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SUSTAINABLE ENVIRONMENTAL SANITATION AND WATER SERVICES

Sustainable water management – an approach

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MAKING DECISIONS ABOUT water management often involves balancing, conflicting, incommensurate and incompatible values of many users and uses of resources. One of the most difficult tasks for water planners and policy makers is that of integrating all those different values in the final decision about water management strategies, in order to take the broad environmental, economic and social impacts into consideration. This is especially difficult since recent experiences of the authors in water management in Eastern Europe, India and in the Caribbean (and not only in those countries) have confirmed that in practice solutions are still mainly based on economic and political reasons and not taking thoroughly into account the needs of the citizens, and are therefore not leading to sustainable water management. To improve this situation, a comprehensive tool to assess the sustainability of different systems for water supply and sanitation, which is applicable for water professionals and which particularly gives the consumers a chance to participate effectively in the planning process, is needed.

This paper sets out some of the main problems of water management in low & middle income countries and proposes a comprehensive decision support tool based on multi criteria analysis to cope with these problems. Further, this decision support tool will be discussed in the context of developing countries.

Overview of the current situation and lessons learned in water management in low and middle income countries

In spite of the general international call for a participatory and integrated water management approach in low and middle income countries as the solution for their water problems (GWP, 2000; WSSCC, 1999), the situation is far more complex than expected. Integrated management seems difficult where conflicting and overlapping institutions exist and where the way demand is expressed is often very different from the way offer is managed at the local or state level. Similarly, participation is often invoked in the mainstream of the world water politics, but its content is often misconceived and reduced to the use of community support for the implementation of externally planned projects or to the inclusion of some local stakeholders in the decision-making process, without questioning their real power in influencing the process.

A recent analysis, [based on interviews with the responsible people] and field visits, of different water projects in India, either managed by small villages and slums, by a municipal corporation or the state government, about water resources management and conservation with the aim to explore different frames of water problems at local and international levels and possible relationships among planning policies and actions put forward by different and overlapping actors and institutions, has shown that the conflicts and overlapping responsibilities of the different levels of government are not the only problem for the obviously weak effectiveness of the proposed measures in these projects. There is an even more striking contrast between how water problems are framed at the state or municipal level, i.e. by those in charge of formal planning in the water sector, and how they are perceived by the local communities. These contrasts are obviously reflected in the range of solutions through which the government, through regulations and plans, and communities, mainly through grassroots and collective actions, try to cope with them. This is important since the reasons for ineffective water management solutions in low & middle income countries lie not only, in the opinion of the authors, in the overlapping planning and management responsibilities, but also in the way in which local communities use local water resources and in the way their behaviour fits, or not, with the requirements of the solutions implemented by the government.

This is a strong reason why a better tool for the inclusion of different values and perceptions in the decision-making process is needed, even if the authors are aware that finding a better and more participatory solution does not mean to have it necessarily translated into practice. In most developing countries, it is well known that even if a better decision and, in some sense, a more participatory and democratic decision is taken, it is not straightforward to say that it will be implemented. For instance, if burocracies are strongly convinced of something, even public statements or official guidelines may not be able to prevent them from making what they have in mind. They may find the way to make their interests in the implementation phase, perhaps not by a strong change, but in a subtle way by creating difficulties for the implementation that the search for an alternative way becomes necessary.

In India for instance, the decision-making process is characterised by a strict hierarchy. In the water sector the plans and decisions that are prepared by the local authority,

are mainly based on economic and technical considerations. There is little stake for people to react to these proposals. Even though due to constitutional amendment for giving more power to the local authority for taking decisions on development issues has not helped to resolve the problem of water and wastewater management in many cities and towns in the last decade. Elected representatives are less concerned about environmental issues. The local authorities such as municipal corporations, councils and gram panchayat (village authority) sometimes force the decisions irrespective of opposition from people and pressure groups.

Similar to the situation in India (see also Trond, 2001), interviews with people involved in water projects in Barbados, West Indies, have shown that direct beneficiary participation was less common in strategy and policy formulation, but more common in formulating local-level project approaches, though the level of primary beneficiary participation never went beyond information sharing and consultation. However, community involvement has improved with subsequent projects, showing a move from a focus on social mitigation of potentially adverse impacts to proactive work with broader operational frameworks for participation in project planning, even if the strong role of consultants and contractors in the decision making process still has not allowed the local end users much influence.

Trying to establish a tool which allows the users to get effectively involved in the decision process is a first step, and this is the aim of the authors. In order to achieve this objective, it is not enough to involve only the community stakeholders in the decision process for determining the most feasible technical option, but also the individual household members have to be involved in the decision process (Sara and Katz, 1997). The main reasons for that are large gaps often existing between the perception of the households and the community leaders, the latter may be alleged to focus on their own benefits of the project and may also be susceptible to corruption.

To cope with this situation, the authors propose a comprehensive approach using a decision support tool based on multi criteria analysis. In the next section this tool will be briefly outlined, in §4 the advantages and also disadvantages of this tool in the context of low & middle income countries will be discussed.

The decision support tool

In order to achieve a sustainable water management, the authors propose a decision support tool based on multi criteria analysis which should be used to identify the most sustainable option among several feasible options for wastewater disposal or water supply.

The general concept of a multi criteria decision support system (MCDSS) for water management has already been described in the literature (e.g. Hoffmann *et al*.,2000, Ertl *et al*., 2000). Therefore the general concept will just be briefly delineated here: Multi criteria decision support comprises four steps. Step one is the formulation of goals (e.g. safe water supply and wastewater disposal). Step two is the formulation of alternatives (various technical options) to reach the goal. Step three is the formulation of criteria to assess how the goals are reached and step four is the calculation of the best alternative with some kind of software program. The MCDSS will calculate for each feasible alternative the total score of all criteria on the basis of their individual weighting. The weighting will be done by individual users, a group of users, stakeholders and/or other persons involved in the decision making process. The scoring for the different alternatives will be undertaken by professionals. That one with the highest total value will be considered to be the most sustainable one for a certain person or group of people. Criteria will cover technical, operational, economic, social, cultural, environmental and hygienic aspects.

To assure an easy application of the MCDSS, it has to comprise a characterisation of available technologies and methods for public (user) participation. The characterisation of available technologies will be a guide to the user for how to rank the different alternatives for each criteria.

Advantages and problems of a MCDSS in low and middle income countries

This section will reflect the possible application of a MCDSS in low & middle income countries and outline possible advantages and also disadvantages as have occurred in practice.

A key benefit of a MCDSS is that it provides a framework which allows the public (user) to get easily involved in the decision making process. As outlined in §2, participation of the individual user in the planning stage for water management options is a desirable aim in order to balance demand and offer in a sustainable way, and to assure that the way in which local communities use local water resources complies with the requirements of the implemented solutions.

To apply a MCDSS, firstly the necessary criteria have to be developed (or better selected from already available generic criteria sets, e.g. Raval and Donnelly, 2001) in a focus group which contains all concerned individuals. To solve a multi criteria problem, several methodologies can be used (an overview can be found in Mahmoud, M.R. and Garcia, L.A., 2000). One is the Analytical Hierarchy process (Satty, 1990) which has shown to be very useful and is able to both structure the problems and combine qualitative and quantitative attributes by disaggregating the problem into a hierarchy of components, determining the priorities for the elements of the hierarchy and finally, composing those numbers into overall weights which measures the decision outcome. [Within the process, it remains part of the user to declare specific priorities between constituent elements.] The value of this method lies in the structured logic of working through the possible comparisons and outcomes.

Since sustainability comprises numerous aspects, in the context of a MCDSS application that means to finish up with numerous criteria. Experiences with MCDSS with projects in which the authors were involved, have shown that for involving the users and other stakeholders, the number of criteria has to be limited, otherwise the people's imagination would be strained which in turn leads to inconsistent results. The authors would therefore propose to have not more than approx. six to seven criteria-groups weighted by the participating individuals. The application of the MCDSS and the consideration of sub-criteria has, anyway, to be done by professionals. The criteria groups should be weighted by the stakeholders including non-professionals in a more qualitative manner indicating the importance (e.g. low, medium, high) rather than in applying a quantitative scale. Also, the criteria (e.g. environmental efficiency, costs, operation, acceptance, hygiene) have to be carefully selected in accordance with the specific decision problem and the involved people. For instance, costs may always be considered to be most important, so this information would not be very valuable for the decision problem. The information that the user may agree to spend an additional amount of money to get a system which needs less operation and maintenance works or which has special benefits to the environment, will be much more valuable. Therefore, the decision process has to be a step approach, allowing the involved users to adapt their preferences if necessary.

The key advantage of this procedure is that individuals and stakeholders will be faced with the consequences of their preferences and in turn MCDSS can reduce complex issues to clear choices and thus addresses emerging issues like accountability and transparency of a decision. Moreover, having clear choices which are understandable for the users in the local community, may be an adequate means to enhance effective communication between the users and the other stakeholders, e.g. government representatives. The importance of this is also emphasised in Sara and Katz (1997), who recommend that projects should adopt clear and transparent rules that allow users to select the level of service, technology, and location of the facilities that best fit their needs, with a clear understanding of the costs and responsibilities that these options bear.

However, to apply a MCDSS at an individual level effectively, the level of education of the people is an important aspect. Poorly educated people may be unable to do the necessary weighting in a sensible way due to a lack of understanding of the problem. Therefore, to involve the user in the decision support process, education measures have to go hand in hand with the participation process. In that context the question rises which people can or should be involved in the decision process. For instance, experiences in India have shown, that the idea of participation there is very different from the idea of a stake holding society we have in the western world. In reality, currently one may be lucky if it is possible to involve some stakeholders. This problem certainly also occurs in other low & middle income countries and even in western countries.

As indicated above, a MCDSS can also help to cope with two of the key problems of water projects in low & middle income countries, which are the willingness to pay of the consumers for the provided services and the willingness to support maintenance and operation of the provided infrastructure (the latter dependent on the level M&O is undertaken by others). Experiences made in some of these countries show that both problems are often growing inversely proportional to the level of acceptance of the proposed options, which in turn might be considered directly connected to the level of education of the future consumers. In that context, it has to be emphasised that a MCDSS is on the one hand not only helpful to involve the consumers in the decision process, but is also an excellent tool for education, and on the other it illustrates the possible trade-offs between different options and thus it can be used to find a trade-off between the technical requirements and the opinion of the various stakeholders and individuals involved in the decision process.

In addition, in small economic regions like the Caribbean islands, there are often no local professionals and engineering firms available, owing to a lack of a previous market in the water and wastewater industry for local companies. MCDS tools may help local consultants to involve themselves successfully in local water projects, since they have a knowledge of local environmental and socio-cultural issues that would unlikely be perceived by international contractors, and therefore they can apply a MCDSS more easily. This will in turn lead to further benefits, e.g. a strong involvement of local consultants in local projects will enhance important processes like capacity building, training and technology transfer in the specific country. This aspect will be particularly crucial for the future sustainability of the infrastructure, i.e. its future successful operation & maintenance as well as its future expansion will depend on the local expertise. Another benefit will be that the local economy may be strengthened by creating small specialised enterprises in different fields, e.g. engineering and applied sociology. Also, a possible contribution of the emerging information and communication technologies to MCDS approaches may be a highly interesting aspect in that context. However, there is not space available to discuss this further here.

Another advantage of MCDS is, that it may be able to cope with different interest groups with conflicting needs, which very often occurs in low & middle income countries (see §2). However, this requires an open approach to the decision problem by all involved interest groups which is often not the case. But a decision making tool based on multi criteria evaluation will at least help to facilitate communication between different actors of the decision making process.

Conclusions

This paper has outlined the main current problems in water management in low and middle income countries according to the experience of the authors, and proposed a multi criteria decision support (MCDS) tool which is supposed to be capable of coping with some of these problems. As distinct from the usual approach to decision making in water management, the MCDS approach exhibits some features, namely enhancing participation down to the level of the individual consumer and leading to accountability and transparency of a decision. Additionally, MCDS addresses issues like dealing with different interest groups with conflicting needs, local capacity building, training and education.

However, as described in §4, even if experiences with the tool have shown promise for its capability to improve the current situation in water management, in order to live up to its promises further research and case studies are needed.

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