

Project plan: Evaluating reuse options for past peatland extraction sites

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1 Background

Climate change is a topic of global interest and has been present in government decision-making that many countries have made for several years (Bae and Feiock 2013). Finland is a country recognized for not being left behind on the subject. In fact, it is a pioneer country in the application of renewable energies in all its sectors on a daily basis. However, Finland continues to struggle with related problems that still do not have a definitive solution (Suhonen 1993). This time we will focus particularly on one: peat.

For many years, the generation of energy through peat has been of vital importance to Finnish daily life. It is for this reason that reducing peat energy production is so difficult for the Finnish population and government: many people receive their livelihood through it and traditionalism makes it more difficult to make some people want to use a different and less polluting method (Salomaa, Paloniemi, and Ekroos 2018).

This project consists of creating a tool that allows landowners to choose the method of reuse for their peatland extraction sites that is feasible and beneficial for both parties: the landowner and the environment. Our client is the Finnish Environment Institute (SYKE), created in 1995. They provide necessary information, multidisciplinary research and expertise, and professional services for decision-making in environmental matters, within the public or private sector. They will provide us with the necessary data to carry out and test the tool.

2 Objectives

The main objective of the project is to support landowners of peatland extraction sites in their decision making by informing them about different reuse options and their potential impacts and benefits. To do this, our goal is to develop a decision making tool to compare the different reuse options using multi-criteria decision analysis (MCDA) methods. The tool will use decision trees to exclude infeasible options and multi-attribute value theory (MAVT) to compare the remaining options. The tool is to

- consider the environmental, financial, and social impacts of the different reuse options;
- take into account the user's preferences and priorities regarding the various decision criteria;
- be transparent about the decision making methods and how conclusions are reached;
- be accessible and understandable to users of varying backgrounds.

3 Tasks

Four main tasks are literature review, development of the initial model and tool, testing and reporting. The order is not strict because some of these tasks will be conducted in parallel. Discussions with the client will be held throughout the project to take into account the insights of the client and to validate the performance of the Excel-based model and tool.

3.1 Literature review

A literature review will be conducted based on sixteen research papers suggested by the Finnish Environment Institute, as well as other relevant papers. These papers include information about peatland reuse options and MCDA methods. The main focus of the review is on social criteria and GIS-MCDA methods. Our objective is to answer the following questions provided by the Finnish Environment Institute:

- What kind of social criteria have been identified?
- How have they been considered in the cases?
- How has the goodness of the alternatives been assessed in terms of social criteria?
- What decision analysis methods have been applied?
- Have stakeholders been involved in the process, and if so, how?

3.2 Planning and developing the model

Based on the literature review and discussions between ourselves and the client, we will choose a decision analysis method that will be used to develop the Excel-based model and tool. After initial discussions, we most likely use weighted sum method and multi-attribute value theory. A decision tree will be built to define criteria and outcomes before building the model. All necessary variables, for example weights and land properties, will be quantified and included in the model.

3.3 Testing and refining the model

Testing is necessary after building the first version of the model. The objective is to improve the model by including additional features and removing or changing features that do not work. Possible changes will be made to the model and the layout of the Excel-tool will be made as user-friendly as possible. It is important that the Excel-tool meets the requirements of the client, and therefore, it is important to have discussions with the client.

3.4 Reporting

There are three reporting tasks, which are project plan, interim report and the final report. This project plan gives a general outline of the project objectives and the planned progress of the project. Interim report includes possible changes to the initial project plan, as well as the progress of the project. The final version of the project will include literature review and the description of the Excel-based model and tool.

4 Schedule

There are three deliverables, which are project plan, interim report and the final report. The subtasks towards the production of the deliverables are as follows:

- Tasks to be completed before the project plan (11.3.2022):
 - Start literature review.
 - Initial discussions with the client.
- Tasks to be completed before the interim report (22.4.2022):
 - Form the decision tree.
 - Define and quantify criteria and weights.
 - Decide on the implementation method.
 - Start to implement the first version of the decision support tool.
- Tasks to be completed before the final report (20.5.2022):
 - Test and refine the model.
 - Write the final report.

Meetings with the client will be held regularly, and we have reserved time for a meeting on a weekly basis. Meeting will not be held if there is nothing relevant to add compared to the previous meeting. Our plan is to complete the tasks ahead of schedule so that there is time for changes.

5 Resources

The team consists of four students of mathematics and operations research: the project manager Adrián Rivera is pursuing a Bachelor's degree in Mathematical Engineering and the remaining three team members are Master's students in Mathematics and Operations Research, majoring in Systems and Operations Research. Collectively, the team has a strong foundation of knowledge in theoretical and applied mathematics, systems analysis, and programming. The team also has experience with MCDA, including MAVT.

The project client is the Finnish Environment Institute, and the project is part of their Systeemihiili project, a larger ongoing project which promotes the use of systems analysis to promote carbon neutral land use. Mika Marttunen and Jyri Mustajoki from Systeemihiili are the contact people. They support us in our research of the topic and put us in contact with other experts in the field when necessary. They will also provide the case data necessary to test the decision making tool. Mika Marttunen is the project leader of Systeemihiili and Jyri Mustajoki is a specialist researcher in charge of advancing the use of systems analysis methods to visualise complex systems and evaluate and compare available courses of action. From Aalto University, Professor Ahti Salo will act as an advisor on the project.

For programming the decision making tool, we consider various programming languages and software. Under consideration are Microsoft Excel and the programming language Python, which can both be accessed using Aalto University servers and credentials.

6 Risks

The risks of the project are in Table 1. We estimate, that the risk of requiring quantities that are too hard for the average user to judge has the highest likelihood. The impact is also severe. Thus, we should pay close attention to mitigating the likelihood of this risk. There is also very little we can do if the risk does realize.

Table 1: List of recognized risks associated with the project.

Risk	Likelihood	Effect / Impact	Mitigation of likelihood	Mitigation of impact
Poorly / misdefined scope	Medium	Wasted effort, delays, not archiving desired objectives	Plan and discuss before implementation, frequent updates to the client for high visibility on where we are heading.	Can we be content with the result even if it is not what we intended?
Loss of team members / team inactivity	Low	Increase of workload, delays	Open communication, a schedule everyone finds feasible.	Re-scoping and re-scheduling (requires us to be ahead of deadlines)
Excel not being a suitable tool w.r.t the objective	Medium	Difficulties in implementation, solution not usable enough	Scope the project so that Excel can be used to achieve the objective.	Investigate the possibility of using other tools (such as Python) to reach objectives.
We are not able to simplify theory enough for the average user	Medium	Solution is not useful	Testing with end users before delivery.	Technical support or educating the end users?
Estimating input features is too tedious	High	Tool is too difficult to use / requires expert knowledge of the effects of different reuse options	Avoid relying only on the user's input on the values of the tricky features.	Expert support.

References

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