Technological accident and natural disaster: integrated approach in prevention policy

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Content:

- Natural disasters and technological accidents as threats of modern society
- Prevention, awareness and preparedness to single events
- Combinantion of disasters and Case studies
- Future needs in civil defense policy

Modern society is still endangered by natural events:

- Earthquakes

- Volcanism

Modern society is still endangered by natural events:

- Extreme weather

- Floods

Modern society is still endangered by natural events:

- Landslides

- Avalanches

Technological development brings certain threats, too

Result:

Society has to fight with complex threats starting by proper safety policy, including

- Risk identification and evaluation
- Awareness of threats
- Risk prevention
- Emergency preparedness
- Remediation and recovery means

Actual situation

- All EU countries have implemented major chemical accident prevention (Seveso II Directive)
- All EU countries have implemented emergency planning and response system for single-cause natural disasters
- Effort to build-up European risk mapping system
- Lasting question: Are we ready to evaluate COMPLEX RISKS involving more events?

Are we ready to evaluate complex risks?

- Complexity of risk is more than simple „addition“
- Combination with synergy like domino effect, triggering often present
- Contemporary system usually does not consider more events interaction

Case studies of interaction of natural and technological events:

- Triggering of technological accidents by natural events
  - Earthquakes
  - Floods
  - Weather
- Aggravating of technological accidents by natural conditions

Case study 1: **Kocaeli Earthquake, 1999**

Source: Eser Durukal

Earthquake caused ignition of fuel storages by fuel release and sparks between roof and body of tanks

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TÜPRAŞ, Fallen Stack

Case study 1: **Kocaeli Earthquake, 1999**

Source: Eser Durukal

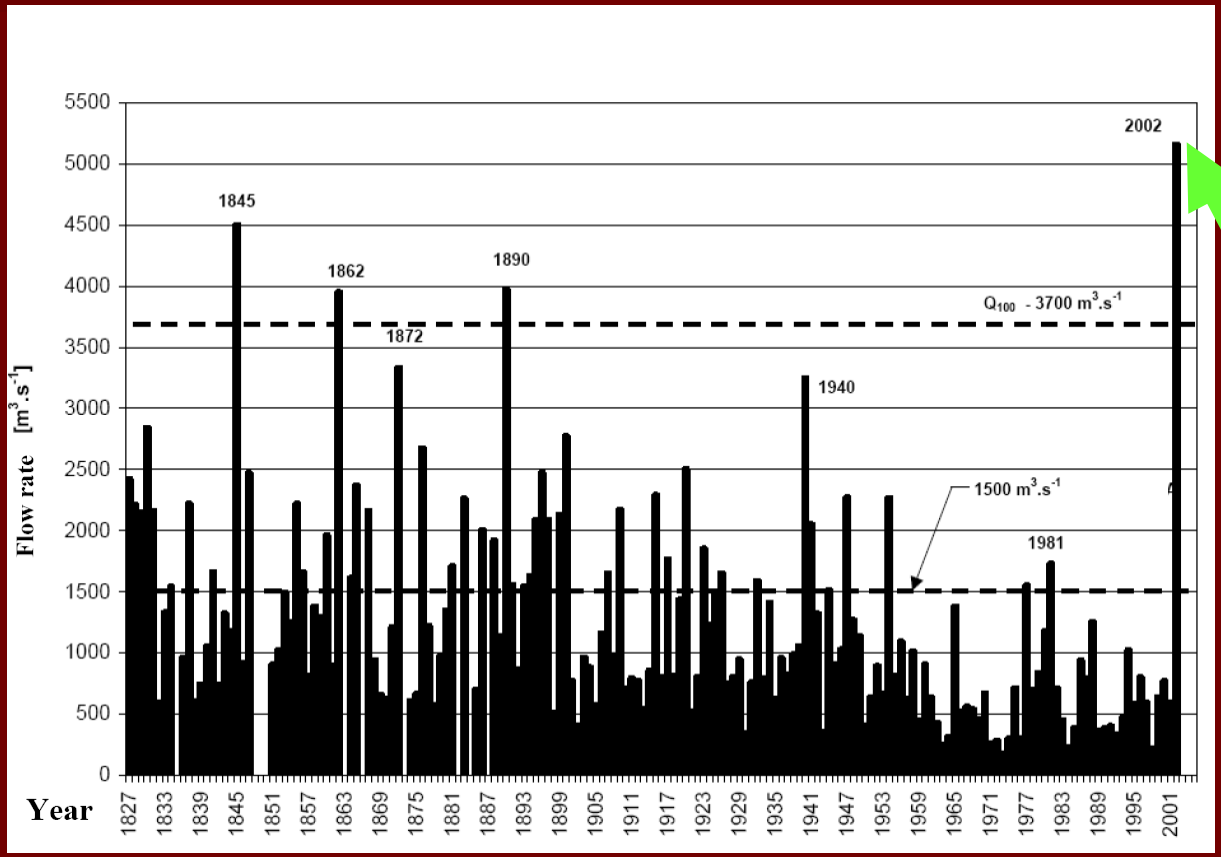
Infrastructure: Adapazarı 380 kV Substation

Damaged electrical equipment

Experience taken:

- Earthquake cause serious structure and equipment failures
- Infrastructure damages complicate emergency response
- Average bussines interruption 35 days

Case study 2: Chemical release during inundation



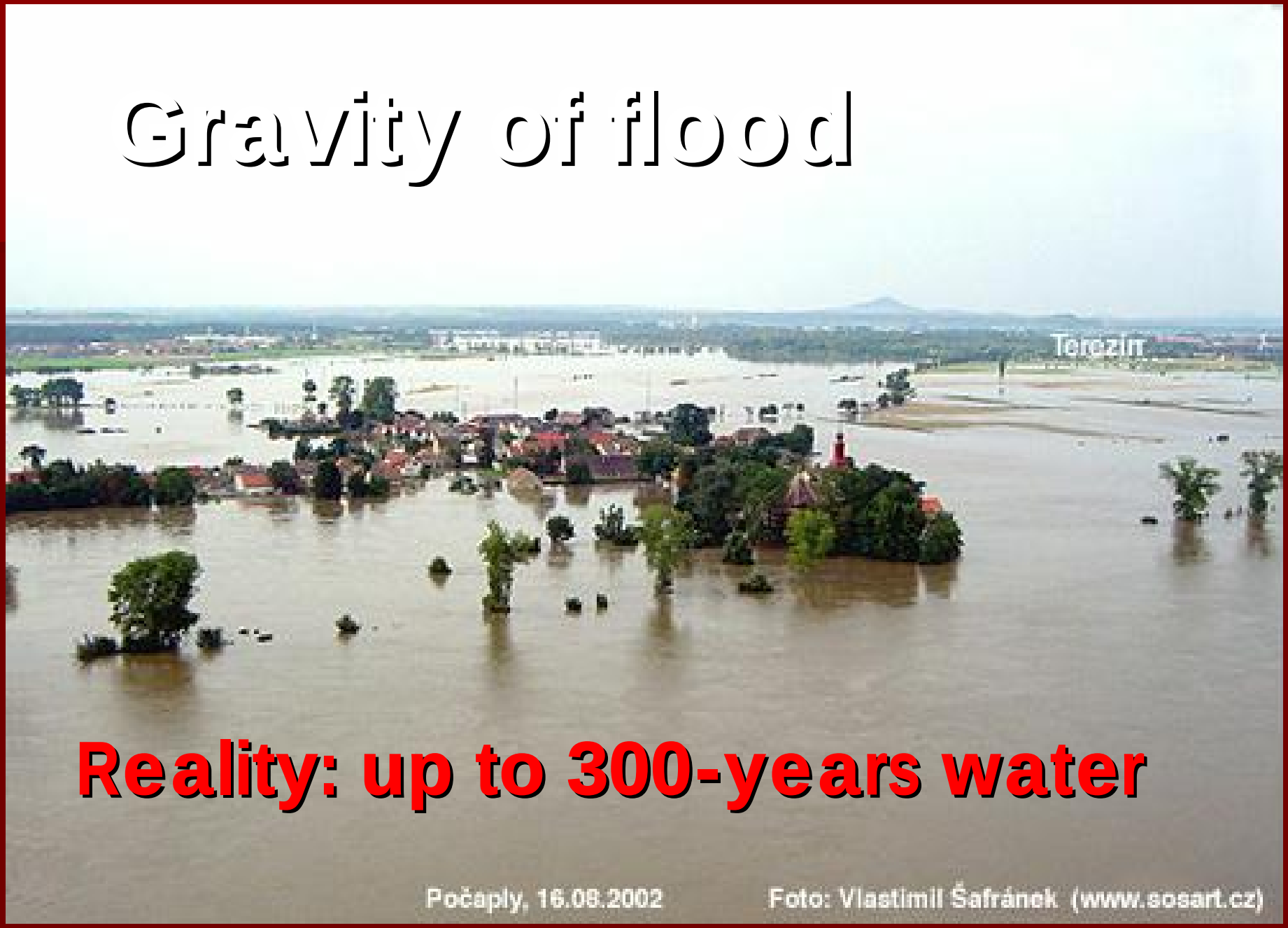
- Floods in Czech Republic 2002:
- Three huderds years water

Maximum flow rate of river Vltava since year 1827

Gravity of flood

- Protection means planned for 100-years water

Gravity of flood



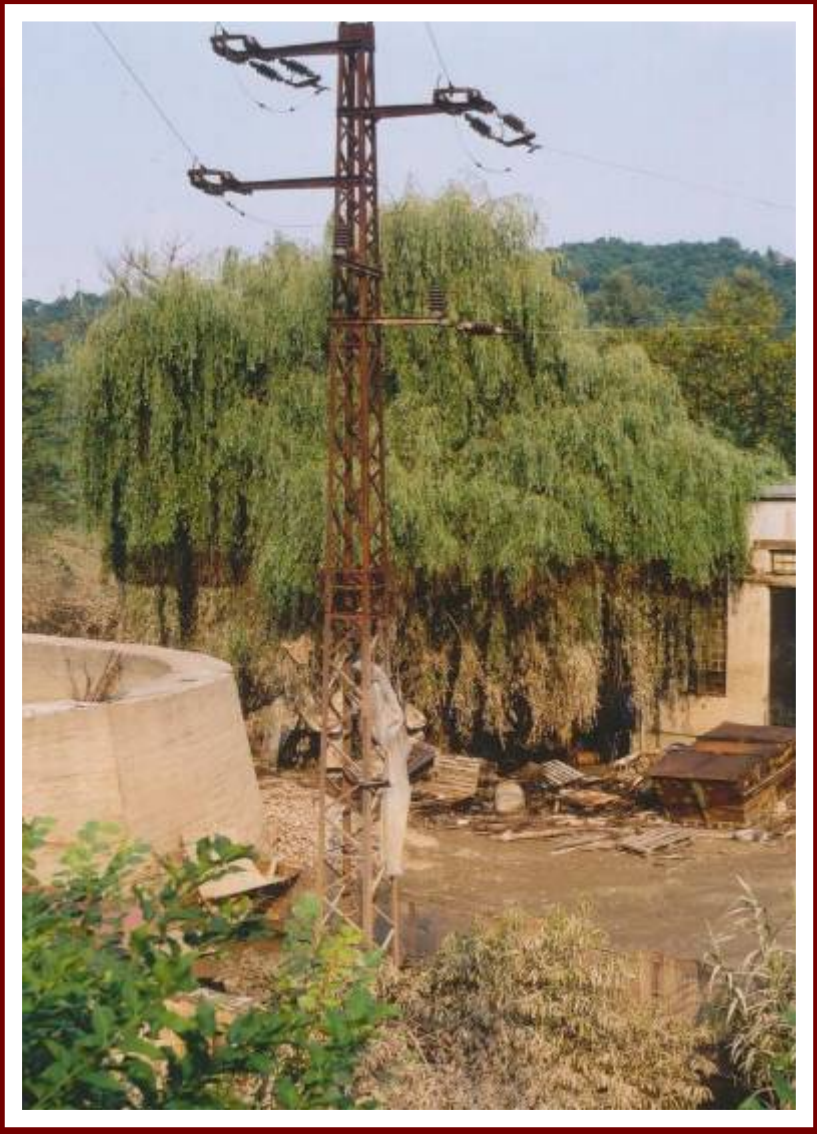
Reality: up to 300-years water

Gravity of flood

Protective means not sufficient

Water level

Flood control dam constructed for 100-years water



Consequences

- Large-scale damages of houses, infrastructure (subway, roads, bridges...)
Problems of industrial facilities – oil spills, tank floating, chemical release

Information source: dekonta

Case of SPOLANA – 86 tons of chlorine release

Vegetation damaged by gazeous chlorine

Water level

Non-damaged vegetation

Information source: dekonta

Case of SPOLANA NERATOVICE chlorine release

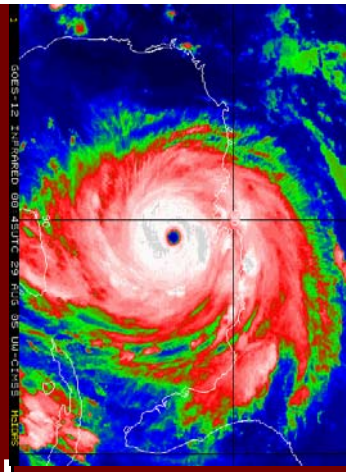
Information source: dekonta

Experience taken from Spolana Case

- Natural evens as floods can trigger technological accidents
- Is 100-years water limit for emergency planning sufficient?
- Importance of good communication before and during accident
- Importance of safety management

Case study 3: Huricane Katrina

Source: A.-M.Cruz, JRC Ispra



- A total of 2000/3000 oil platforms affected
- 100 oil and gas platforms completely destroyed including connected pipeline systems
- Hundreds of miles of oil and gas pipelines were displaced or broken (inland and offshore)
- Over 300 facilities reported loss of containment
- Oil dispersed due to high storm surge and wave action
- Oil spill clean up at more than 140 sites totaling over 8 million barrels

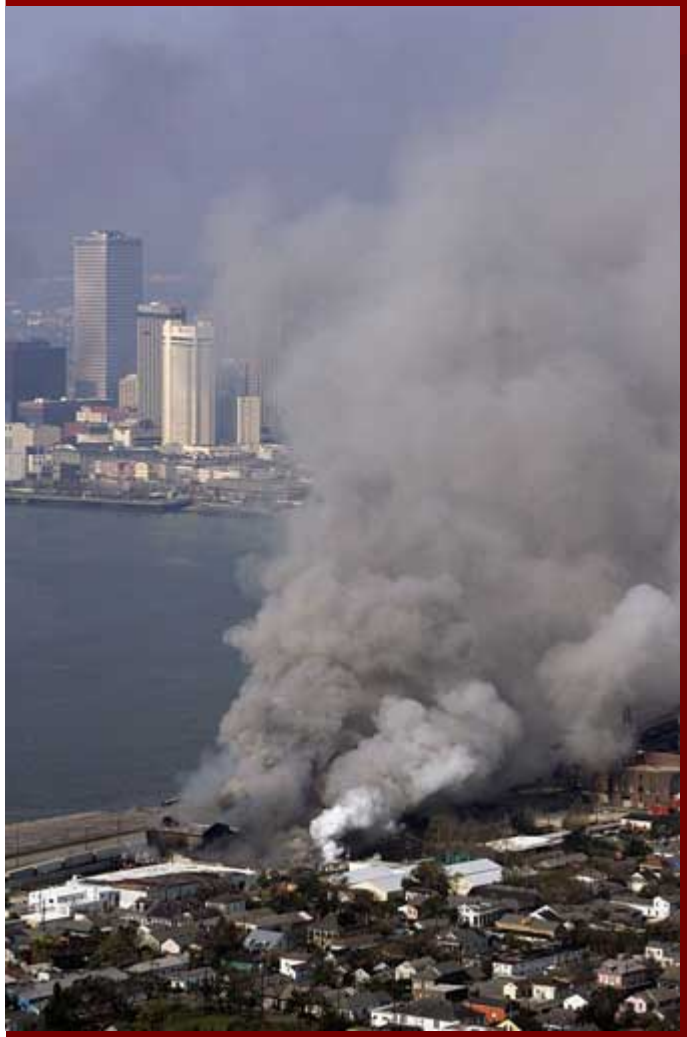
Oil spill in residential area, Chalmette, LA

Source: A.-M.Cruz, JRC Ispra

Oil spill in residential area, Chalmette, LA

Source: A.-M.Cruz, JRC Ispra

Hurricane Katrina
New Orleans



Source: A.-M.Cruz, JRC Ispra

Case study 4: Aggravating of technological accidents

- Toxic gas release in Kosice (Slovak Rep., 28th October 1995)
  - Carbon monoxide release from broken pipeline in metallurgical complex
  - Inversion meteorologigal situation – extremely bad dispersion conditions
  - Result: 7 killed persons inside and outside of facility

Other cases:

- Tankers wrecking in storms and difiicult spill clean-up
- Cold weather (or extremely hot one) in the case of energy supply interruption
- Ice over contaminated waterstream (Jilin accident in China etc.)
- others...

Conclusions:

- Natural disasters combine often with technological accidents
- Despite the progres in civil defense policy,the prevention and preparedness for major accidents needs to involve combinations of natural and trechnological accidends, too.
- We have not yet proper analytical means for combined (complex) risk evaluation
- Further research and policy development is needed.

Thank you for your attention