



European Project
EUWI-ERANET



6th Framework
Programme



MINISTRY FOR FOREIGN
AFFAIRS OF FINLAND

Sustainable development of hydropower involving the private sector in research collaboration in the Lower Mekong Region

- **The results of the Internet questionnaire and interviews related to multi-criteria decision analysis**

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5.11.2010

Project was funded by Ministry for Foreign Affairs of Finland

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Summary

This study focuses on the status and possibilities of improving current planning and decision support practices related to hydro power development projects in the Lower Mekong Region. The material was gathered using Internet questionnaire and interviews, and it includes answers from 45 people. Half of the respondents represented universities and research and governmental people were also well represented in the material. According to the respondents, there are high development needs related to impact assessment methods and the incorporation of stakeholders' and local people's opinions into the planning processes. Multi-criteria decision analysis (MCDA) was considered as a potentially useful method in supporting sustainable hydropower planning, yet just a few respondents had experience in using the method. When assessing the benefits of MCDA, the respondents emphasized most the aspect that MCDA can facilitate discussion in a multi-stakeholder group and can help to find a common language. The use of MCDA is not common in the area, and the major reasons for that were considered to be the lack of expertise and also the fact that MCDA methods and their application opportunities are not known in the area. The respondents were quite unanimous that more education is needed to improve planning practices in the hydropower development projects. A versatile combination of means to support the capacity building is welcomed. Organizing pilot projects during which new methods are demonstrated was considered the most important means to build capacity in the region. The respondents were also very interested in participating different training courses related to planning and decision support practices.

1 Introduction

This study is a part of the SPLASH project Water and Energy: *"Sustainable development of hydropower involving the private sector in research collaboration in the Lower Mekong Region"*. The general objective of the SPLASH project was to increase cooperation among researchers, private sector and policy-makers in advancing sustainable forms of hydro-energy development and management in the Lower Mekong Basin.

This study focuses on the status and possibilities of improving current planning and decision support practices related to

- hydropower development projects in the Lower Mekong Basin, and
- multi-criteria decision analysis (MCDA) methods and water footprint approach, and
- education of water resources planning at the universities in Laos, Cambodia, Thailand and Vietnam.

The material was gathered using Internet questionnaire and interviews. Based on the results of this study, development needs in the current planning practices, methods and education as well as suggestions regarding pilot case studies are presented.

The interviews were carried out by local consultants in Laos (Ms. Noutthong Alouthong, National University of Laos), Thailand (Prof. C. Sukhsri Water Resources Research Unit, Department of Water Resources Engineering, Chulalongkorn University), Vietnam (Dr. Nguyen Van Duong, Department of Higher Education, Ministry of Education and Training) and Cambodia (Mr. Sok Saing Im, freelance consultant).

We would also like to thank all respondents of the interviews and the Internet questionnaire for their valuable contribution to the study. The project was funded by Ministry for Foreign Affairs of Finland.

2 Material and methods

The questionnaire was mainly prepared by the Finnish Environment Institute (SYKE). DHI was responsible for the questions related to water footprint. The material of this study was gathered using Internet questionnaire and interviews. Altogether, the material consisted of 45 people's answers. The interviews were carried out in May and June 2010. These interviews were complemented in Laos with interviews carried out by Juha Sarkkula (SYKE). The interviewees were chosen by local consultants based on the general guidance of the project coordinator. The aim was to interview people who had expertise in the water resources management, research or education. Over 90 % of the respondents lived permanently in Cambodia, Laos, Thailand or Vietnam.

The list of potential respondents for the Internet questionnaire was prepared by Juha Sarkkula and it was complemented by Marko Keskinen (Aalto University). The list included 71 persons representing authorities, experts, researchers and representatives of NGOs in Cambodia, Laos, Thailand and Vietnam. Information about the questionnaire and link to the questionnaire form was sent via e-mail. The e-mail recipients were asked to circulate the message to people who might be interested in contributing to the study, thus all the respondents are not necessarily those who originally were asked to participate. The Internet questionnaire was opened on the 14th of July and it was closed on the 13th of August. It came out that in nine cases the email addresses were incorrect and we did not succeed to reach the recipient. Altogether 22 people answered the internet questionnaire and the response rate was about 30 %.

There were two versions of the questionnaire used in the study. The first version, which was used in the interviews, is called the Interview questionnaire, and the Internet version is called the Internet questionnaire. The questions of the Internet version can be found in Annex 1. The Internet questionnaire was finalized based on the experiences from the interviews. The most questions in the two versions were identical or there were just minor changes related to the phrasing of the questions. In this case the

results from the two versions were interpreted in one in the Results- section. In some cases, however, changes in questions were so large that the results from the two versions were presented separately, for it would have been unfeasible or even misleading trying to adjust the results from different versions in the same graph or statistics.

One problem in the comparison of the results of the two questionnaires was that in some questions (questions 6 and 14) we had different grading scales in the Interview questionnaire and the Internet questionnaire. In order to get comparable results, a systematic transformation procedure was used. For instance, in question six the scale changed from 7-point grading scale (Interview questionnaire) to 5-point scale (Internet questionnaire). The responses from interviews were adjusted to 5 point grading scale so that points 2 and 3 in the 7-point grading scale correspond to the point 2 in the 5-point grading scale. Thus point 4 in the 7-point grading scale corresponds to the points 3 in the 5-point grading scale and so on. Accordingly, in the question 14 the scale had nine points in the Interview questionnaire and seven in the Internet questionnaire. It was modified to 7-point grading scale so that the point 5 corresponded to the grade 4 in the 7-point grading scale. The points 2 and 3 corresponded to point 2 in the 7-point grading scale, and 4 corresponded to 3. Consequently the 7 and 8 corresponded to 6 in the 7-point grading scale and 6 corresponded to 5.

Altogether there were 32 questions in the questionnaire. The questionnaire comprised of five main themes:

- *Background information:* There were three questions of the respondent's background. The respondent was asked in what kind of an organization he/she works, what his/her position in the organization is and whether he/she lives permanently in the Lower Mekong Basin (Cambodia, Laos, Thailand or Vietnam). The region of Lower Mekong Basin was considered as a whole and the respondent was not asked which particular country he/she lives in. Thus, it cannot be distinguished which country or region each respondent's responses cover.
- *Planning methods and practices:* There were eight questions in which respondent's opinions about the current planning methods, their use and the development needs were inquired.
- *Multi-criteria decision analysis (MCDA):* There were three questions in which the respondent was asked about the applicability of MCDA in hydropower development projects, how familiar he/she is with the method, and what the possible reasons for the limited use of MCDA are. Before the questions a brief description of the main features of the MCDA was presented.
- *Water footprint analysis:* The questions were similar to those in the MCDA part. Likewise, there was also a brief description of the water footprint analysis- method.
- *Capacity building and education:* There were four questions in which respondent was asked about his/her opinion of the importance of different means to improve planning practices in the hydropower development projects, and his/her willingness to participate in various trainings for capacity building. Finally, the respondent was asked to name courses related to impact assessment and evaluation of hydropower development projects that had been arranged or are planned to be arranged in the Lower Mekong Basin.

Almost after every question there was an open space for respondent's opinions and comments. Most respondents had written at least one comment. The comments are presented in this report almost as such. Only some minor corrections to wording and spelling have been made and some of the lengthiest comments have been shortened.

3 The results

3.1 Respondents' organization and position

In order to get basic background information, the respondents were asked to tell in what kind of an organization they work. By far most of the respondents acted in universities (26 responses of 43 respondents) and in research (18 responses) (Figure 1). Many respondents also worked in governmental organizations. Instead, only one respondent of 43 worked in business and only two in donor organizations. A couple of answers were received from representatives of non-governmental organizations. In the group "other" the respondents were for instance from intergovernmental or international organizations (Figure 1).

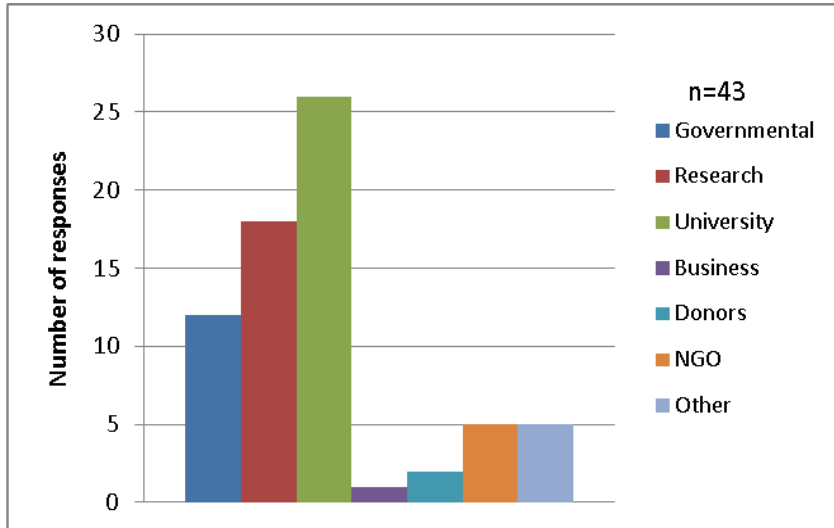


Figure 1. "In what kind of organization do you work at the moment?"

Respondents were asked about their position in the organizations they work in. Several alternatives could be chosen. A considerable proportion of the respondents were professors, teachers and researchers (Figure 2). "Manager" was chosen by ten respondents and "Planner" by five respondents. Only one of 63 responses was an authority, although 12 respondents were in the field of "governmental" in the question number 1 (Figure 1). To the group "other" belonged people, who are for instance advisors, field managers, coordinators, hydrologists and economists (Figure 2).

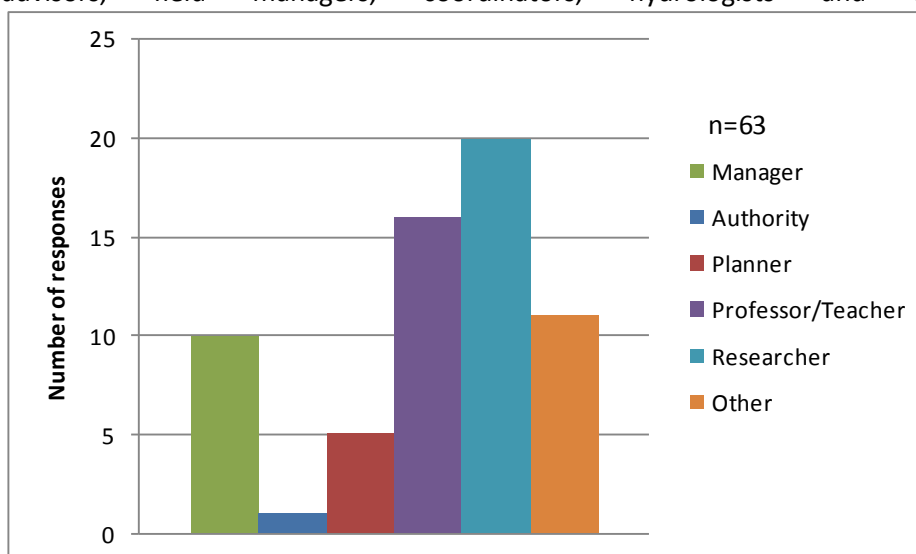


Figure 2. "What is your position in the organization where you work?"

3.2 Opinions about the current planning practices and methods

Currently used planning methods and practices earned pretty low marks for supporting sustainable hydropower development (Figure 3a). 36 % of the respondents considered that currently used planning methods and practices support sustainable hydropower development worse than moderately, 23 % perceived it as moderate and 9 % as better than moderate. However, almost one third of the respondents seemed to find it difficult to assess the performance and chose the alternative "Difficult to say". One reason for this might be that the term "sustainable hydropower development" was not defined in the questionnaire. Defining the term would have been important because "sustainable" is a very vague term that has different meanings for different people. People representing NGOs and research had the most negative opinions of how well sustainable hydropower development is supported by current planning methods and practices (Figure 3b).

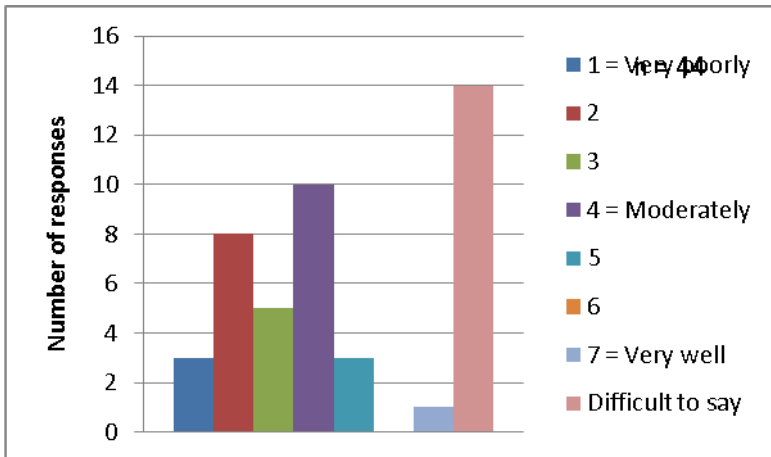


Figure 3a. "Consider the planning related to hydropower development projects in the Lower Mekong Basin as a whole. How well do currently used planning methods and practices support sustainable hydropower development in the region?"

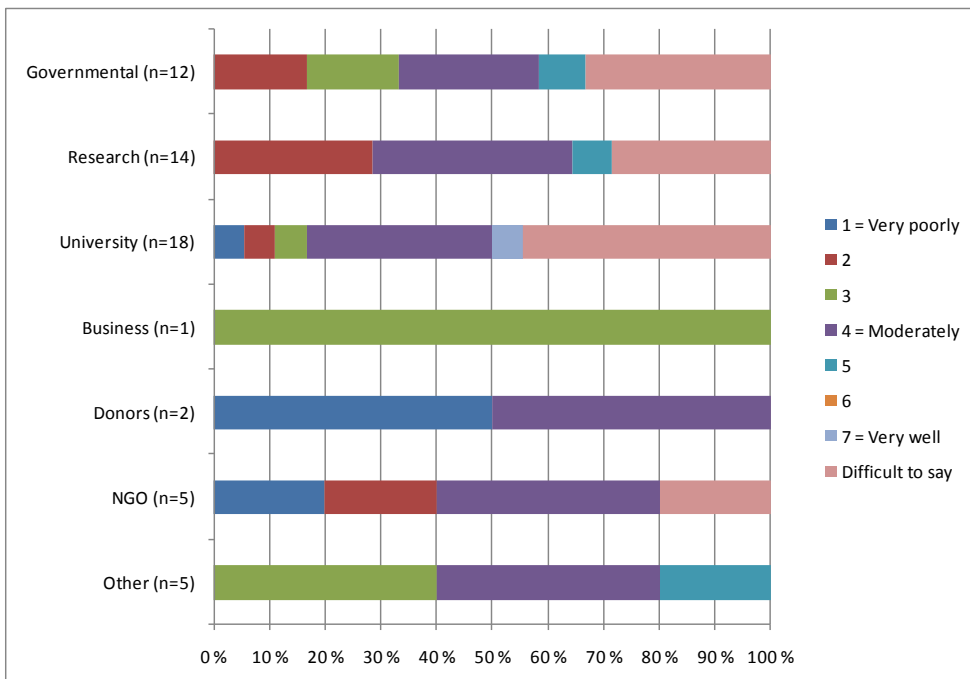


Figure 3b. "Consider the planning related to hydropower development projects in the Lower Mekong Basin as a whole. How well do currently used planning methods and practices support sustainable hydropower development in the region?"

For instance following arguments were presented according to this question:

"Sustainable hydropower implies a technical definition only in terms of efficient water resources management. The planning methods and practices that I am involved with include social, environmental and ecological impacts, assessment, selection and costing of mitigation measures to offset and minimize these impacts, then internalizing these costs into the development costs of the hydropower project. I think that your definition of sustainable needs to be clarified to the reader." (University)

"Problems include: Single purpose planning i.e. to maximise energy production; Non-transparent planning eg. when and how are the plants to be operated is often obscured from discussion; Limited cooperation btw operators of proposed plants in cascades, due to the fact that they are in competition, and no obvious intervention by governments to organise and require such competition." (Governmental)

"There is no community participation. Very little civil society participation and no real transparency on government plans or the projects being proposed." (NGO)

"The methods probably support the energy sector very well and those who benefit directly from dam development. But they do not support the sustainable livelihoods of the people directly impacted as research on environmental and social impacts is of little consequence for energy planners." (Research)

"1. On a national scale it is difficult to judge on how well the plans are (w.r.t. the regional hydropower development) since there are many agencies involve as well as most of these plans their priority are based on 2. On a regional scale, no information to base the assessment. 3. For the Mekong Basin, MRC is working on the coordination / integration / sustainable hydropower development issues but in my view rather slow and not yet successful and lacked behind the proposal from the country, e.g. Don Sahong Project as proposed by Lao PDR is a case in point." (University)

"Civil society groups have still played a limited role in decision making on planned hydropower, especially MRC's hydropower plan" (University)

"Very sectoral and no proper integration of all relevant parameters such as cumulative, social and livelihood of the local community, and transboundary consideration." (Manager)

The respondents were asked how well different actors are incorporated in hydropower planning. According to the respondents, authorities' and experts' opinions were best taken into account in hydropower planning: approximately 70 % of the respondents thought that these actors are moderately or adequately incorporated (Figure 4a). On the contrary, more than 50 % of the respondents felt that local people's and NGO's knowledge and objectives are incorporated totally inadequately or inadequately. As to donors, private sector, Greater Mekong Subregion (GMS), experts and authorities, 40-70 % of the respondents found that their incorporation is moderate or better than moderate. None of the respondents found the incorporation of GMS adequate.

The respondents' opinions were notably fragmented as can be seen in figure 4a, for instance there were many different views about how well the private sector is incorporated in planning. Respondents seemed to have pretty clear opinions, based on the fact that the proportion of "Difficult to say"-answers was less than 20 % in all cases. The proportion of "difficult to say" answers was highest, 16-19 %, when it comes to the incorporation of Mekong River Commission (MRC), GMS, private sector and donors.

The scale and type of the hydropower planning projects the respondents considered when answering the question (e. g. local, regional, strategic) is likely to have had an impact on their responses. In all

respondent groups at least half of the respondents considered that local people knowledge and objectives are not adequately taken into account (Figure 4b).

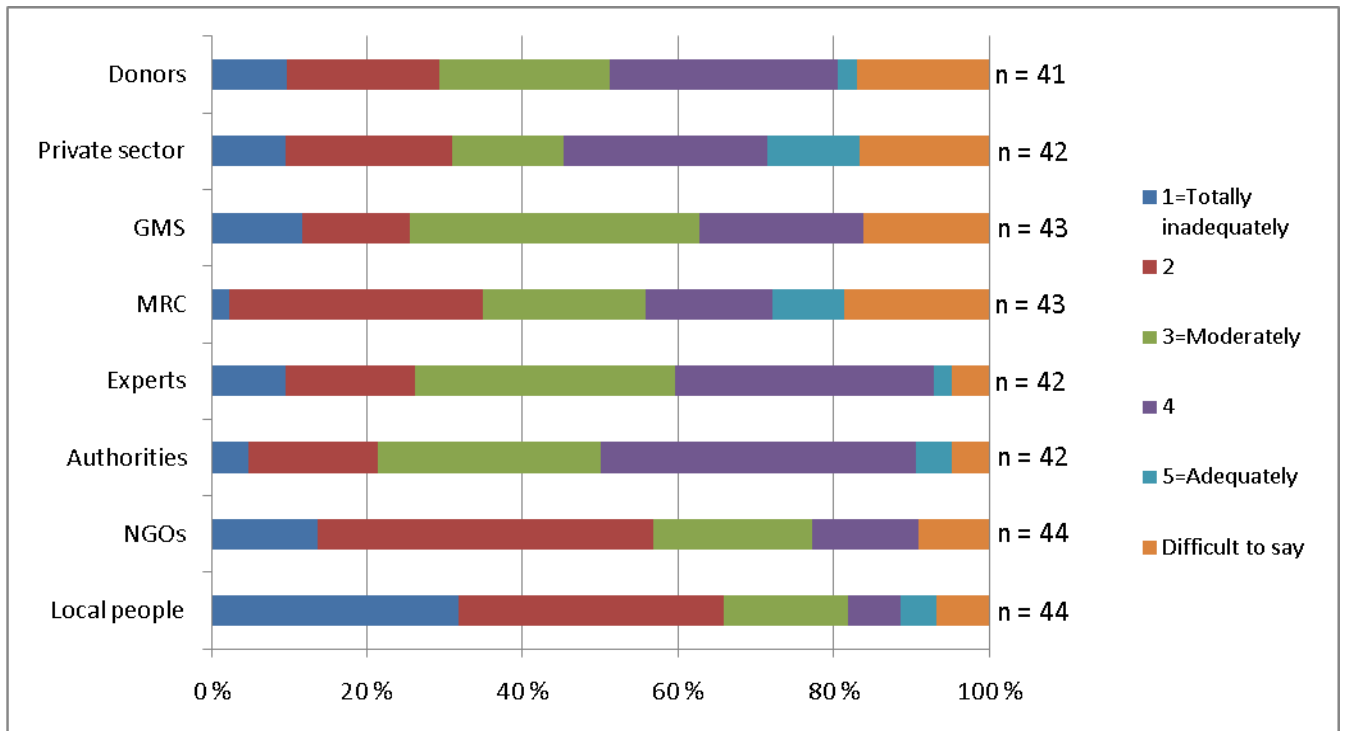


Figure 4a. "How well are the knowledge and objectives of the different actors incorporated in the planning of hydropower in the Lower Mekong Basin at the moment?"

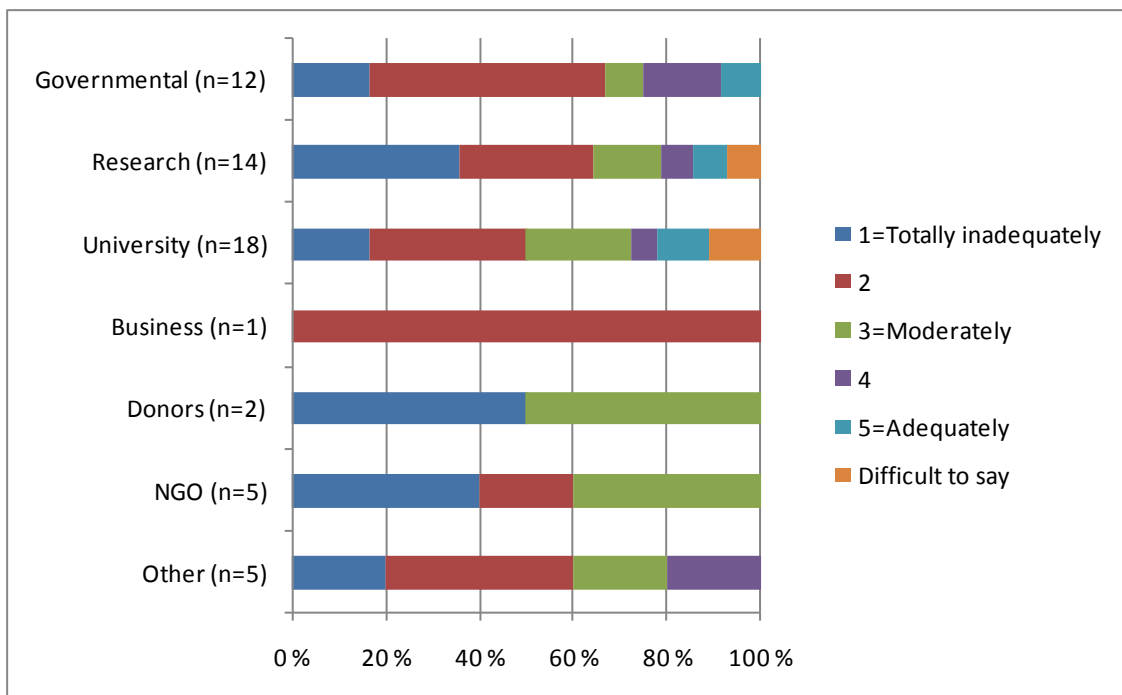


Figure 4b. "How well are the knowledge and objectives of the local people incorporated in the planning of hydropower in the Lower Mekong Basin at the moment?"

There was no big difference in respondents' answers regarding how often different public participation methods have been used (Figure 5). Of the public participation methods listed in the question, workshops seemed to be the most commonly used one: 93 % of the respondents perceived that

workshops are used sometimes or commonly. Other methods are used sometimes or commonly according to 79-86 % of the respondents. The low proportion of "difficult to say"-responses implies that the methods were well-known among participants.

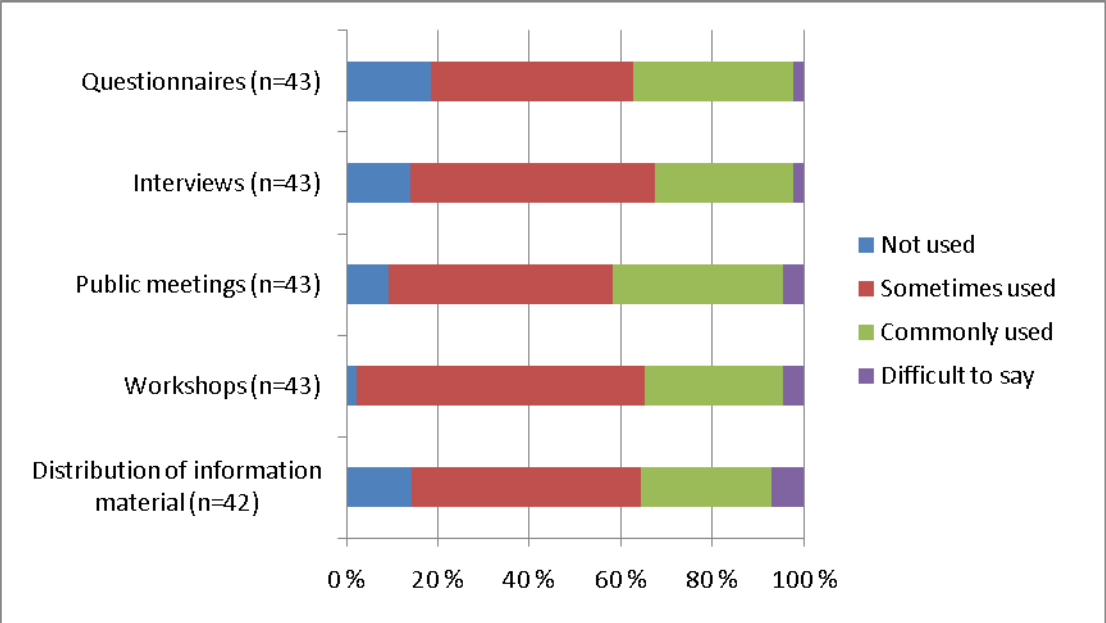


Figure 5. “What kind of public participation methods have been used in the hydropower development projects in the Lower Mekong Basin?”

The respondents were pretty satisfied with the use of the listed public participation methods, 59-76 % found the methods useful (Figure 6). Public meetings, interviews and workshops were deemed as most useful; none of the respondents regarded them as not useful at all. Public meetings and interviews got most "very useful"-responses, 20 % and 17 %, whereas questionnaires were considered as very useful by only 2 % of the respondents. Assessing the usefulness of the methods appears to have been quite a difficult task according to the relatively high proportions of "difficult to say"-responses, 18-27 % (Figure 6). The usefulness of questionnaires and of the distribution of information material was most difficult to assess whereas the usefulness of public meetings was easiest to assess.

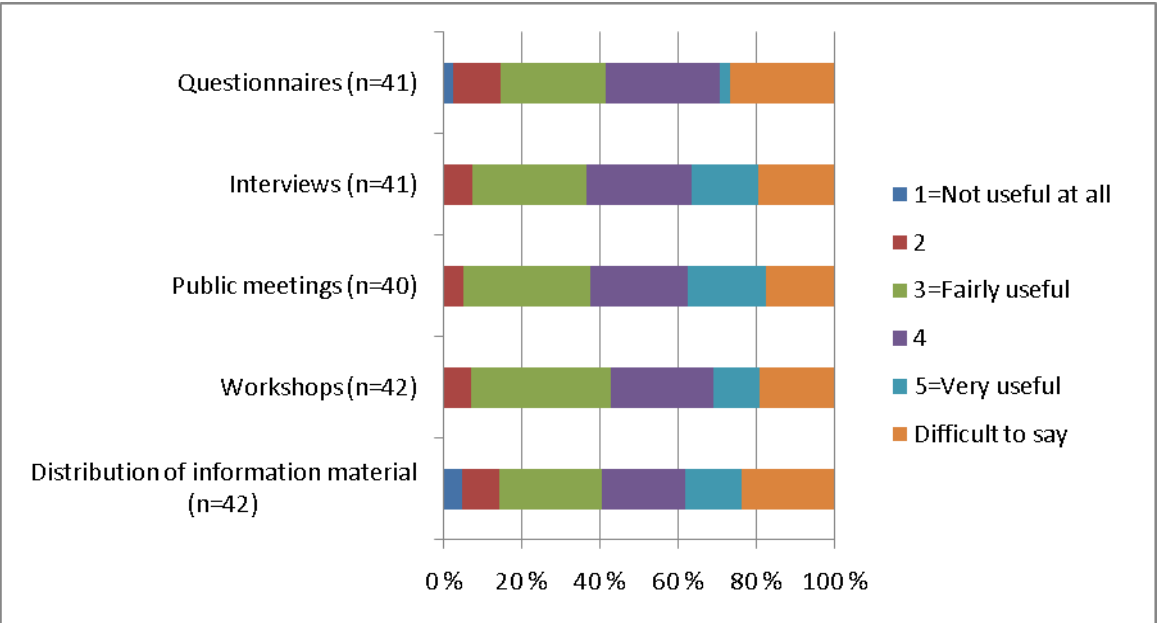


Figure 6. “How useful have the public participation methods been in order to find out citizens’ or stakeholders’ opinions?”

In addition to the methods listed in this question (Figure 6), the respondents mentioned also some other methods that had been used in hydropower development projects in the Lower Mekong Basin such as river basin committees, dialogues, participatory social research, poll, survey, web-sites and press releases. Following comments were presented in the open space:

"It should be the public meetings that lead to decision making with clear information and projected impact, cost-benefit" (Research)

"Sometimes the planners or authorities don't give enough the information to all of stakeholders. Perhaps it came from the budget problem. The most useful method is interviews, however it also need a huge man power and money. Therefore, the authorities used the distribution of information material to be the method of public participation." (University)

"The methods have been useful mainly to the developers, the citizens involvement has been limited." (Manager/researcher)

"Local people are not incorporated in project planning, particularly in technical issues where their knowledge is very limited. Their involvement in environmental and social issues would be more needed, but the local NGOs are not active, and not critical with the projects. Active participation derives mainly from international NGOs." (Government)

"Another possible approach is to make the concession agreement open to public participation. This is before any agreement is signed between the government and the project proponent. . . like a notice to proceed requesting interested parties to notify the responsible government agency with comments about the area in question. The CA can also have Environmental and Social Obligation annexes attached to inform future project proponents what commitments they must consider and include covering socio-economic, social and environmental impacts in their pre-feasibility studies. . . . this is another PP method introduced by the Ministry of Planning and Investment. NGOs have conducted their own interviews and organized meetings. Then they have written to IFCs, posted articles in local newspapers, and journals to stir up local citizens and interested parties against hydropower projects. WB has used public forums effectively to educate stakeholders and gain feedback prior to formal presentation of the hydropower projects. However, these PP methods are well used for international funded hydropower projects. Country-to-country funded projects often bypass public participation inputs and sometimes are permitted to bypass the entire ESIA process!!!" (University)

"Generally, there are very few mechanisms to make affected people heard in hydro power project planning. There is no actual representation of them, or limited feedback from them; they participate mainly as observers. Hearing the message would be more important than the frequency of attending meetings." (Manager/researcher)

Additional problem is that answers from the local people to the experts, who are conducting the planning process, are different to foreign and local experts; people are too shy or polite to raise their concerns to the foreigners. To get honest and informative answers the foreigner needs to learn the local conditions, top-down process does not work. The suggested method by the interviewee is to spend enough time with the local people, getting familiar with their way of living, making friends with them, in order to hear their thoughts in confidential discussions." (Manager/researcher)

The respondents were asked about their opinion of nine potential development needs regarding planning and evaluation of hydropower development projects. Basically, all aspects mentioned in the question were deemed to have high development needs: over 90 % of the respondents found that development needs in all topics are moderate or higher (Figure 7). Improving the quality of the use of

the impact assessment methods had highest development needs with scores 6 and 7 being 88 %). However, two respondents (donor, research) gave that aspect the score 1 or 2. For the other issues mentioned, the proportion of the highest scores 6 and 7 was between 61% (identification of significant and less significant impacts) and 84% (balancing ecological, social and economic aspects in the planning).

The number of responses in "improving the quality of the use of the impact assessment methods" was lower than in other topics because this topic was not included in the Interview questionnaire (Figure 7). Thus the results of this question cannot be compared directly with the others due to lower number of respondents. People seemed to have pretty clear opinions of the importance of developing the methods because the number of "difficult to say"-responses was small, it varied from zero to two responses.

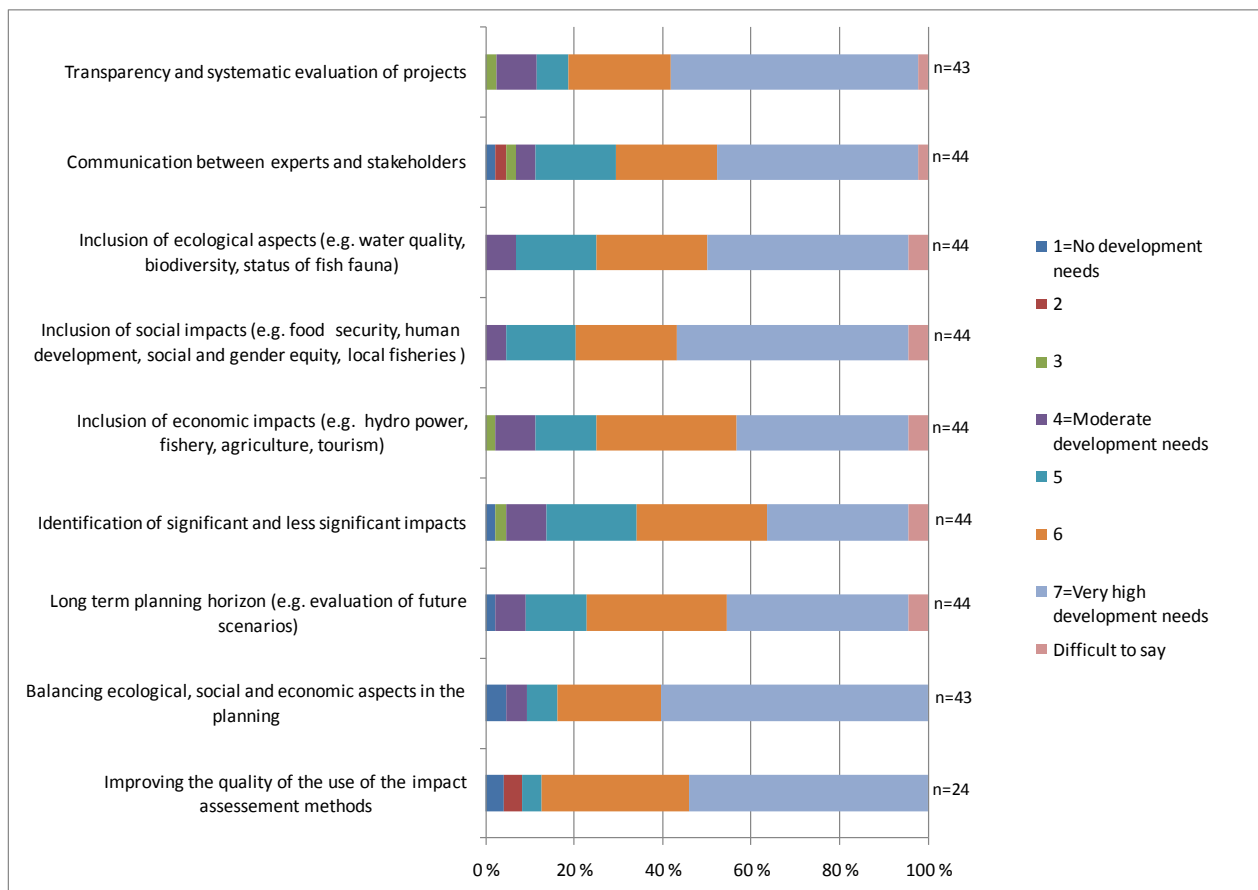


Figure 7. "What are the development needs regarding planning and evaluation of hydropower development projects in the Lower Mekong Basin?"

Following specifications were presented in the open comments:

"EIA is not relevant for hydropower development, long term strategic and visioning are more relevant projects in the Lower Mekong Basin?" (University)

"Public Participation Processes are desperately needed, the development of best practice standards is needed, legal implication research is needed, and research into less environmentally destructive forms of energy technology and generation is desperately needed." (NGO)

"It is not that planning and evaluation needs more or better..., the entire process serves developers not those dependent upon the river resources. So your focus on is technocratic and therefore will do little to address the political context for hydro development, which is essentially state expropriation of resources, transferring to one group of beneficiaries over many different communities of interest. The problem is that planners are not accountable to potential victims or beneficiaries within each affected jurisdiction. Incumbent resource

users have no real rights to defend themselves or advocate for themselves, otherwise they wouldn't need Nordic experts to argue for better planning on their behalf! - fundamentally different from the Nordic context for planning. Without accountability feedback mechanisms, incentives and penalties - information is invariably skewed to favour developers and government beneficiaries." (University)

"In the real world it is always difficult to balance among economic, social and ecological aspects at the same time. Need new tools and mechanisms. "

"Very high development needs in education" (Researcher)

"The question also remains, whether the national groups that participate in the workshops and evaluate the SEA outcomes contain sufficient coverage of the stakeholders. The SEA is carried out in a rapid process and there is the risk that the distribution of information remains too limited and the consequent randomness in the participation may limit the success of the process." (Researcher, Manager)

"Planning process of projects that have more consultation with local people have been more successful and better for all, also for the developers. There have been less problems in project implementation and operation." (Researcher, Manager)

"EIAs are mostly carried out by foreign consultants, and their reports are always very lengthy, consisting of too many pages (up to 1000 pages, written in English). There are difficulties for Lao personnel working on EIAs from the, provincial, local, and even central levels due to English proficiency problems. It is difficult for these personnel to read and understand EIA contents. Furthermore, instead of being conducted prior to a project's implementation, EIAs are mostly conducted after projects begin."

The respondents were asked what kind of impact assessment and evaluation methods had been used in hydropower projects in the region (Figure 8). There were significant differences in how commonly different methods had been used. Cost-benefit analysis was by far the most commonly used method: 73 % respondents answered that CBA is used sometimes or commonly. The distribution of the answers was most heterogeneous in respect of MCDA. All reply categories got almost equal number of responses. Water footprint concept was considered least used with only 24 % of the respondents estimating it to be used sometimes or commonly, and more than 50 % of the respondents answered that they do not know cases where water footprint had been used.

"There is limited knowledge in the use of advanced methods. Generally, the choice of methods depends very much on the data and technical inputs available and which standards are used in the project." (University, Laos)

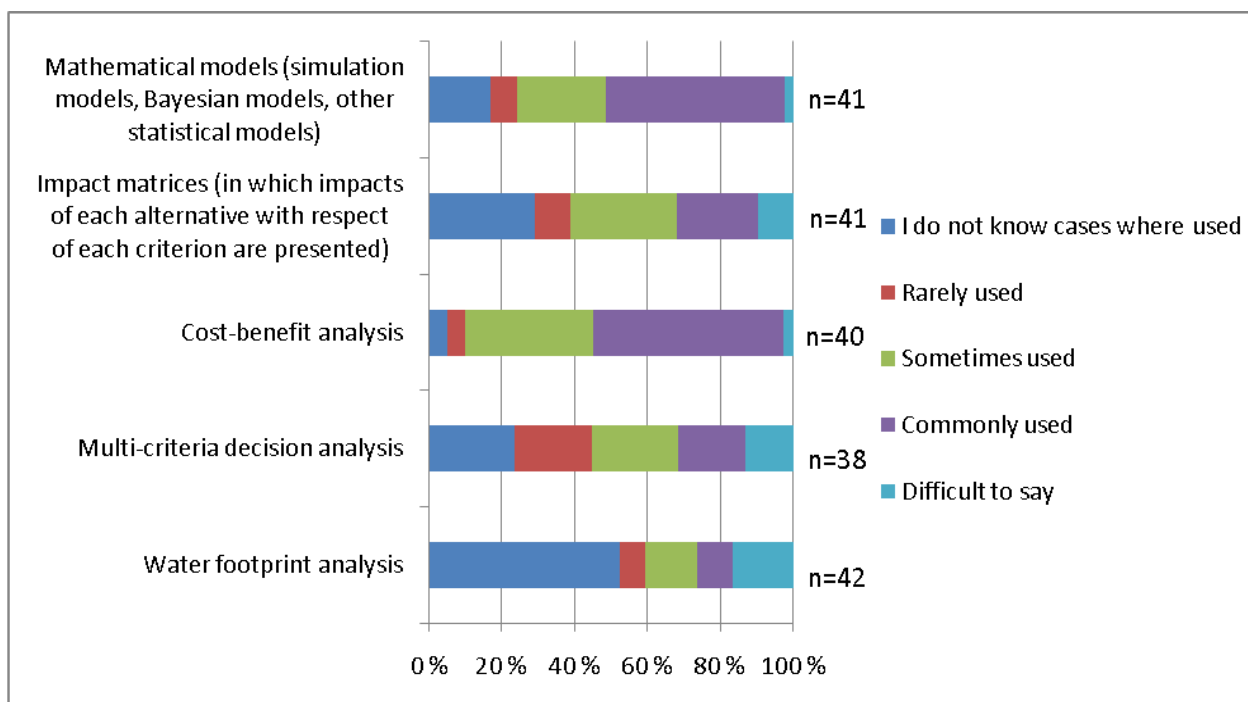


Figure 8. "Do you know if the following methods have been used in hydropower projects in the Lower Mekong Basin?"

3.3 Multi-criteria decision analysis

In the questionnaire special attention was paid to multi-criteria decision analysis (MCDA). Before carrying out the survey it was assumed that MCDA method is not very well known in the region. Consequently, the MCDA method was briefly described and its main features were presented (see below) before asking the respondents about their opinion of the method. There was also a link to a web-page where more details about the MCDA and its application opportunities were presented. (www.environment.sal.tkk.fi/MCDA/)

In the questionnaire main features of MCDA and the benefits it can bring were described in a following way:

- a. MCDA can provide a logical framework for the planning and to improve transparency of planning.
- b. MCDA can facilitate discussion in multi-stakeholder group and helps to find a common language.
- c. MCDA can help to efficiently utilize information from different sources: models, expert judgment and local knowledge to identify data gaps and major uncertainties.
- d. MCDA can support value based planning in which participants' objectives are systematically identified and structured and utilized in the evaluation and development of alternatives.
- e. MCDA can help to identify significant and less significant impacts and to clarify issues of agreement and disagreement.
- f. MCDA can support systematic and transparent evaluation of alternatives, ranking of alternatives from different perspectives and finding balanced solutions.
- g. MCDA can support participants' learning and comprehensive understanding of the planning situation.

The Interview questionnaire and the Internet questionnaire differed to some extent in the question 14, and therefore the results are presented separately (Figures 9 and 10). In the Internet questionnaire

people were asked to give their opinion about the applicability of MCDA. Generally, the respondents had a positive attitude toward MCDA: 72 % considered its applicability better than moderate (Figure 9). Yet, quite a small proportion, 8 %, estimated the applicability of MCDA as very high. Only 16 % of the respondents found the applicability less than moderate. In this question there was no "difficult to say"-alternative, so we do not know if people with little advance information of the MCDA method would had chosen that alternative when given a chance. Of those seven respondents who have applied MCDA in a real case two thought that MCDA's applicability is moderate (grade 4) and two that it is very high (grade 7). The rest three respondents gave grades 5 (one person) and 6 (two persons).

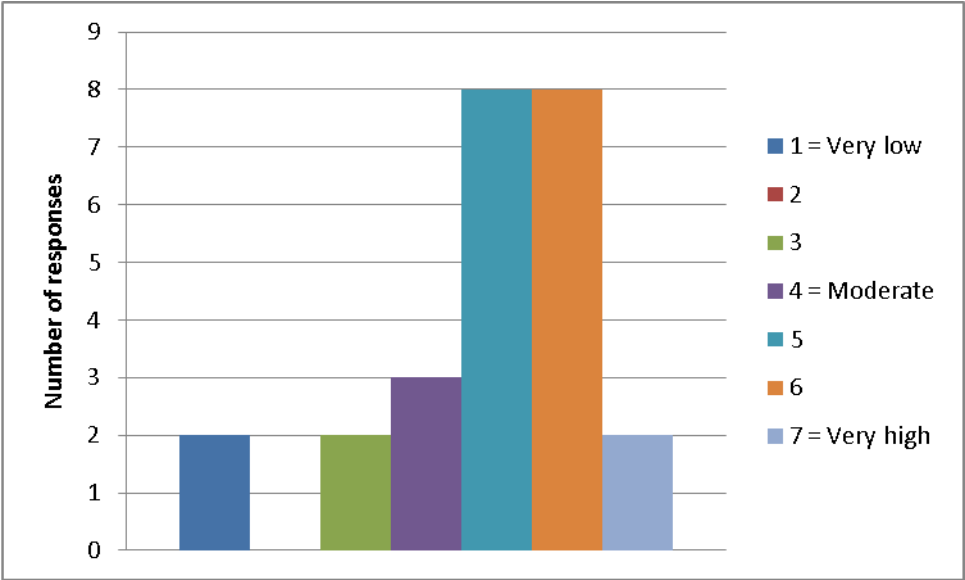


Figure 9. "What is your opinion of the applicability of MCDA in hydropower development projects in the Lower Mekong Basin?"

In the Interview questionnaire the respondents were asked how valuable it would be if many of the benefits of MCDA could be reached (Figure 10). The phrasing of this question was deemed too much of a leading question by the researchers and was therefore changed in the Internet questionnaire. Despite this, the results from the interviews are presented here but they should be interpreted with reservation. Of the 15 respondents no one considered the benefits of MCDA less than moderately valuable while 87 % thought the benefits are more than moderately valuable. Only 7 % chose "difficult to say" in this question.

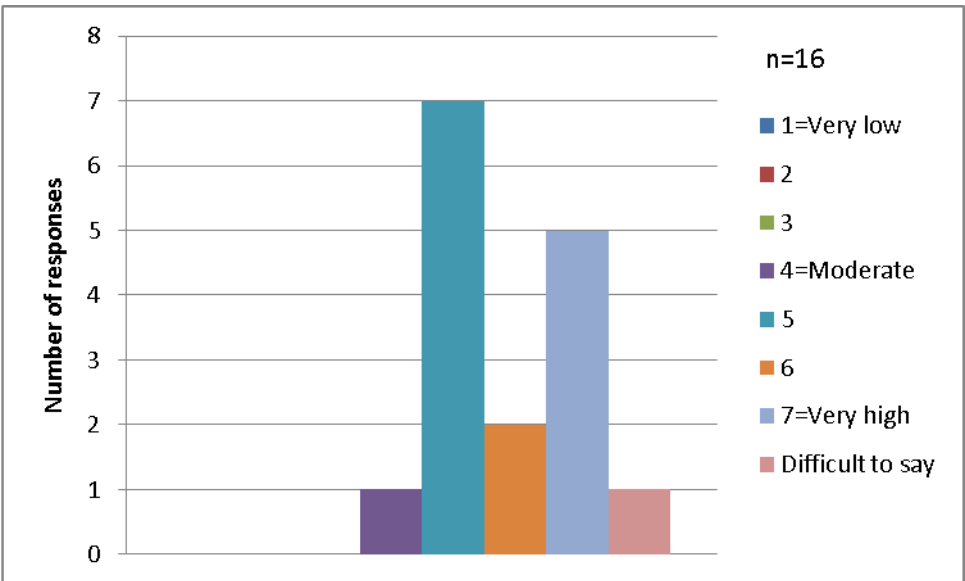


Figure 10. "How valuable would it be if many of these benefits could be reached in the planning of hydro power development projects in the Lower Mekong Region?"

Although the formulation of the questions in Figures 9 and 10 were different, the results are in line with each other and suggest that MCDA is considered a potentially useful method in the planning of hydro power development projects in the Lower Mekong Basin. The responses confirm only partly the assumption that MCDA is not well known in the Lower Mekong Basin. 86 % of the respondents had heard or read about MCDA, but a lot fewer, less than 40 %, knew the principles of the method (Figure 11). However, 16 % had tested some MCDA tool and 7 % included MCDA material in his or her teaching. University people seemed to be most familiar with the method.

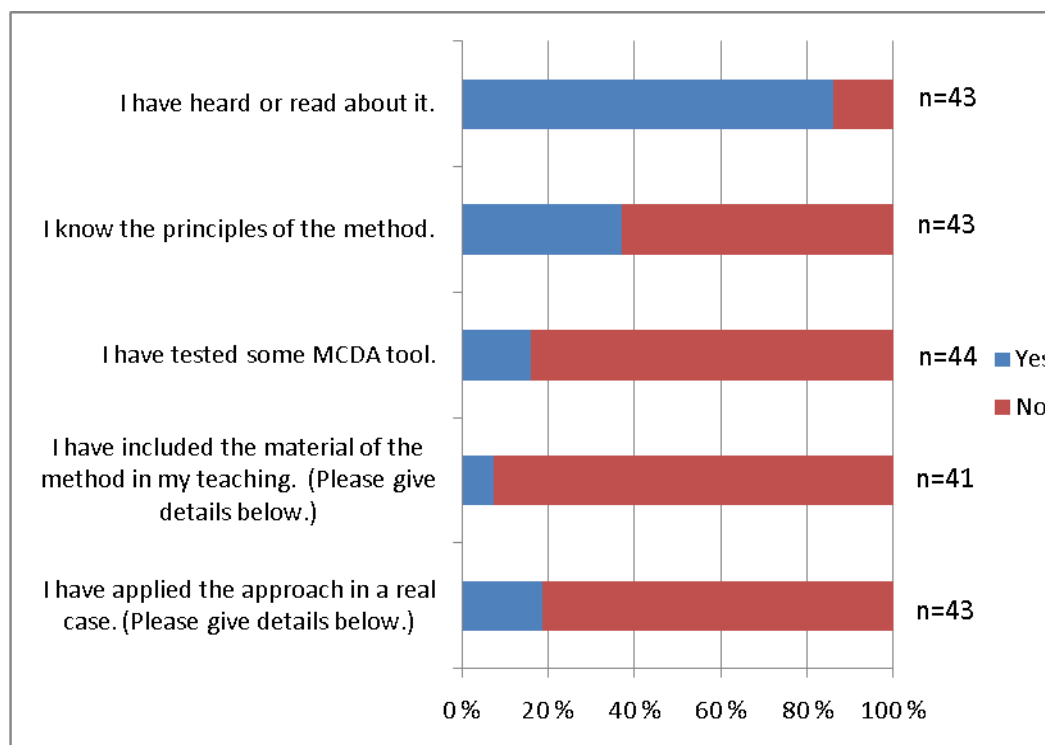


Figure 11. "How familiar are you with the multi-criteria decision analysis (MCDA) method?"

In the open comments some respondents gave references to projects where MCDA method or similar had been used. However, there was only one MCDA project specified. The project was related to support the decision maker in trade-offs among different stakeholders' interests in the coastal Mekong delta of Vietnam (Trung et al. 2006). It was also mentioned that similar logical framework and elements had been applied in the area "Similar logical process to MCDA is used in planning, although it may not mean using neither a specific MCDA software nor full participation of the stakeholders" (Governmental). Some respondents had used MCDA applications elsewhere, e.g. in Australia and Africa.

In the question 18 people were asked to assess what the possible reasons are for the limited use of MCDA method in the region (Figure 12). Half of the respondents thought that there is no expertise for applying MCDA methods in practice. Almost 40 % of the respondents thought that MCDA method and its application opportunities are not known in the area. 54 % of the respondents disagreed with the statement that "there is no need to apply systematic and structured methods". The proportion of "neither agree nor disagree"-responses was largest, 36 %, on the statement that MCDA method and its applications are not known in the area. People seem to have found it difficult to assess whether "MCDA methods have not been considered appropriate" with 50 % choosing "difficult to say" on that statement. One respondent mentioned that "One obvious reason for the limited use of MCDA (as well as other advanced methods) in Laos is the limited opportunity to send students to developed countries for training."(University)

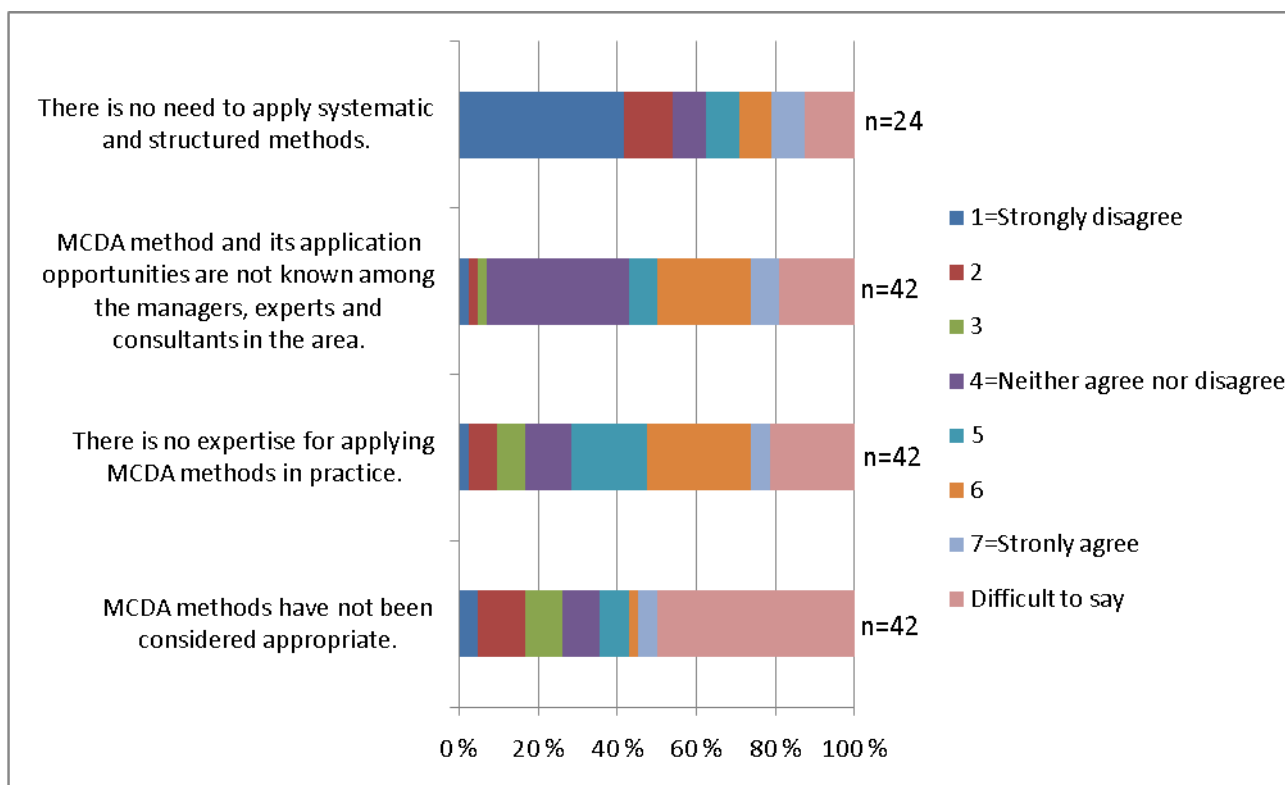


Figure 12. "What are the possible reasons for the limited use of multi-criteria decision analysis (MCDA) method in the Lower Mekong Basin?"

In the Interview questionnaire people were asked to prioritize potential benefits of MCDA. This question was deleted from the Internet version because of the risk of leading too much the thinking of respondent. The most valuable and the second valuable aspect were asked to be chosen. In Figure 13 the results are presented without distinction between the most and second valuable aspect. Opinions regarding which benefits were considered most important varied a lot between respondents. The respondents emphasized most the aspect that MCDA can facilitate discussion in multi-stakeholder group and help to find a common language. Least important was considered the aspect that MCDA can support value based planning in which participants' objects are systematically identified and structured and utilized in the evaluation and development of alternatives.

In the open comments many respondents considered MCDA as a very valuable tool in hydropower planning. Some of the respondents had earlier positive experiences from the method in other countries. Suggestions regarding the use of MCDA in Mekong Region were presented by some respondents. "MCDA should be included in the TORs of the projects" (Business). MCDA could also be used to "develop capacity at the university". The acceptability of the method can be improved by education. In promoting the use of MCDA, it is also important to take into account the requirements of existing legislation.

"As to the MCDA, it seems that a similar logical process is used in planning, although this may not mean using the specific software, neither a full participation of the stakeholders in the process.....The MCDA method and its possibilities are known, there is quite a lot expertise of it and it is considered appropriate for hydro power planning. Main problem is that it is hard to get a budget for bottom-up planning. A problem is also, that local people know very little of hydropower dams and their impacts, hardly even what the dam is since they never saw one. That is why not too much involvement from the local people is to be expected in the beginning of applying this method." (Government)

"The method can be made more acceptable and more known and useful by learning. Some time is needed for considering how the method links with the existing legislation and government policies. If there are conflicts, possible gaps or doubts about the method, the barriers can be removed with additional information and explanation." (Manager)

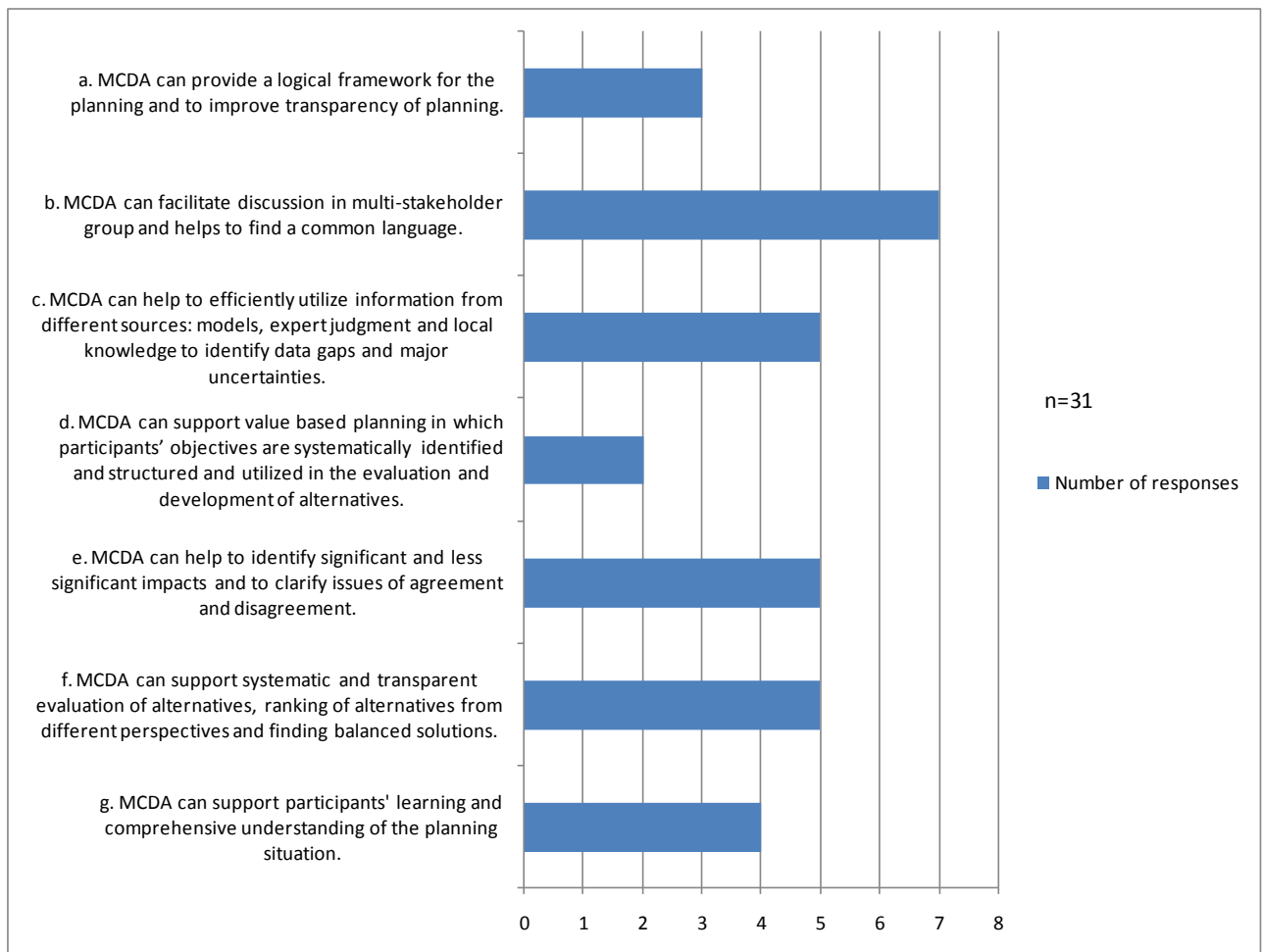


Figure 13. "Which of the above benefits (a-g) would be most valuable when planning hydro power development projects in the Mekong Region?"

Some respondents stressed that they do not have enough information to speak out to MCDA. "First, it needs to be tested and depends very much on the agency that will implement this." (Intergovernmental organization).

However, there were also respondents who were skeptical about whether MCDA could really influence the decision-making processes in the region.

"MCDA was used in limited cases. Its effectiveness varies due to the limited capacity and institutional support in most Mekong countries."(Research)

"MCDA is a tool for sophisticated discussion. There are very few sophisticated deliberative processes re[garding] hydro."(Governmental)

"It is very unlikely that the Government would want to consider public opinions or consult in a meaningful way. MCDA may be done, but it would unlikely influence decision-making." (NGO)

In one open comment was stressed that the insufficient knowledge of the system affects the applicability of MCDA. "MCDA allows for an informed ranking. But in the LMB it seems as if the necessary systems understanding is still lacking to develop an effective MCDA." (Research)

There were also people who had a reserved attitude towards the use of MCDA

"The underlying assumption is that decision makers don't have the information they need to make the right decisions. This is arguable. Decision makers in the Mekong countries are singlemindedly focused on investments that generate short-term revenue for government, allow for payback of government loans, and attract more donor funding..... Dams fit the bill." (University)

"I have heard but never read about it. However, I doubt if it is anything special but just a simple principle with a fancy name. I would rather count on people who implement the participation mission rather than the tools." (Intergovernment)

"Little experience with MCDA. I have read project evaluations with MCDA included but was not convinced of the rigorousness of the methodology. I would like to attend a training program to review the method and see it applied to a real hydropower project case study in the GMS to evaluate the benefits." (University)

3.4 Water footprint analysis

The respondents' attitudes towards the water footprint analysis were surveyed with similar questions as in the MCDA-part of the questionnaire. Likewise, there were differences in questions between the Interview questionnaire and the Internet questionnaire. Because it was assumed that the method is not well-known in the area, a brief description (Annex 1, p. 9) was given before the actual questions.

In the Internet questionnaire respondents were asked about their opinion of the applicability of the water footprint concept in hydropower development projects. Respondents' attitude toward water footprint was quite positive (Figure 14). 36 % of the respondents found the applicability higher than moderate and 23 % lower than moderate. Number of moderate answers is, however, quite high, 40 %. There was no "difficult to say"-option.

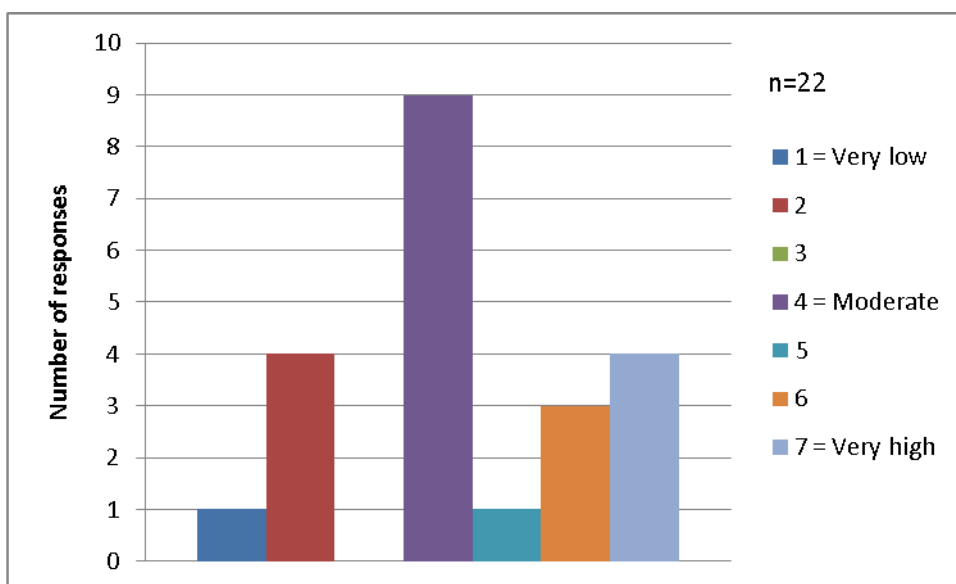


Figure 14. "What is your opinion of the applicability of the water footprint concept in hydropower development projects in the Lower Mekong Basin?"

In the Interview questionnaire people were asked how valuable the water footprint concept would be in the planning of hydro power development projects in the Lower Mekong Region. Half of the respondents could not assess the value of the method and did not reply (e.g. "I don't see the point regarding the hydro"). The rest of the respondents were positive towards the method: nobody of them thought its value would be less than moderate.

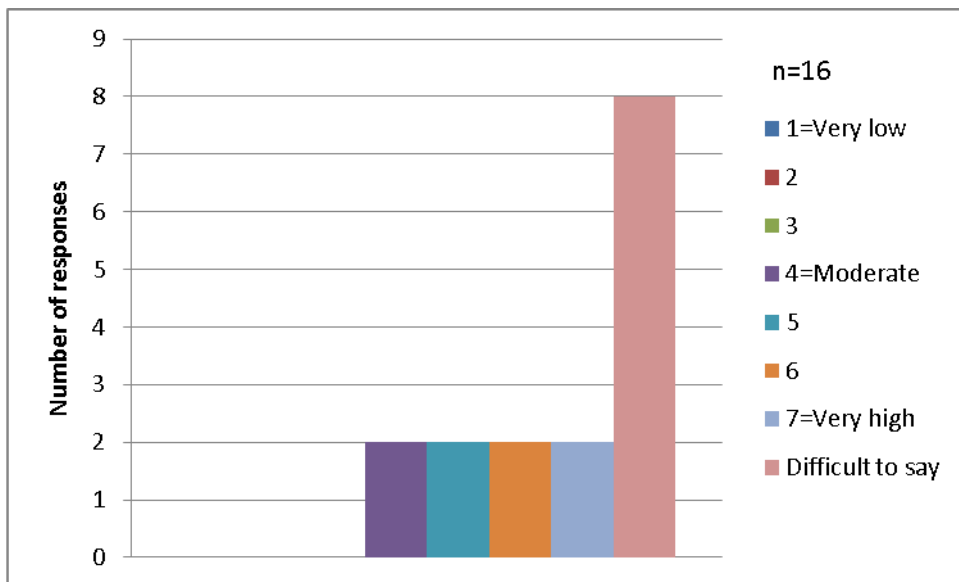


Figure 15. "How valuable would the water footprint concept be in the planning of hydro power development projects in the Lower Mekong Region?"

The majority of the respondents (77 %) had heard or read about the water footprint concept. However, the principles of the method were familiar to only 44 % of the respondents (Figure 16). Only a few had applied the method: 5 % had included the material in their teaching, 12 % had done water footprint analyses and 5 % had applied the method in a real case.

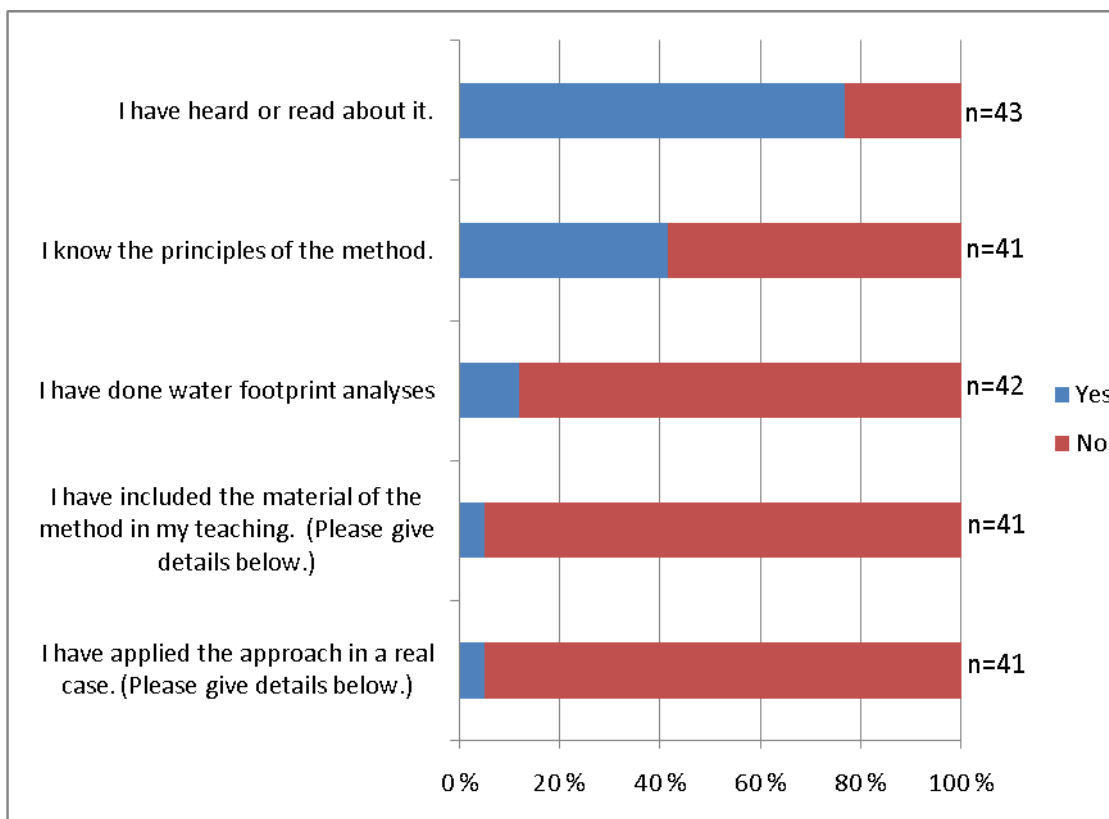


Figure 16. "How familiar are you with the water footprint concept?"

It was supposed that the water footprint concept is not used very widely in the area. Therefore, people were asked what they suppose to be reasons for the limited use of the concept (Figure 17). According to 38 % of the respondents, one reason for the limited use of the water footprint concept is that the concept is not known among the managers, experts and consultants in the area. One third of the respondents also thought that the lack of expertise for calculating water footprints can limit the use of

the concept. The proportion of “difficult to say”-responses was quite high in this question (31-41 %) compared to other questions in the questionnaire. The proportion of “neither agree nor disagree”-responses was also quite high (14-20 %), which implies that people have not had very strong opinions about the statements. It seemed to be hard for many respondents to assess whether the statement “*the water footprint has not been considered appropriate*” can restrict the use of the concept. The responses were in this statement quite disunited with 21 % agreeing with the statement and 19 % disagreeing. Over 40 % chose “difficult to say” in this statement.

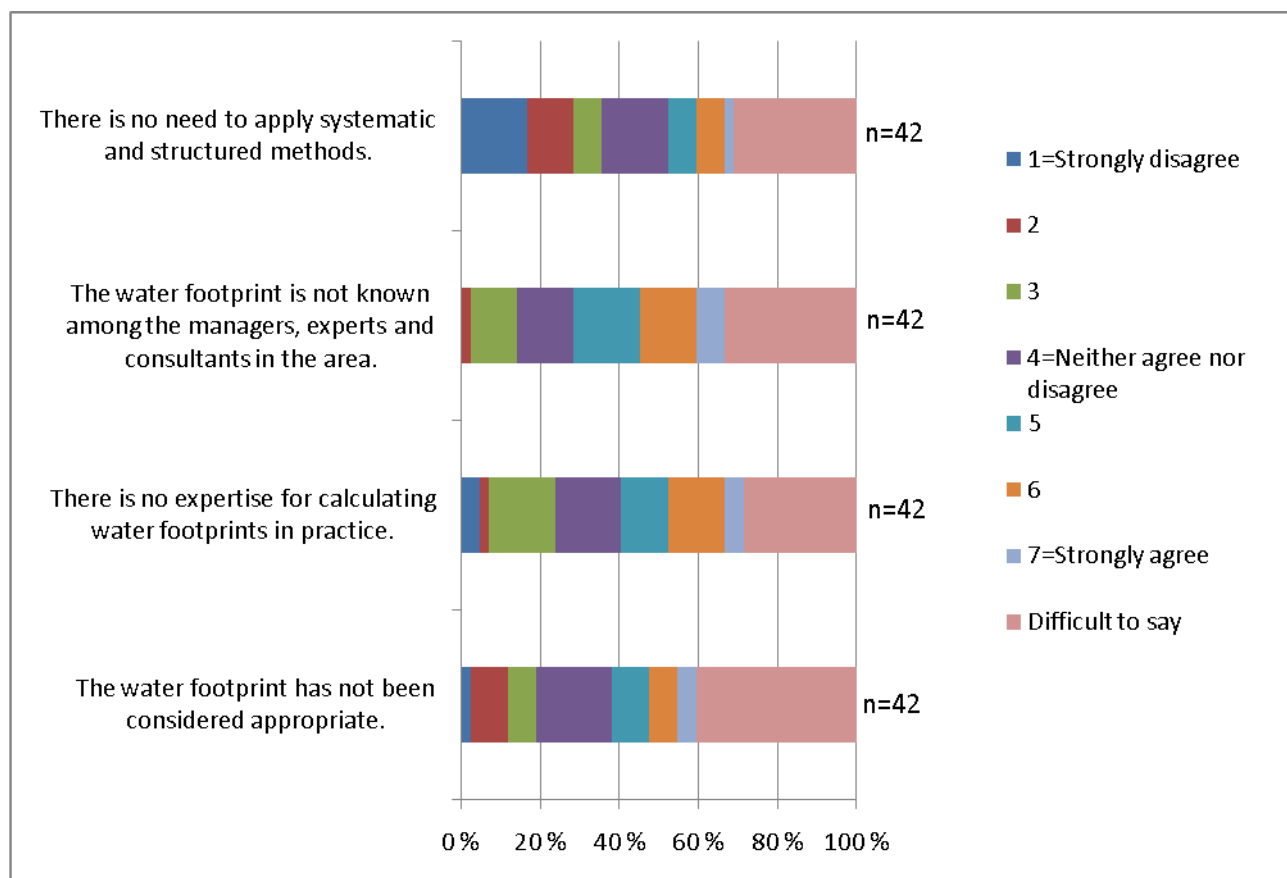


Figure 17. "What are possible reasons for the limited use of the water footprint concept in the Lower Mekong Basin?"

"The Water Footprint Method is very little known and applied in Laos. The discussion at this point typically shifts to water pricing, water allocation and project profit considerations. However, the method itself raises strong interest and is considered appropriate. More practical experiences and demonstration of its application is needed." (Government)

3.4 Education - needs and the current status

In the questionnaire there were four questions related to education. The respondents were asked about their opinions of different means to improve planning practices in the hydropower development, their own interest to participate different kind of training, and what kind of courses had been arranged related to environmental planning.

The respondents were quite unanimous that all the means presented in the questionnaire (Figure 18) would be useful to improve planning practices in the hydropower development projects. On every statement at least 67 % found the means important or very important and less than 5 % unimportant. Over 60 % of the respondents considered "*pilot projects during which new methods are demonstrated*" as a very important means. Arranging new courses on planning at the universities in the region was

considered slightly less important than the other means. Only 2 % found intensive training courses for specific audience not important. Almost 90 % thought that increasing the involvement of experts in applying advanced planning methods related to public participation and decision support is important or very important. In this statement, however, there were fewer respondents than in other cases due to different versions of the questionnaire.

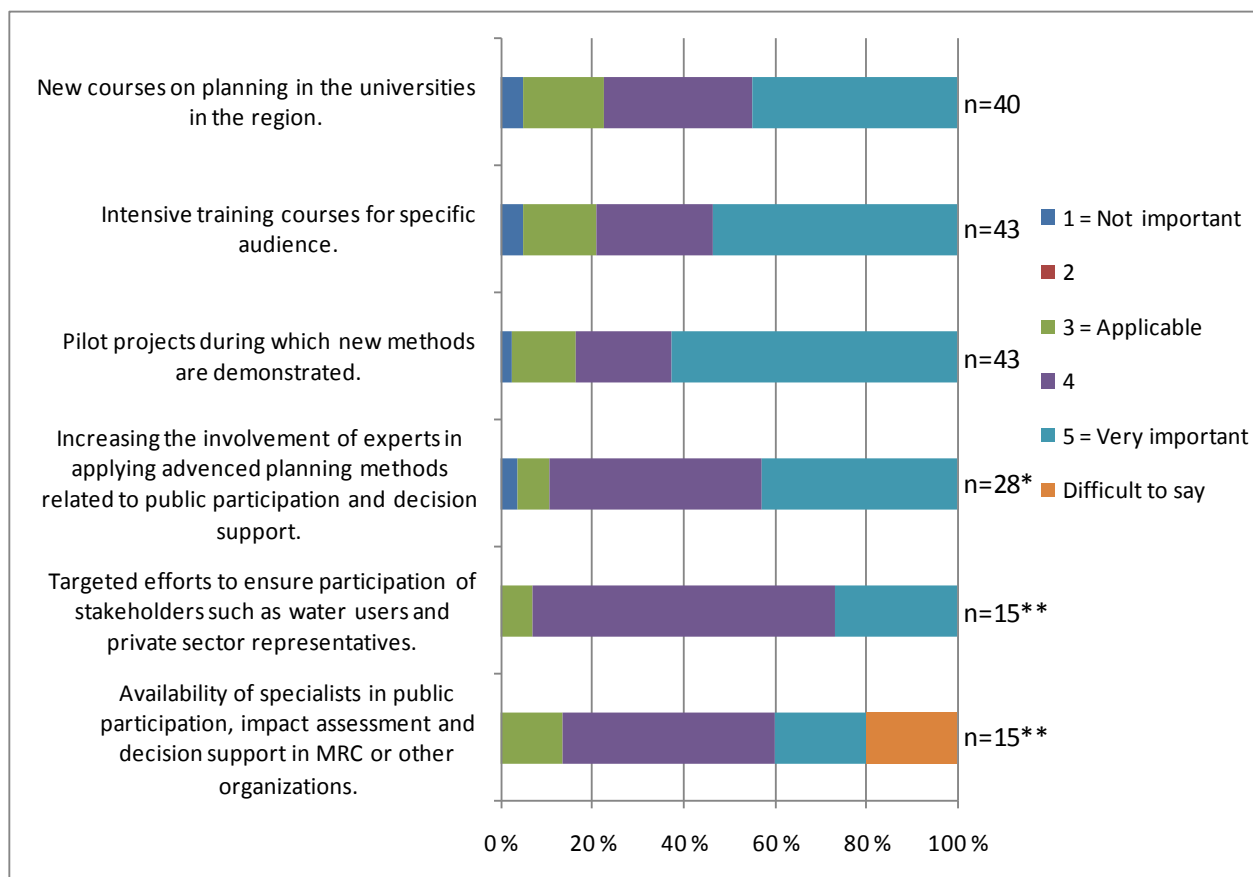


Figure 18. "What is your opinion of the importance of following means to improve planning practices in the hydropower development projects in the Lower Mekong Basin?" The number of the respondents varies because some of the statements were different in the interview and internet questionnaires. (* Presented only in the Interview questionnaire, **Presented only in the Internet questionnaire).

In the comments following opinions were presented:

"All means noted above should be introduced both through the universities and into the government agencies. Eg. a new application for an industrial license or an EIA of a development project would require the project" (University)

"Participants from different disciplines/backgrounds are needed" (University)

Generally, the respondents were very interested in participating in various trainings (Figure 19). 62-91 % of the respondents were willing to participate to presented subjects. Most attractive was the multi-criteria decision analysis and least attractive participatory planning. The willingness to attend to trainings related to MCDA is in line with the results that MCDA method is not well known among the respondents and respondents considered its characteristics useful. The number of respondents varies because some of the methods were not introduced in the Interview questionnaire. There was no more defined scale between "yes" and "no", and no "difficult to say"-alternative, but the results can be seen as an indication of a positive attitude towards trainings.

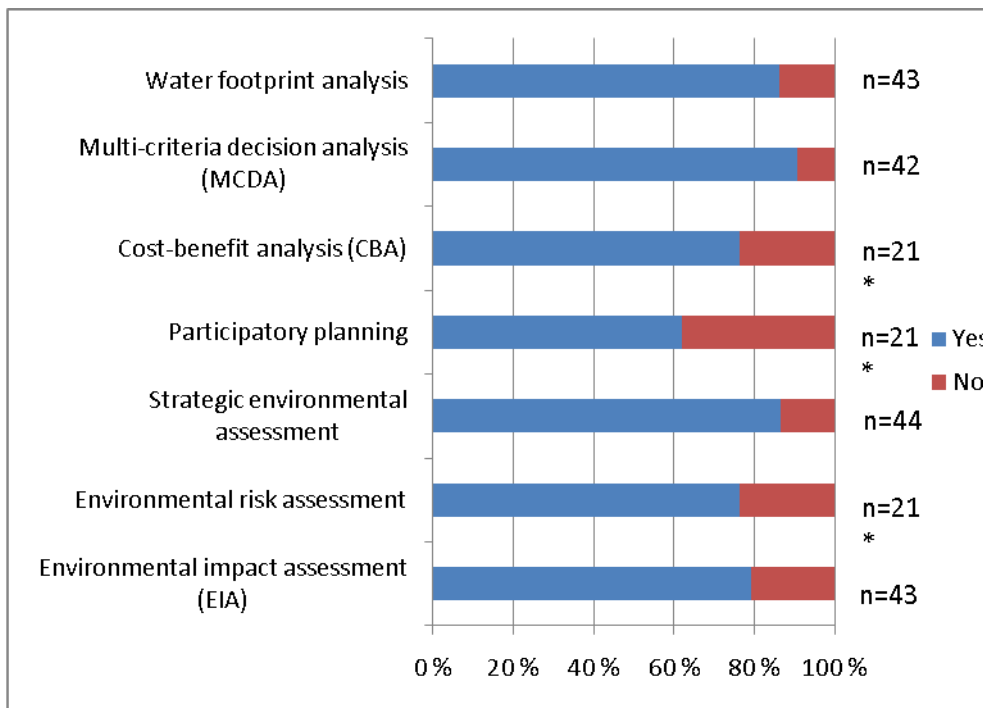


Figure 19. "Would you or your colleagues like to participate in trainings for capacity building related to following subjects?" (* presented only in the internet questionnaire).

People were asked if they know what kind of courses related to impact assessment and evaluation of hydropower development projects had been arranged in the region (Figure 20). In this question there were significantly fewer respondents than in previous questions of the questionnaire. This is maybe because the question was quite long and people who didn't know any courses on that field did not want to choose option "no" in every case but simply skipped the whole question. In general, not many people knew courses arranged. Almost one third of the respondents knew that there had been courses related to environmental impact assessment. About 22 % knew courses related to environmental risk assessment and strategic environmental assessment. Only 9 % were aware of that there had been courses on multi-criteria decision analysis.

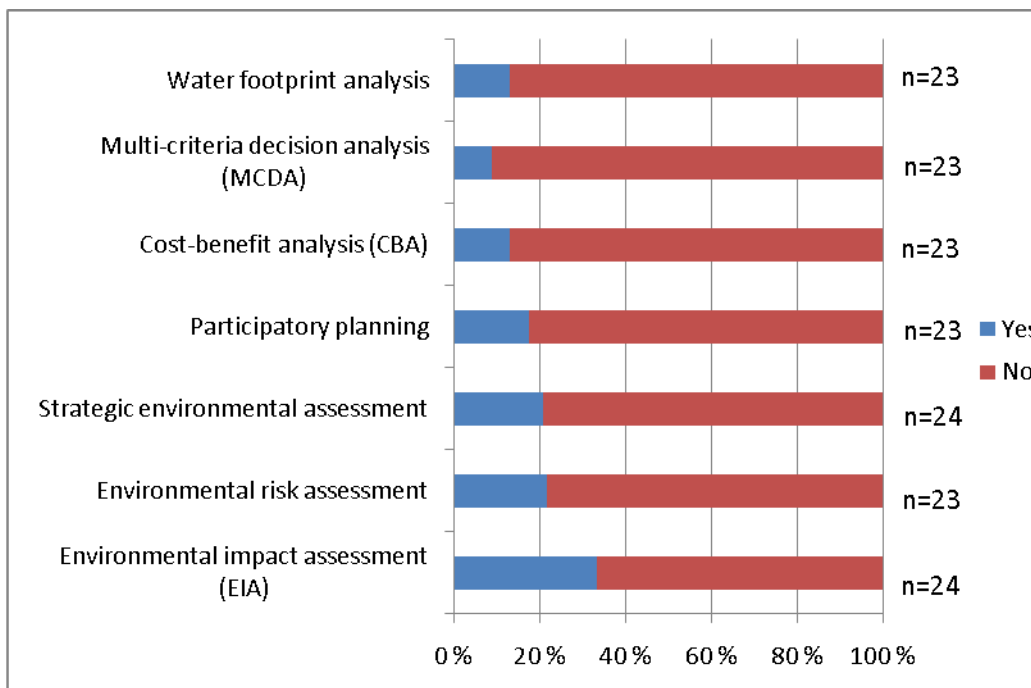


Figure 20. "Do you know of courses arranged that are related to impact assessment and evaluation of hydropower development projects in Thailand, Cambodia, Laos or Vietnam?"

Almost one third of the respondents knew courses on environmental impact assessment that are being planned (Figure 21). Although cost-benefit analysis is quite commonly used according to question 8, only 5 % were aware of courses being planned related to that method. 13 % of the respondents were aware of courses that are being planned related to multi-criteria decision analysis and water footprint analysis. The results of this question are not very easy to interpret because so many did not answer the question at all. People were asked to give details of the courses but just a few did that. Thus it is unclear if people answered “yes” when they knew a specific course by name or if they knew such courses are organized in general in the Lower Mekong Basin.

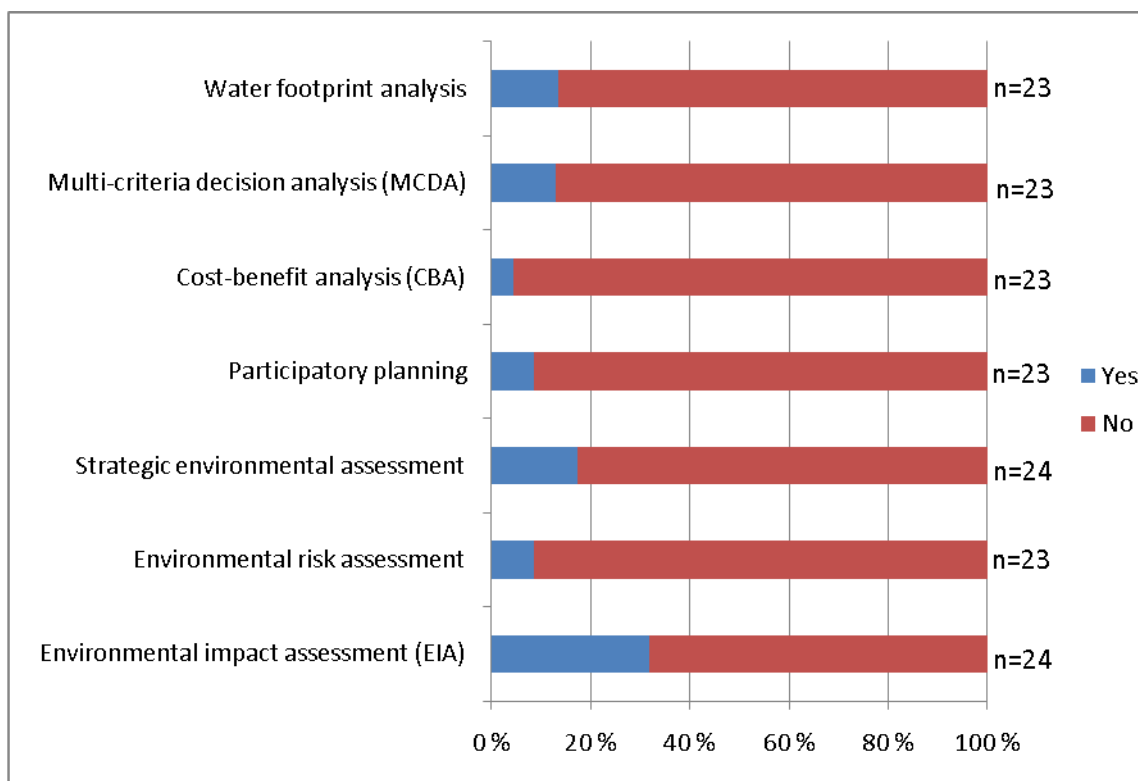


Figure 21. "Do you know of courses being planned that are related to impact assessment and evaluation of hydropower development projects in Thailand, Cambodia, Laos or Vietnam?"

"MCDA is a good and promising method and needs to be made more known.... In practice, the university has to be careful with adding new curriculum items because once the new subject is added in, it cannot be removed easily. This underlines the need of collecting more information or pilot cases on MCDA, and available implementation capacities, before it can be added into the curriculum." (University)

3.5 General comments regarding the questionnaire

At the end of the Internet questionnaire there was space for general comments on the questionnaire and for additional information. Seven respondents out of 22 had given feedback. The comments, which provide valuable input for compiling future recommendations, are presented below as such.

"Planning methods are only a small factor incorporated into decision making in the region nor do you adequately cover all concerns related to hydropower. Too much emphasis is given to the tools, but really more energy should be put into studying impacts, relating this information to decision-makers and training governments to improve public participation in decision-making processes." (NGO)

"If SPLASH want to assist, it must be via real partnerships with Mekong Region institutes, and not just via an avalanche of training materials prepared in English language. Niche exists for development of a cadre of people from the region who don't all have to be practitioners of these tools or methods, but need to be familiar with them to understand their analytical findings." (Research)

"It's very good for our country to have opportunity to sharing information and preparing planning methods with others country or different organizations." (NGO)

"According with your questionnaires has been enable very importance to sharing and exchanging an experience with international and national expertise's for this course of improving current practices related to hydro power development projects in the Lower Mekong Basin." (University)

"Very much worthwhile to assess the understand / usefulness of those methods/tools" (University&consultant)

"I found the questionnaire stimulating and very useful, particularly to encourage future development courses, adult and professional education, and capacity building (short courses) in government agencies of these methodologies using case studies to support theory. We need organizations to push for introduction of these methods among the professionals as well (EIA licensed consultants for example)." (Governmental)

"The questionnaires are goods, but still need time to rethink the meaning. If we have read some methods and used them in advance, i think we can make it more accurate in providing an answers." (University)

4 Summary of the consultants' reports

The material from the consultants' interviews and desk studies was very heterogeneous. Our assumption was that MCDA is rarely used and taught in the region and in this respect the results confirmed our expectations. The only exception comes from Thailand and the Asian Institute of Technology (AIT). Courses of MCDA were taught in Thailand. In the following some main findings of each review are summarized from the perspective of this MCDA study. The summary is based mainly on the direct quotations from the source reports.

Vietnam

Prepared by Dr. Nguyen Van Duong Department of Higher Education, Ministry of Education and Training

There are 30 universities having programs related on water resource (WR) and hydropower development (HD). Synthesis of 30 universities academic programs and their content water resource engineering, environmental science, hydro power construction, for instance. MCDA was not included in any of the university courses analysed in the work.

Suggestion: Develop an academic program focus on cost-benefit analysis, environmental impact assessment, evaluation and assessment of alternative resource management strategies; policy evaluation and monitoring; and analytic tools for studying how environmental developments affect the economic system such as, MCDA.

Thailand

Prepared by C. Sukhsri, Water Resources Research Unit Department of Water Resources Engineering, Chulalongkorn University

Two main regional institutions i.e. Asian Institute of Technology (AIT) and Mekong Institute (MI), offer academic courses, short courses and tailor-made professional and development training courses and technical workshops on natural resources/water resources planning and management. Most of research topics cover broad spectrum on natural/water, land and other related resources; policy statement; water framework and strategy; water resources assessment/balance/allocation, planning, development & management; monitoring & evaluation; performance indicators; decision making processes (including MCDA), stakeholders participation.

In general within the normal graduate coursework, the theoretical background and application of MCDA are addressed in the water resources system or water management graduate courses. Issues such as multi-stakeholder platform, simulation and optimization of water resources system are addressed.

Decision Support tools and models such as AHP, coupling with Fuzzy Logic, and Del Phi techniques are employed to address or assign value to difficult non-commensurate parameters. However, in terms of actual implementation, from the literature review the use of multi-criteria analysis in water resources problems is not yet recognized.

The following is an example of on-going research activities on climate change at CU_WRSRU.

- Web-based Decision Support System for Regional and Community Water Management, 2008.
- Case Study: Water Resources Management Pattern Using an Area-based Water Resources Information System Coupling with a Social Participatory Process and its Application in Rayong Province, January 2010.

Cambodia

Prepared by Mr. Sok Saing Im, freelance consultant

Cambodia is at its very early stage of development in large infrastructure such as hydropower development. The country lack experience and is still largely depending on external assistance technically and financially. There are limited human resources and this vacuum will continue to affect the country effort in its medium to long term economic development. Studies related to hydropower development are principally made by International and local NGOs such as: International Rivers, River Coalition in Cambodia and NGO Forum. The Cambodia Resources Institute for Development (CDRI) has recently developed research programme mainly focusing on water governance. Interviews produced few results due to interviewees' unfamiliarity with the issues.

Laos

Prepared by Assoc. Prof. Souphab Kuoangvichit, National University of Laos, Faculty of Environment

Within NUOL, desk study found that the faculty of environmental sciences, the faculty of engineering, the faculty of social sciences, the faculty of sciences, the faculty of forestry, and the faculty of agriculture offer course on hydrology and water resources with different focuses and objectives. Thus the content (syllabi, course description) is usually different.

The faculty of environmental sciences seems to be the faculty running more courses which cover diverse aspects of water. Three courses are considered as core courses of both undergraduate programs at the mentioned faculty which are (1) Bachelor of Environmental Sciences, and (2) Bachelor of Environmental management. These courses are (1) Water resource and environment, (2) Integrated watershed management, and Hydrology. Later on with the revised undergraduate program, one more course is adding which names Human Value Water Conservation Demand Management (HVWCDM). For an example syllabi of the Integrated Watershed Management is following:

- Concepts of Integrated Watershed Management; characteristics of watersheds (ecosystem, present activities, settlement patterns, land use, hydrology, erosion and sedimentation, economic development opportunities, upstream-downstream relationships); international institutions and watershed management; techniques and methods for integrated watershed management (DRIFT; GIS, land use planning, rapid rural appraisal (RRA) and participatory rural appraisals (PRA)). Case studies of completed integrated watershed management plans.

Recommendation: Information network and sharing is needed to be established in line the improvement of keys factors for the advancement of sciences and techniques which the outputs are the research results, courses development, material and tools created. Throughout that approach research results, as for an example, will be discussed and presented widely among interested individual to group at all level: academia, practitioners and decision markers. In searching for promoting best practices, pilot and/or demonstration project is the most practical.

No experiences or courses related to MCDA were mentioned in the report.

5 Conclusions and recommendations

There are a lot of uncertainties related to the fact that the questionnaire was implemented in English which is not the mother tongue of most of the respondents and not even the researchers. It is probable that there are misunderstandings and difficulties in interpretation especially because the language and terminology used in the questionnaire was in some questions quite difficult. It seems, however, that people have found the questions pretty easy to answer because the proportion of "Difficult to say"-values is low in most cases.

The researchers tried to formulate the questions as unambiguously as possible to minimize the differences in interpretation of the questions. Still, with every respondent the views and meaning of a particular question presented in the questionnaire can differ greatly from what the researcher conducting the survey had in mind. Thus, the researcher can consider the response in a wrong way with respect to what the respondent had actually meant. These kinds of problems can culminate especially when the researchers and respondents are from different cultures.

The target group of the questionnaire and interviews were a wide spectrum of people working in different positions in government, business, universities and NGOs. However, most of the respondents belong to professor/teacher or researcher categories whereas there were only few answers from business and authority people. This should be borne in mind when interpreting the results.

Because the Lower Mekong Basin covers a large area and different countries, the practices and implementation related to hydropower projects can vary inside the area. Comparison of the situation in different areas was not a target in the questionnaire. However, letting the respondent define the area his responses cover, instead of considering the whole basin as one, might have been useful. Some respondent's remarked that they do not know the situation of the whole Lower Mekong Basin. In addition, it is not clear what kind of hydropower development projects the respondent had experience with, for instance how large the projects were. This kind of background information would have been useful when interpreting the results.

The key findings of this work can be summarized in a following way:

- Current planning practices in hydropower development projects were widely considered inadequate. It is not only the lack of appropriate methods but also that they are not used in an appropriate way or their results are not taken into account in the decision making.

- Respondents had a positive attitude toward MCDA and thought it could make a valuable contribution to the planning of hydro power development projects. The respondents emphasized most the aspect that MCDA can facilitate discussion in multi-stakeholder group and help to find a common language.
- Currently the use of MCDA methods is very limited in the region. This is mainly because there is practically no expertise in MCDA. Another important reason is that the application opportunities of MCDA are not known. Respondents did not have information about the courses in which MCDA methods were taught. However, there have been some projects where similar kind of logic to MCDA had been applied
- The respondents were unanimous that more education is needed to improve planning practices in the hydropower development projects. Pilot projects where the use of the methods is demonstrated and courses regarding different methods were considered important.

Suggestions for the next steps in the capacity building of the use of MCDA:

- Capacity building in the universities: student exchange between e.g. Aalto University's Systems Analysis Laboratory, National University of Lao (NUoL) and Asian Institute of Technology (AIT). Searching topics for thesis research in which MCDA approach could be applied. Preparatory contacts has been made with the Faculty of Engineering at NUoL and AIT.
- Intensive training courses for specific audience: 3-5 days training courses related to MCDA for interested actors (e.g. developers, planners, authorities, universities, private sector consultants, NGOs).
- Retrospective analysis of a completed project: One way to learn the philosophy and use of MCDA is to use the material from some realized project and mimic the phases and principles of MCDA in the desk work, and then discuss the process and the results with relevant actors.
- Identification of the interest of various experts to take part MCDA feasibility cases at the MRCS (e.g. ISH, EP/SIMVA, BDP, IKMP) and other organizations/networks (national agencies and authorities, M-Power, Mekong Futures programme, Challenge Programme/3S-case). In addition, potential situations where decision and planning support are needed are identified.
- New pilot projects are launched in which the application opportunities of MCDA methods are demonstrated with the help of MCDA experts.

References

N.H. Trung, L.Q. Tri, M.E.F. van Mensvoort and A.K. Bregt. 2006. Application of GIS in land-use planning. A Case Study in The Coastal Mekong Delta Of Vietnam. 4th International Symposium on Geoinformatics for Spatial Infrastructure Development in Earth and Allied Sciences 2006.

Annex 1. Description of Multi-Criteria Decision Analysis (MCDA)

General description

Multi-Criteria Decision Analysis (MCDA), or Multi Criteria Decision Making (MCDM), is a discipline aimed at supporting decision makers who are faced with making numerous and conflicting evaluations. MCDA aims at highlighting these conflicts and deriving a way to come to a compromise in a transparent process. MCDA methods have been developed to improve the quality of decisions involving multiple criteria by making choices more explicit, rational and efficient. The goal is to create a structured process to identify objectives, create alternatives and compare them from different perspectives.

Today MCDA is an established methodology with dozens of books, thousands of applications, dedicated scientific journals software packages and university courses. MCDA applications are diverse and they cover environmental planning, fisheries management, water resources management, forestry, nuclear emergency management, climate policies and life-cycle analysis. MCDA has been applied in many ways and many purposes, e.g. to identify best alternative, to rank alternatives, to assess conflict potential of the alternatives. The potential benefits of the use of MCDA in environmental planning projects are summarized in Fig. 1.

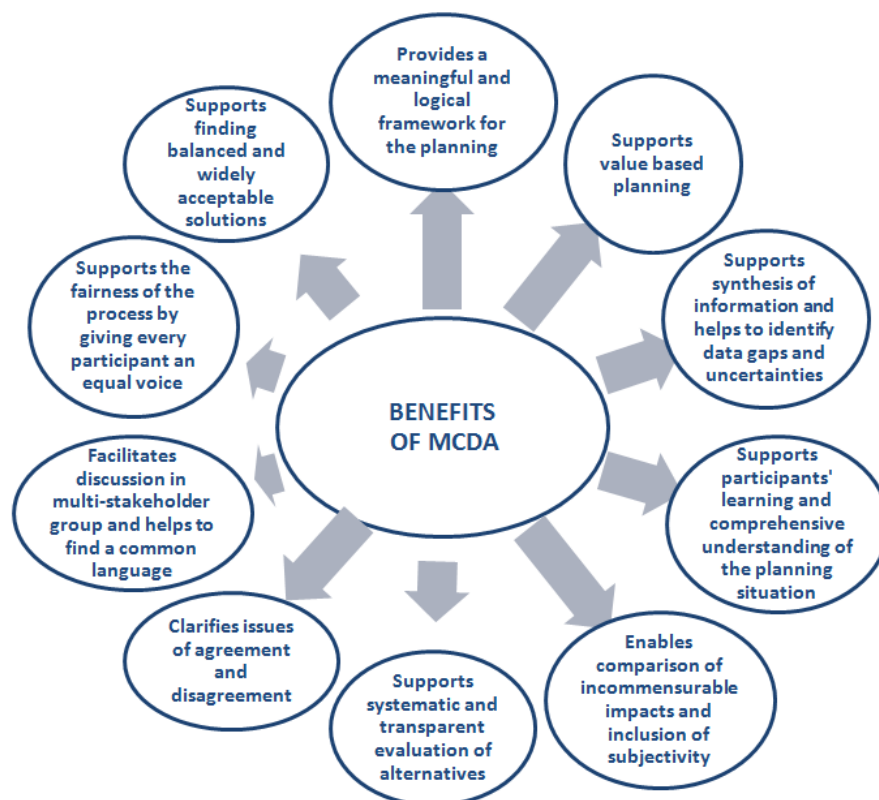


Figure 1. Potential benefits of MCDA in environmental planning.

Steps of MCDA

The realization of MCDA can be divided into several steps, for instance:

1. Analyze the decision or planning situation
 - a. What is the problem?
 - b. Who are the key actors (decision makers, stakeholders etc)?
 - c. What kind of constraints are there?

OUTCOME of this task: Framing of the problem
2. Identify objectives and alternatives
 - a. What kind of objectives different actors have?
 - b. What are the possible alternatives and what kind of impacts they have?

OUTCOME of this task: Objectives' hierarchy (Example 1)
3. Define criteria and indicators
 - a. What are relevant criteria and indicators in the evaluation of alternatives?
 - b. Available information defines what are feasible indicators and scales?

OUTCOME of this task: Refined objectives' hierarchy and list of indicators and scales
4. Assess and describe alternatives' impacts
 - a. Analyse and summarize the results of field studies, modelling, questionnaires, interviews etc.
 - b. Use expert judgments and local knowledge when needed

OUTCOME of this task: IMPACT MATRIX (Example 2)
5. Find out decision makers'/stakeholders' opinions
 - a. What are their opinions related to alternatives' impacts and their significance
 - b. Questionnaires/interviews can be applied

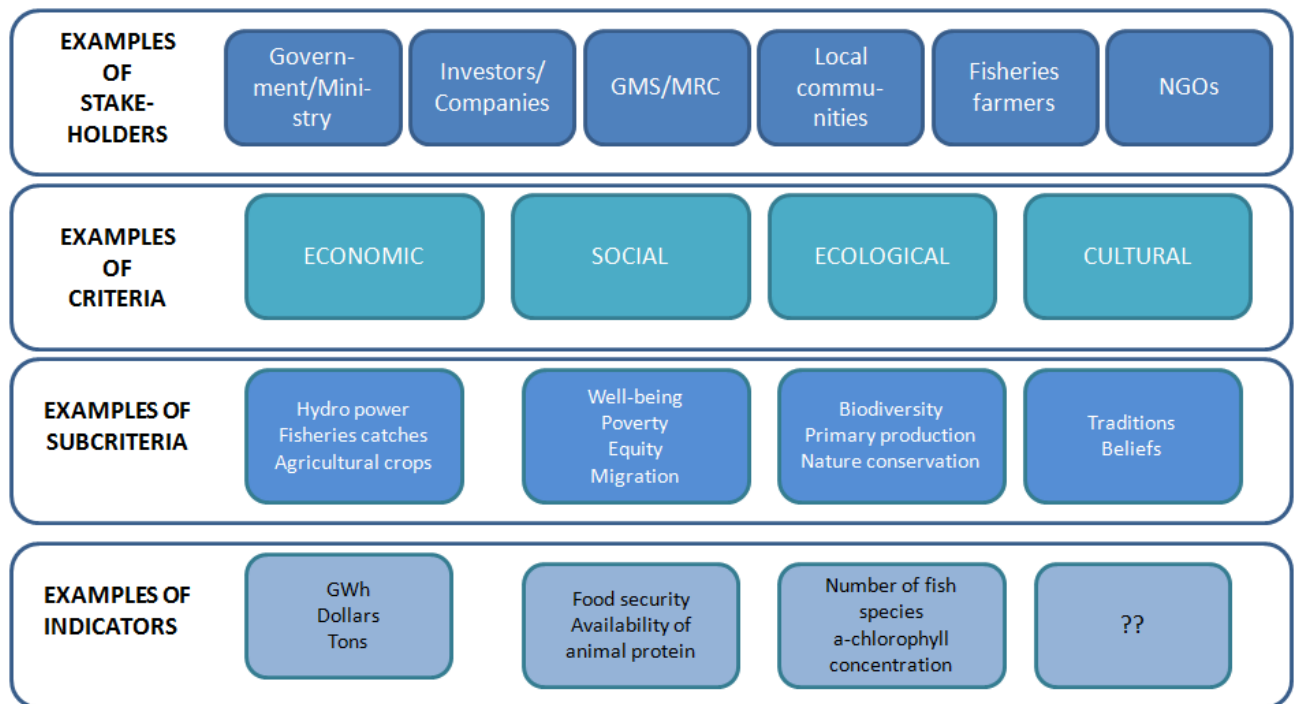
OUTCOME of this task: Respondents preference information (Example 3)
6. Use MCDA software (not necessary step)
 - a. Combine the impact data and respondents' values
 - b. There are several software available e.g. Web-HIPRE (<http://www.hipre.hut.fi>)

OUTCOME of this task: Overall priority values for the alternatives for each respondent or group (Example 4)
7. Analyze the results and realize the sensitivity analysis
 - a. What are major issues of agreement and disagreement?
 - b. What are the most liked and disliked alternatives and why?

OUTCOME of this task: Illustrative figures and tables

Example figures and tables

Example 1. A hypothetical scheme of potential stakeholders, criteria, subcriteria and indicators related to hydro power development projects.

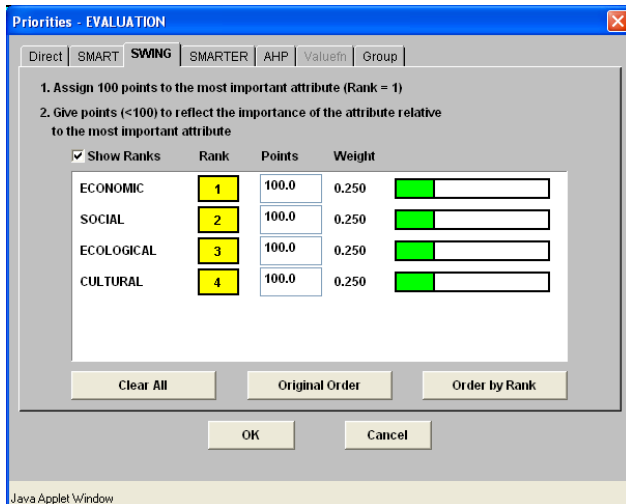


Example 2. A hypothetical impact matrix

Objective	Description, Attribute	Location 1	Location 2A	Location 5A	Location 5B
ECONOMIC IMPACTS					
Costs	Investment and operating costs of the construction work, Money	114,1	85,5	76,2	82,4
House prices	Decrease in the prices of the houses near the spillway (after project), expert judgment: none, low, moderate, high; number of houses less than 100/200/300 m from the spillway.	0	-5	0	0
SOCIAL IMPACTS					
Number of reclaimed houses	Number of houses, which have to be reclaimed and removed due to the construction work, Number of houses	0	49	0	0
Other territory to be expropriated	Area of land, which shall be expropriated (the reclaimed houses and gardens excluded)	9	12	10	12
Safety	Impacts on the safety of the area for children and teenagers, The distance of the nearest house from the spillway, km	1,3	0,1	1,5	1,5
Visual impacts	Impact on landscape, Overall impact, expert judgment -5 - 0 - 5 (significant negative and positive impact)	-1	-5	-2	-2
Recreational opportunities	Impact of land use changes on different outdoor activities, Overall impact, expert judgment -5 - 0 - 5 (significant negative and positive impact)	0	-5	-1	-1
Traffic problems due to increased traffic	Noise, air pollution, traffic jams on the main road, increased traffic on the (small) streets., Transportation costs, Money	9,0	8,7	6,2	7,7
Traffic problems due to building and transferring bridges	During the construction of new bridges there will be temporary arrangements, which cause traffic jams and inconvenience to people, Bridge costs, Money (1000 €)	900	576	576	576
Noise of construction	Number of houses near the spillway	0,5	5	0,5	0,5
Risk to electricity supply	The risk to grid because of relocating cables, transmission lines, switch yard	-3	0	-2	-2

	Overall impact expert judgment 0-5 (no impact- significant impact)				
Jobs	Total construction costs	114,1	85,5	76,2	82,4
ENVIRONMENTAL IMPACTS					
Biodiversity	Impacts of the construction work on flora and fauna (or valuable habitat)	3	3,5	1	1
Erosion	Impacts of construction work and operation on the erosion of river banks and risk of landslides	-4	-3	-1	-1
Water quality (long term)	Impacts on the risk for water quality deterioration due to the toxic compounds in the polluted soil	1	0	0	0

Example 3. Defining weights for the criteria. An example of the questions which are presented in the MCDA (the view is from Web-HIPRE software).



Example 4. Overall priority values for alternative in the Web-HIPRE analysis. The higher the bar the more preferred the alternative is from evaluator's point of view.

