Artificial Intelligence for Water Network Planning

Project Plan

Aalto University

MS-E2177: Seminar on Case Studies in Operations Research

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Client: Sweco

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1 Background

Current design workflows in civil water network planning are heavily based on expert-driven manual work. Despite strong professional know-how, many tasks in water supply planning contain substantial routine elements, standardized steps, and extensive data processing. These characteristics suggest potential for applying artificial intelligence (AI) to support the overall planning process.

This project examines how AI could help in water supply planning, both in general and specifically within Sweco's current practices. The research question addresses how AI could affect water supply planning from Sweco's operational perspective. The approach combines management consulting frameworks with operations research methodologies to systematically examine water supply planning processes, focusing on the Finnish water sector.

The project is structured around five work packages: high-level assessment of AI tools, mapping of Sweco's planning processes, review of AI solutions, assessment of organizational change and impact, and development of recommendations with an implementation roadmap. Data collection is based on interviews and workshops with Sweco personnel, combined with desktop studies and literature review.

2 Objectives

The primary objective is to improve the efficiency of water supply planning by identifying the most suitable AI use cases. The study clarifies what AI can actually do compared to traditional automation, helping to understand where AI adds real value to the planning process.

The project maps Sweco's existing workflows, data flows, and deliverables to understand current practices and identify improvement areas. This mapping helps evaluate different AI solutions (such as language model tools, but also more traditional machine learning methods) in terms of how well they fit Sweco's operations.

The project examines how AI adoption would affect work processes, including changes to daily tasks, skill requirements, and quality control. Finally, the project develops practical recommendations and an implementation roadmap for Sweco, covering both short-term quick wins and long-term strategic changes in technology, skills, processes, and organizational structure.

3 Tasks

The project is structured into five work packages: high-level assessment of AI tools, mapping Sweco's planning processes, review of AI solutions, assessment of change and impact, and recommendations and roadmap. The project team meets weekly and maintains regular contact with the supervisor. A kick-off meeting is held at Sweco with the client to clarify expectations and define the scope of the project.

3.1 High-level Assessment of AI Tools

This work package focuses on a high-level description and assessment of AI as a design and planning tool. The task includes desktop studies and a review of relevant frameworks related to AI and automation. The objective is to distinguish AI-based solutions from traditional automation and clarify limitations and opportunities in the planning context. This task is conducted by Bilqays and Sini.

3.2 Mapping Sweco's Planning Processes

The current water supply planning process at Sweco is analyzed through interviews and workshops. The interview questions are constructed to understand the phases of the workflow, the tasks, the deliverables, the tools, and the roles of the different experts involved. The process mapping identifies where AI could potentially be leveraged and where human judgment is required in decision making. The interview process is coordinated by Leevi and Emma.

3.3 Review of AI Solutions

The third work package consists of market research and literature review to identify relevant AI tools for Sweco's planning process. The review covers LLM-based tools, geospatial analytics, optimization engines, and automated documentation systems. The identified solutions are assessed in terms of applicability, maturity, and integration requirements in the Finnish water sector context. We shortlist the most promising tools and illustrate them through a mock-up style case.

3.4 Assessment of Change and Impact

The impact of AI adoption on work processes and roles is assessed. The analysis focuses on task allocation, competence needs, quality assurance, responsibilities, risk management, and ethical aspects in AI-supported planning. In addition, a risk and responsibility framework is developed to clarify roles and accountability in the use of AI tools.

3.5 Recommendations and Roadmap

The findings from all work packages are synthesized into recommendations for Sweco. The prioritization is based on interview insights, desktop studies, and literature review. The outcome is a roadmap for AI adoption covering technology, skills, processes, information management, and organizational change.

4 Schedule

The project runs from January through May 2026. The timeline below shows the planned workshops and how the five work packages are distributed throughout the project period.

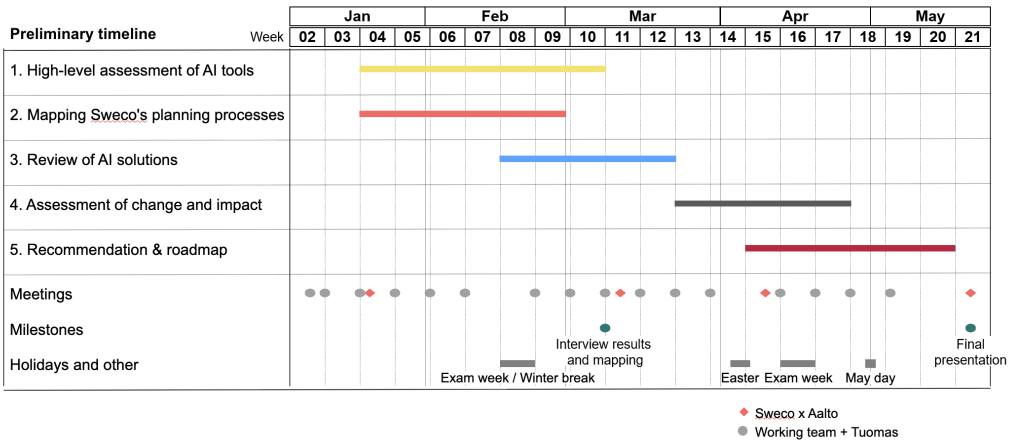

Figure 1: Timeline.

5 Resources

Resources used in the project include: literature, interviews with Sweco's experts, material from Sweco such as reports and plans, and general guidance from Tuomas. Task allocation is determined by interest and abilities of group members to improve quality of the work.

6 Risks

The goal of the project is to meet the objectives of Section 2 within the timeline specified in Section 4. The objectives are reached by completing the tasks in Section 3. Risks can be scenarios relating to any of the parts, either not staying in schedule or not completing the tasks well enough to meet the objectives. Specified scenarios, effects and prevention plan are detailed in Table 2. The Table also includes assessment of likelihood and impact, which have specified scales presented in Table 1.

Table 1: Likelihood and impact descriptions.

Frequency	**Description**
High	At least every other week
Medium	Once a month or few times during the project
Low	Once ore twice during the project

Impact	**Description**
High	Project fails to deliver all the objectives or timeline is exceeded by multiple weeks
Medium	Project fails couple of the objectives or some extension to timeline
Low	Project objectives are met but not at the level client expects, or the timeline requires revision, but the deliverables are still on time

Table 2: Risk assessment of the biggest risks.

Risk	**Effect**	**Likelihood**	**Impact**	**Prevention**
Overly broad project scope	Schedule delays from increased or cumulated workload	Medium	High	Regular client alignment on objectives and scope
Limited interviewee availability	Interview delays impacting work packages 1 and 3	Low	High	Early scheduling and adequate interviewee pool
Unexpected administrative delay (e.g., late NDA requirement)	Delays to interviews and review of critical project materials	High	Low	Progressing parallel tasks while actively following up on NDA signing
Limited useful literature for first work packages	Project lacks framework and foundation, leading to client dissatisfaction	Low	Medium	Allocate time for research to identify sufficient high-quality sources
Conflicts among team due to dynamics or work preferences	Reduced motivation, compromised work quality, and potential timeline delays	Low	Medium	Early communication among team members and regular checks done by project manager to address issues proactively
Inactive team members with insufficient project contribution according to their role description	Project delays, reduced team morale, increased workload for other members	Low	Medium	Clear task ownership, defined roles, regular progress tracking, and workload rebalancing