Participatory Natural Resource Management: A Comparison of Four Case Studies

M. Hare[a], R.A. Letcher[b], A.J. Jakeman[b]

[a] *Swiss Federal Institute of Environmental Science and Technology (EAWAG), Switzerland.*
[b] *Integrated Catchment Assessment and Management Centre and Centre for Resource and Environmental Studies, The Australian National University, Canberra, Australia*
matt.hare@eawag.ch

Abstract: This paper presents an overview of four recent participatory resource management projects carried out on three continents. The aim is to elicit from these case studies a description of participatory process structures as well as an analysis of the driving forces behind the selection of stakeholders and their involvement in management projects. The case studies represent four different process structures set up to achieve two categories of process goal. They also suggest four main drivers in the design of such structures: process goals, existing power structures, process direction and stakeholder numbers. The concept of scale of action mismatch is introduced as directly affecting two out of four studies. Such mismatches reduce the chance of achieving the participation goals (e.g. greater equity and effectiveness) of the stakeholder involvement. The consequential need for greater institutional safeguards for participation is discussed.

Keywords: integrated assessment, stakeholder, participation

1. INTRODUCTION

Participation in management processes has been a goal of integrated assessment and management for some years now [Rotmans, 1998]. In Europe, such goals have been institutionalised in the form of the European Water Framework Directive of the EU (see [Mostert, in press]) which states that future water management in the member states of the EU must be undertaken with relevant stakeholders participating in the management process. This recognition of participation as having a role in natural resources management is also seen elsewhere internationally. For example, in Thailand the role of public participation in public policy and decision making is acknowledged in the Constitution [Missingham, 2000].

The problem is that there is little indication in such institutions of the type of participatory process that ought to be set up. It is unclear what methods ought to be used to ensure suitable participation, what the selection criteria are for stakeholders or even what the role of the stakeholders should be. All-encompassing definitions of stakeholders, e.g. [Glicken, 2000], mean that there are potentially many possible stakeholders to include. Also, participation can take many different forms and many typologies have been developed as a result (e.g.[Pretty, 1995] and [Arnstein, 1969; Carter, 1996 cited by Missingham, 2000]). In this paper, categorisations found in [Mostert, in press] are used, though their interpretations are revised. The categorisations specify varying levels of participation which range from simply receiving information (referred to as the Information level); providing information (Consultation); regular involvement in analysis of problem and design of potential policy (Co-designing) and jointly deciding policy or activity (Co-deciding).

Additionally, to define a participatory process it is important to know exactly why stakeholders are being included in the process. Participation goals [Mostert, in press; Pretty, 1995] include a desire to increase the democratic legitimisation of management decisions; to increase project effectiveness; to encourage social learning (the group learning by system stakeholders of the complexity of the system as well as the sharing of management perspectives [Harte and Gough, 2001]) and to manipulate the public. Finally the actual goal of the process (e.g. problem identification, decision support tool development, extension) also has a critical role

to play in determining stakeholder selection, and participatory methods employed.

This document takes four case studies from around the world and compares them positively, rather than normatively, in terms of the process goals and process structure used. By doing so it attempts to identify driving forces that have affected their design decisions such as stakeholder selection and methods. An important theme which emerges from this comparison is the selection of stakeholders to participate in co-designing, i.e. those brought together within the co-design group.

2. THE FOUR PARTICIPATORY PROCESSES – AN OVERVIEW.

The four processes used address natural resource management problems at different scales.

1. **Zürich, Switzerland, Central Europe [Hare et al., 2001], [Hare and Pahl-Wostl, in press]**

After a century of supply-side water management by the water utilities in the Zürich, the city must begin to switch to demand-side management. Demand-side management is hindered by a poor understanding of the complexity of the socio-economic and technical system within which the stakeholders operate. The focus of the participatory process was to identify new insights into management solutions through social learning. The main stakeholders included the water utilities, manufacturers, politicians, professional bodies, housing associations and consumer representatives. Social learning focussed on generating a common understanding about the complexities of the system and to design and test new management scenarios.

2. **Mahuwe, Zimbabwe, Africa [Lynam et al., 2002]**

Previous management projects aimed at getting community support for management schemes had failed to work in this ward. Researchers thus opted to use a participatory approach which shelved original assumptions about the needs and objectives of the community. In order to develop improved strategies for vegetation resource management, they instead tried to identify what the stakeholders thought were the problems and system dynamics at work, and in doing so improve the level of villager input into the otherwise more autocratic leader-based management system. Of particular concern to the villagers was the immigration of new farmers into the district, about which they had no decision-making responsibilities but bore the effects of such decisions.

3. **Ngnith, Senegal, Africa [Lynam et al., 2002]**

The researchers, led by P. d'Aquino (CIRAD), wanted to develop a simulation tool to help the rural council (elected members of villages responsible for management decisions) and villagers negotiate herder/farmer agreements. To this end, the researchers went to local villages to help construct a model of each village's management problem. Using the model, the process at the village level was aimed at generating, through social learning, a common understanding of management problems and options between the villagers and the rural council. This paper focuses on the participatory process carried out in one of these villages, Ngnith. Here, the management problem was one of negotiating an equitable management solution to the conflicting water requirements of village herders and farmers.

4. **Mae Chaem river catchment, Northern Thailand, South East Asia [Scoccimarro et al., 1999]**

The problem in this area was that there were conflicts of interest between upriver and downriver communities in the management of the catchment. The goal of the project was the development a decision support system (DSS). The DSS was to aid government agency staff in understanding the consequences of household decisions in response to policy changes and other climatic, economic and social shocks (eg. price changes, increased migration into the catchment). It was hoped that they could investigate, on a scientific basis, the impact of different land users' management options and thus select management options that could defuse inter-communal tensions.

Table 1. A categorisation of the four case studies. Process goals: MG -management solution generation (I - identification, N - negotiation), D - DSS development, R - research extension; Participation goals: SL-social learning, E - effectiveness, ID - improved democracy. See text in Section 3 for key to other symbols used.

Study #	Process Goal	Participation Goal	Adaptive managem't stage	Scales of Action	Stakeholder numbers	Process direction	Power structure	Scale of action mismatch
1	MG (I)	SL, E	I, II	R, N, S, H	100,000s	TD	Direct	Partial
2	MG(I)	ID, E	I, II	S, R, H	1000s	BU	Aut	No
3	MG(N)	SL, E	I, II	R, H	100s	BU	Rep	No
4	D, R	SL, E	I, II	N, R, H	1000s	TD	Mon	Partial

3. CATEGORISATION OF THE CASE STUDIES

Table 1 illustrates a categorisation of the four case studies using nine criteria, two of which have been discussed in the introduction (process goals, participation goals). The other seven are: **Adaptive management stages** - which of the five stages of adaptive management [Lynam et al., 2002] are carried out within the process: (I) problem formulation; (II) system understanding; (III) action; (IV) evaluation and (V) updating . **Scales of action** – the scale at which the stakeholders operate: national (N), regional (R), settlement (S), household (H). **Stakeholder numbers** – the numerical magnitude of potentially participating stakeholders. **Process Direction** – whether the process structure encourages a bottom-up (BU) or top-down (TD) influence on management process. Bottom-up is where stakeholders at the lower levels of action are involved in *co-designing or co-deciding*. Top-down is where those stakeholders at the higher levels of action are involved. These two categories are similar, respectively, to *popular* participation and *stakeholder* participation, the World Bank's favoured form of participation, as described by [Missingham, 2000]. The difference here is that unlike stakeholder participation, a top-down process predominantly involves the highest level of stakeholder. **Power structure** – the institutional setting defining who, in principle, is the principal decision maker within society: people - direct democracy (Direct); elected representatives (Rep); a king and his appointees - monarchy (Mon) or a leader - autocracy (Aut). **Scale of action mismatch? -** Whether or not all decision makers are represented amongst those involved in co-designing: all decision maker groups are represented (No); only some are represented (Partial).

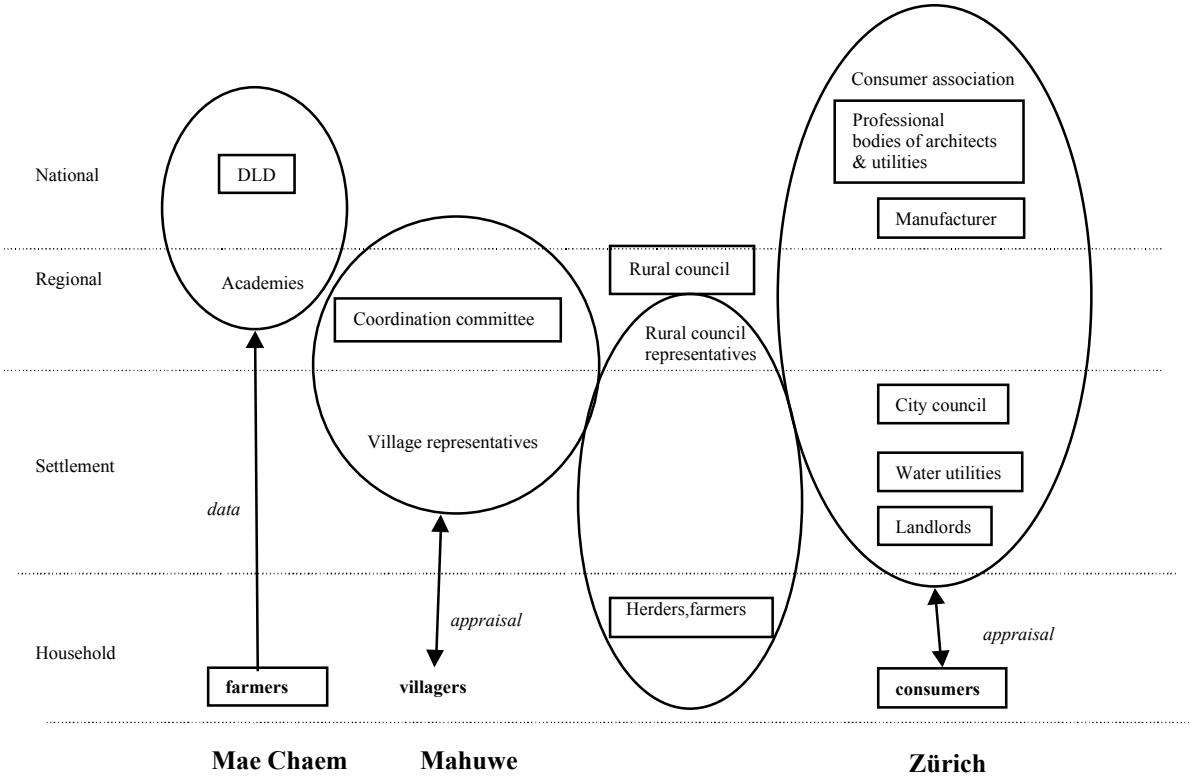

Figure 1. A comparison of the scales of action of stakeholders in the 4 case studies and their presence in or out of the co-design group. Boxed names represent decision makers. Circles encompass the members of the co-design group. **Bold** indicates stakeholders participating in consultation only and *italics* indicates stakeholders used only to provide information to.(Note: DLD is Department of Land Development)

4. OVERVIEWS OF THE PROCESS STRUCTURE USED IN EACH CASE STUDY

The process structure and the level of participation of each stakeholder in each case study is illustrated in Figure 1.

Zurich. The main stakeholders were brought together for regular meetings in a co-design group. During these sessions the stakeholders took part in data elicitation exercises, problem identification, model building (developing a role playing game), model validation and scenario testing exercises aimed at generating common representations of the system and sharing conflicting perspectives. The ideas for management options generated by those involved in co-designing were presented for appraisal by representative householders via focus groups. Feedback from the householders was then to be sent to the co-design group for discussion and was used to realign discussions. The direction of decision-making input is therefore top down. However, householders influence the consumption of water and thus there is partial mismatch between the levels at which the co-design process is and the householder scale of decision making.

Mahuwe. The co-designing stakeholders consisted of 20-25 people. It included a coordinating committee, comprised of the ward's village leaders, and the village representatives group, comprised of normal members of the villages. During sessions the co-designing group of stakeholders took part in data elicitation and model building exercises aimed at developing spidergram models. In this case, the aim was to identify problems in the region. Once problems had been identified, they were fed back to all the villagers for popular appraisal. With their agreement, the problems were represented to the village leaders. The leaders were requested to act on solving these problems. The process was bottom-up, but with those responsible for making policy and decisions also included in the co-design process.

Ngnith Stakeholders involved in co-designing in Ngnith consisted of about 25 herders and farmer households from the village and 2-4 local representatives of the rural council. Over three days, problems were identified, a model built by the participants and management options generated and tested using both role playing and computer simulation versions of the model. The inclusion of the villagers as co-designers made the process bottom-up. Since representatives of the rural council were represented in the co-design group, there is not a serious mismatch between the scale level of those involved in co-designing and the level at which the regional scale decision-making occurs.

Mae Chaem. The main aim of this project was to design a DSS for enabling better decision making at the policy or government agency level. Thus the membership of the co-designing group was targeted at the sponsoring government agencies and partner research academies. The role of the householders was limited to information provision (*consultation* in Mostert's categorisation). Household level decision making was represented using simulation models derived from this information. A second focus was on training of academies staff by researchers on the project. Given the importance of householders' decision making [Scoccimarro *et al.*, 1999] on management there is a mismatch between the scale level of those involved in co-designing and the level at which some decision-making occurs.

5. WHAT CONTROLS THE DESIGN OF A PROCESS?

Four drivers were assessed to be primary drivers of design in these case studies, influencing selection of stakeholders, methods and process structure. This is not an exhaustive list of all possible drivers.

Primary process goal. It is salutary to investigate the influence of the primary process goal on process structure with respect to these studies.

When the production of a DSS is a primary project goal, the intended scale at which decision making is being supported by the tool and the technical capability of various stakeholders will influence the way in which different groups of stakeholders participate in the DSS development. This can, as in the case of Mae Chaem, help to generate a more top-down participatory process, since higher level organisations (such as government bodies) were thought more likely to have computer equipment and computer literacy than householders. Additionally, since the focus of the DSS, in the study, was to aid government level decision-making (by providing insights into the perspectives and possible responses of householders), householders themselves were only utilised in a consultative manner. As such, this study is an interesting case of social learning in which one group of stakeholders (householders) are represented in a computer model rather than in the co-designing participatory group.

In processes seeking primarily to aid the generation of management solutions, the use of models can be subsumed within the process. Indeed, computational models need not play a major role. In Zurich and Ngnith, models are first adapted into board-based role-playing games that require no computer use or literacy from the stakeholders. Only after acclimatization is a computational model used by the stakeholders. In Mahuwe, initial models

(spidergrams) developed were paper-based, thus overcoming concerns about computer literacy.

Stakeholder numbers. The size of the potential stakeholder community also affects stakeholder selection and methods. Working with a single village (Ngnith) the researchers can incorporate a wide section of the villagers (upwards of 25) as co-designers. As a result they become a direct part of the negotiation process. In the city of Zürich, where up to 150,000 households are potential stakeholders, inclusion of householders as co-designers is not feasible. The householders take on the role of appraisers of the management options/issues coming from the co-designers. For the Zürich case study, this raises the problem of the lack of inclusion into the social learning process of a potentially important actor in the system, the consumer, whose beliefs can affect the success of management plans.

The existing power structures in the management area can also have a large influence on stakeholder selection. In the Mae Chaem case study, the highly top-down monarchical system of government may have also limited the involvement of householders as co-designers in the case study (Perez, pers. comm). In Zürich, direct democracy means that all city inhabitants can vote against water utility plans. Thus the composition of the group involved in co-design had to be as wide as possible. This also explains why, although full representation was impossible, households were represented by a consumer association in this study.

The intended process direction also affects the process structure. Particularly, such decisions will affect the stakeholder selection and composition of the co-design group (see Figure 1). In a top-down process, for example, such as in Zürich, more complete representation in the co-design group of the key stakeholders groups operating at the top scale levels is possible, due to their fewer numbers in comparison to stakeholders at lower levels. Bottom-up processes also may limit the presence of top-level stakeholders in order to encourage the free expression of lower-level stakeholders.

In addition, the level at which decisions are being supported by a DSS, i.e. from the bottom-up or the top-down, will also affect the types of participation seen and the technology used. For example a DSS created to support, from the bottom-up, farmer's crop planting decisions will necessarily include different stakeholders in co-design and utitilise different technologies than one created, as in Mae Chaem, to illustrate the magnitude of trade-offs as a consequence of top-down national or regional scale policy decisions.

6. SCALE OF ACTION MISMATCH

What is apparent from Figure 1 is that not all decision makers are included in the co-design group within these case studies. This is a *scale of action mismatch*. Although, in this paper, both case studies with partial mismatches are top-down processes (case studies 1 & 4), mismatches can also occur in bottom-up processes[1]. In a top-down process, the problem is that neglecting to include lower scale decision makers in the co-design group can lead to poor acceptance or dissemination of policies, leading to policy failure. In a bottom-up process, when higher scale decision-makers are missing, the problem may occur that policies designed at the bottom-scale are not considered or permitted by those higher scale decision makers.

The quality of representation of stakeholder groups in the co-design group is another important factor that needs to be considered. In bottom-up processes such as in Ngnith, where representatives of the rural council are used in co-design groups as opposed to the complete council (see Figure 1), a mismatch may still occur if the representatives selected have little or no decision-making power or influence within the council they represent. Such a problem may of course also affect the representatives of the city water utilities used in the top-down process described in the Zürich case study, or the village representatives used in the Mahuwe case study.

As this paper suggests, there may be several reasons for mismatches, all linked to the drivers of process structure design identified in Section 5. Ultimately however, there has to be a method of passing the newly generated management options onwards both up and down the scale, with an expectation that they may be adopted. Following up the co-design process with appraisal meetings which include excluded stakeholders (as done in Mahuwe) is one option. In Ngnith, follow-up workshops brought together the rural council and all the villagers to decide on which management options generated by the co-design group should be tested.

In the absence of such process extensions, some form of institutional arrangement that strengthens the likelihood that decisions in the co-design group are passed to excluded decision-makers would be necessary. A lack of such institutions has been cited as a basic weakness of current participatory practice [Dovers, 2001]. However, new institutions would not

[1] It could be interpreted that case studies 2 & 3 have deliberately omitted stakeholders at the national scale of management in order to enhance local decision making.

necessarily alter the existing power structure, an alteration that some see as also the key to sustainable management, i.e. to give stakeholders at the lower scale levels their own decision making autonomy.

7. CONCLUSIONS

There have been a number of recent reviews looking into different types of participation in environmental management and how to design a successful process. van Asselt et al. [2001], for example, provide a thorough overview of participatory methods and categorise them according to process targets and motivation. Mostert [in press] views the desired level of participation as well as stakeholder education, the power structure of the society, and culture as drivers of process design. Pretty [1995] proposes a form of participatory learning combined with strict "trustworthiness criteria" to ensure a successful participatory process. Glicken [2000] provides a reminder of the need for clear statements of purpose, proper stakeholder analysis and process documentation.

The work described in this paper complements such reviews by working backwards from recent case studies to analyse how participation is implemented in the field to provide insights into the design of future processes. A comparative analysis of four case studies has identified four drivers of process design: process goals; power structures; process direction and stakeholder numbers. Four different process structures (two bottom-up and two top-down) have been identified which have been designed to achieve two basic process goals (management solution generation and DSS design). The nature of the structures has led to the consideration of scale of action mismatches which have implications for the achievement of participation goals. Scale mismatch problems could be ameliorated through the development of institutions which formalise (or enforce) the usage of the results of top-down or bottom-up processes by decision-makers at other scale levels.

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9. REFERENCES

Dovers, S. Institutional barriers and opportunities: processes and arrangements for natural resource management in Australia, Water Science and Technology, **43** (9): 215-226, 2001.

Glicken, J. Getting stakeholder participation 'right': a discussion of participatory processes and possible pitfalls. *Environmental Science & Policy* **3**:305-310, 2000.

Hare, M.P., and C. Pahl-Wostl. Stakeholder categorisation in participatory integrated assessment processes. *Integrated Assessment*, in press.

Hare, M.P., N. Gilbert, D. Medugno, T. Asakawa, J. Heeb, and C. Pahl-Wostl. The development of an Internet forum for long-term participatory group learning about problems and solutions to sustainable urban water supply management., p. 743-750, *In* L. M. Hilty and P. G. Gilgen, (eds). *Sustainability in the Information Society: 15th International Symposium on Informatics for Environmental Protection.*, Vol. II. Metropolis Verlag, Marburg, 2001.

Harte, M., and J. Gough. Sustainability, uncertainty and environmental policy: lessons from New Zealand's pastoral high country, *In* J. W. Handmer, et al., (eds). *Ecology, uncertainty and policy: managing ecosystems for sustainability*. Prentice Hall, London, 2001.

Lynam, T., F. Bousquet, C.L. Page, P. d'Aquino, O. Barreteau, F. Chinembin, and B. Mombeshora. Adapting Science to Adaptive Managers: Spidergrams, Belief Models and Multi-agent Systems Modeling. *Conservation Ecology* 5 : [online] URL: http:www.consecol.org/vol5/iss2/art24, 2002.

Missingham, B. Participatory development in Thailand: a review of some relevant literature. iCAM Working Paper 2000/01. iCAM, The Australian National University, Canberra, 2000.

Mostert, E. The challenge of public participation. *Water Policy*, in press.

Pretty, J.N. Participatory learning for sustainable agriculture. *World Development* **23**:1247-1263, 1995.

Rotmans, J. Methods for IA: challenges and opportunities ahead. *Environmental modelling and assessment* **3**:155-179, 1998.

Scoccimarro, M., Walker, A., Dietrich, C., Schreider, S., Jakeman, A.J., Ross, H. A framework for integrated catchment assessment in northern Thailand, *Environmental Modelling and Software*, **14**: 567-577, 1999.

van Asselt, M.B.A., Mellors, J., Rijkens-Klomp, N., Greeuw, S.C.H., Molendijk, K.G.P., Beers, P.J. and van Notten, P. (2001)."Building Blocks for Participation in Integrated Assessment: A review of participatory methods".*ICIS working paper I01-E003* ICIS, Maastricht, The Netherlands.