Hydrol. Earth Syst. Sci. Discuss., 5, S2486–S2491, 2009
www.hydrol-earth-syst-sci-discuss.net/5/S2486/2009/

Hydrology and Earth System Sciences Discussions

Interactive comment on "A social-economic-engineering combined framework for decision making in water resources planning" *by* E. S. Chung and K. S. Lee

E. S. Chung and K. S. Lee

Received and published: 30 January 2009

We like to thanks R. Hranova (Referee) for this helpful and constructive comments on the submitted manuscript. We acknowledge the suggestions for improving the paper, which will be integrated in the upcoming revised manuscript.

RC: Section 5 - What are the weights assigned to the different criteria? AC: We added the newly-published reference (Chung and Lee, 2009b) including the weights of criteria to identify hydrologic vulnerability.

RC: Why the grades are 'spatial' AC: We removed "spatial" in front of "grades" since it was not clear.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

RC: Why the different regions mentioned in Table 1 are called alternatives in the text? AC: The term "alternatives" in Section 5 has the general meaning of choice experiment method. Since it means choice or option in this study, we changed "alternative" into those to avoid ambiguousness.

RC: Section 6.1 Table 2 what are the C1, 2; B1, 2, etc AC: We added the definitions of C1, 2, and B1, 2 below the Table 2 as follow: *B1 and B2 are the 1st and 2nd target grades of PSD and C1 and C2 of PWQD.

RC: Section 6.3 the proposed model does not explain S1, 2, Q1, 2, etc these are mentioned in the text at this stage with no reference or explanation. AC: There is a brief description of S1, S2, Q1, Q1 and T in the first paragraph of the previous 5.3 section as follows: The utility function of the model without covariates, with the exception of the error term, can be expressed as a linear function of an attribute vector (S1, S2, Q1,Q2, T) = (PSD1, PSD2, PWQD1, PWQD1, Tax). But we added the detailed explanation below equation (5) as follows: where S1, S2, Q1, Q2 and T means element variables (PSD1, PSD2, PWQD1, PWQD1, and Tax) of attribute vector

RC: Section 8 - Table 6 shows two columns for AEI and Standardized AEI, but no reference in the text, comment or explanation is made regarding this. AC: We added the explanation of standardized AEI below the equation 11 as follows: f(1,i) (= f(i,i) / max f(1,i)) and f(2,i) (= f(2,i) / max f(2,i))are the standardized values of f(1,i)and f(2,i).

RC: The major drawback of the paper is that it presents different methods and results (outputs), without clear indication of the input data used, and the link of the input data to the variables presented in the equations. For this reason, it is no possible to verify the results or to reproduce the methodology. AC: Part I (Section 4) and Part III (Section 6) are the results of other papers (Lee and Chung, 2007; Chung and Lee, 2009a, 2009b). Therefore we summarized those procedures and results from those articles. This paper focuses on the Part II and Part IV. Part III and Part IIIV were combined into section 4 and 5, respectively. We removed Tables 1 and 4 not to repeat and

HESSD

5, S2486–S2491, 2009

added Fig 2 (Example of choice set) and Table 2 (Estimation results of the model with covariates) to explain the questionnaire and the procedure in detail. We added the relevant statements in the last paragraph of introduction as follows: To avoid scope insensitivity of CE, the present spatial hydrologic vulnerability developed in Lee and Chung (2007) and improved by Chung and Lee (2009b) was introduced in part I and used to support the respondents with the sufficient information of study watershed. Therefore, residents can respond with the correct and realistic WTPs of improvements on the present hydrological vulnerability grades in the application of a CE, since they can recognize and confirm the status in their place of residence. Furthermore this paper used the alternative evaluation index (AEI) developed by Chung and Lee (2009a) to estimate the monetary values of alternatives by linearly combining AEI with WTPs.

RC: In the cost-benefit analysis, which is the major outcome of the research, and is the major indicator for the selection of the best alternatives, the value of the benefits is based entirely on the projected taxes to be recovered from the population (willingness to pay). Other benefits due to the environmental improvements, such as improved health conditions or economic benefits due to wastewater reuse might be included as well. AC: As you know, it is impossible to estimate all benefits of alternatives due to the environmental improvements. We assumed that WTP include any kinds of benefits. Therefore we added this explanation in the third paragraph of introduction as follows: Valuing willingness to pay (WTP) for a probabilistic supply is useful for reliability planning. If a reliability enhancement project's cost is less than consumers' WTP, the project is economically attractive (Abrahams et al., 2000). Conversely, in highly reliable systems consumers might willingly accept a greater frequency of shortages in exchange for reduced water bills (Howe and Smith, 1994).

RC: English language prove-reading is necessary, as some sentences are not correctly formulated, e.g. on page 2819, line 26, "the incorporation", instead of "the corporation". Also, page 2832, line 4 387 million people on 287 sq. km?? Is that possible? AC: Your indications are all right. We revised them.

HESSD

5, S2486–S2491, 2009

RC: The study has used data from several questionnaires, which are just mentioned with no details at all. More details on each one of these is necessary, but would make the paper very long. In general, it could be recommended that the paper should be restructured. The length of the literature survey is 15 pages , which is too long, compared to 10 pages of methods applied and results obtained. Maybe the authors could concentrate on one part of the total procedure (e.g. section 6). The whole framework (Fig 1) could be mentioned but the main content of the paper should concentrate on one section, where the data collected is reliable and the methodology can be explained and reproduced. AC: We deleted some parts of literature review and cited some references instead of long repeated explanation. Therefore, the length is not a problem any more.

Questionnaires of Section 4 and 6 were derived by other articles (Chung and Lee, 2009a; 2009b) and we utilized those results. Therefore, we made a questionnaire for Section 5 (economic evaluation). We added the description of questionnaire in Section 4.2.4.

4.2.4 Questionnaires and Survey

Since all respondents are residents and stakeholders in the study watershed, the sufficient information transfer is very important. Therefore, the description of study watershed including some pictures, the purpose and backgrounds of survey, and the present conditions (grades of PSD and PWQD) of all sub-watersheds were shown before questions in the questionnaires. In addition, the statement was added that respondents didn't have to pay the money they selected and just answer the willingness-to-pay not to avoid the inactive response.

And we added the example of choice set (Fig. 2) and the explanation of irrational response as follows:

About one hundred respondents of each questionnaire were sampled at random from the official resident registration of the city, in which all the residents of the city are

HESSD

5, S2486–S2491, 2009

recorded. If one of the questions was irrationally answered, the questionnaire was regarded as an ineffective response. Irrational answers can be represented as follows: If the answer to Q1 is (2) in Table 8, the answer to Q2 should also be (2), since the responder has a willingness to pay for the prevention of instreamflow depletion and water quality enhancement. But if the answer to Q2 is (3), the questionnaire was assumed to be useless since we cannot trust the understanding and consistency of the respondent.

As you recommended, we concentrated two parts (II and IV). The detailed explanations of part I and III were replaced by citations of references. We wrote the procedure of part IV in detail. We added the following paragraph and Table 2 (Estimation results of the model with covariates) to make the process clear.

In region I, there are notable declines in the coefficients on sex, age, family, education, concerns, resident years, frequency of visit, income, ngo, and marriage. The coefficients for family and education are significant at the 1 percent and 10 percent levels, and age, income, and concern are significant at the 5 percent level. In region II, there are notable declines in the coefficients on age and year and increases in sex, family, education, visits, income, ngo, concerns, and marriage. The coefficients for family and income are significant at the 10 percent level, and age and visits are significant at the 1 percent level. In region III, there are notable declines in the coefficients on age, visits, ngo, and years and increases in sex, family, education, income, concerns, and marriage. The coefficients for education and marriage are significant at the 1 percent level and family, visits, ngo, age and income are significant at the 5 percent level. In region IV, there are notable declines in the coefficients on age, concerns, marriage, and year and increases in sex, family, education, visits, income, and ngo. The coefficients for age and income are significant at the 1 percent level and visits, marriage, and years are significant at the 5 percent level. In region V, there are notable declines in the coefficients on family, education, concerns, and years and increases in sex, age, visits, income, ngo, and marriage. The coefficient for family is significant at the 1 percent

HESSD

5, S2486–S2491, 2009

level and age and education are significant at the 5 percent level. In region VI, there are notable declines in the coefficients on age, income, concerns, and marriage and increases in sex, family, education, visits, ngo, and years. The coefficients for age and concern are significant at the 1 percent level, education is significant at the 5 percent level, and family, visits, and marriage were significant at the 10 percent level.

References

Abrahams, N.A., Hubble, B.J., and Jordan, J.L.: Joint production and averting expenditure measures of willingness to pay: Do water expenditures really measure avoidance costs?, am. J. Agric. Econom., 82(2), 427-437.

Howe, C.W., and Smith M.G.: The value of water supply reliability in urban water systems, J. Envir. Econom. Manage., 26, 19-30.

Chung, E.S., Lee, K.S.: Prioritization of water management for sustainability using hydrologic simulation model and multicriteria decision making techniques, J. Environ. Manage., 90(3), 1502-1511, 2009a.

Chung, E.S., Lee, K.S.: Identification of spatial ranking of hydrological vulnerability using multicriteria decision making techniques: Case study of Korea, Water Resour. Manage., 2009b (online published).

Lee, K. S. and Chung, E. S.: Development of integrated watershed management schemes for intensively urbanized region in Korea, J. HydroEnviron. Res., 1(2), 95-109, 2007.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 2817, 2008.