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Hydrology and Earth System Sciences Discussions

Interactive comment on "Resolving conflicting objectives in the management of the Plastiras Lake: can we quantify beauty?" *by* A. Christofides et al.

A. Christofides et al.

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1. General response to referee comments

Both referees have made positive and negative comments. Most of the problems they point out indicate that we were not clear enough on some issues or had omitted details on others, and these may have cause misunderstanding. Based on the comments, we are, of course, going to make improvements.

Among the positive comments are that we address an important and central challenge in environmental management, touch a field that deserves attention, and open up fundamental philosophical questions. Since these questions "have cornered philosophers for millenia", it is unlikely that readers and reviewers would fully agree with our views,

but we hope, at least, that readers understand them and feel free to disagree with them.

We are grateful to both referees, who have done substantial work and have provided helpful comments. The positive comments are encouraging and the negative comments are constructive.

2. On the comments by Anonymous Referee #1

Anonymous Referee #1 writes: "there is little effort at comparing [landscape value] to the economic value of water release. Since this is the crucial issue, [the authors] probably would not convince a decision-maker that their recommended level is best." Furthermore, the referee points out that we do not state who the decision makers are.

We agree that the decision makers, as well as the stakeholders, must be mentioned, and that the multicriterion tableau we have presented needs more explanation, which would clarify, to a certain extent, why we prefer some choices to others. When it comes to comparing landscape value to the economic value of water release, we come to the heart of the problem: we believe that such comparison is subjective and cannot meaningfully be put in any kind of math, which is what we explain in the last section. We also feel that a decision maker can be convinced if provided with adequate reasoning.

A further objection of the referee is that "MCDM's agenda is to be of assistance in those cases where there are too many decision criteria to make a holistic understanding possible, and a case with only two decision criteria can therefore not be used to reject the method in general."

Even though we have argued against MCDM, our purpose was not "to reject the method in general". However, we are sceptic on its assumption of utility maximization, and we think that defining such utility would be meaningless. The number of criteria hardly affects this. In problems with more criteria, understanding and deciding will be

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necessarily more difficult than with only two; but it will not make MCDM's assumptions any more valid. In more complex problems, holistic understanding may be harder, but we doubt that MCDM can meaningfully make it any easier.

It can be argued that MCDM may help in understanding the problem or in presenting it. But it can also be argued that the scoring and weighting is chosen based on the analyst's predetermined opinion, which is based on holistic understanding. Such choice can be unconscious, but is also often conscious; for example, see http://www.ssu.missouri.edu/faculty/lmarks/teaching/GP_lect/sld017.htm, an introduction to goal programming, where the last step reads "Inspect the solution to the problem. If the solution is unacceptable, return to step 8 and revise the weights as needed." This means that the analyst already has an idea of what is acceptable and what not, and likely what is preferable and what not, and they seek to create scoring and weighting that will help them gain more insight into the problem and into why they might prefer certain options from others; or help them present the problem to others so that they also gain similar insight. Given the oversimplification of the problem into a linear function of scores and weights, we feel that such insight may be spurious, and that using drawings, tables, and reasoning in simple, well-structured words, can be at least as effective.

As far as the question "can we quantify beauty?" is concerned: Rodger Doyle's article, suggested by the referee, is a report on the U.S. Department of Agriculture's study, which uses six measures in order to rate the "natural amenities" of a county: January temperature, January sunshine, temperature gain between January and July, July humidity, water area, and topographic variation. We cannot understand how any function of these six variables can be claimed to be a measure of beauty. While statements such as "there is a larger number of beautiful locations in warm and humid counties" can be valid, reversing this and claiming that a function of temperature and humidity can be a measure of a location's beauty, as is implied by Rodger Doyle's presentation of the USDA study, does not seem reasonable to us.

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3. On the comments by Professor Colin Green

Professor Green comments: “Unlike the authors, I would argue that we need both [reason and intuition]: decisions are frequently too complex for us to be able to rely wholly upon our intuition; we need a rigorous framework of analysis to reduce the complexity to a level that we can understand. The deficiencies of orthodox economics are ... not a reason to abandon reason altogether. Equally, the limitation of intuition is that [it] does not create an audit trail through which others can follow the chain of reasoning that lead to the conclusion.”

This is a point where we have not made ourselves clear enough. We don’t mean to abandon reason altogether; on the contrary, we think that reason is of major importance, and that a line of reasoning must be presented as clearly as possible with words, drawings and tables; and a reader can follow the chain of reasoning by reading such a presentation. However, we think is that it is impossible to prove a conclusion undisputable (e.g. to make it equivalent to a mathematical theorem). By studying the problem and creating lines of reasoning we (aim to) achieve understanding of the big picture; by adequately presenting the problem and the reasoning we (aim to) deliver the big picture to others.

It is often assumed (e.g. by MCDM) that a decision is rational if it can be explained in strict rules of logic or mathematics; but, in our opinion, this is an extremely narrow definition, and we would not agree that compliance with this definition could be used to judge if one is against reason. With “reason” understood to be the power of the mind to think and understand, and even with definitions of reason still considered narrow, such as the process of making logical deductions, we think that reason should be the main tool used to study problems and make decisions.

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4. Revision outline

The paper will be considerably revised. More information about the conflict between stakeholders is going to be given in Chapter 1, and the decision makers will be mentioned. The discussion about alternative decision making methods will be moved out of Chapter 6 into a new Chapter 7, and will be more extensive, including an example of MCDM application on Plastiras Lake. Chapter 6 will explain the multicriterion tableau in more detail and provide more extensive reasoning about which choice is preferable. These changes will be in the spirit of Anonymous Referee #1's reasonable last paragraph, and will address all other concerns.

Interactive comment on Hydrology and Earth System Sciences Discussions, 2, 801, 2005.