

1997 FLOOD EMERGENCY IN POLAND:
A LESSON FOR EDUCATION AND TRAINING PROGRAMMES

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1. INTRODUCTION

- Flooding is natural and certain phenomena -- it can occur any time on any land surface, ranging in size from a street intersection to the extensive floodplain areas;
- The flood of July 1997 in the Odra basin, the worst experienced in this century, exposed both the strengths and weaknesses of the present flood management and hazard reduction system;
- The strength -- capacity of local authorities for leadership and imaginative crisis management despite the breakdown of communication and information systems;
- The weaknesses -- current technical flood protection system which exists virtually unchanged for almost 100 years (developed after the 1903 flood) as well as current management flood protection system;
- Consequences: human losses and total economic damage in the range of 10 bln.zł (Odra and Vistula);
- 330 km of dikes destroyed; 350,000 ha inundated; damages to municipal and rural infrastructure;
- Storage system performed well, but total flood reserve in the reservoirs rather small;

2. THE NATURE OF 1997 FLOOD-PRODUCING SYSTEM

- The second half of June 1997 in southern Poland rather cool, cloudy and rainy; in the beginning of July soil moisture close to almost complete saturation;
- July 3 to 4, warm and very humid air inflows Poland from the south to meet cold masses of air extending over south-western and western Poland;
- July 4 to 9/10, first series of very intensive rainfall all over the upper and middle Odra river basin; total rainfall for these days in the order of 250 to 500 mm - about two

times higher than the total 4-5 days rainfall which generated some of the highest on record flows during 1985 flood;

- July 15 to 23, second series of intensive rainfall concentrating on the mountainous tributaries of the upper and middle Odra, caused by similar atmospheric conditions as the first series;
- July 24 to 28, third series of intensive rainfall caused again by temperature gradient of air masses; concentrating more on the Carpathian tributaries of the Vistula than the Odra river basin;

3. FLOOD DISCHARGES

- Because of the rainfall intensity and almost complete saturation of watersheds, very rapid increase of river stages and flow rates all over the upper and middle Odra basin;
- On the territory of the Czech Republic, about 20 km south of the Polish state boundary, Odra stages exceeded the historical maximum by 163 cm; in Raciborz (Poland) on July 9 the maximum stage on record of the Odra was exceeded by 207 cm - this stage corresponded to 3,260 m³/s (flow directly measured) while the highest flow on record in this profile was 1,630 m³/s;
- In spite of flood peak on the Nysa Klodzka tributary being reduced from about 2,400 m³/s to 1,500 m³/s (reduction by the Otmuchow and Nysa reservoirs), severe damages below Nysa reservoir and in the lower Nysa Klodzka valley;
- Flood peak from Nysa Klodzka enters Odra on the increasing limb of its hydrograph;
- In spite all upstream breaches of flood protective dikes, the maximum Odra flow immediately upstream of Wroclaw reaches about 3,400 m³/s while the city flood protection system is designed for 2,200-2,400 m³/s (decision taken after the 1903 flood);
- The second series of intensive rainfall affects mostly Odra tributaries and their inflows increase the duration of flood phenomena in the main river valley;
- Duration of flows higher than the alarm values varied from 16-17 days in the upper and middle Odra (Raciborz, Opole) to 35-36 days in the lower Odra (Glogow, Slubice);

4. FLOODPLAIN MANAGEMENT -- THE PROCESS OF REDUCING THE THREATS

- Limited flood control capacity of storage reservoirs built on the Odra tributaries primarily to sustain navigation during the low flow season (summer) - conflict of objectives;
- Flood protective dikes have not been designed for such a flood as the one that occurred in July 1997 - technically the dikes not always in a perfect state;
- Several water gauges overtopped by extreme water stages on the Odra river;
- Not clear chain of command in counterattacking flood phenomena;
- Built-up floodplain - inadequate enforcement of regulations concerning location of houses, wastewater treatment plants and other installations;
- Large cities at risk - the need of flow bypass emergency installations;

- The process of reducing the threats as a basis for identification of flood protection priorities;

5. LESSONS AND PRIORITIES BASED ON POLAND'S RECENT EXPERIENCE

This lessons should guide improvements in the current flood management system:

- An up-to-date river basin and flood management strategy is needed to provide a framework for sound investments, development of local flood protection and response plans, particularly for the main cities and economic centers;
- Better coordination of actions and decisions during flood management operations is needed; changes in existing legislation and institutional arrangements are needed;
- Modern monitoring, forecasting and warning systems, reliable communications, information systems, analytical tools and models are needed (DSSs);
- A local flood response systems are needed -- training for those who must play a role in the response system and the general public;
- Local capacity to reduce the risk of damage and economic loss in flood hazard zones - - reverse the encroachment into floodplains and polder areas;
- Existing flood protection infrastructure must be strengthened and modernized -- reduce flood risk;

Specific priorities:

- Technical Studies -- review and revise key technical standards such as design flood;
- Prepare new integrated basin strategy with the active participation of local authorities based on sound and environmental principles;
- Review and modernize the principles, instructions and contingency plans given to reservoir operators;
- Review the need and technical standards for dike modernization, strengthening and realignments;
- Investment - Repair and reconstruction of damaged flood protection infrastructure is immediate priority -- in medium and long-term:
- upgrading and modernizing flood protection and flood risk management in large metropolitan areas;
- sustainable program of expanding and modernizing the dike system;
- reliable and modern monitoring, forecasting and warning system linked to information system than can reliably disseminate information needed to enable effective planning, operations, preparedness, and response;
- review all storage proposals from an economic, environmental and financial perspective;
- Institutional arrangements - institutional and legislative changes to establish greater transparency, clearer lines of responsibility;
- strengthen basin organizations;

- Fianancing flood protection - flood protection is essentially a public good, but demands for water investments in the basin compete -- consider introduction of a more effective flood insurance program -- use other fiscal incentives not necessarily relying on the central budget;

6. CONCLUSIONS FOR EDUCATION AND TRAINING PROGRAMMES

- Technical Issues - delineation of river floodways and floodplains for floods of different magnitude (numerical terrain maps, application of remote sensing data, application of GIS techniques);
- flood risk assessment (reliability estimates) and valuation of exposure risks -- risk management, including transnational risks and possible compensations), equity concerns in flood risk management;
- estimation of key technical standards such as design floods (probabilistic approach, MPP/MPF, others);
- economic and environmental principles for development of cost-effective flood management strategies;
- methods for estimation of flood losses and benefits (sediment flushing, ecosystem remediation, others);
- models development and/or improvements (coupling meteorological and hydrological models, rainfall-runoff, flood routing with sudden parameter change, DSSs for flood management planning and real-time control, model integration, handling non-stationarities and uncertainties);
- Investment - dike engineering, storage reservoirs construction and operational principles;
- tradeoffs between passive and active flood management schemes -- multipurpose solutions;
- modern monitoring, forecasting (forecast type, reliability, etc.) and warning systems + information dissemination systems;
- Institutional arrangements - centralization vs decentralization in flood management - possible options;
- water vis a vis non-water institutions (e.g. police, firemen) in emergency situations;
- legislation and regulations - motivating mechanisms and protection against uncontrollable risks;
- participatory arrangements;
- Financing flood protection - innovative financial mechanisms;
- Others - regional (land use) planning;

7. CONCLUDING REMARKS

- It's encouraging that the need was recognized not only to repair the damage of July 1997 flood but to implement measures which will reduce likelihood of such disasters occurring in the future;

- The need for holistic flood management: combination of flood preparedness, operational flood management and post-flood reconstruction and review;
- Appropriate education at all levels is needed, including raising of awareness of the society at large;
- Training should be designed with the needs of specific target groups taken into account;
- International aspects -- experience sharing through Network Projects like RIBAMOD and ETNET.