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Positional Analysis in a Decision Situation

—
A Case Study of the Morava River
in the Czech Republic

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ABSTRACT

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TITLE: Positional Analysis in a Decision Situation – A Case Study of the Morava River in the Czech Republic

PROBLEM FRAMING: Environmental problems are typically complex. There are many parameters to consider. For instance different interested parties often refer to different valuational standpoints. Corporations tend to care most about money, while environmental organisations see to the best solutions for nature. Depending on which alternative that is chosen, impacts on different systems will differ. That is why it is important to have an all-embracing tool for decision-making. Is Positional Analysis a well-suited tool for complex decision situations? How can PA be used to illuminate a complex decision situation, such as the one in Czech Republic concerning the Morava River?

PURPOSE: The purpose of this essay is to show how a decision situation can be illuminated. We will do this by using Positional Analysis. We will also apply it to a real life example in the Czech Republic where the Morava River got flooded in 1997.

METHOD: We have chosen to use Positional Analysis and a case study approach. The reason for choosing these methods was that they are both qualitative and quantitative.

RESULT: Positional Analysis is a capable tool for illuminating complex decision situations as the one in Morava Region. Even if PA is a well-suited method, we find some problems using it. The need for information is huge and to collect all the information and making the analysis takes a lot of time.

Thanks

We would like to thank our supervisor, Peter Söderbaum, for supporting us and giving us advises during the journey of this essay. The people in the Czech Republic, prof. Stírba, doc. Sarapatka and assistant Sweeney, also deserves a big thank you for inviting us and taking care of us during our stay in Olomouc.

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1. Introduction

1.1 Background

In July 1997 a great flood struck the Morava River floodplain in the Czech Republic. The river is regulated and the nature surrounding it has been changed. In an attempt to reduce the likelihood of future floods a comprehensive project has been initiated. The government is about to decide what kind of measures that has to be taken to prevent a similar disaster. The alternatives are either to build dams and locks or to reforest and create meadows on the floodplain. Our interest in this project has to do with a request from the Palacky University if we wanted to help them to generate a basis for the decision. There are many methods for generating material for decision-making. With our background in ecological economics we tend to lean on Positional Analysis (PA), which evaluates impacts from different perspectives such as economical, ecological and social. But to make it clear why we chose this method a comparison will be made between PA, Cost-Benefit Analysis (CBA) and Strategic Environmental Assessment (SEA).

1.2 Problem Framing

Environmental problems are typically complex. There are many parameters to consider. For instance different interested parties often refer to different valuational standpoints. Corporations tend to care most about money, while environmental organisations look for the best solutions for nature. Depending on which alternative that is chosen, impacts on different systems will differ. That is why it is important to have an all-embracing tool for decision-making. Is Positional Analysis a well-suited tool for complex decision situations? How can PA be used to illuminate a complex decision situation, such as the one in Czech Republic concerning the Morava River?

1.3 Purpose

The purpose of this essay is to show how a decision situation can be illuminated. We will do this by using Positional Analysis. We will also apply it to a real life example in the Czech Republic where the Morava River got flooded in 1997.

1.4 Limitation of the Study

We have not carried out a complete Positional Analysis. This is because the project is too comprehensive and a complete PA would mean several months of work. What we have done is to suggest how a more complete study can be carried out. When talking about floods we only describe flooding in rivers. Another limitation of our study is to only describe impacts on the floodplain surrounding the river.

1.5 Target Group

Our essay is addressed to those involved in the Morava River project, the students at the program of ecological economics at Mälardalen University and others who have interest in approaches to decision-making.

2. Method

While performing scientific research one always uses some kind of method. A choice has to be made between different methods, as we will clarify in this chapter. We will also present our valuational standpoint and our view on the environment in relation to the future.

2.1 Theoretical and Valuational Framework

To understand the choices and the assumptions we have made, we will present ecological economics, which is the basis of our approach to economics and valuation. The following will therefore be a review of ecological economics as an ideology. We also believe in and hope for new ways of thinking when it comes to development. It is our belief that we need to move in the direction of sustainable development, if we want to continue to be part of this planet.

2.1.1 Ecological Economics

Ecological economics, as we know it, has one of its origins in institutional economics and began as a criticism of neoclassical economics. The strongest criticism aims at the neoclassical way of simplifying complex phenomena to quantitative models.¹ The institutional economics view differs from the neoclassical one in the sense that an organisation or firm's way of behaving is a result of each participant's behaviour. It is no longer true that all participants have the same interests and beliefs as the entrepreneur.² Today the important difference between ecological and neoclassical economics is that the ecological one put questions about environment and survival in focus, while the neoclassical tradition treat them as side-impacts, i.e. something of secondary importance.³

To deal with a complex world, ecological economics has internalised several disciplines, such as, as the name indicates, the sciences of ecology and economy, and also social and natural sciences. It is said that it is interdisciplinary.⁴ One definition is that it "...studies how ecosystems and economic activity interrelate."⁵ It is also suggested that "...ecological economics seeks to understand the human position in the world, where, that world is being simultaneously created and destroyed by humans."⁶ These citations indicate that ecological economics is a broad subject, which it is. The belief is that one cannot just pick one part of a system and argue that it has nothing to do with the rest of the system. All parts are connected and need to be put in relation to each other to fully understand the system. In this sense ecological economics is a holistic discipline. It attempts to look at all aspects of a phenomenon or problem.⁷

¹ Söderbaum, 1993

² Vromen, 1995

³ Söderbaum, 1993

⁴ Costanza, et al, 1997

⁵ *ibid*, p. 134

⁶ *ibid*, p. 139

⁷ Söderbaum, 2000

Another feature of ecological economics is its openness and tolerance towards different opinions, values, methods and solutions. It welcomes competing perspectives, where no one necessarily is the right and true one. Rather than a dictatorship in the scientific field, it is better with several disciplines and theoretical perspectives that are seen as complements. Tolerance also means being open towards different valuational standpoints such as ethical and ideological standpoints.⁸

2.1.2 Decisions for a Better Future

The environmental problems have taken a scary turn. They have got harder to control and overlook. It is no longer only the closest environment that is getting affected. The problems have gone from being local to global, from being easy to overlook to being diffuse and complex.

This is why it is important to make decisions that will lead us in the right direction, whether it is an individual decision or one that concern society as a whole. When it comes to making decisions that have long-term impacts or that are supposed to deal with high risk or uncertainty, it is very important to take time to get all the relevant material for the decision. The decision-makers also need to think everything through carefully and see to the common good and not only to their own benefit. Selfishness is something that we cannot afford when the responsibility of passing on a 'green' world to the next generations is on our shoulders. It has to be recognised that the decisions made today will have impacts far into the future. The problem then becomes an ethical and moral one.

2.2 Qualitative and Quantitative Method

There are two different approaches referred to as qualitative and quantitative method. Qualitative methods are often subjective, speculative and 'soft' as opposed to the quantitative methods, which are considered to be objective, accurate and 'hard'.⁹ Subjectivity means that the researchers standpoint lead the way and is opposed to objectivity where the researcher is supposed to have no opinions at all. The qualitative method is also one where the assumptions play an important role, which make it 'soft', while the quantitative method is 'hard' and demand accuracy, i.e. facts that can be proven to be true.

The advocates of quantitative methods emphasise reliability, verification, reproduction capability, representation capability, and clear rules about how to proceed.¹⁰ All of these words indicate that reliance and replication is very important to the method.

The qualitative methods *“/.../ give a more holistic picture of the respondents experiences without any limitations in terms of questions and answers.”*¹¹ Validity, understanding, intersubjectivity, generation of theories and diversity, exemplify arguments for using qualitative methods.¹² The methods are more descriptive and emphasise subjective experiences while the quantitative method rather is accounted for in terms of statistics.¹³

⁸ Söderbaum, 1993

⁹ Burgess, 1984

¹⁰ Starrin, et al, 1991

¹¹ Notter & Hott, 1996, p. 189, our translation

¹² Starrin, et al, 1991

¹³ Notter & Hott, 1996

2.3 Case Study

The case study as a method refers to a profound study of one or several objects. The case is examined from different point of views.¹⁴ The method is often used in sociology, geography and business-studies.¹⁵ Case studies can be qualitative or quantitative or a combination of both¹⁶. Case studies can be used for studies and research in four different contexts:

1. As illustration.
2. As means for creating a hypothesis.
3. As a method for action research / work with the purpose of social change.
4. As means for creating a new theory.¹⁷

Consciousness about the existence of different opinions and an aspiration to develop new concepts are some of the features of case studies.¹⁸ Other key characteristics are the importance of description of the researcher's subjectivity and the use of different methods to collect data. In the information collection, it is preferred to get data from different origins and also from different kind of sciences.¹⁹

“In general, case studies are the preferred strategy when “how“ or “why“ questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context²⁰.“

“A case study is an empirical inquiry that: investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident²¹.“

What makes this method different from others is the creation of theory. When using the case study the theory emerges *from* the study, it is not validated *with* the study as in most other methods. In the latter case the method is a powerful descriptive model used for confirming that the theory constructed is built on precise empirical foundations.²²

2.4 Choosing Method

We will first describe and explain Positional Analysis (PA), its features and how it is used. We have also compared PA with alternative methods, such as Cost Benefit Analysis (CBA) and Strategic Environmental Assessment (SEA). The purpose of the comparison is to state the reasons for choosing PA.

¹⁴ Wiedersheim-Paul & Eriksson, 1991

¹⁵ Holloway & Wheeler, 1996

¹⁶ *ibid*

¹⁷ Wiedersheim-Paul & Eriksson, 1991

¹⁸ *ibid*

¹⁹ Hamel, 1993

²⁰ Yin, 1994, p. 1

²¹ *ibid*, p. 13

²² Hamel, 1993

The methods used are both qualitative and quantitative. The reason for this is that PA is a broad valuation tool for decision-making where qualitative and quantitative facts are used. The same is true for the case study we have made to illustrate how PA can be used.

Both Positional Analysis and case study were chosen because they comply with our own valuational standpoints and they both are judged to be appropriate for the situation studied.

2.5 Procedure

Josef Dlouhy at the Swedish Agriculture University in Uppsala sent an enquiry to Peter Söderbaum, asking if there were any students interested in providing material for a decision concerning the Morava River in the Czech Republic. This would be done as an exampaper, and perhaps the Positional Analysis could be used. We got interested and took it as a challenge to write an essay in English and going abroad. Our work with this essay started with an article we wrote in another course, about flooding. It was basically built on other articles, which we found by searching in the libraries in Västerås and on the internet. We also used a couple of books. Then we went to Olomouc in the Czech Republic to meet with some of the people, docent Sarapatka, professor Stírba and Sandra Sweeney, who are more or less involved in the Morava River project. They all work at the faculty of ecology at Palacky University and stand behind the ecological alternative. There we received some information about the project and history about the river. The information received was mostly about the ecological alternative. We also went on an excursion to the river and its floodplain. We visited a seminar about how to solve the problem with floods. Back in Sweden again, we searched for more literature. To do this we used searching-systems such as Libris, Science Direct, Ideal and EBSCO. The words we used in our search were for example, flood, floodplain, land use, Czech*, deforest* in different combinations.

2.6 Criticism

2.6.1 Method

Each method has its own advantages and disadvantages and therefore it is possible to criticise the method. When using the method of case study one can never generalise. This is referred to as lack of representativeness. For example it can be difficult to get empirical data, the so-called 'access-problem'. It can also be difficult to know how to collect data, from whom or where to collect the data and finally what kind of data to collect. The data that has been found can also be difficult to interpret.²³ This argument can be used for all methods because of the subjectivity of the researcher that is always present.²⁴

We will also make clear that in choosing Positional Analysis we are under influence of our preunderstanding and our supervisor, professor Peter Söderbaum. The rest of the criticism concerning the method is presented in chapter 3, Comparison Between Different Methods for Decision Making, where we also will state our criticism against the other two methods described.

²³ Hamel, 1993

²⁴ Söderbaum, 1993

Since we do not carry out a complete Positional Analysis, it is almost impossible to create a correct decision-making base. The access-problem makes it impossible for us to give a definite answer about which alternative to choose. The Analysis is mostly based on our own assumptions, which might not always be correct. Those assumptions are built on our pre-knowledge and our valuational standpoint, resulting in more or less biased conclusions.

2.6.2 Sources

We have clearly experienced the ‘access-problem’ in our search for information. This has led to some lack of information where we only have parts of it and therefore we cannot present the whole picture. One reason for this can be that we only visited Olomouc once, for four days.

All the information we have received about the situation in the Czech Republic has its origin in the faculty of ecology at Palacky University in Olomouc. We have not talked to or received information from other interested parties such as the industries, the citizens in the area or the farmers. This might mean that our information is not as many sided as we would wish.

2.7 Difficulties

During our work with this essay we have experienced a lot of difficulties, the biggest being not receiving all the information we would have needed for making a more fair Positional Analysis. The cause for this is mostly language related, since most of the data is in Czech. For example we are lacking information about laws and regulations, values and ideology of the stakeholders and decision makers, on what different interested parties are involved and what they want, and also information about the ‘technocratic’ alternative. Another problem was that we had no opportunities to talk to and interview other interested parties, such as farmers, citizens et cetera. The reasons for this are the obvious distance, lack of time and language. Our ambition was never to create a complete Positional Analysis. We have received bits and pieces of information from which we have made assumptions.

When visiting Olomouc we ran into some other problems, in the sense that our and their cultural and ideological backgrounds are very different. This resulted in difficulties to always understand each other. The language made it even more difficult. This led to a communication where they did not always understand our arguments and vice versa.

3. Comparison Between Different Methods for Decision Making

There are many different approaches to decision-making. The kind of method chosen depends, of course, on laws and regulations, the investigator's ideology and beliefs, what kind of decision that has to be made, and to some extent on the decision makers wishes. We have already decided to use the Positional Analysis, but we would like to compare it to two other methods, Cost-Benefit Analysis (CBA) and Strategic Environmental Assessment (SEA) for the purpose of making the differences visible. We will explain how to use the methods, and the nature of each method.

3.1 Cost-Benefit Analysis

Cost-Benefit Analysis (CBA) is a well-established tool that is used by governments to analyse the costs and benefits of different projects. The method is aggregated; in this case it means that all impacts are expressed in monetary terms, where both positive 'benefit' and negative 'cost' aspects can be included. CBA is mostly a quantitative method.²⁵

According to CBA an activity is considered beneficial for the economy if the ones that win on the change can compensate the ones that loose. However the compensation does not have to be done in practice. Costs and benefits are estimated in terms of market prices. When there are no actual market prices, the preferences and willingness to pay of individuals are often used as a base for estimates of costs and benefits.²⁶

The structure of a cost-benefit analysis can be something like this;

First of all welfare has to be defined because what the method is supposed to estimate is increased welfare.²⁷

Stage two includes the definition of the project itself and also the boundaries of the project.²⁸

The third stage is the identification of the impacts from the planned project.²⁹ The effects on society caused by the project can be compared with a zero alternative (zero alternative = continuing the same activity as before).³⁰

In the fourth and fifth stages the impacts that are economically relevant are identified and relevant physical impacts are estimated.³¹

Stage six will contain a monetary valuation of the relevant effects.³² When the effects are evaluated they are described as costs and benefits in monetary terms at

²⁵ Moberg et al, 1999

²⁶ ibid

²⁷ ibid

²⁸ ibid

²⁹ Hanley & Spasch, 1993

³⁰ Moberg et al, 1999

³¹ Hanley & Spasch, 1993

³² ibid

different times. Effects that cannot be quantified or be evaluated are presented in qualitative terms.³³

Next step is to discount the cost and benefit flows. The so-called net present value test is applied.³⁴ The costs and benefits are being translated to present values applying a specific discount rate.³⁵

A sensitivity analysis³⁶ is carried out as stage nine. The different alternatives can be ranked in order of precedence according to each alternative's net present value.³⁷

There are some problems arising when using the CBA. The transparency of the method is often bad because of the aggregation to one unit.³⁸ When the method is applied to environmental issues difficulties of evaluating non-market goods, such as wildlife and landscape often appear. How should this be done, and how much reliance should society place on estimates so generated? Are we acting immorally by placing money values on such things? If one human being is willing to pay X units of money for a clean nature, how can we rely on such a figure?

When the ecosystem is complex, how can society accurately predict the effects on an aquatic ecosystem of effluent inputs? Also the discounting procedure and the discount rate can be questioned. Does discounting violate the rights of future generations and should society discount? Is CBA a truly objective way of making decisions, or can specific interest groups capture it for their own purposes? And how will uncertainty and irreversibility be included in a CBA?³⁹

3.2 Positional Analysis

Positional analysis (PA) is a way to systematically study or analyse a project or a problem in preparing for a decision. The purpose of the PA is to illuminate the decision situation and *not* to solve the problem, i.e. the PA will not give an absolute answer or say which alternative is the best. While evaluating different impacts, the purpose of PA is to disaggregate and keep all the different impacts separate, and not to aggregate them into one number (as in Cost-Benefit Analysis). Other important features are democracy, openness and a comprehensive view of economics. In the concept of positional analysis, democracy means to involve all interested parties and take their opinions under consideration. Openness means to be open about all information, alternatives and impacts, difficulties during the process, and the analyst's basis of valuation. To have a comprehensive view of economics is to see the whole value of something, and not only the monetary value. Economics is a word that stands for housekeeping i.e. being careful with resources, whether it is money, forest, water or other kinds of resources.⁴⁰

As with all methods there are restrictions/limits. PA is a demanding method that takes a lot of time to carry out. It also put a lot of responsibility on the researcher and the decision maker,

³³ Moberg et al, 1999

³⁴ Hanley & Spasch, 1993

³⁵ Moberg et al, 1999

³⁶ Hanley & Spasch, 1993

³⁷ Moberg et al, 1999

³⁸ *ibid*

³⁹ Hanley & Spasch, 1993

⁴⁰ Söderbaum, 2000

which in turn means that they need to have a lot of knowledge about many different things. A highly disaggregated method can also seem confusing to the decision-makers, who have become accustomed to simplistic recommendations. A too aggregated method on the other hand, risks losing important information.⁴¹

The following sections will describe how a PA can be carried out. Depending on the decision situation, the social and institutional context, simplified versions can be chosen.

First, there is a description of the decision situation. The background to the decision situation, the relationship to other decisions, interested parties, rules of the game like laws and regulations, expectations from stakeholders et cetera is explained.⁴²

After the introduction to the decision situation the problem/s perceived can be identified. An attempt will be made to clarify how the different stakeholders view the problem/s.⁴³

Three or four alternatives will be generated through co-operation with stakeholders.⁴⁴ This includes a zero-alternative. The alternatives will then be investigated from the point of view of the different stakeholders and their perceptions and images of the problem.⁴⁵

The next step is to identify systems that will be influenced, depending on which alternative that is chosen. All sectors that may be influenced, for example social systems, ecosystems, and monetary systems should be described.⁴⁶

After this there should be an identification of impacts. The monetary and the non-monetary impacts are kept separate, and the alternatives are compared with respect to impacts. Here flows as well as 'positions' (or states) are being considered.⁴⁷

Possible irreversible effects and effects that take a long time to reverse should also be attended to in non-monetary terms. These effects could influence options in the future. Possible future scenarios can be designed to analyse risks and uncertainty.⁴⁸

Then there will be an analysis of activities (agriculture, forestry, housing, recreation, water supply et cetera) and interests in relation to which alternative that is chosen. For each affected activity, an assumption is made about goal-direction. Then there will be a ranking of the options in relation to the goals. The conflicts between the different activities will be illuminated; who wins and who lose depending on which alternative that is chosen. In this way the conflicts of interest are made visible.⁴⁹

The different alternatives are then related to the different interest/activities and impacts.⁵⁰

Then the different ideas or ideological orientations, about development and progress that can be relevant to stakeholders and decision-makers, are articulated.⁵¹

⁴¹ Moberg et al, 1999

⁴² Söderbaum, 1986

⁴³ ibid

⁴⁴ Moberg et al, 1999

⁴⁵ Söderbaum, 2000

⁴⁶ Söderbaum, 1986

⁴⁷ ibid

⁴⁸ ibid

⁴⁹ ibid

⁵⁰ Söderbaum, 1986

Conditional conclusions are the last step where the impacts of each alternative are related to scenarios and possible valuational standpoints (of the decision-makers), making the ideological standpoint visible.⁵²

3.3 Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is a new approach, which is rather a process than an analysis. The method is disaggregated and can be seen as a development of the Environmental Impact Assessment (EIA) method.⁵³ Early discussions on EIA suggested that it should be applied in an earlier stage in the decision-making process. The SEA is meant to evaluate the environmental impacts of policies, plans, and programs (PPP) – as well as individual projects.⁵⁴ The purpose with this is to integrate environmental questions at an early stage in the planning process and to be helpful in formulation of policy. Therefore the method is prospective and tries to predict environmental impacts.⁵⁵ SEA aims to prevent environmental degradation by giving decision-makers better information about the consequences that development actions could have on the environment, but the method cannot, by itself, achieve that prevention.⁵⁶ SEA can involve different tools like Environmental Impact Assessment and Risk Analysis. It shall be used as a complement to other decision-making processes.⁵⁷

As part of a SEA, the goal with the plan, policy and program should be defined and then alternative PPP to reach these goals should be presented. Another important aspect in the process is to consult all the involved parties and the public. To make a description of recent and future environmental situations, a comparison between different environmental indicators is used. The indicators will be used to show the expected goal-fulfilment of different alternatives.⁵⁸

The SEA should contain effects of the plans or programs, and the effects can be indirect, cumulative, synergistic, short-, middle- and long run, permanent and occasional, positive and negative. Different scenarios are used to discuss possible future situations. It is difficult to know what the future will look like. A worst-case scenario can be included. Next step is to make an evaluation of effects and to compare different alternatives.⁵⁹

⁵¹ Moberg et al, 1999

⁵² Söderbaum, 1986

⁵³ Moberg et al, 1999

⁵⁴ Therivel et al 1995

⁵⁵ Moberg et al, 1999

⁵⁶ Therivel et al 1995

⁵⁷ Moberg et al, 1999

⁵⁸ ibid

⁵⁹ ibid

SEA should contain some steps and from the established SEA systems in existence, it is possible to suggest the following:

- *“Summary;*
- *Description of the proposed PPP and its objectivities;*
- *Description of the need for and feasibility of the PPP;*
- *Alternatives to the PPP;*
- *Description of boundaries – regional or sectoral – that form the limits of the SEA;*
- *Relation to other relevant PPPs and environmental requirements;*
- *Scooping of issues/ impacts to which the SEA is limited (including a statement ;explaining why other possible issues/ impacts are not addressed);*
- *Description of affected environment;*
- *Environmental consequences of the proposed PPP and alternatives;*
- *Impact evaluation;*
- *Proposed mitigation measures;*
- *Recommendations;*
- *List of preparers and recipient.* “⁶⁰

Depending on what the plan, policy or program is for, some of the steps above can be overlooked.⁶¹

3.4 Comparison

To compare the three methods we chose to use a couple of criteria. The criteria are democracy, aggregation, the ability to include environment/nature in the analysis, the role of the decision maker and his/her ideology, if it is suitable for a complex situation, reliability of the result, transparency, if it is established and well known, if its ambition is to solve the problem and in what stage of a decision process the method is used. We chose these parameters because we thought that they were relevant to our case study on the Morava River project.

Democracy. In this context the meaning of democracy is “//... that all stakeholders or all interested parties should be encouraged to ‘participate’ in the planning and decision process.”⁶² Cost-Benefit Analysis does not involve the community except when necessary. It is only in a situation when there are no market prices that the ones that creates the material for the decision asks all involved for their opinion and willingness to pay. That is why we do not think that CBA is compatible with democracy. Positional Analysis attempts to involve the public during the whole process and therefore is more democratic. An important corner stone in the method is that the citizens or interested parties are supposed to give their opinions and make their voices heard. Like PA the Strategic Environmental Assessment method also emphasises democracy.

Aggregation. Aggregation means that one sum is estimated for each alternative, for example in monetary terms and there is disaggregation when the different impacts are separated. CBA summarises all the effects to a monetary sum as far as possible, whereas impacts are kept separate according to PA and SEA.

⁶⁰ Therivel et al, 1995, p 72

⁶¹ Therivel et al, 1995

⁶² Söderbaum, 2000, p 78

Ability to include environment and nature. Is it possible for the method to include environmental aspects and the nature's interest? All three methods have the possibility to include environmental aspects and nature, although they do it in different ways.

The role of the decision-maker and his/her ideology. Does the result of the method depend on who works with it and who looks at the result and makes a decision out of it? Will the result be the same who ever produces the decision-making base? If the CBA is used as a method the opinions of the decision-maker will not influence the outcome, at least not in theory. The numbers that are processed are what they are, a monetary sum. The other two methods are more dependent on the decision-makers opinion about different questions and in relation to different situations. For example, if a person is more interested in an industry's well being than the nature and environment that is going to be affected, the decision will differ from a situation where the environment is the main priority.

In a complex situation. Are the methods well suited for complex situations? We think that all the methods are. But as a comment to the CBA, this method probably will be more complicated to use when the situation is complex, and it is hard to translate every effect into a monetary sum. The two other methods can also be difficult to use, but for them the complication is that the result of the work can be evaluated differently depending on who does the evaluation. But the methods are created to fit complex situations.

Reliance on the result. How much reliance can be put on the result? We think that CBA is unreliable in this sense because one monetary sum can hardly show all the aspects of a decision-making situation. The other methods show different effects and impacts in relation to different values, the idea being that the decision-maker then can draw his own conclusions.

Transparency. A high degree of transparency of a method means that the method shows everything openly, how the results have been reached, all the involved party's opinions et cetera. Once again the CBA does not do well in terms of transparency because of the aggregation to one monetary sum. The exact numbers that have been used may be shown, but from where those numbers emanate is not so clear. This is the reason why we do not think that the CBA is acceptable from the point of view of transparency. And once again we think that the two other methods are preferable.

Established / Well known. How well known and established is the method? CBA is a well-known, established and accepted tool. PA has been used in some cases, but is much less known and used than for example CBA. SEA has now become a more common tool, but is relatively new, and therefore has not been used much yet. On the other hand, the SEA is relative well known because it is a development of the EIA, which in turn is established and accepted.

Ambition to solve the problem. What is the ambition with the method? The CBA's ambition is to optimise and find the best solution. Both the SEA and PA doesn't have that ambition. They only strive to illuminate the decision situation through presenting conditional conclusions. Then the decision is up to the decision-maker and not to the researcher.

Early stage in the decision-making process. When is the method implemented in the decision-making process? The CBA is, or at least have the ambition of being done before the start of a project. This is also true for PA. The SEA is supposed to be used at an even earlier stage. The method is supposed to be involved from the very beginning when making policies, plans and programs.

Table 1. Comparison between the different methods CBA, PA and SEA

Different aspects of comparison	CBA	PA	SEA
Democracy	No	Yes	Yes
Aggregation	Yes	No	No
Ability to include environment and nature	Yes	Yes	Yes
The role of the decision-maker and his/her ideology	No	Yes	Yes
In a complex decision situation	Yes	Yes	Yes
Reliance on the result	No	Yes	Yes
Transparency	No	Yes	Yes
Established and well-known tool	Yes	No	No
Ambition to solve the problem	Yes	No	No
Early stage in the decision-making process	Yes	Yes	Yes

All the methods have their advantages and their disadvantages. All the methods described above are built on assumptions. Assumptions in themselves imply uncertainty, so no one of these methods can present a result that is 100 % true or certain. Other criticisms that can be raised about all three methods is that the reality and the ambition of the method do not always match.

PA and SEA are similar; they are both disaggregated and want to illuminate an issue more than creating a number. There are some differences however, connected with how the methods are applied and there are also some details in the methods that make them differ from each other.

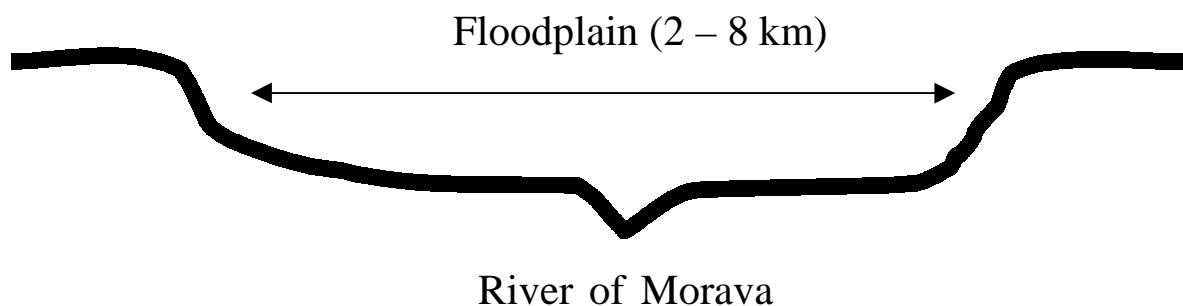
4. Flooding

Floods can simply be described as too much water in the wrong place. During the last few years the number of floods have increased. We are going to try to explain why this change has occurred and what the consequences are.

4.1 The Floodplain

The floodplain of a river represents that area across which the river escapes during floods. Terraces set the floodplains natural limits. When the lands begin to rise it obstruct the floods to spread further. The floodplain is suitable for human settlement, agriculture and communications.⁶³

Figure 1. Illustration of the floodplain



4.2 Why Do Floods Occur?

Flooding is a natural phenomenon. Natural floods are often related to the *variations in climate* during the year, for example snow melting and rain seasons.

The *greenhouse effect* is a natural phenomenon, without which there would not be life on earth. The problem is that humans add their discharge of greenhouse gases and these tend to accelerate the global warming process.⁶⁴ When the temperature in the atmosphere raises, the evaporation from the seas and oceans increases. At the same time, the warmer atmosphere can carry more moisture. One of the consequences is more and heavier rainfall, which in turn can lead to additional floods. The connection between the increased number of floods and the greenhouse effect is however not proved. These floods and rainfalls can also be seen as natural variations in the climate.⁶⁵ A prognosis has been made and it says that there is going to be more precipitation as snow and this will give larger water-volumes in spring, which in turn increase the risk of flooding.⁶⁶

Deforestation is another contributing factor to floods. The trees are cut down to give space for agriculture, communities and to be used for fuel. When the roots of the trees, that earlier held the

⁶³ Newson, 1992

⁶⁴ Lestienne and Péricard-Méa, 1997

⁶⁵ Greenpeace, 2000

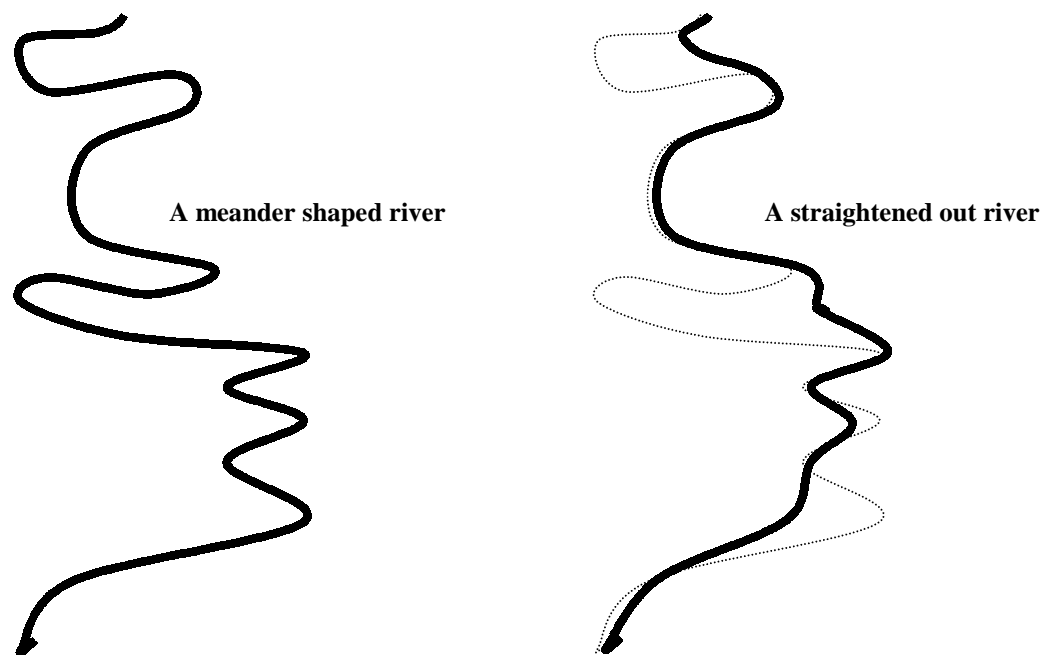
⁶⁶ Seminar, 2000

soil together, disappears, the 'sponge function' of the soil decreases.⁶⁷ The soil gets more sensitive towards drought and huge quantities of water. When the ground is flooded the water pressure leads to soil erosion.⁶⁸ It is not only the roots of the tree that protects the topsoil, but also its crown that moderates the rainfall. Leafs and the top layer of the soil also prevents erosion.⁶⁹ When the *communities* are built the ground is getting 'hard' by asphalt. The larger areas that are made hard, in this sense, the less water the earth can absorb⁷⁰.

Humans sometimes believe that they can prevent floods by *building dams*. In the short run dams can prevent floods, but the capacity of dams are decreasing the more water that passes through them. The reason for this is that the stream of water contains particles that settle as sediments in the dams.⁷¹ There will also be a bigger risk for extreme floods if the dams would burst.

Another human activity that can contribute to floods is changing and *straightening* of a river. A straight path for a river makes the flow faster and more violent. Natural rivers are often meander shaped.⁷²

Figure 2. Meander shaped river compared to a straightened out river.



A shortening of the river changes the sedimentation capacity of the river and also the functions of the river. By losing the sedimentation capacity the area might lose eroded, fertile soil to

⁶⁷ Carlson, 1993

⁶⁸ Rapp et.al, 1997

⁶⁹ Wijkman, 1985

⁷⁰ Baltscheffsky, 1995

⁷¹ Oja, 1998

⁷² Baltscheffsky, 1995

other areas down stream. The self-cleaning function gets affected and this might give negative impacts on water quality.⁷³

The kind of practical political system in the area is also of importance. Here countries that were/are led by communists can be mentioned. The politics of communism is mostly guided by the goal to increase growth of the national economy.⁷⁴ For example Mao Zedong ruled China into an insecure situation with his communism. He encouraged people to get more children, to deforest in favour of agriculture and fuel for industry. People settled furthermore close to the rivers where soils were especially fertile. All these political decisions influenced the damages from floods in a negative way. The floods were harmless before, but now risk being catastrophic.⁷⁵

All the mentioned causes are reinforcing each other, which makes it more difficult to avoid and protect oneself against floods. When humans do different things that enhance the natural floods these get bigger and cause more damage. The main part of the responsibility can therefore be put on humans.

4.3 Impacts

Floods generate a lot of effects, on nature, humans and communities, which can be both positive and negative, in the long and in the short run. Direct losses after a flood can include loss of health or lives and destruction of property and crops. Limitation or breakdowns of human activities during floods are seen as indirect losses.⁷⁶

At flooding, the earth gets saturated with water. In a flood situation the flora can be stressed and this in turn makes the flora more sensitive to other attacks. When the water does not experience any currents, there will be lack of oxygen in the soil, which can lead to drowning of plants.⁷⁷ When the flood has retreated, the water may have contaminated the soil. The water could have brought poisonous material from for example waste deposits or factories.⁷⁸

The consequences in society are often getting comprehensive. Roads, bridges and houses can be destroyed; the phones, electric systems and outlet systems can be eliminated. Industries may be forced to stop their production. The monetary consequences of floods are thereby very costly.⁷⁹ Even if the monetary aspect is important, it often cannot be compared with the suffering of humans. The water takes away and destroys the homes of families, and maybe even lives.⁸⁰

In spite of considerable suffering of humans, a flood can also have positive impacts. The rebuilding of the community gives job opportunities for the people in the area. Buildings and factories are given a chance of improvement. Dirty industries can improve their production to be

⁷³ Stírba, 2000-03-27

⁷⁴ Beckmann, 2000

⁷⁵ Oja, 1998

⁷⁶ Economic Commission for Europe, 1976

⁷⁷ <http://willow.ncfes.umn.edu/Flood/toler.htm>

⁷⁸ Baltscheffsky, 1995

⁷⁹ Klíma, 1997

⁸⁰ Oja, 1998

more environmentally healthy and so on. A catastrophe can also make humans think of what is important in life.⁸¹

4.4 How to Prevent Flooding

To prevent or make the impact as limited as possible, there are different ways of acting. One alternative is planting forest and/or creating meadows on the floodplain. If this is done, the soil can easier absorb a larger volume of water and also prevent soil from eroding.

Another option is to recreate rivers to their natural meander flow. Then the water will have a slower flow and will not destroy the riversides and take away the fertile soil at the riverside. The river capacity increases and can hold a larger amount of water. Even if the relation between the global warming and floods is not proved, the gases that contribute to the greenhouse effect can be reduced. This can perhaps lead to lesser rainfall and decrease the possibility of floods. The most important object is for the governments to understand the implications of their policies and make the right decisions when trying to influence development.

⁸¹ Beckmann, 2000

5. Case Study of Morava River Basin

Morava River is flowing through the east of the Czech Republic. The length of the river in the country is 270 km⁸². The location of the country in the upper parts of the river basins contributes to a lot of floods. Around the area are also a lot of mountains. Winter flood-flows, of short duration (from a few hours to a few days) are predominant. There are also summer rainfall floods that are usually lower than the winter ones.⁸³ The floodplain of the Morava River is varying from 2 till 8 kilometres broad.

Picture 1. Map over Czech Republic



Source: www.nato.int, 2001-01-13

5.1 The Great Flood

During the summer of 1997 the Morava River in the east of Czech Republic got flooded. It rained for three days in the northern mountains of Mähren; the precipitation during these three days was more than the usual yearly precipitation.⁸⁴ 40% of the Czech Republic was flooded during this period⁸⁵. It was the greatest flood in 1 000 years.⁸⁶ The main cause of the flood was the rains. It had not been raining for a long period of time, so when the heavy rain fell on the dry

⁸² Stírba, 2000-03-27

⁸³ Economic Commission for Europe, 1976

⁸⁴ Klíma, 1997

⁸⁵ Tempus, 1997

⁸⁶ Stírba, 2000-03-27

soil it could not handle the large amount of water. Ten minutes after the rain, the filtration got bad, and when the rain kept on falling the capacity to absorb water was decreasing.⁸⁷

With these conditions there was not much that could prevent a disaster in July 1997. 4 000 km² of vegetation close to the water was destroyed. In Mähren about 100 000 ha of arable land and almost 500 communities were affected. 46 people died. Houses, bridges, dams and roads were destroyed. Some houses were built of unburned brick, which dissolved in the large volumes of water⁸⁸. The water got undrinkable, the telephone, the electricity, the sewage and gas systems ceased to work. Even the garbage pick up stopped. Many of the companies in the area were forced to shut down their business for a week.⁸⁹ A biological disaster occurred when a big wave hit an oil-recycling factory where 500 tons of used oil leaked and polluted the water and nearby area. There was no one who knew what the oil contained, where it would end up or the exact impacts of the discharge. What they knew were, that it was going to be a disaster.⁹⁰

The damages caused by the flood are difficult to evaluate in monetary terms. A rough estimate was done, where the losses quoted approximated 100 million Czech crowns (100SEK = 383CZK, 2001-01-12⁹¹). An even harder task is to put a price on the human suffering that the huge amount of water left behind. Some of the people affected received an aid from the government of 30 000 Czech crowns per capita, but the losses cannot be limited to that sum.⁹²

Many of the losses and damages caused by the flood could have been prevented if the communication between the different rescue teams had worked. There were very little professional knowledge and no one who could organise the rescues properly. Critics have also been expressed about how the authorities acted upon the first reports on the flood. Many residents did not know that a flood threatened them until the water came knocking at their doors.⁹³

5.2 History of Morava Region

There were several causes of the big flood in the Morava River 1997. Before the great flood there had been a lot of smaller ones⁹⁴. About thousand years ago, humans began to influence the Morava River. Forests surrounding the river were cut down to make way for arable land.⁹⁵ The soil in the Czech Republic is especially fertile, which has made it an agricultural country.

After the Second World War the communists came into power in Czechoslovakia.⁹⁶ Around 1953 started a period of major changes of the Morava River. The forests and meadows surrounding the river were replaced by increasing arable land.⁹⁷ The politics of communism made the methods of agriculture even worse in an effort to make the country richer. These methods involved the use of heavy machines and monoculture which were combined with a

⁸⁷ Seminar, 2000

⁸⁸ Sweeney, 2000-03-28

⁸⁹ Klíma, 1997

⁹⁰ www.rec.org/REC/Bulletin/Bull72/Odra.html, 2000

⁹¹ www.forex.se, 2001

⁹² Klíma, 1997

⁹³ Tempus, 1997

⁹⁴ Beckmann, 2000

⁹⁵ www.webnet.sk/kam/chodnik/tabula13/index.en.html, 2000

⁹⁶ Utrikespolitiska Institutet, 1996

⁹⁷ Stírba, 2000-03-27

large usage of chemicals. The pressure on the soil increased, which was fast getting exhausted. Forests in the surrounding mountains have been cut down. When trees are cut down, some important ecological functions are lost and the land became more sensitive to floods⁹⁸. The mountains get more sensitive; when snow melts and rain falls there is nothing that has the capability to stop the water to reach the river and flood it.

Channels, dams and oxbows have been built in the river to straighten the river; the result is a loss of meanders. This in turn has contributed to a loss in biological diversity and a faster stream in the river. The risk of flooding increased when the storage capacity of the river decreased.⁹⁹

5.3 The Situation Today

The present river management in the Czech Republic is influenced by the way agriculture has been managed and the tradition of settlement in the area.¹⁰⁰

Today about 90% of the Morava River is regulated. Along the river 36 dams have been built. This has led to the disappearance of the salmon that used to live and mate in the river, since it cannot travel naturally.¹⁰¹

Today there are often natural floods. The arable fields are covered with water from time to time and this could be a sign indicating that the land is more suitable for something else than agriculture. Also the roads between the villages are often flooded.¹⁰² The climate in the area includes wet springs after the snow melting and this gives a lot of water and floods.¹⁰³

The farmers on the floodplain have grains like sugar beets, winter wheat, wheat, rye and corn. The soil is very fertile so it might be difficult to create meadows of it, since it is probable that the farmers will object.¹⁰⁴

Some work has been done to restore the rivers natural course. This has begun by opening up closed meanders¹⁰⁵. Some areas with meadows and forest have also been protected outside and around Olomouc to preserve the area as much as possible. To keep the protected area intact, a forest management plan has been produced.¹⁰⁶

The disastrous flood in 1997 involved an awakening. Authorities began to understand that new measures had to be taken and that new strategies for land use were needed.¹⁰⁷ After this a large SEA-project has been initiated to prevent similar disasters in the future. Attempts are made to map the causes and to suggest measures. The authorities co-operate with companies and other organisations to create good solutions. During the first SEA-meeting in Olomouc they said that they do not want to see any new floods, and that they are waiting for solutions. But it is hard to find solutions in a complex situation like this. Opinions differ a lot. One of the issues with the

⁹⁸ Sweeney, 2000-03-27

⁹⁹ Stírba, 2000-03-28

¹⁰⁰ Newson, 1992

¹⁰¹ Stírba, 2000-03-27

¹⁰² Own observations

¹⁰³ Economic Commission for Europe, 1976

¹⁰⁴ Sweeny, 2000-03-27

¹⁰⁵ Csagoly, 2000

¹⁰⁶ Sarapatka, 2000-03-28

¹⁰⁷ Beckmann, 2000

co-operation is to implement new standards. The key issue is the communication in the community. They want to learn how to communicate with the community so everybody's opinion may be heard.¹⁰⁸

The phenomena of flood-protection functions are new for the actors involved and they do not really know how to act. There are some difficulties in co-operating for flood prevention and reforestation and creating meadows for example.¹⁰⁹ Villages have taken their own measures to prevent future floods; for example they have dug dykes and built walls surrounding the villages.¹¹⁰

Growing economic and social demands in Czech Republic have resulted in increased exploitation of floodplains for agricultural purposes. The investment is considered profitable if flood protection is provided for valuable croplands, and for land used for transportation networks or industrial plants. Flood forecasts to a great extent eliminate casualties or losses in crops etc.¹¹¹

¹⁰⁸ Seminar, 2000

¹⁰⁹ Beckmann, 2000

¹¹⁰ Sweeney, 2000-03-27

¹¹¹ Economic Commission for Europe, 1976

6. Positional Analysis on the Morava River project

In the following chapter we attempt to apply Positional Analysis to the Morava River project in the Czech Republic. The analysis will not be a complete one, but will show how the method can be used to illuminate a complex decision situation.

6.1 Description of the Decision Situation

To know what the decision situation is all about, it is useful to describe what circumstances that have led to the present situation. It is also fruitful to identify stakeholders and their expectations, laws and regulations and if there are any relations to other decisions.¹¹²

The Morava River project is about preparing a decision on flood prevention in the Morava Region. The question is how to do this and what the best solution is. Interested parties in this project are governments on the national, regional and local level, the farmers in the region, the industry, residents in and around Olomouc, forest owners, recreational people, and Palacky University.

6.2 Identification of Interest Conflicts

An important initial step is to identify the problems perceived by listening to the different opinions that the interested parties hold. Since we have not had any chance to make interviews, we have speculated ourselves about the different opinions of stakeholders.

The overall problem is how the region is supposed to prevent new great floods comparable to the one of 1997. All the interested parties agree that something has to be done, but the conflict is about how to do it. They all just seem to be interested in the solution that is best for them.

Farmers want to have their arable land where the soil is most fertile. The most nutrient soil is located at the floodplain. They want to be able to continue their business as before, with as short interruptions as possible.

The industries have different opinions depending on what kind of industry it is. Most industries probably want to prevent floods to avoid losing money. What kind of solution that is chosen is not the issue, just that the problems with floods are solved.

Citizens/ residents are most concerned about the probability of floods. Their priority is to live in safety and knowing that their lives are not in danger by floods.

Forest owners want to keep the forest they already own and to have the possibility to earn more money through logging activities and selling timber.

Recreational people want to have access to beautiful nature to visit for recreational purposes.

¹¹² Söderbaum, 1993

Palacky University, actors connected to the university have the knowledge and a personal interest in solving the problem in an ecological way.

6.3 Alternatives

In the Morava River Project, the generation of alternatives had already been done when we got to know about the project. It seems as different interests have been met, when looking at the alternatives. There is one 'technical' solution and one more 'ecological'. This is of course a simplification; there are in fact innumerable alternatives for solving the problem, but we cannot account for them all, so we chose these three.

Zero-alternative, (A_0), Business as usual.

Alternative T, (A_T), Technocratic solutions, building dams and locks.

Alternative E, (A_E), Ecological solution, create meadows and reforest the floodplain.

6.3.1 Zero Alternative, A_0

The zero-alternative is to continue the same activities as before and not to change anything at all. In this case the river would look like today. The arable land would still be on the floodplain. The forests and meadows that exist should still be there. The conclusion is that the risk for flooding will continue to be considerable.

6.3.2 Alternative Technocratic, A_T

The first alternative is a technocratic solution including building dams and locks to prevent floods. At the same time as the dams will prevent floods they can be used for producing energy like electricity. This method might work out well if the dam will not rupture, because in that case an even bigger catastrophe will follow.

If a dam is built some impacts will arise. The first impact is that the natural pattern of the river flow is changed. A large area will be set under water where the dam is placed. This destroys that land. The storage itself is also vulnerable for sedimentation in still standing water conditions. If the sedimentation is poisonous the water will also be contaminated. Dams also give changes in erosion and deposition downstream of dams.¹¹³

6.3.3 Alternative Ecological, A_E

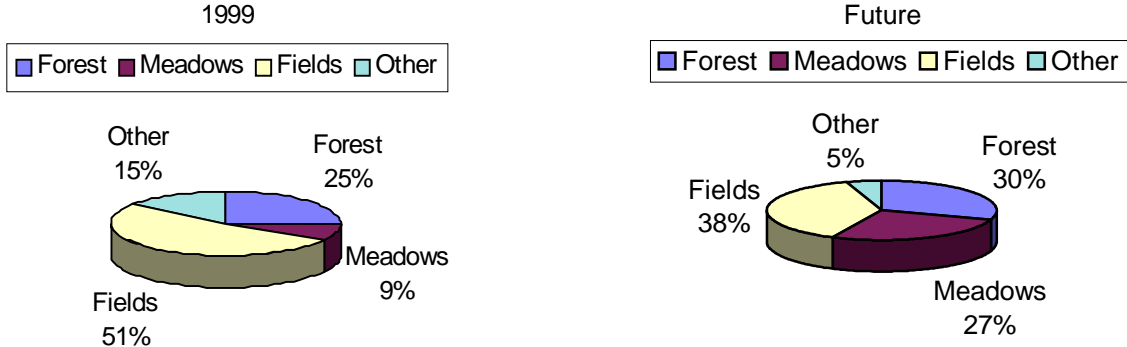
The second alternative is the ecological solution. People at the Palacky University in Olomouc have designed this alternative; they want to replace some of the arable land on the floodplain with meadows and forests. The proposal is to make 12 000 ha meadows and 3 000 ha forest.¹¹⁴ A lot of the land will be turned into meadows and some arable land will be turned into forests. Here a conflict arises because it is the most fertile land for agriculture and the farmers will not like the

¹¹³ Newson, 1992

¹¹⁴ Stírba, 2000-03-27

idea of being forced to move their business elsewhere.¹¹⁵ Some of the arable land will be relocated outside the floodplain. The original flow of the river must be reconstructed. Fish ladders at existing locks must be built for fishes like salmon. The most important feature of this alternative is the focus on the quality of land and water.

Diagram 1. Comparison between landuse 1999 and if alternative E is chosen



Source: Our own interpretation, Sarapatka, 2000-09-06

According to Professor Stírba, the Morava River today is in the best condition where there are forests. The forest has a cleaning effect on the river, and thereby the quality of the river is better when there is forest near the river.¹

With this alternative they want to direct floods to forests on the floodplain instead of the arable land. When arable land gets flooded, the erosion of good, nutrient soil is large. This accumulates as sedimentation. As it is today a lot of the fertile soil that erodes is lost to areas downstream the Czech Republic. One purpose with this alternative is to make the nutrient soil sediment to stay in the Czech Republic instead of flowing with the river out of the country.

6.4 Identification of Affected Systems

Whatever alternative is chosen, different kinds of systems in society and in nature will be influenced. To know how the systems will be affected they first need to be identified. The systems will be influenced differently depending on what alternative that is chosen. To better understand this, it is necessary to explain what a system is. A system can be seen as a whole that consists of several parts that influence each other mutually and depend on each other.¹ The systems that will be influenced, depending on alternative chosen regarding the Morava River are the ones listed below. All the identified systems can in turn be subdivided into smaller parts.

¹¹⁵ Sweeney, 2000-03-27

S 1 Water ecosystem – the river and its channels and oxbows, surrounding lakes on the floodplain, its quality and also the flora and fauna in the water.

S 2 Land ecosystem – includes ecological aspects, arable land system and forestry system. Aspects are the quality of the soil and the flora and fauna on the floodplain, all the agricultural land on the floodplain and the forest that is used in the timber industry.

S 3 Recreational system – protected nature areas and recreational organisations.

S 4 Cultural system – old buildings and historical artefacts.

S 5 Social system – humans being influenced in one-way or the other, i.e. health, income and life standard.

S 6 Industrial system – the industries in the area that will be affected by having to move or by loss in income.

S 7 Labour market system – job opportunities.

S 8 Housing / building system – houses and buildings that are located on or near the floodplain might have to be removed or can be destroyed.

S 9 Infrastructure system – roads, railways, sewage system, telephones, electricity and other technical systems can be affected.

S 10 Monetary system - the monetary costs and revenues of different parties affected.

The effects on these systems have different spatial extensions. The levels chosen are local, regional and national. The part of the floodplain surrounding Olomouc, is here referred to as local, the regional level refers to the whole Morava River system, also called Mähren, and the national level is the Czech Republic.

Table 2. Spatial extension of effects on systems

System		Local	Regional	National
S 1	Water ecosystem	X	X	
S 2	Land ecosystem	X	X	X
S 3	Recreational system	X	X	X?
S 4	Cultural system	X	X	
S 5	Social system	X	X	X
S 6	Industrial system	X	X	X
S 7	Labour market system	X	X	X
S 8	Housing / building system	X	X	
S 9	Infrastructure system	X	X	
S 10	Monetary system	X	X	X

6.5 Identification of Impacts

In this part the alternatives and their different impacts will be related to the identified systems. The effects can be divided into ecological, social and economic. The alternatives are no policy changes at all (A_0), a technocratic solution with building of dams and locks (A_T) and an ecological solution including reforestation and creating meadows on the floodplain (A_E). A summarising table will present the relation between these effects and the alternatives (Table 3, p. 39). This valuation is based on our own assumptions, and that is why the result should not be taken as the truth.

When identifying all the systems and the kind of effects connected with them, a comparison between the different alternatives is needed. The comparison is done to see which one is the best. We use the signs -, + and 0 to indicate if the effects are negative, positive or there will be no significant change, in relation to A_0 .

6.5.1 Ecological Effects

The definition of ecological effects is “...changes in the biological life supporting systems.”¹¹⁶. We have identified the systems where ecological impacts can be expected:

S 1 Water ecosystem	A_0	A_T	A_E
Quality	0	-	+
Sedimentation	0	-	+
Fauna	0	-	+
Flora	0	-	+

Quality: If the quality of the water is changed it can lead to positive and negative ecological effects. For instance, if the flow of the river slows down, the supply of oxygen decreases. The reverse is true if the path of the river is restored to its natural flow.

If A_0 , there can be negative effects on the water quality, flora and fauna, when there are big floods, as the one in 1997.

If A_T , the quality of the water might decrease since the water in a dam is standing still, i.e. less circulation of oxygen and nutrients. This goes for both the dam, where the water usually stands still, and down stream, where the flow of water will be less and more irregular.

If A_E , the water-quality can improve. If the river is allowed to flow in a natural way the supply of oxygen and nutrients can increase. Forest and meadows on the floodplain can also increase the amount of nutrients in the water and help cleaning it. On the other hand too much nutrients may lead to overfertilization.

¹¹⁶ Forsberg, 1996

Sedimentation: Slower water-flow in the river causes sedimentation of particles. The river gets shallower and the water might find other paths to go. The possibility of floods may also increase.

If A_0 , there will be little sedimentation as in the present situation, because of the fast flow of the river. Nutrients will be lost to other areas.

If A_T , there will be sedimentation in the dams, due to the non-flow of the water. In the long run this decreases the dam's capacity and can cause big floods if the dam ruptures.

If A_E , there will be 'normal' sedimentation in the river. This will be caused by slower flow of the river when it is restored to its natural meander shaped form. It will also lead to containing the nutrients in the soil in the area.

Fauna: Due to changes in the water flow, animals living in the river may not be able to adjust to the new circumstances and die. If the water is poisonous there will be extremely bad effects for the fauna, it can lead to defects or extinction.

If A_0 , the fauna can be affected both positively and negatively depending on the water quality.

If A_T , the animals living in the river that demand/need streaming water will be negatively affected by a dam and have to give place to animals that are more suited to live in water that stands still. A quite new ecosystem will arise.

If A_E , with a natural flow, the river animals' natural habitat will be secured. Some animals that have not been able to live in the now fast flowing river can return. The biodiversity will most likely increase.

Flora: The flora in the water reacts in a similar way to the fauna.

If A_0 , the water living flora will be negatively affected especially if the flooding water is of bad quality.

If A_T , oxygen demanding flora in the river / dam will die.

If A_E , at a normal state see above under Water ecosystem; Quality. The biodiversity will increase.

S 2 Land ecosystem	A_0	A_T	A_E
Quality	0	-+	+
Fauna	0	-0	-+
Flora	0	-0	+
Erosion	0	-	+
Arable land	0	-+	-+

Quality: The quality of the soil can be affected both positively and negatively in ecological ways (see above on Water ecosystem; Quality).

If A_0 , the effect on the soil can be both positive and negative depending on water quality and the severity of the flood. The water can be poisonous which in turn can harm the soil and affect its fertility. The soils can also be 'water sick' if the area is flooded during a long time. This can affect the soil's water holding capacity in a negative way.

If A_T , in some places it can have positive effects if floods can be prevented. The effects for the land that are put under water for dams are negative. The land put under water will be lost and will not be able to be restored in the future.

If A_2 , the land on the floodplain will be more natural. The soils water holding capacity increase when there are meadows and trees on the floodplain. This means that the roots of the plant can suck up the abundance of water during a flood. The soil's cleaning ability will increase.

Fauna: The fauna on land surrounding the river can be affected. The fauna might be cut off from its natural habitat and have to move. The competition with other species about food and space increases and will have impacts on all animals. If A_0 , animals might have to move from their natural habitat when the floodplain floods.

If A_T , animals that live in the area where dams are built have to move to other places. This is negative if they have to compete with other animals for space and food.

If A_E , the animals that have their natural habitat near arable land can be negatively influenced and have to move since most of the arable land has to be moved from the floodplain. When creating meadows and reforesting the floodplain the biodiversity is likely to increase.

Flora: The flora's natural environment may change and this can lead to extinction. The circumstances may also be better and increase the living conditions of the flora.

If A_0 , the flora on the floodplain can be affected both positively and negatively depending on the water quality. It will also depend on how much water a flood contains and how long the area is flooded. If the water is of good quality, and the flooded area does not lie under water for too long, it can bring positive effects for the flora by bringing nutrient water to the plants. If the water is poisonous, or in any way not useful to plants, and the area is under water for a long time, it is very likely that the plants will die, either of drowning or by destroyed life supporting systems.

If A_T , the largest effects are at the dam area. The entire flora at the site of the dam will be destroyed. Flora downstream from the dam can be negatively influenced, due to less water in the river.

If A_E , the flora will not be under such stress either during a flood or at normal state. The cause is that the meadows and forests have a large capacity to hold large amounts of water that in turn will mitigate the effects of a flood. The biological diversity of flora will probably increase when creating meadows and replant forest.

Erosion: The erosion around the river might get better or worse.

If A_0 , the erosion of soil will continue and drain it on nutrients. The risk of flooding increases since there will be nothing that holds the soil in place if a huge rain falls. The loose soil will then go straight into the river and be washed away. The soil's water holding capacity decreases and also the fertility of the soil.

If A_T , erosion will occur at the sides of the dam and also after the waterfall. Downstream some erosion can occur when the water in a dam is released.

If A_E , trees and other plants will hold on to the soil and prevent erosion. Some natural erosion may occur.

Arable land: If the arable land will change it can give positive or negative ecological effects depending on where the new arable land will be located and how it is done.

If A_0 , no arable land has to be moved.

If A_T , the only arable land that has to be moved is the one located where the dam

is going to be built. The ecological effects may occur at the new location. Some valuable piece of land might have to be sacrificed to keep the agriculture in the area alive.

If A_E , almost all the arable land located on the floodplain have to be moved outside the area to give place for meadows and forest. Since most of the floodplain consists of arable land a considerable area outside the floodplain have to be turned into arable land. This can have large ecological effects if the land chosen as the new site is valuable from an ecological point of view.

6.5.2 Social Effects

Our definition of social effects is the effects that affect individuals or the community as a whole in different ways, such as health, inconvenience due to forcing to move, decreased water quality, loss of recreational space, and interruption in the social network.

S 3 Recreational system	A_0	A_T	A_E
Protected nature areas	0	-	+

Protected nature areas: These areas help to protect nature and the biological diversity can increase. This in turn leads to more space for recreation. If nature is created or taken away it has different social effects.

If A_0 , there are some areas that are protected and these will still be there. It is only during a flood that the areas will be unavailable.

If A_T , the land that is taken away for construction of a dam will not be accessible for people any more. If the area were valuable to a group of people or organisation for social purposes, this can have negative social effects on them. If some of these parks or part of them are in the area where a dam is being planned, they will be severely affected. People enjoying nature will lose nature to visit.

If A_E , the area might be more attractive when meadows are created and more forest is planted. This can have impacts on the willingness of people to stay outdoors more, to enjoy nature and meet other people that do. Creation of meadows and forest increase the available recreation possibilities.

S 4 Cultural system	A_0	A_T	A_E
Old buildings	0	+	+
Historical artifacts	0	+	+

Old buildings and historical artefacts: has a social value for the people in the area. These buildings and artefacts are part of the population's history. And if it gets destroyed it can give negative effects.

If A_0 , as long as the area will not be struck by a flood, there will not be any impacts at all.

If A_T , the old buildings and historical artefacts located in the area where the dam is supposed to be can be destroyed. They can be moved, but then they will be taken out of their context. Downstream artefacts and buildings can be destroyed if the dam bursts.

If A_E , it can be assumed that since the purpose of this alternative is to recreate nature and ecology as it once were, this can also include an historical aspect related to old buildings and artefacts. This means that they will be protected as far as possible.

S 5 Social system	A_0	A_T	A_E
Health	0	0	+0
Displacement of population	0	-	-
Farmers	0	-+	-
Forest owners	0	-	+

Health: Social effects of health can be that people's physical health can be affected if the water quality decreases and diseases are spread. They can also be upset, because they are forced to move.

If A_0 , people's health can be affected negatively if they are struck by a flood that decreases the quality of the water and contaminate it so that it spreads diseases.

If A_T , people will be forced to move if they live in the area planned for the dam and this might be upsetting and influence their health. If a big flood bursts the dam it is very likely that the water quality will decrease.

If A_E , some might have to move from the floodplain. This might cause psychological stress for those involved.

Displacement of population: People may have to move from their houses if the latter get destroyed. Their social network may get disturbed.

If A_0 , unless a flood force them to move, no changes will occur.

If A_T , the people that have to move are the ones living in the area where the dam is planned. This might force people to move to places where they are not familiar with the neighbourhood or the people. This can negatively influence their social lives.

If A_E , some of the population might have to move from the floodplain disturbing their social network.

Farmers and forest owners: They have to move their business elsewhere and this might disturb their social life. Farmers and forest owners might also be forced to give up their occupation if they cannot find new land to cultivate. They might also lose the social network that they have created with farmers and neighbours in the area.

If A_0 , no land has to be relocated and therefore no social effects are identified.

If A_T , some farmers and forest owner might have to move their business or give it up all together if it is located on the planned dam area. If they have to give it up they might find it hard to adjust to the new situation and finding a new occupation.

If A_E , most of the farmers will be negatively influenced by having to move from the floodplain. The forest owners on the other hand are positively affected since more trees are being planted.

6.5.3 Economical Effects

Impacts that have an economical effect are those who impose costs or benefits on individuals, the community or the government.

S 6 Industrial system	A₀	A_T	A_E
Relocation of industries	0	-+	-+
Loss of income	0	-+	-+

Relocation of industry: If an industry has to be relocated, it will be expensive to move it. The government probably has to give the industry some kind of compensation since it is their decision.

If A_0 , there will be no costs for the government since no industry has to be relocated. The costs that will occur is for the industry if a flood strikes and they themselves decide to move their business.

If A_T , some compensation has to be paid to the industries that are located in the planned dam area and are forced to move. There will probably be some costs for the industry itself too. A big cost can occur if the dam bursts. Then the industries probably are totally destroyed and have to be built up again. The government might have to pay damages. Positive effects are possible if floods are prevented, then the industries will not experience any damages at all.

If A_E , some of the industries that are located on the floodplain might have to be relocated. The government will have to give the industries compensation. But in the long run both the government and the industries will gain since future floods can probably be prevented.

Loss of income: If the production has to be shut down during the move or while the industry stands still, then there will be economical effects. Effects can also occur if the area is flooded. This also is a fact for the farmers and forest owners.

If A_0 , loss of income for all kinds of industries can occur if it suffer damages from a flood. Otherwise there will not be any effects.

If A_T , the industries that have to be relocated might have to shut down production while being moved, which means a lot of loss in income. It is also possible that the industries can continue production during the move and then the loss will not be that great. The biggest loss in income occurs if the dam is ruptured and the industries downstream are damaged or destroyed.

If A_E , see above under A_1 . The risk of floods is decreased so in the long run the industries might not be interrupted in their production and will not loose any income.

S 7 Labour market system	A₀	A_T	A_E
Job opportunities	0	+	+

Job opportunities: Can have both positive and negative effects from the economical point of view.

If A_0 , after a flood there will probably be a lot to repair, which lead to job opportunities, but this is most likely not to be exceeding the normal state of living and working.

If A_T , building a dam will give a lot of people jobs and some of them might stay on site to manage the dam after it is finished. This is a good thing for the economy of the community.

If A_E , creating meadows and reforest the floodplain will generate some jobs. It is also likely that a couple of jobs will last longer than just during the construction period.

S 8 Housing / building system	A_0	A_T	A_E
Relocation of houses and buildings	0	-	-

Relocation of houses / buildings: To build new houses or to relocate houses for those who have to move will be quite costly for society and the government.

If A_0 , no houses or buildings have to be relocated so this will not put any extra costs on the government as long as there are no big floods.

If A_T , buildings and houses located on the site of the dam have to be moved. The more people that have to move, the higher the costs will be.

If A_E , the government will have to compensate the ones that have to move from the floodplain, and as above, the more houses / buildings that have to be relocated the higher the costs.

S 9 Infrastructure system	A_0	A_T	A_E
Roads and railways	0	+	+
Sewage	0	+	+
Telephone and electricity	0	+	+

Roads and railways: If there is a need to build new roads and railways or repair the old ones it will probably cost a lot of money.

If A_0 , no changes are necessary, unless roads and railways are damaged by a flood and those kinds of repairs might be expensive.

If A_T , new roads and railways might have to be built instead of the ones located in the area where the dam is planned. Of course it is costly to build new roads and railways, although further costs can be avoided as long as the dam does not burst.

If A_E , the roads and the railways on the floodplain might have to be replaced and located outside the floodplain. The new roads and railways will most likely last long if meadows and forest are preventing floods.

Sewage: The sewage system can be damaged when hit by a flood. Contaminated water can escape and give negative effects on land and water. When damaged, the system need to be repaired, which means intrusion in the ground. Some sewage systems might need to be moved or repaired (see above under Roads and railways).

If A_0 , no effects will occur if there are no big floods. But if a flood strikes the sewage system it might have to be repaired or replaced, which will cost some money. If the sewage contain some hazardous substances there might be costs related to sanitation of land and water.

If A_T , the system will probably be protected by the dam unless it is ruptured, then the system might be destroyed and this can affect the whole area. The cost for such a disaster may be large.

If A_E , it is likely that the sewage system will be quite intact and not suffer any large damages and this means low costs or no costs at all.

Telephone and electricity: If the telephone and the electricity net is affected it can give economical effects such as for repairs and / or replacement of the system.

If A_0 , the net is most likely to be affected if a flood strikes the area, then there might be costs to repair it, otherwise there will not be any effects.

If A_T , there will not be any costs for repairs or replacement of the nets, unless the dam bursts, then the costs will probably be high.

If A_E , no negative effects on the telephone and electricity net are to be counted for. It is most likely that the effects are positive since the repair frequency decreases if there are lesser floods.

S 10 Monetary system

	A_0	A_T	A_E
Cost of the projects	0	-	-
Revenues of the projects	0	-+	-+

Cost of the projects:

If A_0 , no costs since there are no changes. Of course there will be costs if there is a flood.

If A_T , the cost of building and maintaining the dams and locks and maybe compensation to farmers, forest owners and other people affected.

If A_E , creating meadows and reforesting the floodplain, supervising after the change, it can also include compensation to farmers, forest owners and other people affected.

Revenues of the projects:

If A_0 , no revenues will occur since there are no changes.

If A_T , the revenues might not be large, especially not in the short run. There will be costs to manage the dam, and of course there will be revenues if floods can be prevented. A dam can produce electricity which in turn can give benefits.

If A_E , revenues can be found in floodprevention.

Table 3. Relating the effects and systems and comparing each of A_T and A_E to A_0 .

System	A_0	A_T	A_E
<i>S 1 Water ecosystem</i>			
- Quality	0	-	+
- Sedimentation	0	-	+
- Fauna	0	-	+
- Flora	0	-	+
<i>S 2 Land ecosystem</i>			
- Quality	0	- +	+
- Fauna	0	- 0	- +
- Flora	0	- 0	+
- Erosion	0	-	+
- Arable land	0	-	+
<i>S 3 Recreational system</i>			
- Protected nature areas	0	-	+
<i>S 4 Cultural system</i>			
- Old buildings	0	+	+
- Historical artefacts	0	+	+
<i>S 5 Social system</i>			
- Health	0	0	+0
- Displacement of population	0	-	-
- Farmers	0	- +	-
- Forest owners	0	-	+
<i>S 6 Industrial system</i>			
- Relocation of industries	0	- +	- +
- Loss of income	0	- +	- +
<i>S 7 Labour market system</i>			
- Job opportunities	0	+	+
<i>S 8 Housing / building system</i>			
- Relocation of houses and buildings	0	-	-
<i>S 9 Infrastructure system</i>			
- Roads and railways	0	+	+
- Sewage	0	+	+
- Telephone and electricity	0	+	+
<i>S 12 Monetary system</i>			
- Costs of the projects	0	-	-
- Revenues of the projects	0	- +	- +

6.6 Possible Irreversible and Inertia Effects

Irreversibility and inertia more generally means that when a decision is made and carried out it is impossible or very hard to reverse the effects. This also means that the future options can be limited. That is why it is important to carefully consider all information before making a decision. The decision-making base has to contain varying factors in the sense that as many effects and impacts as possible are defined.

In the case of Morava River, the possible irreversible effects mostly strike the flora and the fauna, and there could be effects like:

Building a dam is the hardest thing to reverse. The area where a dam is considered will be laid under water. The plants will die, the animals have to move, and if there are houses in the area they have to be moved or destroyed, and also fertile land for agriculture and forestry might be lost for all future.

Poisonous water, if the flooded contaminated water flows into areas, the water can get dirty and spread the poison to both the water itself and to the land that gets flooded. This might give effects on both flora and fauna that cannot easily be repaired.

If old buildings and historical artefacts with high cultural value are destroyed, it will be impossible to return to the initial position. They will be gone and the area will have lost some of its history.

6.7 Analysis of Activities and Interests

In this chapter the alternatives will be valued and related to each activity with assumed goal direction. The interested parties carry out the activities as mentioned in chapter 6.2. The interested parties are farmers, government, industry, citizens/residents, forest owners, recreational people, and the Palacky University in Olomouc. Conflicts between the different interests will be visible.

The ranking will be done in a scale from 1 to 3, where 1 is the alternative that mostly fits the goal of the activity and 3 is the worst alternative.

The *farmers* in the region have the goal to continue to farm, where the soil is most fertile. If they are farmers in the dam-building area they will not be able to continue their activities at that place. Therefore the order of their ranking will be that they first of all is interested in the alternative that does nothing about the problem. Second, the alternative implying the creation of forests and meadows, A_E , may be accepted because some of their farming may continue. The worst case is the dam building alternative. For the farmers on the floodplain that would not be impacted by the dam building the best alternative would be to build dams. If the small natural floods would cease to strike their land the second best alternative from their point of view would be the zero-alternative, according to which they can continue as today. The worst case for them then is to create meadows and forests.

The *industries'* activity is to produce products and services. Their goal with the activities is to be able to do this with no interruptions, because interruptions create costs. The best solution

for the industries therefore is to choose A_E , and then the industries do not get disturbed. This alternative is not that good for the industries that are forced to move from the floodplain and are interrupted in their business. The alternative A_T is quite good for them too, but there is a risk for the dam to burst, and if the dam bursts there will be a catastrophic flood that will strike the industry. If the zero-alternative is chosen the risk for new big floods is greatest, and therefore this would be the worst alternative.

The *citizens/residents* of Olomouc probably do not want a new big flood and therefore both A_T and A_E are good alternatives for them. The risk for big catastrophes decreases, but the ecological solution will be a little bit better since then there is no risk for a dam to burst. The worst alternative for the citizens would be to do nothing.

For people interested in *recreation* the ecological alternative, A_E , of course is the best. Then there would be more nature to visit. The second alternative is to do nothing, because then they can stroll in the nature that exists today. If the dam-building alternative is chosen a lot of nature will be covered with water and that is not aesthetically attractive.

Forest owners in the region should prefer the ecological alternative, A_E . In the case there is a possibility to grow larger forests and increase their profits. The second alternative, A_0 , is to do nothing so they can continue having their forest as it is today. The worst alternative is to build dams, A_T , because there will be forests that get covered with water.

The people at the *Palacky University* want to keep the biodiversity in the nature. They have the knowledge of the importance of biodiversity in nature. Therefore the A_E is the obvious choice. The second best alternative is to have it like today, A_0 , and the worst would be to build dams, A_T .

Table 4. Ranking the alternatives from the view of activities and their goals.

Interested parties	Activity	Goal	Ranking-order		
			A_0	A_T	A_E
Farmers	Farming in dam building area	Continuing farming	1	3	2
Farmers	Farming on the floodplain	Continuing farming	2	1	3
Industries	Producing products and services	Production with no interruption	3	2	1
Citizens / residents	Living in the city	Living a safe, secure life	3	2	1
Recreational people	Recreational possibilities	Enjoy the nature	2	3	1
Forest owners	Forestry	Make benefits of the forest	2	3	1
Palacky University	Researching of nature	Keeping the biodiversity in the area	2	3	1

6.8 Analysis of Risk and Scenarios

Next step is to “*perform an analysis of risk and uncertainty, for instance with reference to scenarios*”¹¹⁷.

The risk with the zero-alternative A_0 is that there still are risks for big floods like the one in 1997.

For the technocratic alternative A_T the risk is that the dams can burst. If they do, an even more dangerous flood can occur. Other risks are that the surrounding and both upper- and downstream flora and fauna can be negatively affected and make the quality of the water in Morava River worse than before.

Also the ecological alternative A_E involves certain risks. No one can certainly know if the guesses are correct concerning the functions of the meadows and forests. What if the new-created landscape would not absorb the water? Humans may not be able to create nature in an artificial way.

¹¹⁷ Söderbaum, 2000

7. Conclusions

7.1 Results

Depending on the limited information we received for doing this partial PA we do not want to create any conditional conclusions and argue that one of the alternatives is better than the other. We only wanted to show how it is possible to apply the method. In the essay we have used Positional Analysis to show how to illuminate a complex decision situation, using the Morava River and the decision-making process there as an example. By using the method we focused on two alternatives of how to possibly act for preventing floods in the Morava River in the Czech Republic. The alternatives were either to use a technocratic solution or to use an ecological one. We also identified the interested parties and made assumptions about their standpoints and by doing this we made conflicts of interests between the parties visible. All systems affected by the alternatives were also identified. The impacts on each system were analysed and related to the alternatives. A valuational assumption was made concerning the compatibility between the goals of the different parties and the alternatives A_0 , A_T and A_E .

We think that Positional Analysis is a well-suited tool to illuminate a decision situation, and it is appropriate in a complex situation. But we also think that it is a complex method that is very demanding for both the ones that are going to produce the material and the decision-makers. The person/-s that is going to use the method for creating the information basis for a decision need a lot of information for example from all interested parties and about consequences of the different alternatives. It is always difficult to guess what will happen in the future if something is done. A complete PA also takes a lot of time to produce. But even if the method is complicated it is probably necessary, because in reality the world is not easy, it is complex.

7.2 Discussion

After writing this essay we have understood how comprehensive the method is and the importance of having enough time for the analysis. To perform a complete Positional Analysis, it is very important to have the right and a lot of information to make a correct basis for the decision. The information is needed to illuminate the different views of the parties involved. The method is supposed to be democratic and if all the interested parties do not have the opportunity to make their standpoints clear the method is not used in an acceptable way. If the decision-makers do not wish to consider all interested parties and their opinions, a fair and good solution will be hard to reach. The Positional Analysis carried out really demonstrates the different opinions of stakeholders and makes the conflicts between them visible.

Decision-makers need to see that to cope with a complex decision situation, like the one concerning the Morava River in Czech Republic, the need for an all-embracing tool is of importance. The decision that will be made will have great impacts on the surroundings, far into the future. The decision-makers also have to consider all eventual risks with each alternative. If there are possible irreversible effects, it is even more important to be careful in making a decision. The decision-makers need to care about more than money when making a

decision. If just the cheapest alternative is chosen several problems may appear, the environment might be affected, people may have to move and so on. We think that the decision in the Czech Republic concerning the Morava River should be taken after considering all democratic aspects. This means listening to all parties involved and to have the future in mind while making the decision.

Another aspect to be aware of is the valuational standpoint of the producer of the decision-material. The analyst must be open about it and show what kind of decisions that have been made during the process. To get a manageable decisionbasis, the producer need to remove some of the information received and there he is making a choice of what information to consider. These choices have to be visible to the decision-makers, otherwise the democratic aspect can be lost, and the material produced will not be transparent.

If a CBA had been carried out on the Morava River-project, a price or rather an aggregated number, would be the result of each alternative. How they have been reached and what assumptions that were made will not be visible for the decision-makers. It would be tempting to choose the cheapest alternative and that number can overshadow the consequences. In the case of the Morava River in the Czech Republic we assume that the technocratic solution would be the 'cheapest', since it would involve a one time cost to build the dam, compared to reconstructing the hole area into meadows and wetlands. The ecologic alternative would involve costs such as compensating people for the land, construct new areas for living and farming et cetera, and maintenance of the meadows. Our standpoint is that to put a price on nature like that is close to impossible. The estimations will be too coarse.

Using the SEA at the Morava River-situation, would be almost like using the PA in our opinion. The conclusions would probably be comparable.

The best thing in such a complex decision-situation would be to use several different methods, to get an overall picture. For example both a Positional Analysis and a Cost Benefit Analysis could be produced, or perhaps a Strategic Environmental Assessment, an Environmental Impact Assessment and a CBA, and so on. Different views on the project would become visible, since the producers probably have different standpoints regarding the project, the alternative and the consequences. The methods would complement each other and give the decision-makers more to take into account.

The ideal method for the decision-makers would be to receive the same information as a PA or a SEA can give, in a shorter period of time and presented in an easier way. It is our hope that methods like this, which force the decision-makers to think more carefully, will be more common in the future. It is necessary for the human beings survival on this planet.

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