PRE-PROJECT AND FEASIBILITY ANALYSIS AS MANAGEMENT-TOOLS FOR COMPLEX FLOOD PROTECTION PROJECTS WITH HIGH IMPONDERABILITIES

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INTRODUCTION

The management of complex flood-protection projects has to deal with various imponderabilities. Thus the planning and approval process must be adapted to such uncertainties and should be conducted stepwise.
Flood protection projects of federal authorities can be regarded as special civil engineering works that implicate considerable ground risks. Due to the high threat for human life and goods mitigation projects require high safety factors to prevent failing. Geological and geotechnical questions have a strong effect on the feasibility, the construction time and the costs of the project however these questions can hardly ever be solved in the planning phase of the project. In this paper a retrospective analysis of a concrete mitigation project is conducted. An ex-post project flow chart is developed to show how eventual risks and necessary project adjustments can be regarded by means of organizational tools and management instruments provided by the Austrian Forest-Technical Service for Torrent and Avalanche Control.

METHODS

A flood-protection project that is currently being realized and will be completed shortly is described, analyzed and discussed concerning its project management in five steps:

1. Original project flow chart: How did the intended timetable look like? Which sequence of investigations, planning activities and approvals was supposed?
2. Actual Project Flow Chart: What was the actual progress of the project? The original project flow chart and the actual progress of the project are displayed graphically using the MS Project standard software.
3. Deviation analysis: Differences between the original and the actual project progress are revealed, analyzed and discussed. Where and why did unexpected changes occur? Which decisions were made, while the basis was unsolved? Where should the flow chart be changed or decisions be postponed? Reasons for occurred deviations are named, their predictability and their effect on the planning time, the construction time and the costs of the project are described quantitatively.
4. Revised project flow chart: How could a project flow chart look like, that would have considered all uncertainties and imponderabilities (whether occurred or not)? A management-plan, that would have taken account of all occurred or potentially occurring complications is developed and illustrated by a flow chart using an MS Project.
5. Lessons learned: which general planning guidelines can be derived for complex mitigation projects of the Austrian Forest-Technical Service for Torrent and Avalanche Control? General planning guidelines are defined and suggestions are provided to make use of existing management instruments, like pre-projects and feasibility analyses that were recently introduced by the Austrian Forest-Technical Service for Torrent and Avalanche Control, in order to cope with inevitable imponderabilities of a civil engineering project with high geogenic risks.

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RESULTS

The comparison of the original and actual project flow chart show significant differences concerning estimated costs and scheduled time of realization:

1. Originally estimated project progress:
   Estimated costs were 1.5 to 2.0 Mill € and estimated completion date was by the end of the year 2005.
   A first draft of the mitigation project was submitted in 2/2002 and presented to the community and the affected residents. It was planned to realise a short pre-study (including a hydrological survey, a mitigation concept and a hydrological raw design) between 01/2002 and 10/2002 and to complete the project planning (including the detailed hydrological and hydraulic design, the structural analysis and the engineering design as well as an estimate of costs) by the end of the year 2003. The approval phase (funding, legal water approval) was scheduled for 01/2004 to 06/2004 and finally the construction period was estimated from 07/2004 to 12/2005.
2. Actual project progress:
   By 12/2003 a short geotechnical and soil-mechanical report revealed groundwater flows and slow slope movements that could eventually increase when submerged. A civil engineer was charged with the planning of the project in 05/2004. In 12/2004 it was decided to move the site of the flood retention basin by 350 m upstream in order to avoid geological complications. Estimated costs were 3,2 mill. € and funding negotiations were conducted and completed by 05/2005.
   According to Austrian national law and due to the fact, that the maximum height of the retention dam exceeded 15 m, the project had to be submitted to the Austrian flood reservoir commission that determined 31 additional requirements: Detailed geological mapping, geophysical investigations like hybrid seismic and ground-penetrating radar, core drillings and drill hole monitoring with packer tests in the drill holes were conducted in the period from 10/2006 to 11/2007.
   The approval of the project by the federal water authorities was achieved by 02/2007. Significant water permeability was revealed by the Geological Service of the Austrian Federal Forest-Technical Service for Torrent and Avalanche Control by 04/2008.
   Construction works started by 10/2008 with concrete injections for soil sealing (duration until 09/2010).
   By 12/2008 the community authorities were informed that the project costs would amount to 5.5 Mill Euro instead of 3.2 Mill Euro.
   Concrete construction (main barrage and lateral dams) started by 05/2009 and were finished by 11/2010 including backfilling. Minor works were completed in 2011.
3. Analysis:
   The project was drafted, presented and approved by the authorities and interested parties in a state, when the calculation bases were unreliable. Although short geotechnical and soil-mechanical investigations were conducted within the pre-study severe geotechnical problems (slope movements, permeability) were not recognised in this state of the project. Cost estimation and funding negotiations were based on poor knowledge concerning underground risks.
4. Revised project flow chart:
   Detailed preliminary investigations should have been realized by means of a feasibility analysis funded by the interested parties. All investigations imposed by Austrian flood reservoir commission should have been completed within the feasibility analysis (appr. 2 years)
   Based on this feasibility study a detailed structural analysis, engineering design and estimate of costs would be possible with higher planning security due to less imponderability.

DISCUSSION

A revised scheduled project progression chart and a discussion of lessons learned will be provided after the completion of the project in June 2011.

Keywords: Feasibility analysis, project-management, imponderability, project flow chart, MS project