Strengthening Links Between Anthropologists and System Dynamicists: Participatory Group Modeling & Natural Resources

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Introduction

In this brief communication, we argue for more systematic and self-conscious attention, within the field of system dynamics, to the *process* of knowledge sharing for the purposes of model construction. After explaining our rationale, we provide a number of examples showing how various groups of people---often those with central roles in the problems being modeled---are marginalized, their voices mute or silent. We recognize the valuable work of a number of SD modelers (e.g., van den Belt (2004), Vennix (1996)), emphasizing their work in western, often corporate, worlds.   However, there are special problems that emerge when important members of the would-be client population are comparatively powerless, under-educated or even illiterate, as is the case in many international natural resource contexts---contexts likely to become more important as attempts to cope with climate change increase. We then provide some practical suggestions for addressing such communication problems. We believe that SD can be of great value in the analysis of natural resource conflicts, climate change mitigation and adaptation, the development of improved management systems, and in policy formulation and evaluation. The anthropological perspective may provide insights that will allow for better integration of the views of marginalized peoples into SD models.[3]

Rationale

This year has been declared the International Year of the Forest (with the theme of 'Celebrating Forests for People'); and there is huge global interest in the role of forests in climate change.

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[1] Colfer, a Senior Associate at the Center for International Forestry Research in Bogor, Indonesia and a Visiting Fellow at Cornell Institute for International Food, Agriculture and Development, is not a modeler, but rather an anthropologist with long experience working with forest peoples and with significant attention to equity issues (e.g., Colfer (2005)). Her links to SD are peripheral but longstanding (including experience with causal loop diagrams (Colfer, Dudley, and Gardner 2008); multi-year supervision of participatory SD modeling in Cameroon, Indonesia and Zimbabwe (e.g., Vanclay (2003)); reviewing others' SD work (e.g., Dudley et al. (2008)); participation in one of Cavana's SDS workshops on participatory modeling; and, perhaps most importantly, marriage to a practitioner.

[2] Dudley teaches system dynamics in the Cornell International Institute for Food, Agriculture and Development, and is a SD modeler, focused on natural resource issues and policies. His earlier work and PhD are in Fisheries.

[3] The integration of the views of marginalized peoples is not a problem of SD alone.   In a recent literature review, Colfer (2011 (in press)) found very few studies related to forestry and governance that provided systematic representation of the views of marginalized groups (specifically those of women, youth, and marginalized ethnic and occupational groups) about their own governance systems---either customary or formal.

The timing is ripe for considering ways to improve SD within natural resource contexts, including in collaborative efforts to mitigate and adapt to a changing climate.   A systems approach, looking at interconnections among parts, is also characteristic of the field of anthropology, with its emphasis on holistic analyses, parallels which have been beautifully documented by Richardson (1991). These parallels (see also footnote 7), as well as the complementary strengths of the two fields, argue for greater linkage, more interchange, between them. This paper represents an attempt to act on that notion.

Another issue that prompts this note is the growing interest globally in participatory approaches. Within the context of international development efforts there is a strong and growing realization that effective action, whether conservation or development-oriented, is to some extent dependent on local people's recognition of the legitimacy of related policies and actions.   People are far more likely to be supportive of effective implementation, when they have been involved in decisions about such policies and related actions (also noted by Vennix (1996), writing about more corporate contexts). Elias et al. (2000, 2002) provide nice summaries of the theoretical history and role of stakeholders in R&D contexts and argue for its relevance to system dynamics,[4] but neither they nor Adams and Cavana (2009) touch on the interactional elements we consider so important here. Insofar as SD is and should be used to improve policies, its practitioners need to be certain they are adequately reflecting the views and behavior of those whose behavior and beliefs affect the issues being modeled.

As we have become more sophisticated about participatory approaches, the plurality of voices has become ever more evident (their voices in some cases, increasingly strident); we have come to realize the variety of interests, goals, and expertise extant among stakeholders (see Wilshusen et al. (2002) for a thorough discussion of these and the related social justice issues as they relate to conservation). Wollenberg et al ((2001), (2005)) clarify some of the key social implications--- particularly relevant for those trying to model human behavior--- of the pluralistic situations encountered when trying to manage natural resources well (see also Gonsalves et al. (2005)). The collection by Cooke and Kothari (2002) provides ample evidence of the dangers of 'participation' badly organized (or see Peterson (2011) for some of the mechanisms by which some stakeholders' input is ignored). The conflicts that beleaguer natural resource managers and users are legion (from administrative hassles (Westley 2002) to outright warfare (Richards 1996)); but improving communication among stakeholders,[5] giving the marginalized a better chance to express their views, *can* serve to de-fuse worrying conflicts (e.g., Diaw and Kusumanto (2005)).[6]

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[4] Colfer et al. (1999) provide a simple mechanism, as a first step, for identifying 'who counts' in sustainable forest management. This first step involves locating groups/individuals on seven dimensions: proximity [to the resource in question], pre-existing rights, dependency, poverty, local knowledge, culture/forest link, and power deficit. The stakeholder analysis used by Elias et al. (2002) in a variety of contexts, from super markets to emissions trading schemes, examines power, dependency and urgency.

[5] The term, stakeholder, has different meanings for different folks. Elias et al. (2002) report the once common view that it referred to 'groups without whose support the organization would cease to exist' (p. 302). Our use of the term is simply 'people who have a stake or interest' in the domain under discussion. [6] The political context cannot be ignored, however. There are situations where power differences and mutual antagonisms are so great that increased communication only makes matters worse.

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Indeed, Diaw and Kusumanto's (2005) analysis argues for what they term 'an engaged practice of science' (see also Ludwig (2001)); and much of what both anthropologists and SD practitioners do in fact conforms to their suggestion---in the effort to reflect, to model, systems as they are lived (not necessarily as 'the rules' or written materials suggest). SD practitioners, like anthropologists, routinely engage with the people who populate their models.[7] Our purpose here is simply, hopefully, to provide some improvements to that practice.

Here, we provide some specific examples of how, particularly in the developing world, voices of marginalized folks tend to get ignored. This is important in many international conservation and development contexts because a) many of those most affected by policies and decisions about natural resource management are among the most marginalized of peoples, and b) they are also generally directly dependent on those resources, often in ways not widely understood or acknowledged by the broader society. Such people's vulnerability under changing environmental conditions has become increasingly recognized in global policy discourse. Although local people's dependence on local natural resources has been more widely addressed in the literature this is often still done without addressing the lives of the most marginalized groups. But to develop useful and comparatively accurate system dynamics models related to natural resource use and management and consequent effects on climate change, as is increasingly being attempted (see below), a fuller understanding of local people's interactions with such systems can be key.

Some Illustrative Examples of Constraints to Meaningful Participation

We focus here on five examples of how marginalized people's voices get lost. Peoples living within tropical forests for instance, tend to be from ethnic groups that differ from the national majority. They tend to speak different languages, have been raised within different cultural and subsistence systems, and typically have different values, gender roles and expectations, from those who dominate national settings. Further increasing their likelihood of being ignored is their residence in remote areas where access is difficult. Finally, at least with regard to forest

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[7] Cf. Forrester's (1975) differentiation between a conceptual Region A (which he advocates and considers characteristic of 'practicing managers and economists') and Region B (which he dismisses and links to 'mathematical analysts of economic and management phenomena'). The approach advocated here fits squarely into his Region A, with its emphasis on the descriptions of the social scientist 'whose skill is measured by his [sic] acuteness in perceiving the motivations and interrelationships in economic and managerial affairs'; who seeks to improve 'real situations' (p. 47); who recognizes 'the relevance of system non-linearities as primary causes of important occurrences'; and whose 'data come from personal observation and participation in economic and business affairs'. He says, "In Region A opinions are more apt to be built up from individual incidents such as how the individual person reacts, how the actual production process is designed, and how long it takes to build a factory…the manager and the government policy maker deal with the dynamic interactions between men [sic], materials, decisions, equipment, and money" (p. 48) (also discussed in Forrester (1961):3-4). If communities are substituted for economic/managerial affairs and factories, many of Forrester's observations apply to anthropological approaches. Anthropologists are trained to look at cultural systems holistically, to ground their observations in concrete behavior (including verbal behavior), to seek patterns, and to participate in the lives of the group under study. A major difference is the more usual involvement of SD practitioners in processes linked to planned change. Observations parallel to those outlined by Forrester are crucial in the facilitation of the communication processes discussed herein.

peoples (the groups with which we're most familiar),[8] they typically suffer from a general disregard for their intelligence and relevant experience, by people from the outside world, whether from governments, projects, industry, and even many academics. In short, such rural people are likely to be viewed as strangers or outsiders, even in cases where they have been the primary users of the natural resources in question, and are thus central to the models being created.

The examples given below come from international contexts, where at least some participants recognized the value of fuller involvement of the marginalized, yet still failed to gain their input. We believe these examples are directly relevant for SD practitioners who would like to expand the method's use into such spheres.

Lack of identification of relevant stakeholders:

> In a remote and densely forested part of the Congo Basin, a process of participatory modeling is planned. An international contingent of researchers has been flown in by helicopter to conduct the participatory work. Some of the biophysical researchers are familiar with the ecological and general social context. The most involved social scientist is very junior (still a grad student) and visiting the country for the first time; another has come only as an observer, with little say in the proceedings. The process, reported later as participatory, involved discussions with conservation workers and a few villagers. A couple of members of the local pygmy population (people with a mobile lifestyle and among those most directly affected by external decision making about local forests) were seen peering in the window at the proceedings---but had no opportunity to participate in the discussions, which were carried out in French, a language they did not know.

Socio-cultural constraints to providing input:

> Our adaptive collaborative management (ACM)[9] team at headquarters in Bogor, Indonesia is international in flavor. The leaders include Colfer, another American woman and an Indian man; others with strong voices include a Canadian woman and a

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[8] See Peterson (2011) for an analysis of a fisheries context with many similarities to the forest context. Peterson provides a useful typology of 'external' and 'internal' modes of exclusion in Loreto, Baja California Sur, Mexico.
[9] ACM is an interdisciplinary approach to research and management of forests [though applicable to other natural resources] that strives to involve all relevant stakeholders in a collaborative management process. Specifically, this involves facilitating processes of shared goal determination, and planning, implementation, and monitoring of related actions, with the intention of revising plans iteratively, as needed. The intent is to make management more collaborative and adaptive, in recognition of the variations in goals and kinds of expertise among stakeholders; and to empower local communities to influence formal management more beneficially---see (Locatelli et al. 2008) or (German et al. 2010) for discussions of its use in climate change adaptation. SD modeling has been used extensively in the early, self-analysis phase of this process.

Cameroonian man---all talkative. The rest of the team is junior, Indonesian, and has strong cultural conditioning to be 'respectful' (i.e., quiet and submissive) with more senior researchers. This feeling is strengthened by CIFOR's own office social structure, which places national staff below international staff in prestige, power, salary and benefits, a rather common situation (see Dudley (2003)). The early meetings of this team have involved a lot of talk by the international team members and almost no input from the Indonesians. We realize that these young Indonesians will be doing a lot of the work, and for good results we need full commitment to our planning process. Our early efforts to encourage their involvement initially fail. [Some of the techniques we eventually used to overcome this constraint appear in the penultimate section of this paper.]

Direct barriers to communication (ethnicity, religion):

ACM teams in Indonesia, Cameroon, Zimbabwe, and Nepal are primarily composed of members of the dominant ethnic (or caste) groups in those countries. Team members speak different languages, come from different cultural traditions (sometimes with different religious affiliations), and have been consistently exposed to views of hinterland dwellers as somewhat uncivilized.[10] Try as they might to overcome these differences, Colfer still finds evidence of more consistent communication with the few locals whose languages and cultures are closest to the team members' own.

- Ethnicity: In Zimbabwe, we find the nationally dominant Shona reflecting the views of other Shona more fully than they do the views of the traditional hunter-gatherers, the Shangwe (Mutimukuru-Maravanyika 2010). One local effort in Jambi, Sumatra is to strengthen the voice of Javanese transmigrants in local governance in villages that are traditionally of Minangkabau and Jambi ethnicity (Kusumanto 2007). The decision to address this issue---ostensibly a local decision toward greater equity---is instead likely to have been influenced by the power and prestige of many of the team's decision makers who are from the island of Java, long dominant in Indonesian political affairs.
- Religion: In Jambi, Sumatra, one of the Muslim fieldworkers refused to interact with the hunter-gatherer Orang Rimba, because he felt they represented a source of Islamic pollution through their practice of eating pork---a potent constraint to the communication of Orang Rimba views.

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[10] A central part of this assessment in some cases derives from the people's practice of swidden agriculture (see Scott (2009) for a discussion of such uncomplimentary stereotyping in Southeast Asia). Swidden agriculture is the technical term for what has been called 'slash and burn' or 'shifting cultivation'. It is the dominant mode of agriculture in tropical forests, and has long been (in many cases) unfairly demonized as 'forest-destroying', despite the complexity of some of its manifestations, the suitability of its characteristics to many tropical soils, and its centrality in many human cultural systems (see special issue of *Human Ecology*, volume 37, 2009).

Such ethnic differences and related power inequities have sometimes translated into project activities that, to varying degrees, disfavor the least powerful (see Colfer (1983) for more wide-ranging examples of this pattern, including one on interactions between social and biophysical scientists at an East-West Center workshop in Honolulu).

The powerful inhibiting (sometimes in the guise of 'protecting') the less powerful:

Colfer needs input about women's roles and views for some ethnographic research she is doing in Danau Sentarum Wildlife Reserve [now National Park], in West Kalimantan, Indonesia----in the interests of better conservation management. She has noticed that the women are shy to speak up in front of men; their silence is deafening in mixed company. But she needs to understand the women's perspectives and to hear their thoughts about their lives, to ensure that any management plans her team develops reflect these interests and capabilities. With this goal in mind, she has gotten agreement from her male research assistant to leave her alone with a local woman, working in her ricefield. As the morning progresses, things are going well, the woman has begun to feel at ease and to talk freely with Colfer as they wander through the familiar and comforting landscape. In the midst of their conversation, Colfer suddenly sees her research assistant coming over the hill (contrary to their agreement), accompanied by several other men. They approach the two women and immediately take over answering any questions Colfer has for her new friend, reinterpreting her responses and giving their own. The local woman quickly closes her mouth and does not open it again.

A field trip is arranged by a plantation company as part of an international conference on forest governance to an area near Durban, South Africa. We (the organizers) have specifically requested that the field trip participants have the opportunity to see not only the plantation itself, but also to visit with villagers in their homes, in order to get a better sense of issues surrounding plantation agriculture there. Despite agreement to do so, when the bus of participants arrives at the agreed locale, it is not a village or a villager's home, but rather a plantation field to which two hand-picked 'village representatives' have been invited. We are free to ask them questions, in the presence of the powerful plantation managers, people who have nearly life and death power over the villagers. The likelihood of getting any understanding of problems between villagers and plantation managers is nil. While this outcome might not be surprising from a short field trip from an international conference, it is not uncommon in other, seemingly less formal contexts.

Such anecdotes could be reproduced in great numbers, but perhaps this will be sufficient to indicate the ubiquity of the problem. By way of illustration, we have provided these five anecdotes---from various contexts where the voices of the marginalized were deemed important and sought unsuccessfully---illustrating the barriers to access. The factors highlighted above

make the process of gaining access to marginalized people's views exceedingly difficult, even when there is a desire to gain such access---a rarity, in itself.[11]

Difficulties similar to those portrayed above can be found in a variety of contexts more familiar to SD consultants and experts, such as:

- the need to elicit the views (or even acknowledge the existence) of illegal aliens perhaps surreptitiously involved in a factory or farm;
- the views of secretaries trained to parrot the words of their bosses and the formal organizational structure, while in reality making serious, substantive decisions that affect the functioning of the entire institution;
- the views of groups systematically marginalized (by ethnicity, religion, gender) within an organization, groups that may not be invited to the SD modeling group (intentionally or through a misguided sense that their input would be irrelevant).

Group Model Building in a Developing World Context

This section has been influenced by the notion put forth recently by Rouwette et al. (2011), who note that "Knowledge on constructing a system dynamics model is far better codified and structured than knowledge on eliciting information from a group or on how to deal effectively with group dynamics" (p. 1). Here we introduce some of the key sources within SD, and then briefly highlight some significant differences between the contexts that have been most typical of SD efforts and those where modelers are trying to model natural resources systems in the developing world.

Selected pertinent contributions from within SD

Here we highlight two excellent books, *Group Model Building* by Jac Vennix, which focuses on organizations; and *Mediated Modeling* by Marjan van den Belt (2004), which describes the process as used in environmental contexts in the US and Portugal. These books illustrate the comparabilities and differences between participatory modeling in a western context and that in a natural resource context in the developing world.

Vennix (1996) has identified a number of attitudes and skills he found useful in group modeling within organizations, many of which are perhaps even more critical in the pluralistic contexts of natural resource management, including efforts to deal with climate change (as part of resource management) in developing countries. He lists some pragmatic skills, like the importance of thinking through the purpose of a meeting and how the agenda should be structured beforehand; making sure the needed equipment will be on hand; holding meetings away from participants' offices to minimize distractions. He also stresses the need for facilitators to take breaks (p. 137). He and van den Belt both point out the advantages of establishing rapport over a *series* of meetings, not just one; and arranging seats in an open, semi-circle to enhance communication

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[11] In an anonymous review of the aforementioned study on marginalized people's perceptions of governance, one reviewer asked, a bit sheepishly, "But why would be interested in the views of such people, anyway?"

and visibility of the 'group memory' (white boards, computer monitor, and/or flipcharts, with evidence of the group's thoughts and progress).

Vennix identifies four key *attitudes*, all of which remain important in the natural resource context: a helping attitude, authenticity and integrity, an inquiring mind, and an air of neutrality (also discussed by van den Belt). Vennix then identifies some important *skills*, such as being able to provide appropriate feedback and positive reinforcement:

> "Providing positive reinforcement can be accomplished by an active posture, by looking at the interviewee (rather than taking notes) and by cues like gentle head nodding (showing that you are interested and understand what is said)." (p. 122).

But Vennix goes on to warn against using these skills as a trick or using them without "the corresponding attitude of genuine interest" (p. 122).

Vennix, van den Belt, and Vanclay et al. (2006) follow Richardson and Andersen (1995), who identified five important roles in the group modeling process: facilitator, recorder, content coach, process coach, and gatekeeper. Whereas Richardson and Andersen argue that, at least in large and complex processes, these roles should ideally be in the hands of separate people, the authors who followed saw advantages to merging some of the roles in single individuals. Richardson and Andersen (1995) encourage a pro-active and constructive stance for the process coach.

> A process coach, focusing solely on intragroup interactions, can be enormously beneficial in helping the facilitator maintain the group's motivation and momentum. However, both process and content coaches have to keep in mind that the facilitator/elicitor is, in a sense, on stage and vulnerable. Hearing that "the group is unraveling," "something must be done to energize those folk over there," and the like, can be unnerving. We have chosen the word "coach" advisedly — a coach does more than diagnose problems; a coach suggests plays. And great coaches make their suggestions with deep knowledge of the situation in the game and all the players' strengths and weaknesses. (p. 132)

SD enthusiasts stress the importance of logistics, attitudes and a specific set of skills, including good facilitation, in the group model building process.

Contextual differences in developing country, natural resource management settings

In the discussion below, we strive to build on the experience of Vennix, van den Belt, and others, to illustrate the need for some additional skills or attention in the developing world context.

In many such contexts, rather than the formal hierarchy of a business (as stressed in Vennix' cases), there is likely to be a welter of different systems at play in addressing any natural resource problem.[12]   These are likely to range from the industrial hierarchy of a timber company

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[12] Besides the aforementioned relevance to climate change mitigation and adaptation efforts, we're imagining problems like reducing Indonesia's level of illegal logging (Dudley 2002, 2004) or governmental and industrial corruption (Dudley 2000); resolving natural resource conflicts among local stakeholders in Indonesia (Purnomo et

to one or more governmental bureaucracies to an NGO's conservation project to a newly migrant, sedentary agricultural group of farmers to indigenous farmers and/or hunters and gatherers---all of which have significant roles in natural resource management activities, including efforts designed to mitigate or adapt to climate change.

There are also likely to be gender differences that can hinder communication. Such hindrances can range from the relatively common male dominance of formal hierarchies, like government bureaucracy or industry, to less easily recognized cultural forms. In many forest groups, for instance, women have key knowledge about and roles in the management of medicinal, food, and other non timber forest products. Yet their input is rarely sought in formal forest management, which is focused on timber. Among some groups, there are strict rules against even talking with women. Such circumstances are likely to require special efforts, such as involving female modelers and facilitators and perhaps separate meetings involving only women.

Vennix and van den Belt both stress the significance of active participation in model building by holders of all relevant perspectives, as a prerequisite for both the quality of the model and, more importantly, for everyone's ultimate willingness to implement its results---the solutions that the group identifies. But van den Belt expects a 'balance of power' among stakeholders (p. 28), as do Elias et al. (2002)---not something that characterizes most developing country, natural resource contexts. In many developing country forests, the government, an industry, or a conservation project may have the legal right and responsibility to manage local resources, but actual day-to-day management is very likely to be in the hands of local people (often customarily and illegally). The balance of power is typically extraordinarily skewed in these situations: corporate and/or governmental power is usually high, with equally high dependence of local people on local forests. Local people's participation, as complicated as it may be, becomes vital under such (quite common) circumstances to the usefulness of any models created.

There are likely to be a significant numbers of illiterates, or near-illiterates, who play important roles in natural resource management and use, and are thus key to finding good solutions to related problems. It's important, in such contexts, to be creative to ensure that these folks also have the opportunity to express their views without embarrassment. Some specific techniques for accessing the views of illiterates are described in the penultimate section.

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al. 2003); critical examination of livelihood options, in pursuit of more sustainable resource management in Zimbabwe (Standa-Gunda et al. 2003); or stabilizing population levels in ways that benefit local people (Colfer, Dudley, and Gardner 2008).

Some Likely Characteristics of Tropical Forest Contexts

- A plethora of stakeholders with differing interests, expectations, experience, goals, and power
- A significant number of illiterate or near-illiterate stakeholders
- Highly conflict-ridden relationships among stakeholders
- Gender differentiations that vary by cultural group, with gender norms that are difficult to predict
- Marginalized groups (class, caste, ethnicity) that may be difficult to identify and will be difficult to include
- Confusing policy context with overlapping and conflicting rules and regulations about forests

Parallels between conventional and natural resource modeling contexts

The logistical and attitudinal elements already recognized within SD group modeling remain important in the developing world, as do the specific skills identified. There are often additional logistical complications: The simple absence of infrastructure (no place nearby to buy the forgotten name cards; participants may have no transport or may have difficulty freeing up time to participate because of urgent subsistence or childcare needs; unreliable or unavailable equipment like computers, projectors, even flipcharts; the need to provide one's own electricity via generators) can constitute more daunting constraints, significantly slowing one's progress.

The relevance of the location of meetings remains important in developing country contexts, though the preferred locale differs. The likelihood of participation of marginalized groups is significantly increased if the modeling sessions are held close to their places of residence or work, in familiar settings. [13] Offices or meeting room settings, so familiar to SD practitioners, can constitute a serious barrier to many members of marginalized groups. The unfamiliarity of such formal settings, and sometimes their conceptual linkage with past oppressive experiences, work against widespread participation. Certainly initial stages of model formation can take place in settings like those portrayed in Figure 1.

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[13] Another constraint is the opportunity cost, in terms of foregone income or subsistence work, which may be considerable within the local context, and is often ignored by outsiders who fail to value local people's time adequately (see Peterson (2011), for a Mexican fisheries example).

Figure 1. An Indonesian example of a congenial setting for involving rural peoples in the development of SD models [The Indonesian says "Design Process: Health and Forests Workshop"]

The importance of allowing adequate time---to build rapport, to access people's views, to obtain ongoing, iterative input from relevant stakeholders, to test provisional models repeatedly---increases with the move from SD's more typical settings to developing country contexts. The one-day workshops described by Cavana and Adams (2010), for instance, would be unlikely to work in a rural setting of a developing country---though in villages where Colfer was well known, villagers quickly clustered around her computer, anxious to learn about this (to them) fascinating new technological device.

A final difference is the increased importance of being culturally aware. Cultural prescriptions are general tendencies, rather than strict and unalterable rules. Still, among some groups, we have found that an invitation to unrelated men and women to work together for meaningful exchange in a public workshop is next to impossible (Sultanate of Oman); in others, it's only mildly uncomfortable (Laos). In some parts of the world, overt public conflict is taboo so debate is limited (Indonesia); while in other areas such conflict is the norm (Brazil).   These kinds of generalities are quite subject to exceptions---and with time and interaction even strong cultural prescriptions may be negotiable---but adhering to them initially can avoid some important and unnecessary set-backs in the model building process and demonstrate the modelers' respect for local people and their conventions.

Key steps in the process, in tropical forest contexts

The most vital first step is to identify and include the stakeholders relevant to your modeling domain. This requires recognizing that the voices of already marginalized people are likely to be lost, without special efforts to find them and elicit their views. Obtaining the viewpoints of marginalized groups will almost certainly take more time and effort; but if done well, such care will result in more viable and insightful models and a far greater likelihood of their actually being used.[14]

It's important to remember that recognizing such groups and inviting them to modeling sessions is only a first step. Cavana and Adams (2010), strong proponents of stakeholder analysis and integration into SD efforts, note the small number of key stakeholders who participated in their analysis of a New Zealand emissions trading scheme (7 of 21 stakeholder categories). Of particular note is the absence of any groups likely to be marginalized. Specifically among those

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[14] Such broad involvement often uncovers official illegalities, which represent serious constraints to bureaucratic follow-up action. However, ignoring such illegalities often renders formal policies irrelevant.

not participating were 'Maori iwi', landowners, farmers, agricultural workers, forestry workers, and consumers. For natural resource management purposes, these would likely be key participants. We believe making special efforts to engage such groups is warranted.

Once the participants have been identified, some decisions about how to fulfill the functions identified by Richardson and Andersen (1995) will have to be made. One advantage, in the developing world context, of combining functions is the important consideration that one should avoid out-numbering and 'over-powering' otherwise-marginalized participants by the number and prestige of the facilitators and modelers themselves. In rural tropical forest contexts---where stakeholders (or participants) differ so markedly among themselves, where conflict levels and power differences can be extreme, and where the stakes are particularly high for those with the least power ---the roles of facilitator and process coach become particularly crucial.

A second practical step in moving forward is to obtain facilitation expertise from those already knowledgeable about such techniques (as urged also by Senge et al. (1994)). System dynamics in general already recognizes the value of interdisciplinary effort; this is just one more area of expertise that can contribute to better models and better 'real world' impacts.

Good facilitation is a skill that requires practice; reading about it, though a good beginning, is not enough. There are a number of organizations that offer such training. Dialogue Matters Ltd., for instance, has a training course on "Good Practice Stakeholder Participation" with a focus on the environment, in the UK (http://www.dialoguematters.co.uk/training.htm or email training@dialoguematters.co.uk). Other groups that commonly offer training include Mosaic International (http://www.mosaic-net-intl.ca/whatis.shtml) in Canada, which provides both English and French courses; or the Institute for Integrated Rural Development which works in Asia (http://www.iird.org.in/events.htm).

But if gaining the help of facilitation experts is impossible, one can still improve on standard operating procedures. There is a plethora of books and manuals on facilitation techniques. The recent book by Hewlitt and Lamoureux (2011) would seem particularly well suited for the needs of system dynamicists, since it focuses on 'knowledge sharing' (also available on line at: http://www.eldis.org/go/topics/resource-guides/manuals-and-toolkits&id=56954&type=Document). Other useful sources include Kanero et al. (2007), Landscape Mosaics Team (2008), among many others. Useful websites include the International Association of Facilitators (www.iaf-world.org), Thiagi Resources (www.thiagi.com) and Empowerment Learning Development (http://www.eldtraining.com/trainingschedule.htm).

Whether or not you have access to a trained facilitator, there are several skills you might consider gaining or strengthening. The first and probably most important is learning (through practice) to observe, as objectively as possible, the social processes underway in your own settings. Any text on conducting participant observation can provide useful guidance. Who's dominating the discussion or proceedings? Which internal social groupings are forming and what are the ramifications for the voices of others? What underlying assumptions are 'visible' from people's words and analyses? Vennix (1996) describes this skill as "reflective listening" (p. 122) and emphasizes the role of 'process coach' (a largely silent observer/advisor) as an important one (p. 134).

In processes such as this, it is impossible to avoid the fact of power imbalances (compare the examples given at the beginning of this paper), and this is always tricky to handle. The good will of the powerful is useful (in some cases, vital) to maintain; yet this very imbalance can be instrumental in creating or sustaining the problem/issue being modeled. In the circumstances where we have worked most, our neutrality has had to be carefully scripted, a neutrality that recognized the need for a change in the balance of power and worked subtly to reflect this in the modeling effort. Facilitation in a natural resource context is, by its nature, political;[15] one must simply strive to make it as just as possible within one's constraints.

The facilitation process itself

A powerful and simple step is to begin a group process by inviting the members to express their *hopes and fears* (verbally or on paper for anonymity) about the modeling process itself, at the very beginning. [16]   People often mention that they hope to have a good time, that the process will be exciting or fruitful or inspiring (and there is evidence that an enjoyable process, in which people are genuinely engaged, is likely to be more fruitful). Participants may fear sarcasm, verbal put-downs, domination or acrimonious debate---fears that can be anonymously expressed, if desired. Writing these combined hopes and fears on a flipchart or paper that is posted in the room reminds people of their shared goals for their meetings, and helps the group to maintain the kind of supportive atmosphere needed for open communication of ideas. The group can determine its own rules. Some examples that we've seen emerge include: no interrupting, no cell phones, no smoking, participants should come on time, whoever is there makes the decisions, everyone there has the right to speak and be heard. Facilitators are free to suggest rules as well, checking with the group to make sure there are no serious objections.

Consider locally appropriate strategies for gaining access to the views of the silent (ideally, without alienating the powerful). One we have commonly used is forming separate groups of men and women, or bosses and employees, or lower and upper castes. These groups with unequal power can then discuss their views (or your models) privately and safely; then they can present their conclusions to each other with the benefit of some level of individual anonymity. Anonymous voting can also work; or among literate groups, the distribution of cards on which people write their views, which are then clustered on the walls of the meeting room, for further shared discussion.

There are a number of simple techniques one can use when one or two elite members are dominating the discussion. We have used a 'talking stick' (only the person holding the stick can speak); or passed a ball to whoever wants to speak (or whoever the facilitator would like to hear

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[15] Peterson (2011) notes that "…participation [can become] an arena for gaining or maintaining control over resources by excluding uses and users from discussions. In this way, participatory processes can conceal acts of exclusion within a process widely believed to be politically neutral" (p. 102).

[16] Facilitation is an art, and part of its practice involves making judgments about how to proceed. Whether people feel comfortable expressing their views will be visible by the expressions on their faces. Downcast eyes and silence when invited to indicate their fears, for instance, suggest that a mechanism for anonymous contributions may be in order. Quick and uninhibited verbal responses, shining eyes and enthusiastic faces while conveying their fears indicate no or little need for anonymity. But if some are fearful, it's good to offer the options of both anonymous and public contributions.

from). Another technique is to borrow the yellow and red cards from soccer. When someone in the group is not complying with the group-determined rules (or is realizing the group's fears), anyone can hold up a yellow card. If the 'misbehaviour' persists, the red card can be used (though it's not usual to actually expel anyone).

Figure 2. The Fishbowl Game (at a workshop on health and forests in Pontianak, West Kalimantan, 9 November 2007; the yellow sign on the central chair says *kursi panas*, or literally 'hot seat').

The illiteracy of some key participants, mentioned above, can preclude the use of some conventional SD group modeling approaches. Although some of the facilitation tools can be adapted to visual or oral use,[17] this requirement is likely to require significantly more facilitation time and more interaction than is usual.

One useful technique with any group, including illiterates, is fishbowl. In this 'game' a panel of several 'experts', seated in a curved space, expresses their respective views on the subject to be modeled,

very briefly (3-5 minutes each). There is a 'hotseat' in the open curved space in front of the panel (see Figure 2). Anyone in the audience can take the hotseat and speak or question for one minute. This requires fairly firm facilitation (to stop people speaking too long) and good documentation to record the views of all. But the required brevity and the playfulness of it seems to encourage people, who normally would be too shy, to speak.

The following facilitation techniques represent a smattering of those that have proven useful to us, but we encourage readers to examine one or more of the more complete compendia available on the subject.[18] Some examples follow:

- *Future Scenarios* – When there is a need to clarify the future state desired by sub-groups within communities. A community meeting is divided into relevant social categories. These could be men and women, as might be important in the Middle East; age-groups, in much of Central Africa; ethnic groups, in Southeast Asia; castes in India; occupations in Brazil; etc. Each group is invited and facilitated to produce a drawing of its desired future (which can be as restricted or broad as needed). Participants are requested to think through the elements of the desired future and portray them in the picture they create, so as to present it back to the other groups in plenary. The approach referred to by Cavana

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[17] See e.g., McDougall et al. (2009) on indicator development among illiterates in Nepal; Vanclay (2003) provides examples of models developed among such groups from Cameroon, Indonesia and Zimbabwe; or Vanclay et al. (2006) for three popularized samples of the use of SD in such situations, in India and Zimbabwe.

[18] Another body of useful methods for understanding local systems is described in an abundant literature on what has most typically been called 'participatory rural appraisal' or 'rapid rural appraisal' (see e.g., Geilfus (2008); Gonsalves et al. (2005); among many others.

Figure 3. Group presentations of their perceptions of the interactions between human health and forests, Pontianak, West Kalimantan (9 November 2007).

and Adams (2010) as 'rich pictures' can be used at this stage of this process (See Figure 3). This method can be very powerful in making clear the differences and similarities within a community, and in developing a shared 'guiding star' (or one with complementary components) for action. It could also be helpful in thinking through the stakeholders, the important components of a problematic system (in place, for instance, of the simple listing of the elements of the problem suggested by Vennix as a sort of warm up, first step in a modeling process).

- *Line on the floor* - When there's a need for people to express their position on a controversial issue; to categorize people (e.g., social scientists vs biophysical scientists; farmers vs. industry reps); or as an excuse when folks simply need a break, an 'energizer', to move around a bit. Using masking tape, make a line on the floor, from one end of the room to the other. Identify each end as an opinion on the controversial or dichotomous issue. Invite participants to indicate their opinion/position along a continuum, by standing on the line on the floor, appropriately near to the end with which they agree (or in the middle, if they are neutral).

- *Solve my Problem* - When there is a need for inputs from a variety of people, working in problem solving mode. This might work well for multiple interpretations of a particular segment of the model a group is creating (in a comparatively large group---say, 25). Five people, for instance, may be selected to identify problems with which they would like help. Within the SD context, the facilitator could assign problems that are troubling the model builders, selecting a participant who is sufficiently knowledgeable to present each problem. The large group is split into smaller groups (preferably at some distance from one another so their discussions don't interrupt others), each with a flipchart. The person with the problem describes his/her problem to a small group of five participants, and they discuss the problem for 10-20 minutes---offering perspectives, solutions, ideas---with the problem-owner taking notes on the flipchart. A whistle is blown and the audience group then moves to the second person and his/her problem, where the same process is repeated. This occurs until all the audiences have addressed all the problems. This serves several functions: It directly helps solve existing problems, it informs the whole group of the issues worrying five of their members, and, in the SD case, it should contribute to a more integrated view of the overall problem being modeled.

- *World Café* – For use when there is a need to come up with shared conclusions or recommendations. The group is divided into smaller groups of 5-7 participants, and given the task: a question to be answered or a topic for which recommendations are

Figure 4. World Cafe. Participants discuss a topic of interest.

sought. Each group selects an 'ambassador' who will record the discussion of the group for explaining to other groups. After 10-30 minutes of discussion, the 'ambassador' from each group takes his/her group's conclusions to the adjacent group, and explains them.   The same process is repeated until all the ambassadors have visited all the groups. The ambassadors then return to their original group, bringing with them the advice and suggestions from the other groups, and each group refines its product. In this way, the quality of the products is improved, and there is sharing of perspectives among a larger group of participants.   A larger plenary discussion can then be facilitated in which more genuinely agreed and clearly thought out conclusions can be finalized (Figure 4).

Some Simple Principles about Group Process

- Smaller, like-minded groups, as opposed to large plenaries, tend to encourage freer and wider participation [and are thus important in early stages of a model building process to understand the problem fully. The expectation is also shared that they will report back to the larger group.]
- Diverse groups are useful for sharing of perspectives and developing shared, holistic analyses [and are thus important as models begin to come together and need testing]
- People tend to be more at ease, and thus more communicative, in their familiar settings
- Effective facilitation can at least partially overcome interactional difficulties like domination by elites and the silence of shy participants
- The ability of a facilitator (or modeler) to 'suspend assumptions' is important in trying to first understand, and then bring together, the divergent views of participants into an accurate and coherent whole (a model).
- Sincere respect for participants, their cultural systems and their opinions is difficult to fake; sincerity tends to 'come across' and encourage people to share their views honestly and fully.

Conclusions

Much of SD modeling has been focused on situations that hold in the 'developed' world. Yet system dynamics' group model building approach has significant relevance and utility for addressing problems in natural resource management anywhere; and its potential is particularly interesting as we seek solutions to climate change. In tropical forests and other natural resource

contexts in developing countries, there may be a need for more sensitive attention to human factors less crucial in corporate or industrial settings. These include at least cultural difference, illiteracy, extreme power differences among a more complex and/or conflict-ridden array of stakeholders, and infrastructural challenges.

If one can maintain a fairly stable group over time, many of the communication difficulties or inhibitions discussed herein may fall by the wayside; but the significance of power differences as communication inhibitors should not be under-estimated in efforts to create SD models (see Colfer (1983)). In this paper, we have indicated some of the divergences between typical western contexts in which SD has often been applied and remote, developing country settings, where additional logistical constraints need to be addressed, and for which additional skills may need to be acquired. We have concluded with some specific suggested techniques found useful in such contexts.

With these suggestions in mind, we hope that readers will take on such challenges and apply the needed modeling expertise to urgent, developing country resource management problems including climate change mitigation and adaptation.

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