Creating change through deliberation and learning systems

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Conventional expert-led decision-making approaches are increasingly shown to be inadequate for addressing complex environment-related problems facing contemporary policy makers. An alternative collaborative process is proposed in this paper, which builds on the idea of a learning approach that draws multiple perspectives and interests together. Based on soft systems methodology (SSM) as a systemic learning device, the process is an overlay of two elements: a system for deliberation and a learning system. The system for deliberation seeks to create dialogue between participants that is consistent with deliberation as defined by the deliberative democracy discourse. The learning system seeks decision-making that combines specialised expert knowledge, stakeholder interests and broader societal values. SSM offers a structured way to bring together rational and aesthetic strands of knowledge as complements through dialogue that reaches accommodations about describing what exists, what is desirable, and what is feasible, that can reveal ways of improving problems. This approach may be tailored to different contexts. In our paper we demonstrate how such an approach may be designed for making decisions on sanitation infrastructure planning in the context of Colombo, Sri Lanka. We submit that such a process for arriving at change-creating policy and planning decisions is broadly consistent with the values of the sustainability discourse encompassed in ecological economics and post-normal science.

Many of the contemporary problems affecting sustainability that come under the domains of planning and policy may be labeled as complex or ‘messy’. These are problems about which there is no consensus about a definitive formulation, which are associated with multiple perspectives, multiple actors, key uncertainties, important intangibles and conflicting interests (Mingers & Rosenhead 2004). Rittel and Webber (1984) propose that a messy problem cannot be ‘solved’ because it is generally not possible to judge whether a ‘solution’ is ‘correct’ – instead, “at best they are only re-solved – over and over again”. Cartwright (1973) concurs, proposing that interventions in complex or messy problems

can be expected, at best, to contribute to a *partial improvement*. Messy problems therefore do not yield to standard analytical and reductionist scientific approaches to 'problem solving' that are applied successfully to non-messy problems.

In this paper we propose an approach to responding to messy problems, which we explicate using urban sanitation in Colombo, Sri Lanka as our messy problem. Our approach is based on Soft Systems Methodology (SSM), a member of the new class of problem structuring methods that have emerged in response to the failure of conventional approaches in tackling messy problems. SSM was pioneered by Peter Checkland and co-workers (Checkland & Scholes 1999) out of their failed attempts to use 'hard' systems thinking approaches to 'engineer' or control messy situations, and has been applied to several hundred 'messy' management situations (Checkland 2001). It is adapted and integrated with methods from elsewhere to suit our context, in order to discover resolutions to the problem that reflect a combination of technical expertise, rational analysis and public values and preferences.

We begin by introducing some of the central ideas underpinning our proposed approach, followed by an overview of the approach. A brief introduction to SSM is then made, to enable elucidation of our proposition which is based on SSM. The elements of our approach to resolving the problem using deliberation and learning are then described.

Problem resolution through a learning process

Methodologies better suited to non-messy problems are frequently applied to messy problems, giving detailed, comprehensive and prescriptive 'solutions' that have not taken appropriate consideration of the problems' complexity – a situation described rhetorically in terms of reaching the "right answer" to the "wrong question" (Bell & Morse 2003; Cartwright 1973; Gallopín et al. 2001). Cartwright (1973) notes that an "approximately

right answer" to the real questions of interest would be preferable to this situation – although formulating the "right question" is not a straightforward matter:

> "…questions such as: What is the system? What are its objectives? ignore the fact that there will be a multiplicity of views on both, with alternative interpretations fighting it out on the basis not only of logic but also power, politics and personality" (Checkland 2001).

New approaches to analysis of messy problems have been gaining ground over the last thirty years. These approaches shift the focus on to practical processes for gaining understanding about messy problems through a learning process that moves beyond a need for prior consensus on definitions or "right questions" (Checkland 2001; Meppem & Gill 1998; Rosenhead & Mingers 2001). The learning occurs through iterative processes that aim to accommodate a wide range of stakeholder perspectives, which can then lead to action aimed at improving the problems as perceived by those involved at the time (Checkland 2001; Meppem & Gill 1998). A problem-resolving process needs to be iterative since interventions cause changes that can lead to "yesterday's 'solutions' [becoming] today's 'problems'" (Checkland & Scholes 1999).

These learning processes are strongly aligned with concepts of post-normal science, that prioritise dialogue and mutual respect based on the principle of a "plurality of legitimate perspectives" (Funtowicz & Ravetz 1993; 2003). Funtowicz & Ravetz propose that in contrast to the truth-seeking reductionist approaches of normal science, a post-normal science is required to deal with messy or "issues driven" problems characterised by high and irreducible uncertainties in knowledge, and high decision stakes arising from a multiplicity of perspectives, conflicting interests and interplays of power amongst stakeholders – while urgent action is needed. Post-normal science emphasises a need to integrate scientific and technical expertise with "local knowledge and legitimate interests, values and desires of the extended peer communities" (Funtowicz & Ravetz 2003).

Dialogue between a wide range of stakeholders is fundamental to the learning process. The dialogue that is required here coincides with 'deliberation' as understood within the

deliberative democracy discourse. Deliberation is a group process where participants listen to each other, use reasoning to persuade one another, contemplate on the different arguments, and identify group choices after due consideration (Fung & Wright 2003, p. 17). For Riedy (2005, p. 191), deliberation actively challenges unconsidered beliefs and values, provides space for individuals to change their views and preferences, and encourages individuals to reach defensible positions on an issue. Deliberative democracy aligns with and supports post-normal science in seeking to enable citizens to be directly involved in public choices, and to engage deeply with substantive issues with an assurance that their concerns and judgments will be taken into account (Cohen & Fung 2004).

Another key idea promoted by ecological economics and the sustainability discourse in general, is that disciplinary boundaries need to be transcended to tackle messy problems - “there are no 'economic', sociological', or 'psychological' problems, but just problems, and they are all complex” (Söderbaum 2000, quoting Myrdal 1975). Max-Neef (2005) argues that transdisciplinarity requires collaboration and coordination of knowledges from all of four levels of disciplinary knowledge: the values disciplines (e.g., philosophy, ethics), normative disciplines (e.g., planning, politics, law), pragmatic disciplines (e.g., engineering, commerce) and empirical disciplines (e.g., ecology, physics, chemistry).

A final idea underpinning our proposition is that complex systems are highly relevant to messy problems. A systems perspective on messy problems requires thinking in terms of “complex systems” to account for the complex interrelations that constitute the problem (Gallopín et al. 2001). Complex systems are thermodynamically ‘open’, exchanging energy and materials across their boundaries, making their behaviour responsive to their environment and context. Gallopín et al submit that complex systems need “two or more irreducible perspectives or descriptions” to characterise them, to represent the lack of consensus amongst different perspectives. Complex systems have emergent properties that cannot be anticipated by studying their components, and can exhibit non-linear behaviour, making them, like messy problems, difficult to predict and control. Checkland notes their usefulness with messy problems:

> "We use systems models because our focus is on coping with the complexity in everyday life, and that complexity is always, at least in part, a complexity of interacting and overlapping relationships. Systems ideas are intrinsically concerned with relationships, and so systems models seem a sensible choice; and since they have been found, time after time, to lead to insights, they have not been abandoned." (Checkland 1999, p. A24)

Overview of approach

The key characteristics of our approach are described in terms of the three interacting elements in any systematic approach to resolving problems in general, as identified by Checkland (2000), namely:

- a *situation* perceived to be problematic;
- a *process* to set about tackling the situation so that some actions to improve it may be found; and
- a *group of people* involved in the process.

The three elements of our approach interact as shown in Figure 1, showing our process as a combination of deliberation and learning.

We have chosen a specific *situation* in order to explicate our process, in recognition that its context – such as prevailing political and policy-making landscapes- determine the kinds of influences that can be brought to bear by the *process*. We make a hypothetical case study of Colombo, Sri Lanka, where urban sanitation, perceived to be problematic, is our *situation* of interest. We propose that the physical boundaries of the *situation* be chosen to be no larger than a local government zone, which is the scale at which urban plans are currently gazetted into policy in Sri Lanka. This choice may simplify the gaining of necessary approvals. Whatever scale is chosen, systems thinking requires that the domain of the problem be placed within its larger geographical and institutional

context of the city and beyond, as well as its situation within a hierarchy of subsystems – local government wards, neighbourhoods and households.

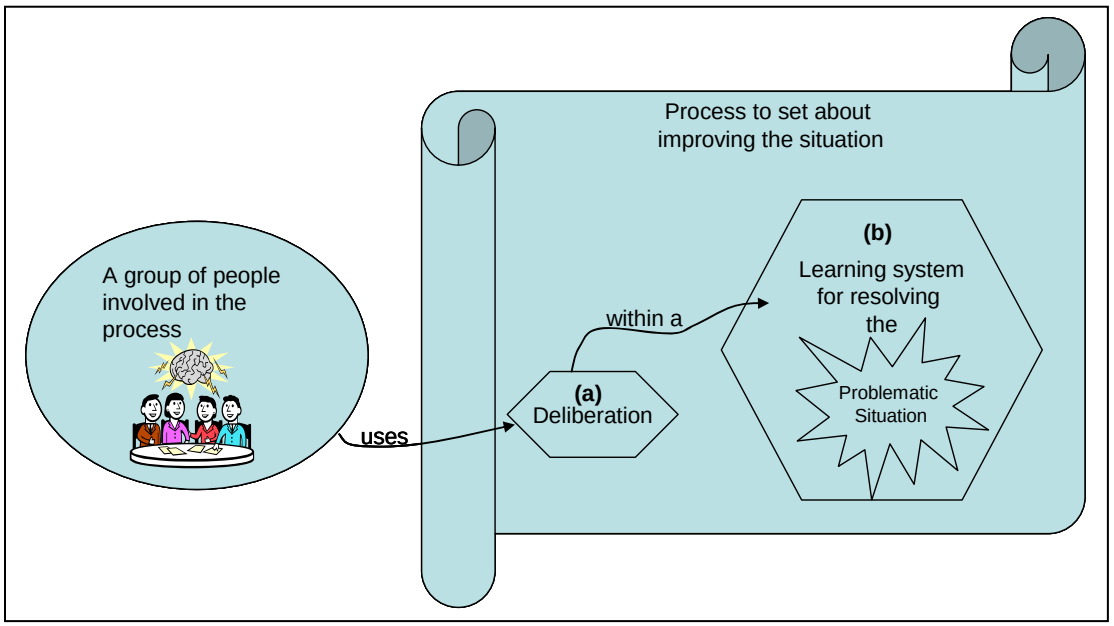

Figure 1: Interaction of elements in approach to resolving messy problems

We propose that the *process* be framed as a research project that explores resolutions within the prevailing policy and decision-making environment. The outcome of *the process* would be a set of recommendations about sanitation for *the situation* considered, for urban planners to incorporate into their planning. We contend that the prospects of implementation could improve when the *process* is positioned as research, since implementation can then be positioned as an investigation, that can justify making special exceptions[1] to regulations if necessary.

The *process* to set about improving the situation is concerned with enabling the group of people involved to interact constructively and usefully with each other as they action different elements of a method that leads to a desired outcome. We have thus

[1] Precedents for such policy exceptions exist in Sri Lanka, where sanitation technologies impermissible under existing Municipal Ordinances have been implemented as 'special projects' under a separate Act (Wikramanayake & Corea 2003).

disaggregated the process into two elements: (a) a way to facilitate the group's interaction such that it is deliberative, and (b) a set of activities to constitute a potential method. Deliberation and problem resolution through learning are facilitated by having our *process* made up of an explicit **system for deliberation** overlaid on a **learning system** based on SSM.

The composition of the *group of people* needs to be such that the resultant recommendations reflect a combination of technical expertise, rational analysis and public values and preferences (Carson & Gelber 2001; Renn 1999; Riedy 2005). Renn (1999) argues that the necessary analytic-deliberative processes should therefore involve three groups of participants– 'experts', 'stakeholders' and 'citizens'. The three groups contribute different forms of knowledge – specialist knowledge based on technical expertise, knowledge derived from social interests and advocacy, and knowledge based on common sense and personal experience (Renn et al. 1993).

Informed by Renn et al, we advocate the involvement of three types or sub-groups of people within *the group*. Firstly, in the status quo for Sri Lanka, the 'experts' would include public administrators, techno-bureaucratic experts and institutional agents that are responsible as decision-makers. In addition, to facilitate transdisciplinary insights to be gained through the process, this group would include practitioners from the range of disciplines advocated by Max-Neef (2005). The second sub-group within the *group of people*, the 'stakeholders', are those who are directly affected by the problem and its possible resolutions - as beneficiaries or victims (Costanza et al. 1997), as well as "all those with a desire to participate in the resolution of the issue" (Ravetz 1999). Stakeholders are typically not representative of the broader public, and may be dominated by special interest groups who might appear to seek diversion of the process to serve their own ends. The third sub-group are chosen to counter this risk of diversion, and to include a wider range of perspectives from the community. They are citizens selected randomly through a representative sampling procedure to reflect a cross section of their community (Carson & Gelber 2001; Ryfe 2005).

In the remainder of this paper we describe the *process* consisting of the **system for deliberation** and the **learning system.** Since these are based on soft systems methodology (SSM), a brief overview of SSM precedes this discussion.

Overview of Soft Systems Methodology

SSM is a system for learning about a messy problem, that leads to finding ways for taking action aimed at improving the situation – actions that appear sensible to those concerned at the time. Checkland (2001) describes it as a set of activities linked in an organised structure to form a whole, a complex system, with learning as an emergent property. SSM is designed to bring together different stakeholders with different perspectives on the problem into a process of inquiring about the problematic situation, to generate constructive debate that leads to accommodations between different interests about actions that might improve the situation.

SSM's aim for reaching accommodations rather than consensus recognises that conflicts between stakeholders are inevitable. Reaching *accommodations* refers to the willingness of different parties to 'go along with' a course of action for the sake of improvement despite their differences, in contrast with *consensus* that implies resolution of conflicts. Consensus is "the occasional special case within the general case of seeking accommodations in which the conflicts endemic in human affairs are still there, but are subsumed in an accommodation which different parties are prepared to 'go along with'." (Checkland & Scholes 1999, p. 30).

The generic form of SSM is characterised by a core set of linked activities, which may be seen as an interaction of two parallel streams of inquiry: a stream of cultural inquiry and a stream of logic-based inquiry (Checkland & Scholes 1999):

- Finding out and reflecting on *'what is'*, that describes the problem situation. This forms the 'cultural stream' of inquiry, that seeks to describe the perceived real world situation, to inquire into the myths and meanings, and examine the roles, the social system and political dimensions of the situation (ibid). It enables boundaries to be set on what can be feasible interventions in the given context.

- Conceptualising or visioning *'what could be'*. This forms the logic-based stream of inquiry that uses systems ideas to build conceptual models of what might be possible, as complex systems of relevant human activities. Each model has its purpose or objective defined; the emergent property of the modeled complex system would then be the fulfillment of this purpose. The naming of the purpose is made with the simultaneous declaration of the worldview upon which it is based, in recognition that many interpretations of 'purpose' are possible depending on worldview (Checkland 1999, p. A7). The set of models that results then represent multiple perspectives.

  The conceptual models need to exhibit the complex system properties of emergence, hierarchy and self-organisation/adaptation. Checkland (1999, p. A24) notes that this last property requires each conceptual model to include monitoring and control activities, so that changing environments can be detected and responsive control action taken. He proposes that monitoring requires the performance of the conceptual model to be judged against a set of criteria that include at least three counts: *efficacy* (whether the intended output is produced – or 'does the means work?'); *efficiency* (whether a minimum of resources are used to achieve the objectives); and *effectiveness* (whether it is worth doing in terms of long-term or higher level aims)[2].

[2] Checkland (1999) propose that these "3Es" performance criteria are the minimum requirement for assessing every model. It is possible to include more performance criteria - for example, ethicality (whether the transformation is morally correct) and elegance (whether the output and process are aesthetically pleasing). The key point is that systems for monitoring against performance criteria of at least efficacy,

- Comparing and using the differences between *'what is'* and *'what could be'* as the basis for discussion and debate. This brings the cultural and logical streams of inquiry into interaction. The conceptual models are compared with the perceptions about the real-world situation to structure inquiry and debate, leading to new knowledge and insights about the problem situation. This could lead to further ideas for more models, new inquiry and debate and knowledge - so the process of learning could be iterative, until accommodations are reached about *'what is possible'* for resolving the problem situation.

- Taking action. The learning cycle above would end with accommodations reached among those involved about the choice of a certain course of action to improve the situation, that are desirable and feasible as they see it.

Although SSM has sometimes been described as a series of stages that apply systems tools in particular ways to assist model-building (for example, as described in Checkland & Scholes 1999, pp. 28-52), it is presented as a *methodology* or "the principles of method" that allow "*mouldability* by a *particular user* in a *particular situation* [which] is the point of methodology. That is why a methodology is so much more powerful than mere method or technique" (Checkland & Scholes 1999, p. 58).

We have chosen SSM as the basis for our proposed approach because it provides a structured and defensible way of approaching messy problems, while, as a methodology, it has space to adopt methods and concepts from elsewhere to supplement its own set of devices and tools, as we describe next.

The system for deliberation

efficiency and effectiveness, and for taking control action must be included in any conceptual model of a complex system.

The system for deliberation explicitly requires that the dialogue that occurs within the process is consistent with 'deliberation' as defined by the deliberative democracy discourse. While such consistency is implied in descriptions of dialogue and its effects occurring within SSM (for example, in Checkland 2000), we see the explicit definition of a system for deliberation to overlay the learning system as a moulding of SSM that emphasises deliberation as a key feature of the process.

In designing the system for deliberation, we pay attention to three criteria that deliberative democrats emphasise for effective engagement of participants: the degree of *influence* to affect outcomes; the quality of *deliberation* that takes place, which is critically dependent on how well the power inequalities amongst participants are reduced or managed; and *inclusiveness*, the extent to which participants represent the diversity of the public's perspectives and values (Carson & Hartz-Karp 2005; Fung & Wright 2003; Levine et al. 2005; Mansbridge 2003; Riedy 2005). While contextual constraints may require tradeoffs between the criteria, Carson & Hartz-Karp (2005) observe that even where performance against the criteria is suboptimal, desirable progress and change can still result.

In structuring the *system for deliberation*, we have utilised one of SSM's tools normally used for building conceptual models, as a thinking aid. While we do not require SSM's learning cycle to design the *system for deliberation*, we see modelling as a useful tool for identifying key facets of the system. Framing our description in terms of the CATWOE tool also provides an illustrative demonstration of the tool.

SSM's mnemonic CATWOE (Table 1) aids logical consistency in model building, and helps to construct a 'root definition' stating the model's objectives as the basis for the model (Checkland & Scholes 1999).

C: 'customers'	The victims or beneficiaries of the transformation T
A: 'actors'	Those who would perform the transformation T
T : 'transformation process'	The conversion of input to output
W: 'weltanschauung'[3]	The worldview which makes the transformation T meaningful in context
O: 'owner/s'	Those who could stop the transformation T
E: 'environmental constraints'	Elements outside the given system which it takes as given

Table 1: CATWOE mnemonic (Checkland & Scholes 1999)

Transformation:

The first step in using the tool is to articulate the perceived purpose of the system from a particular worldview that then allows the other elements of the CATWOE to be identified. SSM advocates that the purpose be stated as a transformation of some input into an output. The transformation is not unique, but depends on the observer's ideological orientation and worldview. For us, the transformation T in a desirable *system for deliberation* would be the transformation of a group of autonomous individuals into a group who, together, are able to make reasoned arguments and accommodations in the public interest (about resolving problematic sanitation).

Weltanschauung:

The transformation is based on our weltanschauung (worldview) that the application of deliberative democratic theory can increase the capacity of the group to find out and learn about the problem and find resolutions that are desirable and feasible in an economic, social and ecological sense.

Customers:

[3] [3] Checkland (2001) favours the German term "weltanschauung" that refers to "the stocks of images in our heads, put there by our origins, upbringing and experience of the world, which we use to make sense of the world and which normally go unquestioned" over its rather "bland" English translation as 'worldviews'.

Who benefits or loses from the system for deliberation? Firstly we submit that decision-makers would benefit and hence be 'customers', because the products of the process are intended to make legitimate and defensible contributions to resolving problems that the decision-makers have responsibility for. Secondly, the deliberative democracy literature highlights that deliberation is frequently a transformational experience, implying that all those who participate in the deliberation would be 'customers'.

Actors:

We see the participants who engage in deliberation as the central 'actors', along with the moderators who facilitate deliberation. As noted earlier, those engaged in deliberation would include:

- *'Experts'* who include decision-makers who have primary responsibility for policy decisions (planners, public administrators, techno-bureaucratic experts), as well as external disciplinary experts whose presence can facilitate relevant transdisciplinary insights to emerge through deliberation.
- '*Stakeholders'* who are self-selected stakeholders and interest groups and anyone interested in participating in the process. This allows groups with specific interests and concerns to have an input into the process, bringing a different set of perspectives from the experts. They are also more likely to have spent more time considering the issues than the typical citizen. However their perspectives cannot be relied upon as being representative of the broader community (Riedy 2005).
- '*Citizens'* selected through a random sampling of the community representing the diversity of the public's perspectives and values. Random representative sampling is a recent innovation in community consultation, and a favoured procedure for recruiting participants free from bias or conflict of interest (Carson 1999; Fishkin 2006; Ryfe 2005). As with randomly selected juries in the judiciary systems of most democracies, it is argued that a representative random sample of participants would possess the "recommending force of the public's considered judgements"

(Fishkin 1995, quoted by Ryfe 2005), which gives legitimacy to their recommendations.

The moderators, the second central 'actor' group, are "a neutral, professional staff that helps participants work through a fair agenda" (Levine et al. 2005). Ideally, they would be experienced with deliberation so 'apprenticeship learning' could occur for participants without prior experience (Ryfe 2005). In order to play their critical role, deliberative democrats highlight a number of characteristics they would need to have, including leadership and neutrality, the ability to manage power dynamics within a group, diffuse conflict and maintain focus on the task at hand. There is added complexity in the Colombo context, where the language of fluency may be English[4], Sinhala or Tamil, so moderators may need to be multilingual. Furthermore, women's perspectives is critical since they are generally more affected by sanitation and have different experiences of it than men (WSSCC 2006) – requiring moderators to manage gender-based power dynamics[5]. It may be necessary to identify potential moderators and develop their skills through training where there has been little prior experience with deliberation. The number of suitable moderators available might well be the deciding factor for the total number of participants that can be involved in deliberation and for the scope of the process.

Owners:

Those driving the transformation T and having the ability to stop it, would 'own' the system for deliberation. We see two groups, identified by Renn (1999), as the 'owners': a research team and a sponsor. The research team would be the driving force behind the design of the process - the 'someone' in the following description:

[4] Fluency in the English language itself is seen as a commodity of power in Sri Lanka (often referred to as a metaphorical sword or *kaduwa*), another power dynamic to be managed by moderators.

[5] In some cases when power inequalities between participants are inseparable from social or cultural norms, it may be preferable to separate participants along divisive lines such as language and gender, rather than attempting to manage the conflicts – a trade-off between inclusiveness and quality of deliberation within small groups.

> "To achieve high-quality deliberation, someone must organize a discursive process, choose a topic, recruit the participants, prepare background materials or invite speakers, provide facilitators, and raise the funds that are necessary to do these things." (Levine et al. 2005)

In the case of Colombo, the research team could potentially be a collaboration between local and international academics, international development agencies and local planning authorities, who together have a keen interest in resolutions on the ground as well as in testing more widely applicable methods and tools.

The sponsor is needed for two roles, which may be possible within a single sponsoring entity or in an aggregation of sponsors. Firstly, a sponsor needs to increase the credibility of the project and thereby increase its potential influence on decision making – such as a high profile government agency or personality might do. Secondly, a sponsor needs to provide the necessary funds as estimated by the research team. The exact hierarchy in the relationship between the research team and sponsors can vary, as one of them initiates the process as a whole and identifies and recruits the other[6].

The research team would, within the context of the *process to set about improving the situation*, plan the specifics of the system for deliberation, such as:

- Decide on the scope of deliberation – number of' 'citizen' participants in total, number in each deliberating group[7], mechanism for recruitment, compensation for their participation[8]; publicity mechanisms for inviting stakeholders,

[6] There are examples of government ministers convening the process as the sponsor, and appointing a 'steering committee' as research team (for example, in Carson & Hartz-Karp 2005). Where such high level initiative is lacking, however, as is potentially the case in Colombo, an initial research team of concerned individuals may identify and canvass for the involvement of influential sponsors.

[7] There is no definitive number of participants for a deliberative group beyond the need to keep them small enough that each participant's voice matters (Fishkin 2006) – ranging from 5-25 in the literature.

[8] Compensation is seen as essential for encouraging participation by the 'citizen' group (Carson & Gelber 2001; Fishkin 2006; Renn 1999), which also indicates to participants that their role is serious and that dedication to the task of participation is expected (Renn et al. 1993).

accommodation of stakeholders in deliberative groups; accommodation of bureaucratic and scientific experts in deliberative groups;

- Identify, recruit and train individuals capable of being moderators to facilitate deliberation within each group.
- Agree on a set of deliberating rules and norms in collaboration with moderators;
- Organise the preparation and dissemination of balanced and accurate information by qualified experts[9], for circulation amongst participants so they may be appropriately informed on facts and issues – thereby reducing knowledge-based inequality between participants;
- Plan timelines for deliberation in collaboration with decision makers, ensuring that it can occur early enough in the planning cycle that it can influence its direction;
- Estimate costs and gain necessary financial sponsorship;
- Play the role of 'secretariat' for facilitating deliberation within the larger context of the problem solving process (Riedy 2005, p. 394). This includes organising plenary meetings and other forms of liaison between groups, reporting on key outcomes and key themes that have emerged at different milestones of the process (Carson & Hartz-Karp 2005; Riedy 2005) and liaising with the media to maintain transparency. In this role, the research team may also be viewed as 'actors' in the CATWOE.

Environmental Constraints:

The system for deliberation would exist in a cultural, social, institutional and political environment that would impose various constraints that need to be accommodated, managed or overcome. In Colombo, for example, language barriers impose constraints

[9] Qualified experts would ideally include holders of traditional knowledge and spiritual perspectives, that would be consistent with post-normal science.

on the range of participants that can deliberate together, which may be heightened by ethnic tensions and prejudices. Socio-economic class stratification introduces different power dynamics and can constrain the willingness of participants to engage with each other. Organisational or experiential viewpoints can sometimes be in conflict. Gaining a political 'champion' in Sri Lanka would add momentum and influence, but conversely, a change in government can stymie or reverse advances made.

The CATWOE tool allows the systematic identification of key factors to be considered in the model. A model of the system for deliberation can then be constructed based on elaboration of a root definition of the system: "a system for learning about problematic sanitation, that engages participants in deliberation to collaboratively discover resolutions to the problem". In the next step, not taken here, a model would be constructed as a collection of activity sub-systems (for example, 'a system to gather and disseminate balanced information', 'a system to recruit citizen participants' and so on) that can each be deconstructed with its own CATWOE, to help specify the system for deliberation in detail.

The learning system

The *learning system* is based on SSM with its key action elements, described earlier, set out as in Figure 2. Each element takes place within the deliberative space of the *system for deliberation*.

Finding out 'what is'

The process of 'finding out' in SSM usually consists of drawing 'rich pictures' that capture the messy connections between different actors and contextual factors, and

making social and political analyses to examine *roles*, *norms* and *values* and expressions of power. These can often be quite a fluid and 'fuzzy' processes, which Checkland & Scholes (1999, p. 66) acknowledge can be "too uncertain a process for some". There is opportunity to introduce additional tools to decrease this 'uncertainty', that may be seen as another 'moulding' of SSM in its application in this paper.

In particular we advocate use of the STEEP framework as a tool for drawing out contextual factors to aid 'finding out'. It is a taxonomy used to break down the task to identify existing conditions, constraints and trends that can influence future direction within Social, Technical, Economic, Environmental and Political categories. An illustrative use of this tool on finding out about sanitation in Colombo is provided elsewhere (Abeysuriya et al. 2005).

Another potential tool is described in the IWA *Sanitation 21* framework, that aids the understanding of context along the lines of interests and objectives in different decision-making domains (household, neighbourhood, ward/district, city, and beyond-city) (IWA 2006, pp. 15-19), and might be included for 'finding out'.

The 'finding out' process can take place as a plenary process with input from all participants. However, it may be preferable to use this process initially as an 'ice breaker' for discussions within groups that will come together for deliberation in the other activities, followed by a plenary session where all insights are shared.

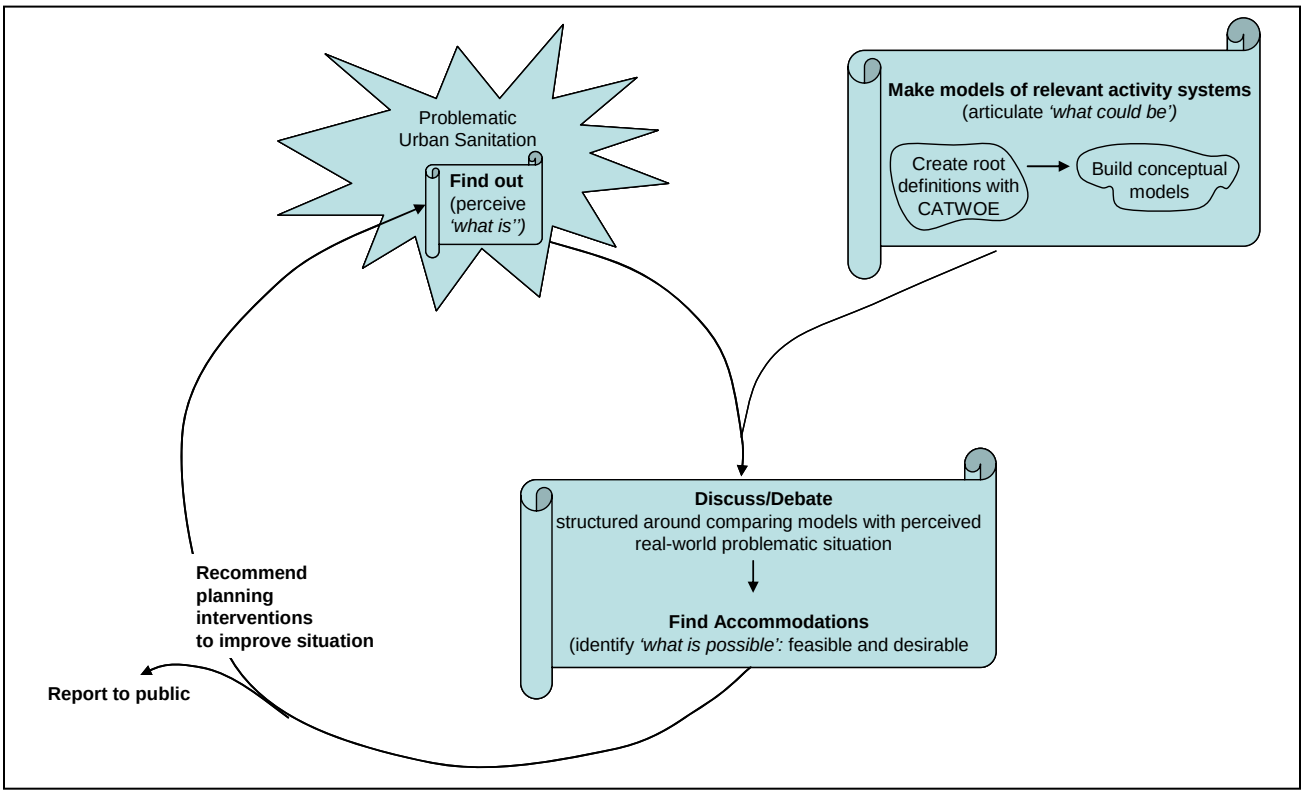

Figure 2: The Learning System based on SSM

Making models, finding accommodations about feasible and desirable resolutions

The discussion of the remaining elements of the *learning system* is centred on the need for the different actors in the process to contribute technical expertise, rational analysis and public values and preferences into their recommendations to decision-makers of urban sanitation. Each actor group of experts, stakeholders, and citizens has different strengths and capabilities, so their contributions are likely to be stronger in some areas and weaker in others. This presents another opportunity for 'moulding' SSM here, since the people involved in the SSM activities in much of the literature tend to be stakeholders who are already familiar with the general issues and are consequently treated as equals in their capacity to participate in all of the SSM action elements.

We focus on the allocation of tasks to different actors in the learning system here. This is meant to be illustrative rather than prescriptive. The research team designing the *learning*

system could equally decide on a different allocation, since any such decision is based on what appears “sensible to those concerned at the time” (Checkland 2001). Alternative views would be

> "... quite consistent with the systems view that the variable perceptions of different stakeholders in a problem context are legitimate *but need to be justified*." (Bell & Morse 1999, p. 88, emphasis added).

The key requirement, emphasised above, is that the allocation needs to be made on the basis of defensible arguments.

To make a justifiable or defensible match between actors and tasks, we are informed by Renn et al.’s cooperative discourse model for decision-making related to policy design (Renn 1999; Renn et al. 1993), to which we draw parallels with the application of SSM here. Their model is specifically designed to enable experts, stakeholders and citizens to input their particular expertise and experiential knowledge to the process. Renn et al.’s model has been applied to several case studies (ibid), and been adapted by others for different contexts (Carson & Gelber 2001; Riedy 2005). We explore how these ideas can be merged with the systems approach of SSM to allow these groups to appropriately participate in the learning system.

The cooperative discourse model

The essence of the cooperative discourse model relevant to our discussion, is a reasoned allocation of the various tasks to different actors. The actors include sponsors and a research team, in addition to the experts, stakeholders and citizens (Renn 1999; Renn et al. 1993). The tasks in their model are grouped into key steps, with one group playing the central role at each step. Even when groups perform the same task, deliberative democrats advise they be kept separate to avoid problems of perceived unequal competence. For example, when citizens and experts are placed together, citizens typically defer to the views of experts; likewise, “incensed and articulate” stakeholders are likely to dominate citizens if placed together (Carson 2006). When actor groups are

not playing a central role, they may play supporting or complementary roles at each step – such as adding to a list of outputs, making suggestions, and giving witness to the central actors.

Each step of the original cooperative discourse model, and their adaptations by Carson & Gelber and Riedy are outlined below, along with connections and implications for the SSM-based *learning system.*

Step 1: Elicit values & objectives (create CATWOEs & Root definitions)

The first step is the elicitation of values, objectives and evaluative criteria for the process, a set of tasks that Renn et al. (1993) allocate to stakeholders, "since their interests are at stake and they have already made attempts to structure and approach the issue". In Carson & Gelber's (2001) adaptation, vision-creation is added to the first step, for which citizens are assigned the central role. Riedy (2005) argues that both stakeholders and citizens should be involved equally in this first step to represent a broader set of interests and values. A *set* of visions that reveal different values and objectives and evaluative criteria is the output of this step for Riedy's particular context.

This first step of eliciting a set of objectives based on different values is reminiscent of the naming of transformations and their underlying worldviews in a set of CATWOEs and root definitions in SSM. Since the purpose of assigning each task explicitly to an actor group is intended to match a task to a group's knowledge potential, we agree with Riedy that both stakeholders and citizens can contribute in complementary ways to this step. Furthermore we contend that the expert group also has the capacity and legitimacy to be active in this step. Having a range of disciplinary backgrounds to facilitate alignment with transdisciplinarity, the expert group would contribute a different set of worldviews and values to the other groups. We argue that being explicitly involved in

this activity will contribute positively to the process of naming systems and root definitions, as well as providing the expert group valuable practice in deliberation.

Thus, we assign the task of defining CATWOEs and root definitions within the first stage of SSM modelling to citizens, stakeholders and experts. The task would begin with participants within each group proposing desired objectives using the language of transformations and declaring the worldviews or weltanschauung underlying them. Deliberative discussions can lead to the seeking of objectives that serve community interests while acknowledging other interests. The set of CATWOEs and root definitions created would reflect the multiple perspectives on the objectives of an urban sanitation system for the *situation* under discussion. Each group would come to an accommodation on a small number of CATWOEs and root definitions that encapsulate the essence of these perspectives. While there is no fast rule about how many CATWOEs should be modelled, it would be pragmatic to seek the smallest number that are inclusive of all the perspectives, to be manageable within time and other constraints of the process.

Step 2: Operationalise objectives (make conceptual models to meet objectives)

Performance profiles for a set of policy options are gathered in the second step of Renn et al's model. Options are assembled on the basis of their alignment with the goals and values identified in the first step, and their performance and impacts are evaluated using the criteria from the first step. The expert group is allocated this task because "the desired outcome is a specification of the range of scientifically plausible and defensible expert judgments and a distribution of these opinions among the expert community …" (Renn 1999). This step is broadly seen by Carson & Gelber as "operationalising" the visions and goals from the first step into potential action plans. Carson & Gelber and Riedy agree that the expert group should play the central role here.

A parallel to this step of operationalising and building action plans can be drawn with the SSM activity of building conceptual models of activity systems on the basis of root definitions and CATWOEs from the previous step. Though resonant and parallel, it must be reiterated that modelling in SSM is a conceptual tool for systemic thinking rather than ways of describing the real world. Conceptual models focus on "unpacking and displaying the concept of the root definition" (Checkland 1999, p. A25), tracing logical dependencies and hierarchies (Section 3.5.2). Checkland suggests that :

> "assembling an activity model ought not to be too difficult: simply a matter of assembling the activities required to obtain the input to T, transform it, and dispose of the output, ensuring that activities required by the other CATWOE elements are also covered; then link the activities according to whether or not they are dependent upon other activities" (Checkland 1999, p. A25).

Although emphasising logic, Checkland notes that logic alone is insufficient for constructing models: "real-world knowledge does inform model building" (ibid).

We contend that the group of experts, with diverse disciplinary backgrounds spanning all levels consistent with Max-Neef's (2005) conditions for facilitating transdisciplinary insights, would bring a sufficient range and depth of experiential "real-world knowledge", to complement the logical activity of translating CATWOEs and root definitions into conceptual models. We thus propose that the expert group should be the central actors in this task, in agreement with Renn et al's cooperative discourse model and Carson & Gelber's and Riedy's versions of it. Although it is arguable that citizens and stakeholders can contribute other experiential knowledges, we argue that , since this activity is based on logical systemic thinking informed by experience (particularly associated with public planning and decision making), citizen and stakeholder values and perspectives are not critical for this activity.

Step 3: Evaluate options (compare models against real world)

In the third step of Renn et al's model, each profiled policy option is evaluated, and policy recommendations are made to the legal decision makers. Randomly chosen citizens are assigned this task, because "citizens are the potential victims and [beneficiaries] of proposed planning measures; they are the best judges to evaluate the different options available on the basis of the concerns and impacts revealed through the other two groups" (Renn et al. 1993). Carson & Gelber describe this step as 'testing' the acceptability of the options on the basis of citizen values. They make two modifications to Renn et al.'s model here: they open the 'testing' process to "the community as a whole", and, if the options are found to be unacceptable, they allow the process to return to Step 1. In contrast, Riedy recommends that the same citizens who were involved in the visioning in Step 1 be the central actors in the 'testing', so that the options can be tested against the values, objectives and criteria elicited earlier (Riedy 2005, p. 398). He concurs with Carson & Gelber's modification that allows the process to return to earlier steps if the group is unable to align policy options from Step 2 with their values and preferences in order to make policy recommendations.

This step of 'testing' has its parallel in SSM's step of comparing conceptual models with the perceived real world problematic situation (or testing the models against the real world) that forms the basis for debate and reaching accommodations about action to be recommended to decision makers. We submit that this activity should be undertaken by the citizens and stakeholder groups, each group in collaboration with the expert group who would present the models they created. While Renn (1999) describes the role of experts in this step as analogous to witnesses to a jury in a judicial trial, we argue for a more collaborative relationship between the experts and the others. The expert group might be seen to be in partnership with the other groups, whose CATWOEs and root definitions they have modelled with their own; this step opens up their collective models for debate and discussion. In theory, this step might even be run as a plenary session, but we propose that citizens and stakeholders be kept apart in order to avoid their deliberations becoming complicated by possible power dispositions. While the same charge may be made against combining citizens with experts, Carson (2006) observes that when citizens and experts deliberate together, citizens tend to defer to the experts

unless citizens are charged with a specific task. The chances of such deference is reduced here since citizens have a specific task – the task of judging and comparing models with the real world as described through the earlier 'finding out' task where they were key players. The presence of moderators would continue to be critical to mitigate unequal competence and manage conflict during deliberation.

In a final plenary discussion, the outcomes of the deliberations and accommodations might be collated into a list of recommendations for sanitation planners and decision-makers. The research team may potentially take a facilitating role here, and lead the compilations of recommendations, that those involved have sought to ensure as technically and institutionally feasible, socially and environmentally desirable, appropriate to the context, and accommodating their collective and community's values and interests.

Step 4: Maintain accountability and transparency

While Renn et al. describe their model as consisting of the three steps above, Carson & Gelber add a fourth step they label 'evaluation', consisting of communicating the outcomes of the process to the public: "this allows for community evaluation of the plan and the plan-making process. It also ensures that those making the final decisions are accountable to the community" (Carson & Gelber 2001, p. 15). The participant groups also separately evaluate the process so that learning for the future can occur. Riedy recommends this evaluative step as one that leads to "social learning" for both the community and the participants (Riedy 2005, p. 399).

For the SSM-based learning process here, we recognise two levels of accountability as necessary. Firstly, there is accountability in terms of meeting the criteria for efficiency, efficacy and effectiveness ("the E's"), ethicality or any other criteria considered important by the participants, incorporated within the SSM requirement for conceptual

models . These would be put in place by the expert group as argued in Step 2, and discussed and evaluated against the E's by the other actors during Step 3.

Secondly, there needs to be accountability to the public: that the accommodations reached through the process, and the planning recommendations that result, be exposed to public scrutiny as argued by Carson & Gelber, and Riedy. Ryfe (2005) argues that public scrutiny can act as a motivator that increases the commitment by participants to the deliberative process. We see this as another occasion for 'moulding' SSM in this application – to include communication of process and outcomes to the public – a task that could be undertaken by the research team. A separate evaluation by participants, of their experience of participation in the process, can be included within the project to add to the learning for both participants and the research team. In combination, accountability provides social learning: for the public through education about the process and results, and for the participants through the evaluation process (Riedy 2005). A final set of recommendations could then be presented to planners, accompanied by any feedback received from the public.

Conclusions

The sustainability discourse including ecological economics highlights that messy environment-related problems that challenge sustainability cannot be tackled using the perspectives and conventional scientific methodologies of specialist 'experts' alone. Fresh approaches that espouse sustainability as a learning process (Meppem & Gill 1998), and adopt transdisciplinarity, post-normal science, deliberative democracy and complex systems thinking can lead to discovering resolutions to the problems, where conventional problem 'solving' has proven inadequate.

We have proposed such an approach, applied to the messy problem of urban sanitation in a hypothetical case study in Colombo. It uses soft systems methodology (SSM), adapted to involve people with diverse capabilities to use deliberation and learning to discover

resolutions to the problem. The process is thus composed of *a system for deliberation* and *a learning system*, to emphasise the two objectives of the process.

The *system for deliberation* emphasised that, in order to reach outcomes aligned with values of sustainability and transdisciplinarity, dialogue between participants need to be based on deliberation as defined by the deliberative democracy discourse. We made an illustrative use of the CATWOE tool from SSM to help specify the system, to identify the key actors and actions necessary.

The *learning system* was described as a series of activities that were consistent with a generic form of SSM. We were informed by Renn et al's cooperative discourse model in proposing how and by whom each activity might be performed. The overlay of the *system for deliberation* with the *learning system* would lead to each activity in the learning process being performed in an explicitly deliberative form. Through accommodations reached through debate and dialogue structured by SSM, ways to improve the problematic situation may be discovered.

We contend that the approach such as proposed here could lead to qualitatively different resolutions than the 'solutions' that conventional expert-led approaches would offer. Its alignment with the values of the sustainability discourse raises the probability of meeting sustainability criteria in the long term.

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