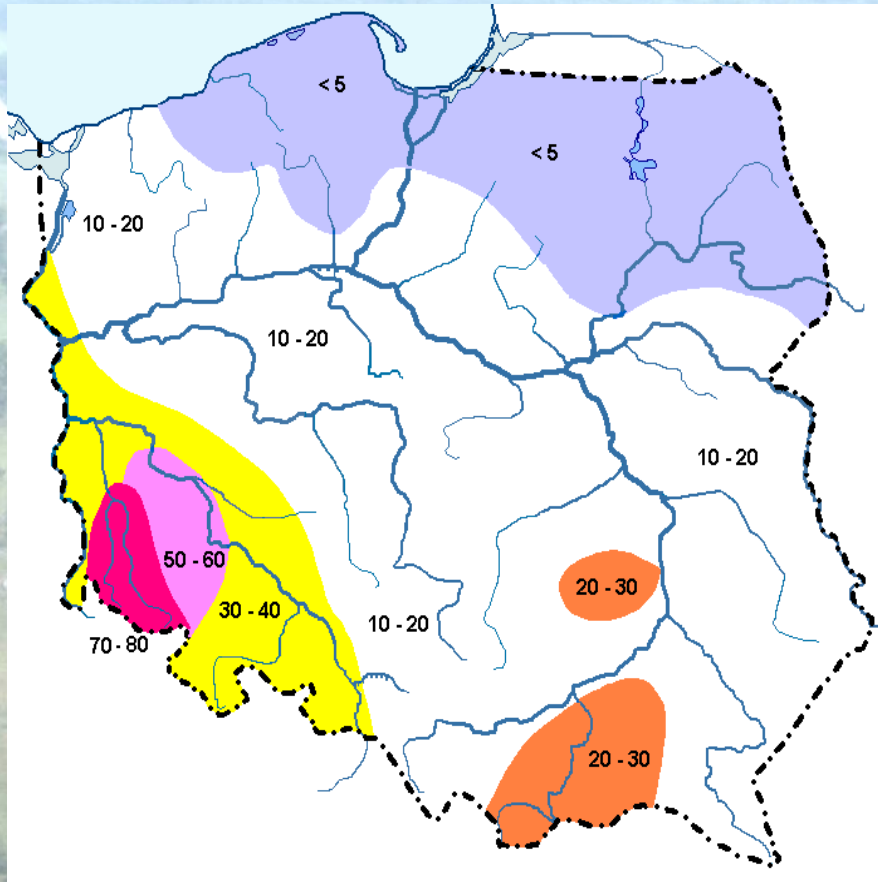
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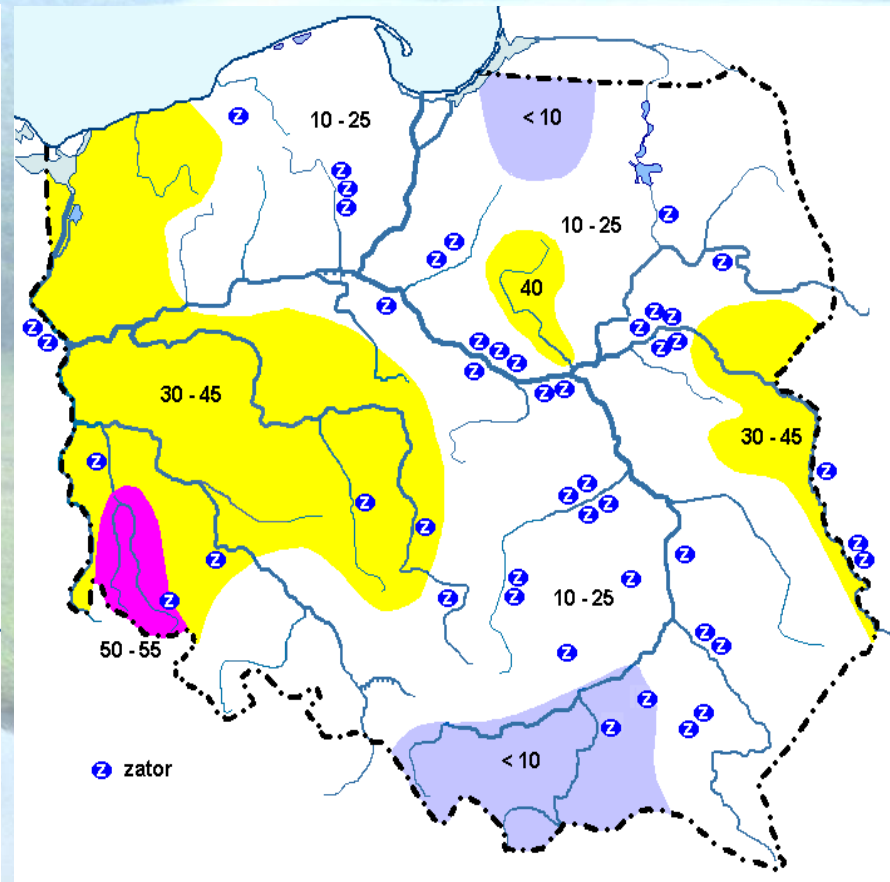


Floods in Poland 1945-2005

(IMGW)



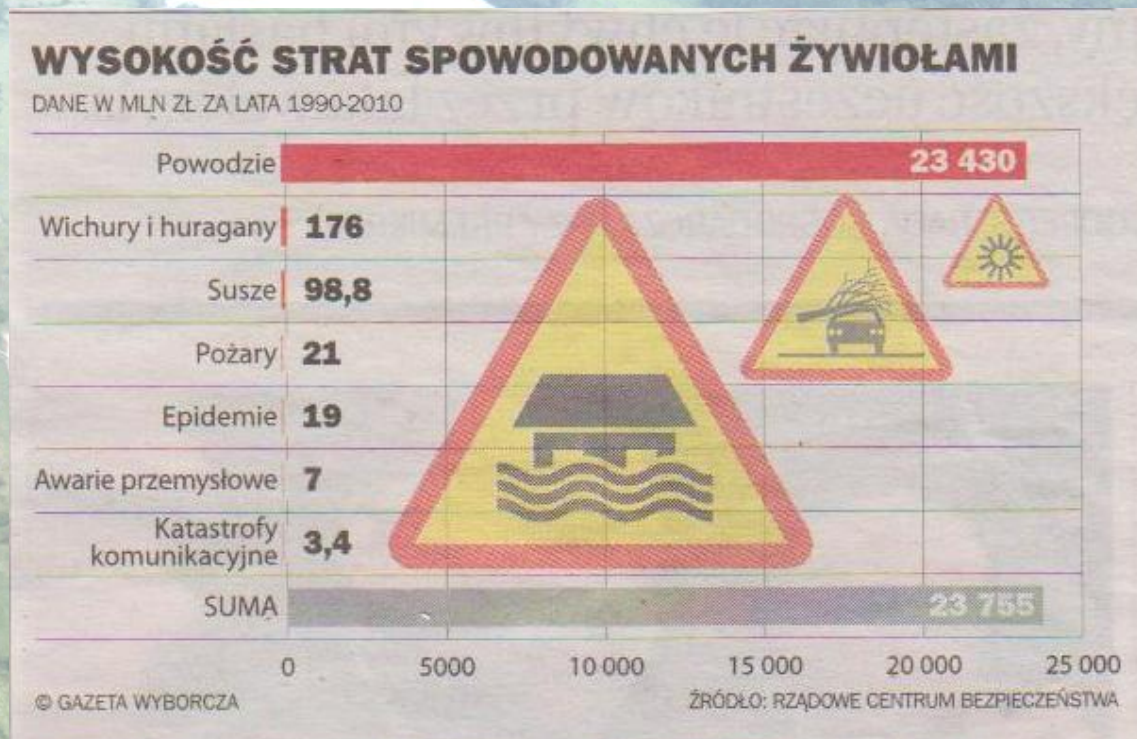
Precipitation based



Winter floods

Flood losses in Poland 1990-2010

- 23 430 Million PLN
- 1 270 Million PLN per year
- 98,5% of all natural disaster losses
- Underestimated!!



Dane RCB

Odra River Basin:

1. 120 000 sq.km
2. Poland 89%
3. Germany 6%
4. Czech Republic 5%

Odra River :

1. 854,3 km
2. 742 km in Poland
3. incl. 187 km – the border of Poland and Germany



The 1997 Flood on Odra River Basin in Poland

54 human lives

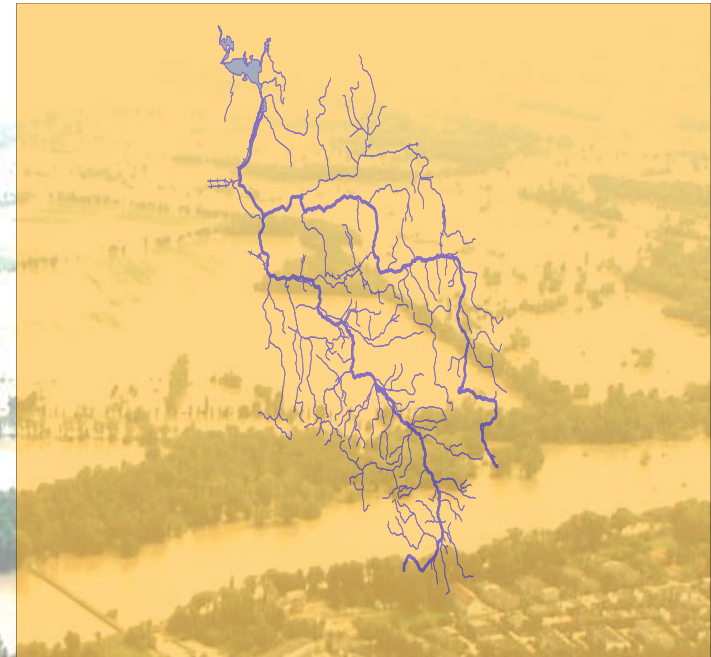
680 000 dwellings affected by flood

2,34 mln inhabitants

4 000 institutions (schools, hospitals,
theatres, museums, etc.)

9 000 companies employed more than 5
employees

143 000 small enterprises



The 1997 Flood on Odra River Basin

POLAND:

ENTERPRISES ≈ 730 mln \$

GOVERNMENT & MUNICIPAL INSTITUTIONS ≈ 1300 mln \$

AGRICULTURE AND FORESTRY ≈ 50 mln \$

and another: + costs of the action during and after the flood

+ losses of churches and other non-profit organisations

+ losses of profits

loses: approx. 3,5 billion \$

GERMANY:

loses: approx. 511 million \$

CZECH REPUBLIC:

loses: approx. 850 million \$



Racibórz



Racibórz



Racibórz



Opole



Opole



Opole



Opole



Opole





Wrocław

Wrocław



Wrocław



Wrocław



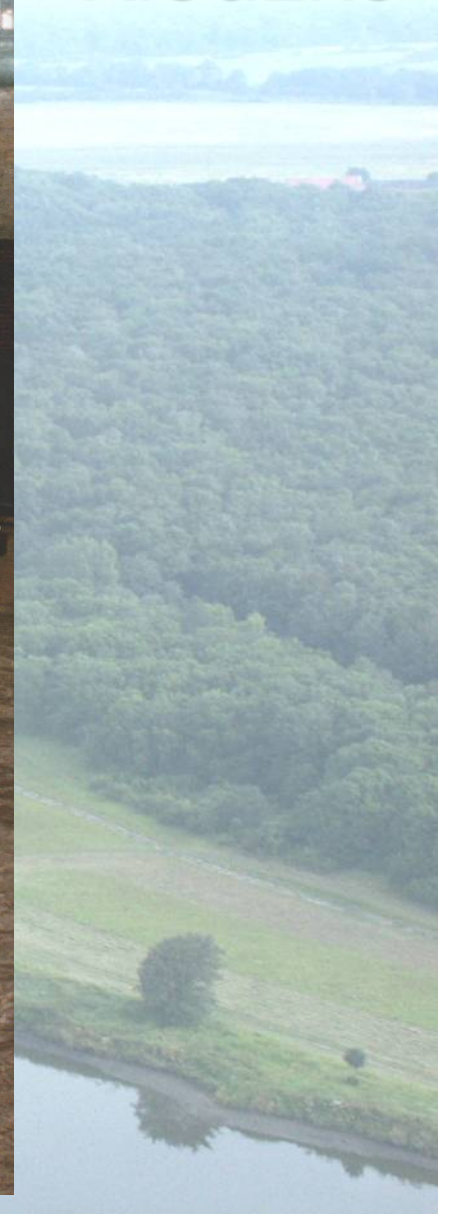
Wrocław



Kłodzko



Kłodzko









Poland, May 17, 2010



Poland, May 17, 2010



Poland, Kraków, May 17, 2010



Poland, May 17, 2010



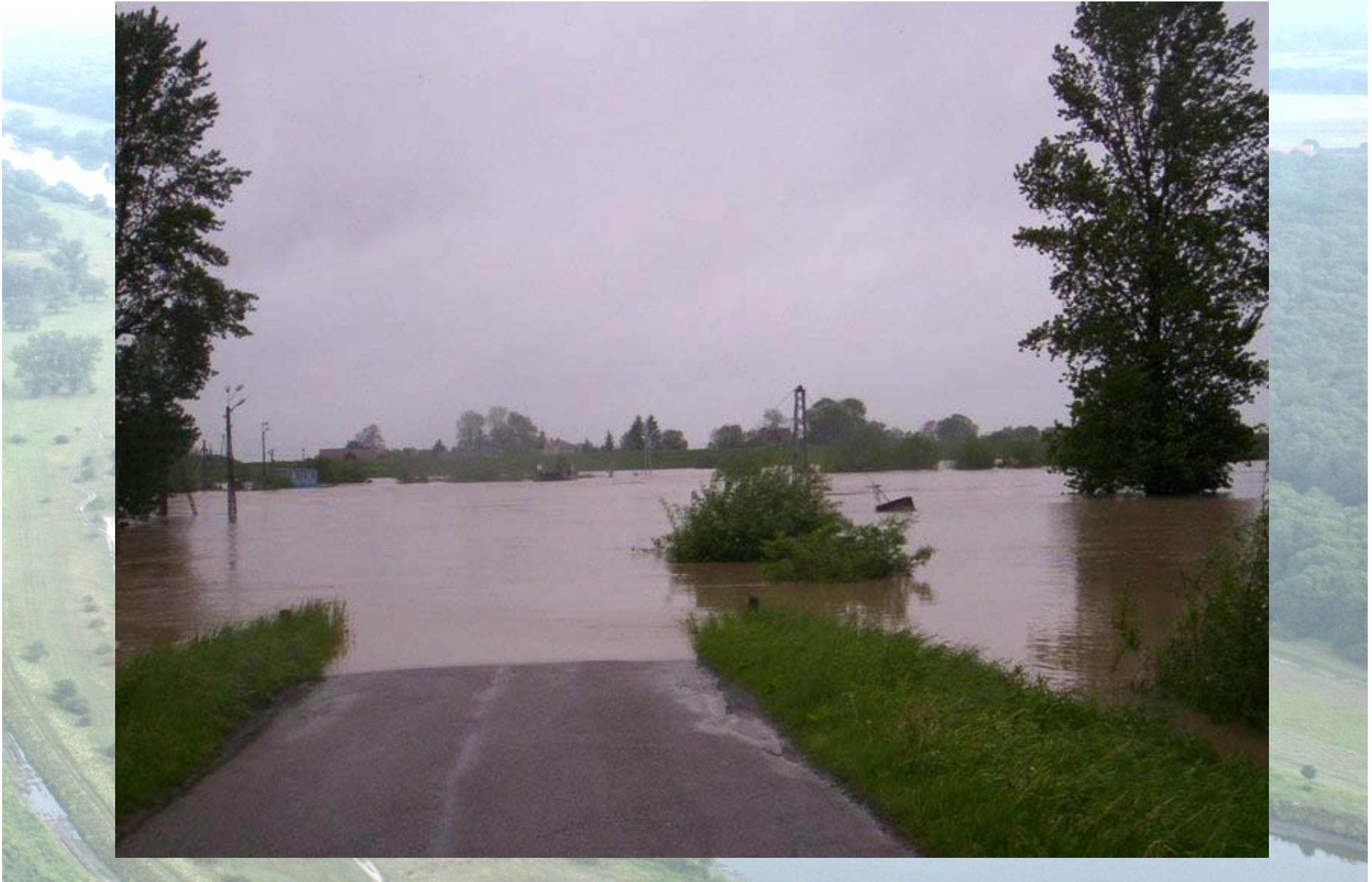
Poland, May 17, 2010



Poland, May 17, 2010



Poland, May 17, 2010



Auschwitz, Oświęcim, May 18, 2010



Auschwitz, Oświęcim, May 18, 2010



Auschwitz, Oświęcim, May 18, 2010



Poland, May 20, 2010



Poland, May 20, 2010



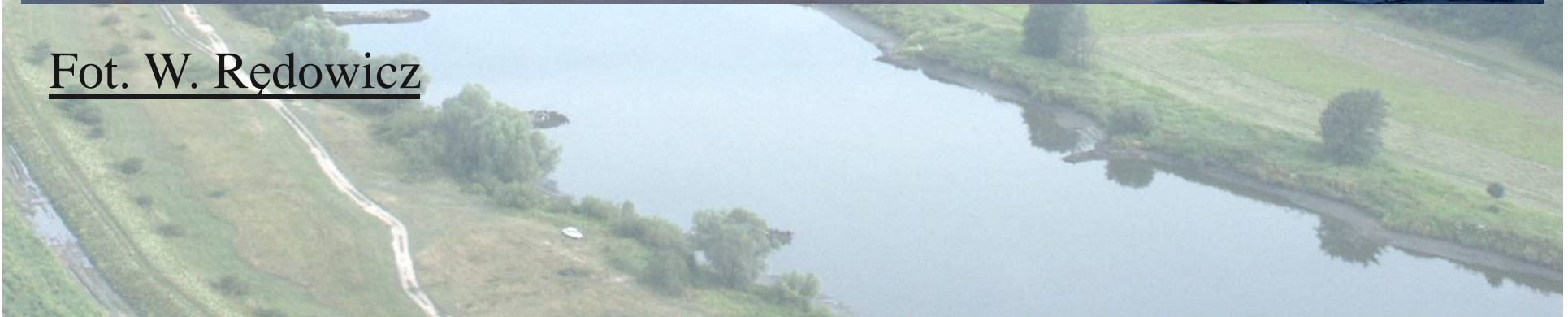
Flash flood on Witka River



Flash flood on Witka River



Fot. W. Rędownicz



PROGRAM DLA ODRY 2006

On July 6th 2001 Polish Parliament adopted the Act on establishing the multi-annual „Programme for the Oder 2006”.

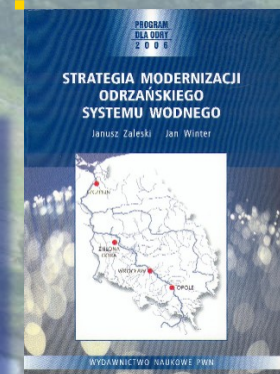
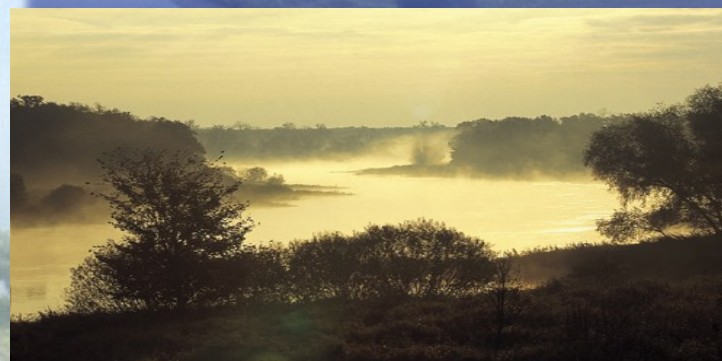




PROGRAMME FOR THE ODER 2006

Main Objectives

- Construction of passive and active flood management systems
- Nature preservation & water quality
- Flood recovery
- Preventive land use planning and ecosystems re-naturalization
- Increase of wooded areas
- Maintenance and development of the inland navigation
- Utilization of rivers for power generation
- Regional and local economic development



The main projects of Program for the Odra 2006



Completed projects of Program for the Odra 2006

1. Krynka – Przeworno polder reservoir.
2. Szczytniki weir (Wrocław).
3. Bartoszowice weir (Wrocław).
4. Construction of diversion channel in Opole.
5. Buków polder (1st stage of the Racibórz reservoir construction).
6. Topola and Kozielno water reservoirs.
7. Lipki weir.
8. Mokry Dwór ring dike (Wrocław).
9. Śluza Mieszczańska lock (Wrocław).
10. Reconstruction and modernisation of dikes of the Bystrzyca River in Wrocław.
11. Flood protection of the city of Wleń (on the Bóbr River).

Flood management and risk reduction project (World Bank supported)

prepared and designed: 1998 -2001
implemented: 2001-2005
Follow up: 2009-2014

Subcomponents:

- B.1. – Basin flood management planning
- B.2. – Monitoring, forecasting and warning
- B.3. – Flood protection interventions and infrastructure
- B.4. - Prevention and flood risk reduction

B.2. Monitoring, forecasting and warning

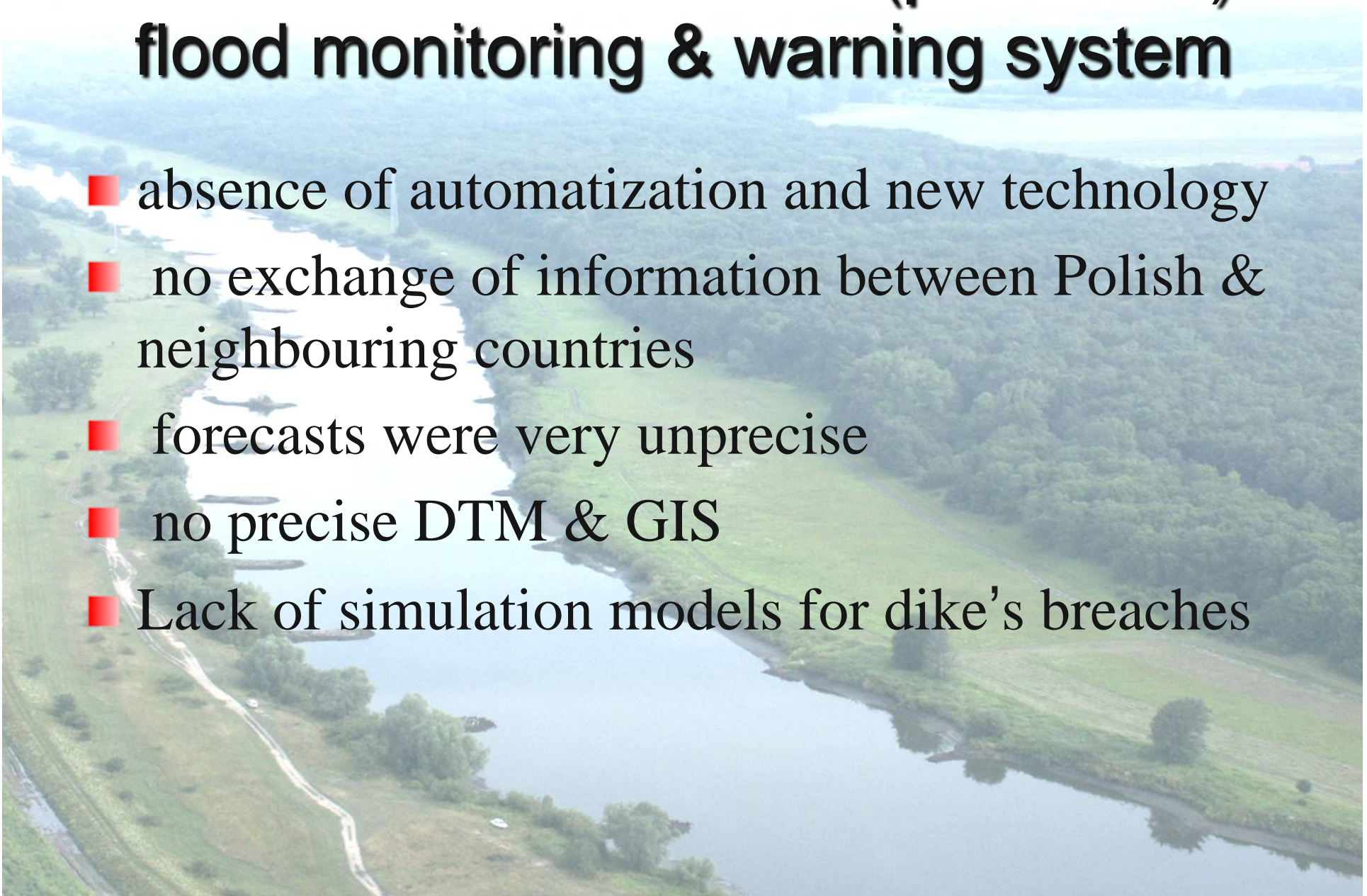
Implemented by IMGW (Institute of Meteorology and Water Management) in Warsaw

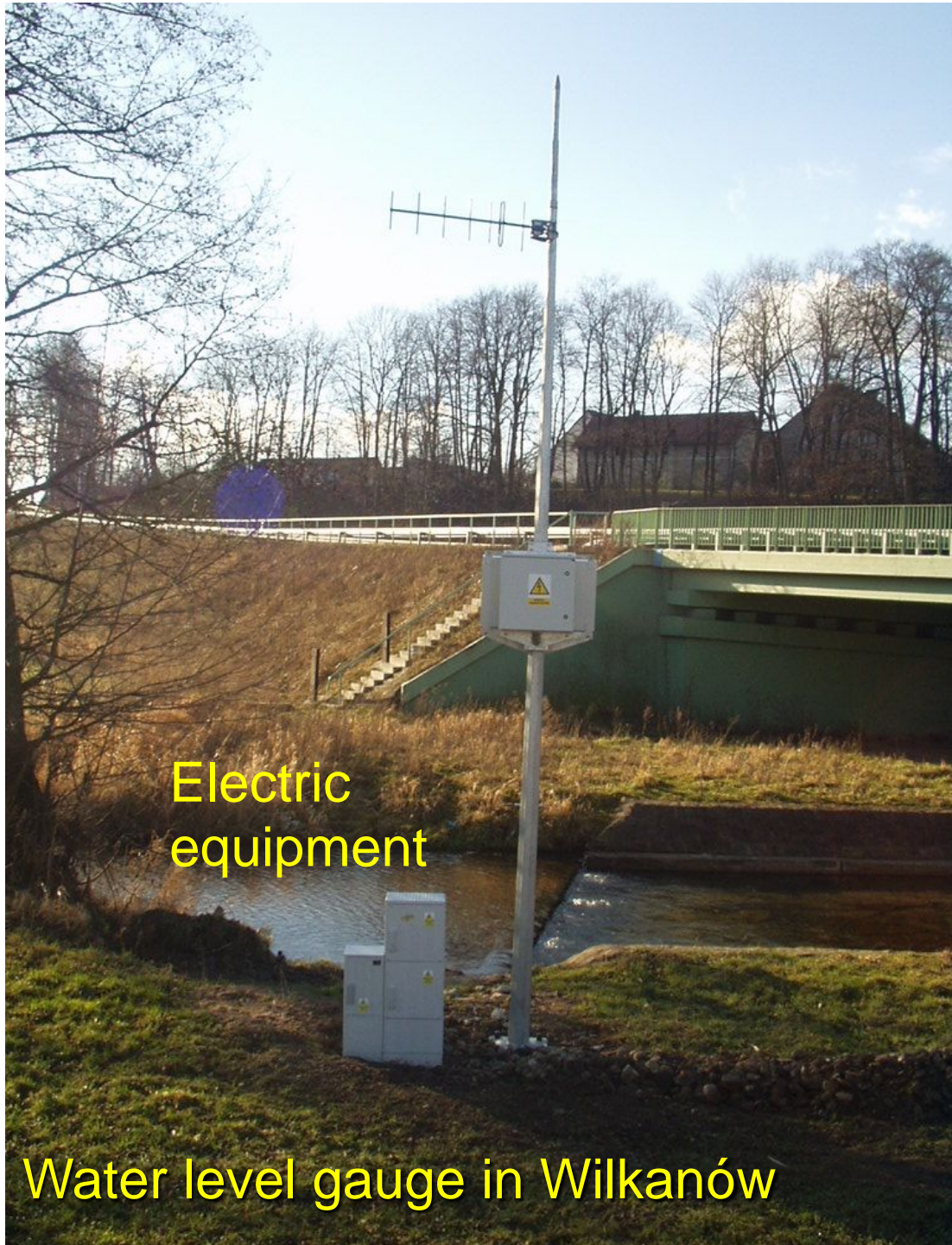
innovative weather and hydrosphere monitoring system that facilitates prediction of, and warning on hazardous natural phenomena and, assimilation, generation and distribution of update meteorological and hydrological information and products

- hydrological and meteorological stations network
- system for lightning detection and location
- weather radar network
- system for data processing and transmission

Weaknesses of the old (pre -1997) flood monitoring & warning system

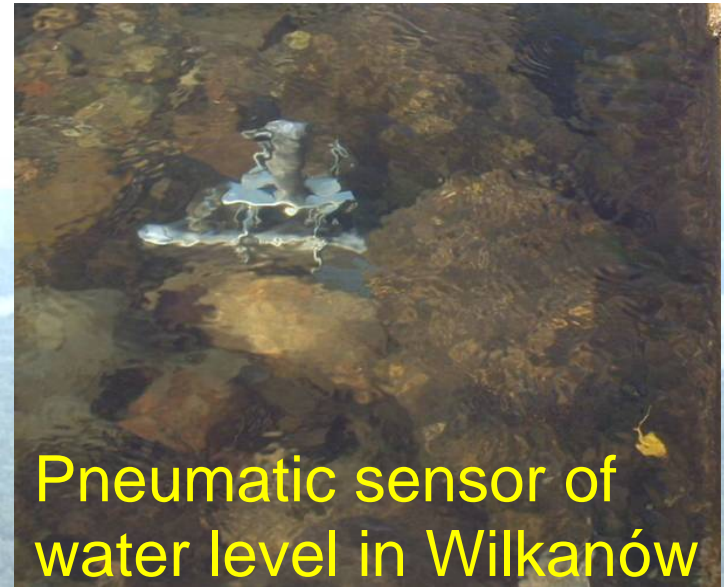
- absence of automatization and new technology
- no exchange of information between Polish & neighbouring countries
- forecasts were very unprecise
- no precise DTM & GIS
- Lack of simulation models for dike's breaches



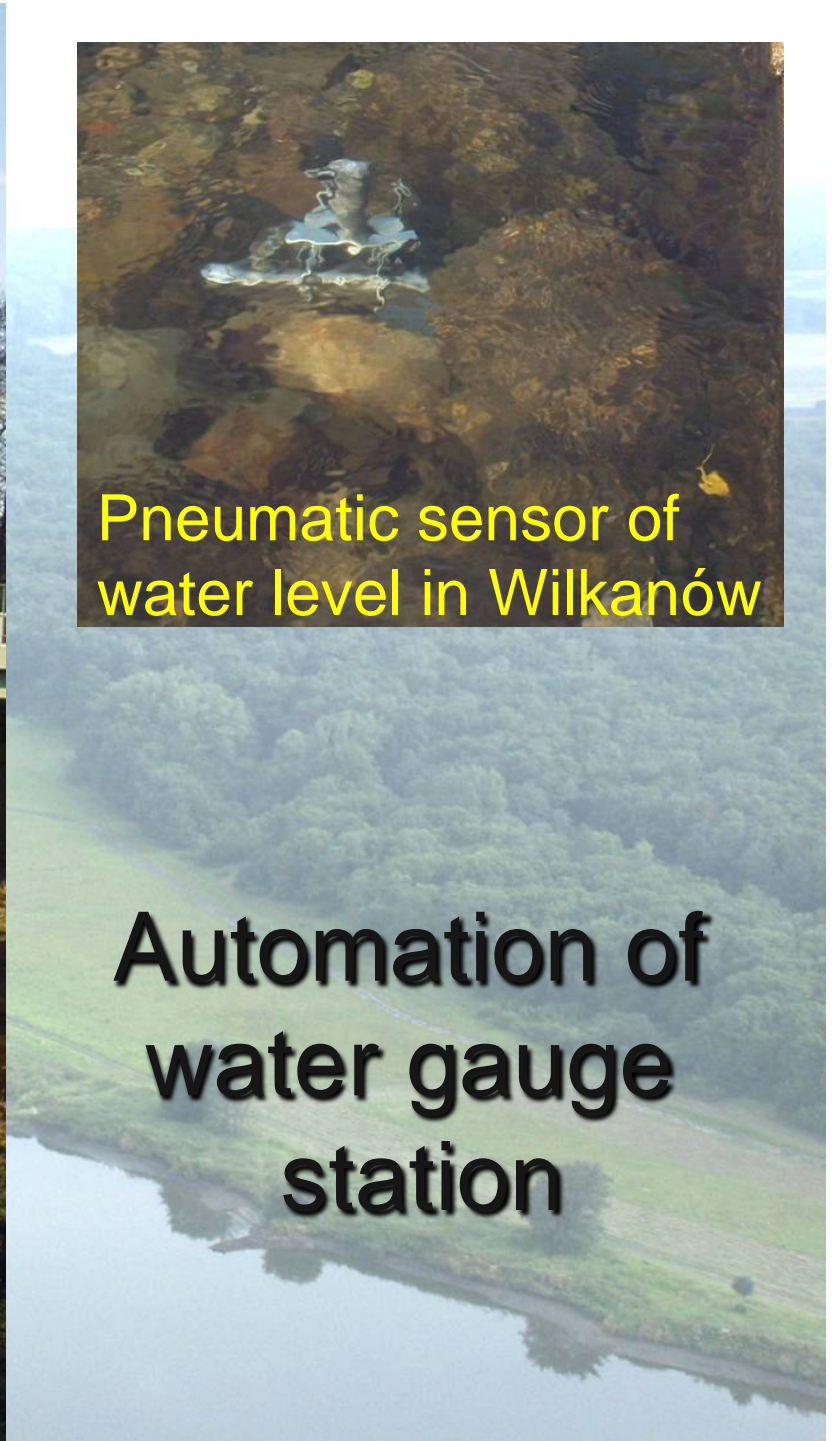


Electric
equipment

Water level gauge in Wilkanów



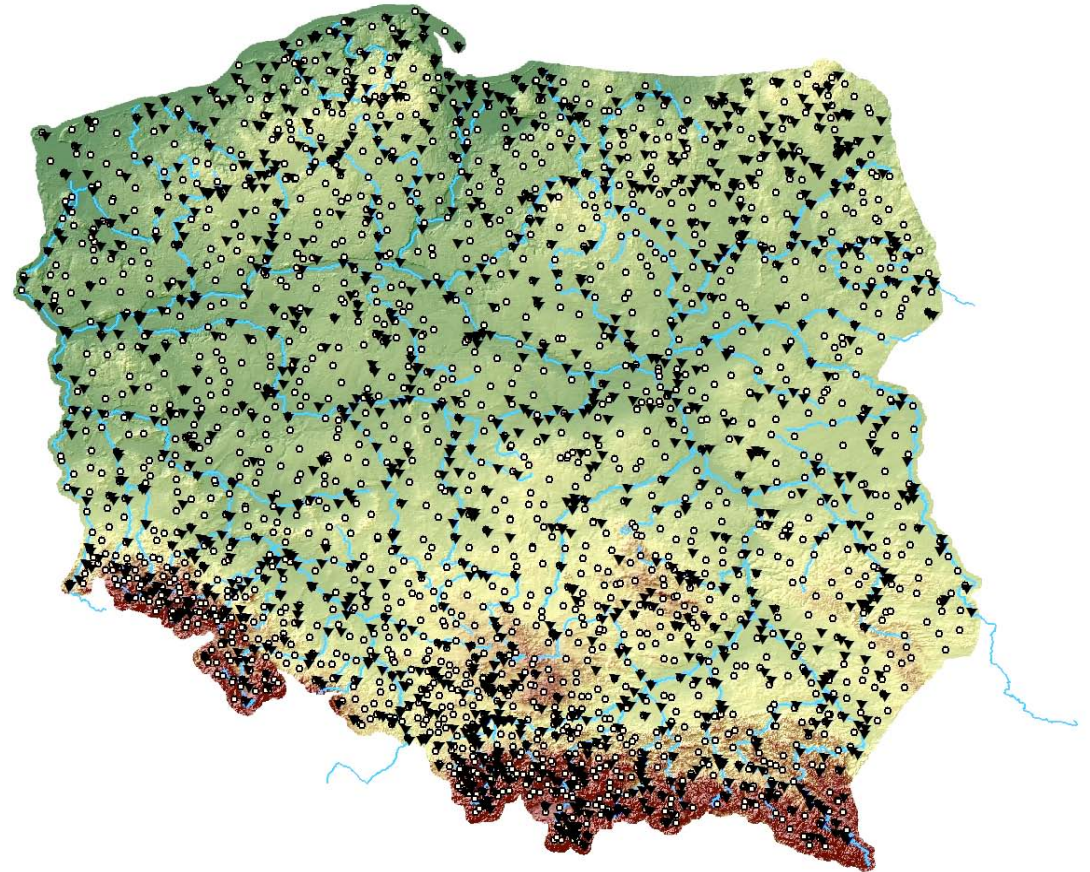
Pneumatic sensor of
water level in Wilkanów



Automation of
water gauge
station

Automatic Telemetry System in Poland consists of:

- ◆ 570 water level stations,
- ◆ 181 stations for water temperature monitoring in the rivers
- ◆ 41 groundwater stations (wells, piezometers),
- ◆ 379 rain gauging stations with heated and non-heated rain gauges
- ◆ 129 meteorological stations executing meteorological measurements (air temperature, humidity, velocity and wind direction, ground temperature)
- ◆ 100 automatic meteorological stations MAWS.





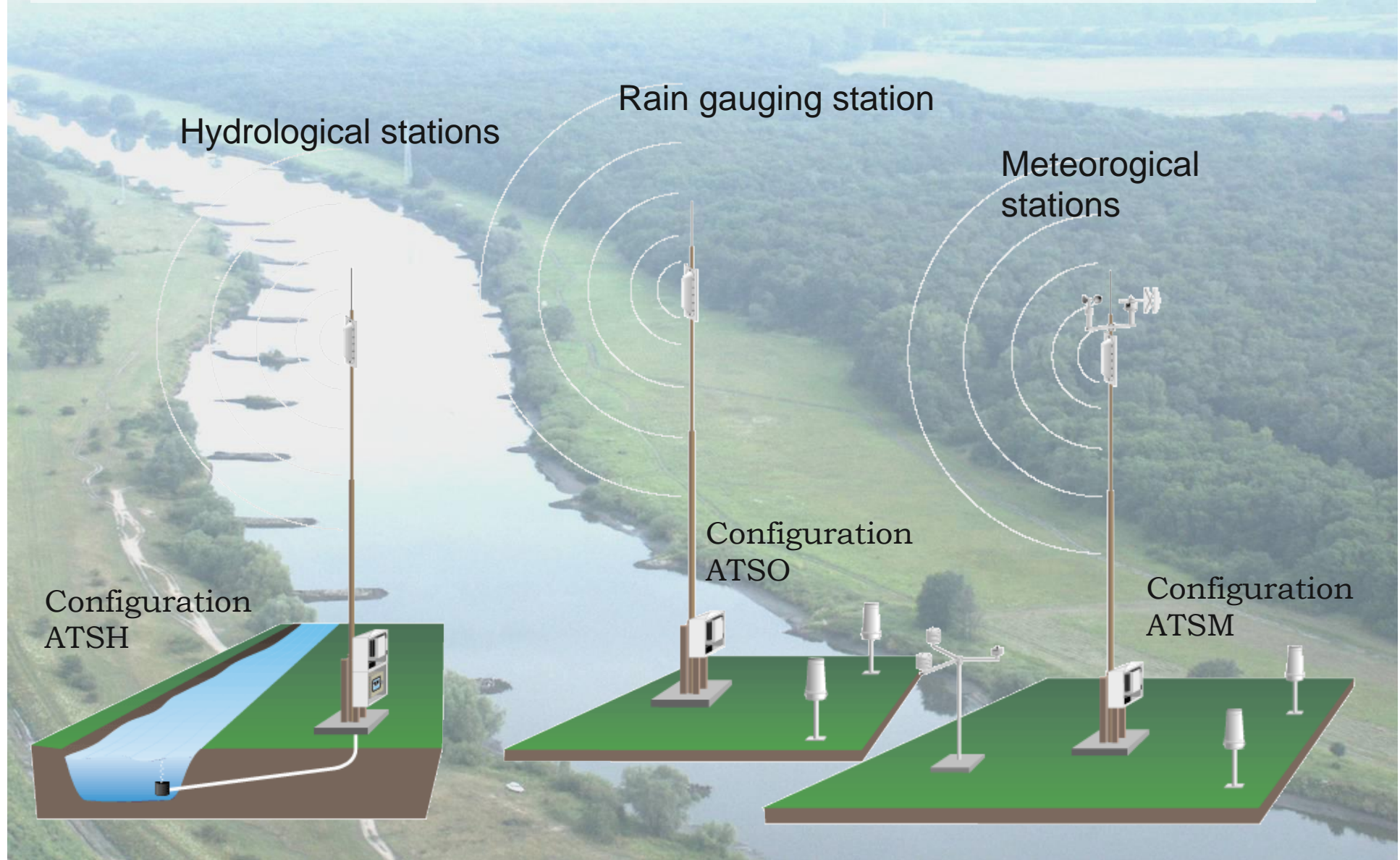
Uncovered piezometer well with gauging sensor



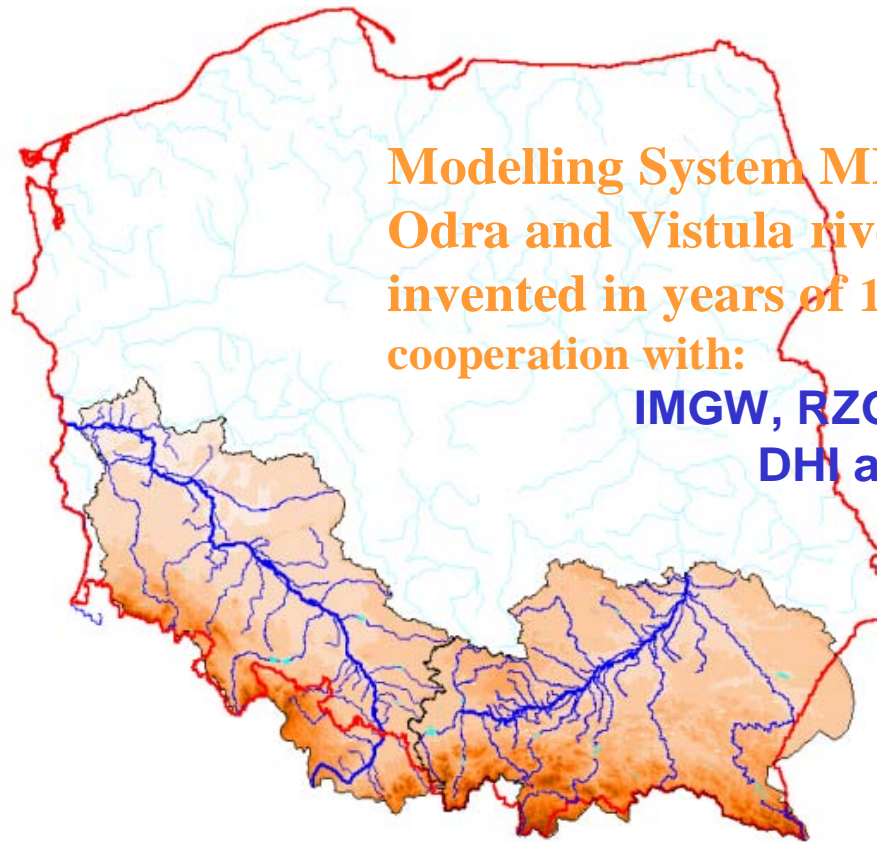
Groundwater station in Szalejow Gorny

Automation of groundwater stations

Forming and Setting Data Collection Platform



Modelling System: MIKE-11



Modelling System MIKE-11 for Odra and Vistula river basin was invented in years of 1998-2000 in cooperation with:

**IMGW, RZGW,
DHI and GEOMOR**

Location and range of Polish meteorological radars of POLRAD system



Czech meteorological radars

Date & time: 05-03-2003 21:01:21

Location of Polish system stations of storms detection



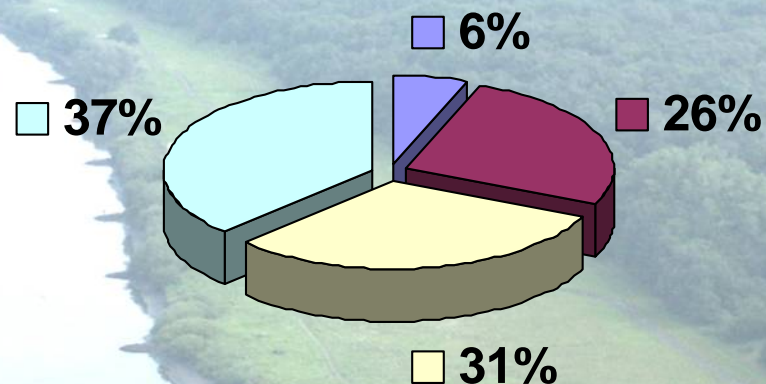
Central processing unit of SAFIR 3000 system



Stations of detection of electromagnetic waves that were generated by atmospheric discharge and converted into electric signals.

ODRA RIVER BASIN FLOOD PROTECTION PROJECT 2008 - 2016

Preliminary Financing Package – **505 mln Euro**



-  **Government of Poland 30.0 mln Euro**
-  **EU Cohesion Fund 130.0 mln Euro**
-  **Council of Europe Bank (CEB) 154.6 mln Euro**
-  **World Bank 189.2 mln Euro**

ODRA RIVER BASIN FLOOD PROTECTION PROJECT 2008 - 2016

Project components & Costs

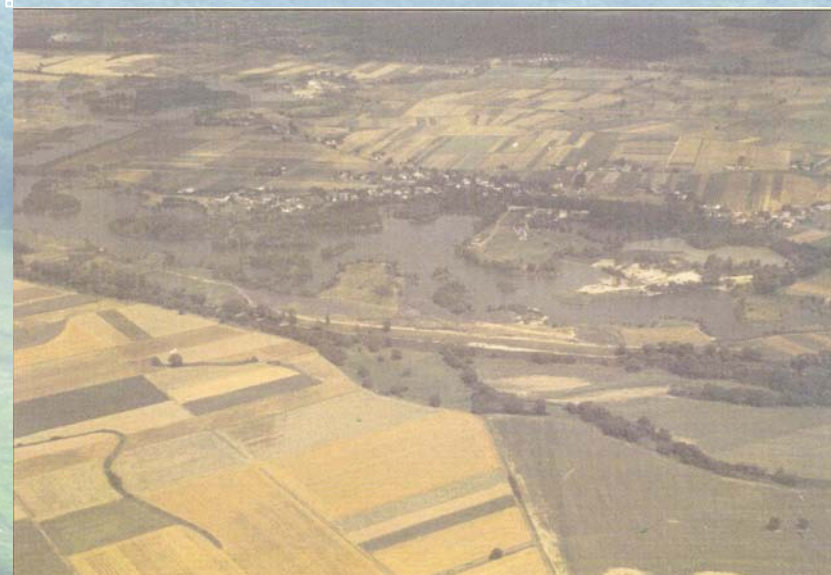
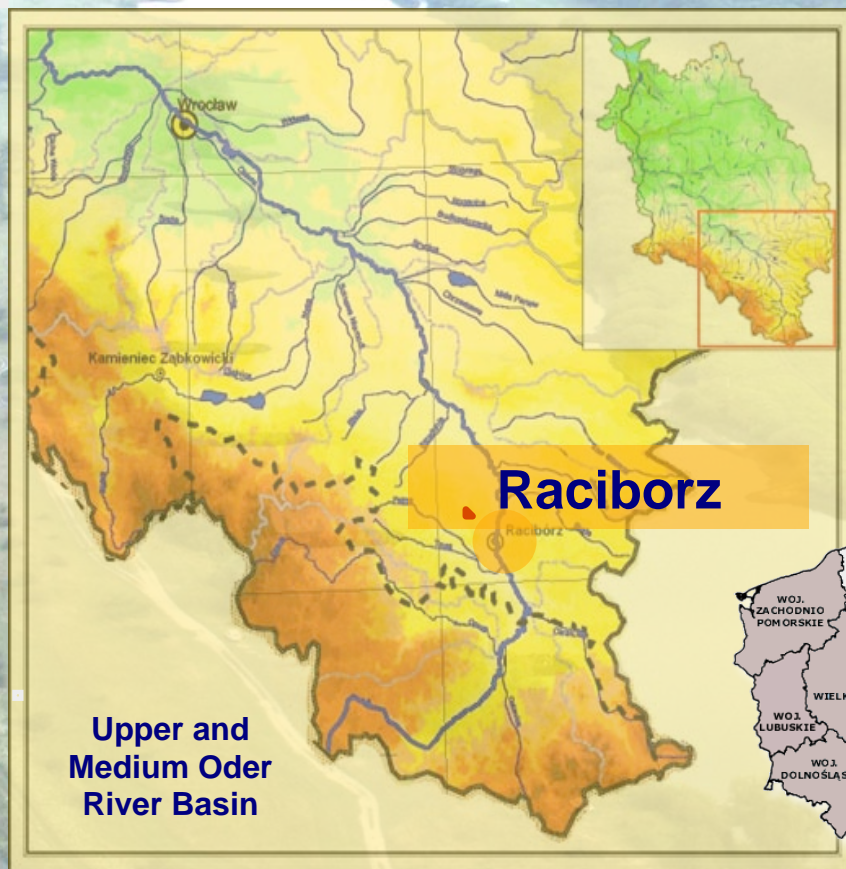
Project Components	Total cost (Million Euro)
A. Construction of Raciborz dry retention flood reservoir	218.3
B. Modernization of Wroclaw Floodway System (WFS)	253.9
C. Improvement of flood management, monitoring, evaluation and supervision of the implementation of Environmental Management Plan (EMP) and Resettlement Action Plan (RAP)	26.6
D. Project management, technical support and training of Implementing Agencies	5.1
Total project costs	505.0

€111 milion in VAT and other taxes

ODRA RIVER BASIN FLOOD PROTECTION PROJECT 2008 - 2016

Component A

Construction of Raciborz Dry Retention Flood Reservoir Location



Raciborz reservoir is crucial for safety of Upper Oder Basin

ODRA RIVER BASIN FLOOD PROTECTION PROJECT 2008 - 2016

Component A

Construction of Raciborz Dry Retention Flood Reservoir

Parameters:

- Storage capacity of **185 million m³**
- Total area **26.3 km²**
- Dam across the Odra channel **4.0 km** long
10.5 m high

Estimated costs:
€ 64.9 milion



ODRA RIVER BASIN FLOOD PROTECTION PROJECT 2008 - 2016

Component B

Modernization of the Wroclaw Floodway System (WFS)



B.1. Modernization of dikes and boulevards

B.2. Modernization of the Odra channels

B.3. Widawa Channel Improvements

B.4. Design, construction supervision and administration

B.5. RAP Costs



ODRA RIVER BASIN FLOOD PROTECTION PROJECT 2008 - 2016

Component C :

C.1. Emergency preparedness and Improved flood management

C.2. Flood Forecasting System (SMOK)

C.3. Flood management strategy and assistance in additional project preparation

C.4. M&E of project impact and supervision of Environmental Management Plan (EMP) and the Resettlement Action Plan (RAP)

C.5. Works for EMP

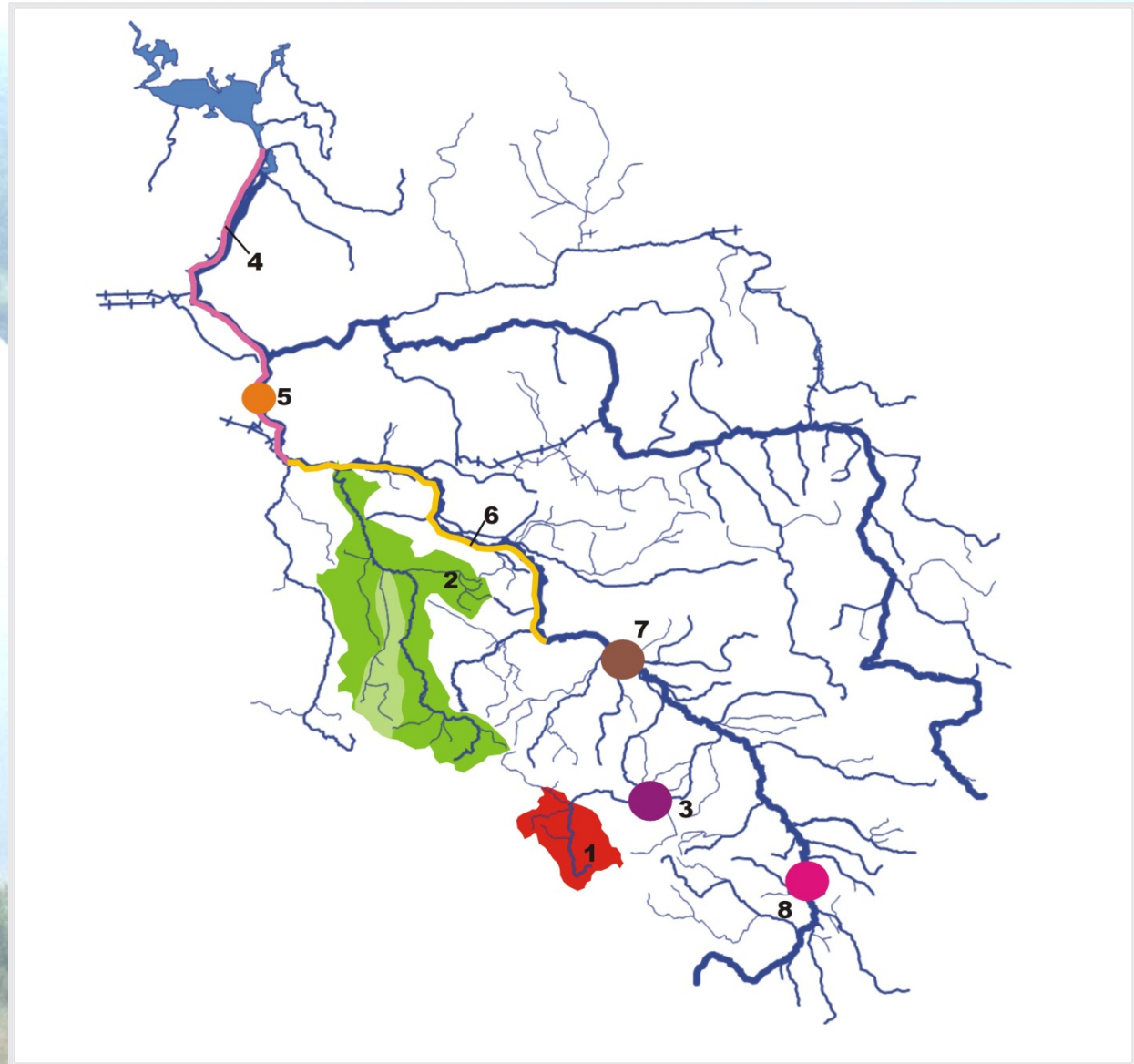
Conclusion:

Flood protection investment Programs

- Odra River Flood Protection Program (Odra 2006 Program component) – 5 billion PLN (2008 prices) / 2001-2016
- Update and extension until 2030 (+8 billion PLN)
- Upper Vistula Flood Protection Program – 13,15 billion PLN / 2012-2030
- Middle Vistula Flood Protection Program – (under preparation)

Main challenges for the future

1. Kłodzko Valley
2. Kwisza and Bóbr subcatchment
3. Nysa reservoir
4. Lower section of the Odra River
5. Słubice
6. Odra between Malczyce and the Nysa Łużycka mouth
7. Wrocław
8. Racibórz



Thank you for your attention

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