Flood protection strategy Cost Benefit Analysis, Vendline (JU)

Supervisors
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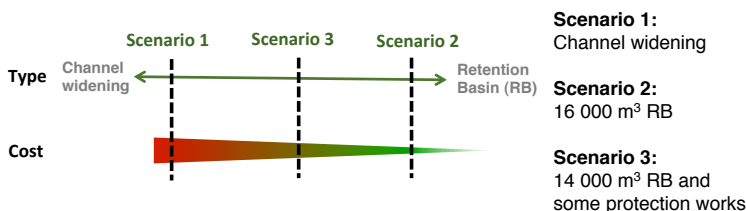Paolo Perona (AHEAD, EPFL)

Context

Vendlincourt, Bonfol and Beurnevésin (JU) experienced heavy flooding in 2007.
Updated flood maps revealed important **protection deficits** and the **need for a new flood protection strategy** for the Vendline river.
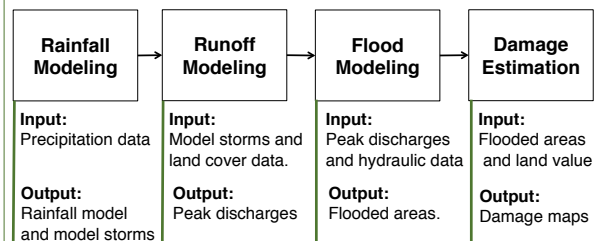
Objective

The objective of the project was to determine the best mitigation scenario by performing a **Cost Benefit Analysis (CBA).**
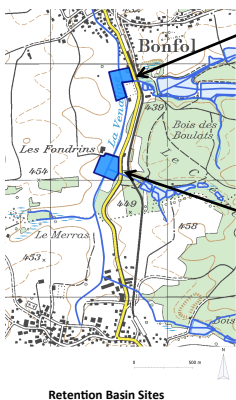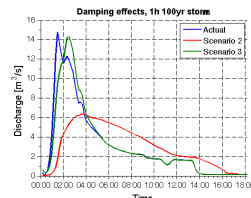
Scenarios

Scenario 1:
Channel widening

Scenario 2:
16 000 m³ RB

Scenario 3:
14 000 m³ RB and some protection works

Methodology

Rainfall Modeling	Runoff Modeling	Flood Modeling	Damage Estimation
Input: Precipitation data	**Input:** Model storms and land cover data.	**Input:** Peak discharges and hydraulic data	**Input:** Flooded areas and land value
Output: Rainfall model and model storms	**Output:** Peak discharges	**Output:** Flooded areas.	**Output:** Damage maps

Results

A. Retention Basins Efficiencies


Retention Basin Sites

Scenario 2:
RB has a a strong damping effect on peak discharges through Bonfol.

Scenario 3:
RB has no significant damping effect on peak discharge through Bonfol. This is due to the temporal overlaying of discharge from the ponds southeast of Bonfol and the damped discharge from upstream sub-catchments.

B. Flooded Areas and Damages

Flooding and building damages in Bonfol for the 100 year storm
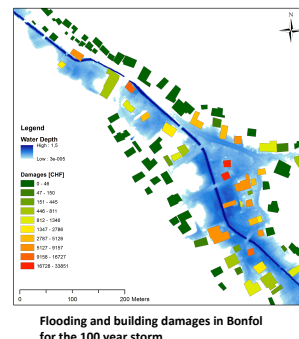
Actual State:
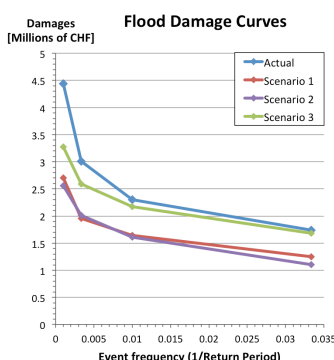Bonfol presents the highest damages, in particular on city center buildings.

Scenarios 1 and 2:
Efficient flood mitigation at Bonfol thanks to channel widening and peak discharge reduction respectively.

Scenario 3:
Lower flood mitigation because of the inefficiency of the RB despite protection works.

C. Cost Benefit Analysis

- None of the scenarios is economically justifiable since **investment costs are higher than avoided damages.**
- Scenarios 1 and 2 present similar damage reductions.
- **Scenario 2** is cheaper and therefore it has the **highest utility ratio.**

Scenario	Investment [MCHF]	AACA [CHF]	AAC[MCHF]	Utility ratio
1	2,36	22 400	0.39	0.17
2	0.87	24 450	0.42	0.49
3	1,07	5 800	0.1	0.09

AACA: **A**nnual **A**verage **C**ost **A**voidance; **AAC:** **A**nnualized **A**voided **C**osts
Utility ratio: AACA/Investment

Conclusion

Performing the CBA of flood protection strategies entailed **extensive modeling**, from precipitation to inundated areas and damage calculations.

The results indicate that the best scenario, from an economical point of view, is **scenario 2** due to its low investment cost and high mitigation capacity.

Nevertheless this scenario is not economically reasonable and **further measures are needed** to ameliorate its mitigating capacity, like adding dikes and walls to decrease flooding and increase the utility ratio.