TECHNISCHE UNIVERSITÄT DRESDEN

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LANGE NACHT DER WISSENSCHAFTEN
Ein Projekt des Netzwerks Dresden – Stadt der Wissenschaften

FLOOD*master*
1st Focus Workshop 2005

Fakultät für Forst-, Geo- und Hydrowissenschaften

Risk Management of Extreme Flash Floods

Pathways: Hydrological Aspects and Engineering Measures - a Post-/Pre-Event Perspective of the Müglitz Flood 2002 -

Introduction

"Post-flood action is pre-flood action."

To protect public against consequences like in the flood of August 2002 (as shown in poster group B1) new hydrological aspects and engineering measures have to be taken into account. Three possible approaches are discussed:

Discharge Regulation

Problems to face:
- high flow velocities
- fast occurrence
- large quantities of discharge
- projectile effect - risk of blocking
- erosion,
- destruction by strike or pressure

Solution: a retention reservoir as flood control reservoir

Effects: peak discharge reduction and delay, flow velocity reduction and bed-load sedimentation

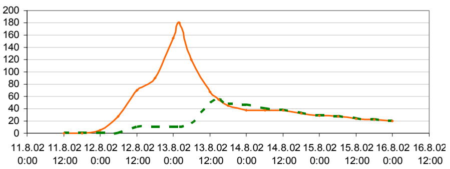

Fig. 1: Discharge Development in a Reservoir by the Example of the Eibenstock Reservoir for the 2002 Flood Event

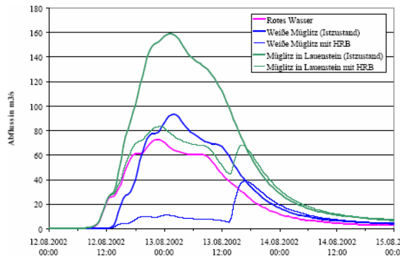

Fig. 1: Discharge Development for Different River Sections with and without Flood Control Reservoirs for the 2002 Flood Event

Feasibility study: Technical and economic restrictions versus benefits have to be calculated in a Cost-Benefit-Evaluation in order to find optimum solutions.

Conclusion: Flood control reservoirs represent a long-term interference with the natural, structural and social environment. This is an expensive but can be an effective way to prevent flooding.

Influence of Surface Measures

Amplified runoff considerably originates from anthropogenic influence. Deforestation and inadequate agriculture cause land loss and erosion.

Parameters of water retention:
Surface retention - land cover can store up to 10mm of water, depending on effective surface and roughness.
Soil stockage - compacted or sealed surfaces exclude the soil below from infiltration and cause the complete precipitation to run off.
Drainage pattern density - a dense network of drainage channels reduces surface retention potential and runoff time.
High channel conductivity causes increased discharge into the downstream network.

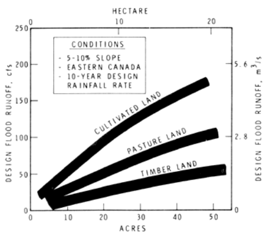

Fig.3: Strong Influence of Land Use on Storm Events of Medium Return Period

Parameters of runoff generation:
Curve number (CN) modeling

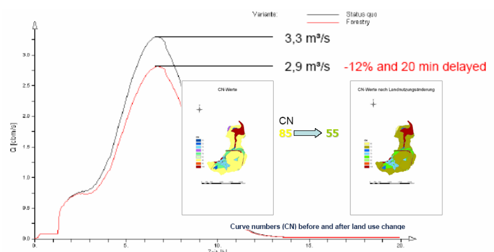

Fig. 4: Reduction and Delay of Runoff after Land Use Change from Agriculture to Forestry

Conclusion: Although land use has a considerable influence on erosion processes and runoff concentration for weak to medium storm events, the effect diminishes with higher peak rainfall intensities or in general an increasing return period of the event.

Optimizing Flow Regime

Fig. 5: Weesenstein during the 2002 Müglitz Flood

During the 2002 flood, the entire park at Weesenstein was inundated at the sharp river bend. While one part was subject to strong erosion processes the other part was buried under huge quantities of bed load.

Problems:
- discharge capacity in the park: as low as 70m³/s
- the Bridges "Bogenbrücke" and a weir → inhibiting discharge and blocking the passage for floating load
- limited area of possible changes as the park's appearance should not be affected

Solutions:
Measures within the actual river bed are of limited efficiency, as the river course has two sharp bends within the area and the cross section is insufficiently extended.
- enhance invert roughness
- change of bridge geometry
- reconstruction of the weir

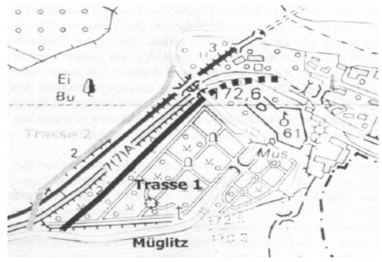

Fig. 6: Comparison of two possible Relief Channels within the Urban Area of Weesenstein worked out after the Müglitz Flood 2002

The relief channel "Trasse 2" more efficient in comparison to "Trasse 1":
discharge 190m³/s for a 6 m cross-section up to 280 m³/s for a 10 m cross-section
On the other hand "Trasse 1"
- can be built as a shallow trench,
- is adequate to diminish erosion effects,
- can be integrated discretely into the park.

International Teaching Module
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Integrated Flood Risk Management of Extreme Events

B-2

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