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Bridging sanitation engineering and planning: Theory and practice in Burkina Faso

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Short title: Bridging sanitation engineering and planning

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ABSTRACT

The global challenge of providing sanitation services to the un-served underlines a need to change the way in which sanitation planning and service provision is approached. This paper offers a framework for categorizing sanitation projects planning processes based on planning steps and procedural planning theory to help engineers and sanitation planners gain a deeper understanding of the dynamics of these processes. The analysis identifies and discusses trends in both guidelines and actual sanitation programs. The results show that contemporary sanitation planning guidelines and field projects utilize patchwork processes of different planning modes, although the step of designing options is dominated by an expert-driven, rational-comprehensive approach. The use of planning theory can help engineers to ask critical questions about the objectives of the planning process and to develop context-appropriate planning processes that will make a difference for improving sanitation service provision.

Key words | planning theory, process, sanitation, service provision

INTRODUCTION

The movement towards an integrated global economy requires engineers to play an increasingly larger role in critical international issues such as adaptation for climate change, poverty alleviation and promotion of sustainable development (Mihelcic *et al.* 2008). The challenge of meeting the world's needs for improved sanitation (e.g. disposing of human excreta) is one of these critical issues where engineers are needed to make significant positive impacts on environmental and public health, economy, and human dignity. However, sanitation has proved to be a difficult service to deliver in many situations. There is general agreement within the field of sanitation that the sector has failed to deliver substantial improvements to the most needy. For example, access to improved sanitation facilities in Burkina Faso was only 11% in 2008 (WHO & UNICEF 2010). Despite the efforts made to reach the United Nations Millennium Development Goals, the world will meet only 43% of its target of halving the percentage of people without access to improved sanitation in 2015, leaving over 2.7 billion people under served (WHO & UNICEF 2010).

The challenge of increasing sanitation services is that a strict engineering approach of estimating demand and designing a corresponding service delivery scheme often does not result in improved access. Globally, project evaluations repeatedly report cultural constraints, difficulties in securing behavioral change, prohibitive costs, lack of political and managerial support, or low community demand as reasons for low success rate of water and sanitation projects (World Bank 2003). The challenge in developing countries, which rely on on-site sanitation for a majority of urban and peri-urban dwellers, and with a large fraction of non-served, thus goes beyond "normal" engineering skills and will have to address the issues listed above. Proper planning of sanitation interventions is therefore essential to identify and address such constraints. It is during the planning phase that critical decisions are made regarding choice of technology, budget, service area, demand creation and institutional management.

The large number of sanitation planning guidelines available underlines the growing consensus that process matters if sanitation improvements are to be made (e.g. UNICEF 1997; Kvarnström & af Petersens 2004; WSSCC/Eawag 2005; IWA 2006). Many of these guidelines apply system-thinking and participatory methods under the belief that they will increase the potential for sustainability through better management of the numerous risk-factors and through improved local capacity for continued operation and maintenance (WSSCC/Eawag 2005). However, these tools for participation are often tacked on without clearly defining the ground-rules for the entire planning process, thus running the risk of

missing much of the potential contribution from involving stakeholders. In order to improve sanitation programs, and the sanitation situation, it appears necessary to improve understanding of how the whole planning process is structured and why. The authors believe that a better understanding of planning theory can help engineers to more clearly define the focus of sanitation planning processes and the roles which various stakeholders should play, ultimately leading to more sanitation services being delivered to the non-served.

The objective of this paper is thus to (i) introduce concepts from the field of planning and (ii) use them to gain a better understanding of how sanitation planning is currently being designed and practiced.

METHODS AND MATERIALS

This paper builds an analytical framework that attempts to capture two dimensions of the planning process; *when* actions are taken in the process (planning steps), and *how* they are performed (procedural planning theory). The time dimension is captured using five generic planning steps that were identified in previous studies (Kvarnström & McConville 2007; McConville 2010). The five main steps in a planning framework are: (1) Problem identification, (2) Defining objectives, (3) Design options, (4) Select solutions, and (5) Action plan for implementation. The analysis uses the generic steps as a backbone structure, so that *how* planning is done can be assessed within each step in the process.

In order to examine differences in planning styles this paper draws on existing theories of procedural planning. There is a wide variety of literature on procedural planning that go into minute intricacies, yet for the purposes of this investigation it has been useful to develop a simplified typology of procedural planning modes in order to make the discussion more accessible. Out of the proliferation of existing planning approaches, five major strands of theory have thus been chosen for the typology (Table 1): rational-comprehensive (Faludi 1973), incremental (Lindblom 1959), advocacy (Davidoff 1965), collaborative (Healey 1997), and post-modern (Allmendinger 2001). Inspired by Hudson (1979), the ambition is that these five strands, together, cover the larger part of the wide spectrum of planning approaches. It should be noted that some of them are more like ideal types of planning (e.g. rational-comprehensive) while others are based on empirical studies of what planners actually do (e.g. incremental). Also, they are not at all mutually exclusive, but can be combined in different ways to better support planning, see e.g. Critical Pragmatism (Forester 1999). Yet, for the

purpose of this article, they are seen to represent five distinctive understandings of what planning is all about.

Case study methodology was selected as the primary research methodology for understanding how sanitation planning is currently being designed and practiced. Case studies focus on the in-depth study of single cases as a way to learn from practical experience in a complex situation with too many uncontrolled variables. Results can be generalized as long as it is kept in mind that the results are an analytical generalization and not a statistical generalization (Yin 2003). The framework was applied to the study of two sanitation planning guidelines (i.e. theoretical models) and two implemented projects from the field (i.e. local practice in Burkina Faso). Data gathering was carried out through literature reviews for the guidelines and document reviews, interviews and site visits for the projects. Case study methodology (Yin 2003) was applied during data collection and analysis to assure accuracy of the information.

The two selected planning guidelines are widely known in the sanitation field and are supported by credible institutions. They were chosen because they can be considered representative of engineers' perspectives in sanitation, i.e. those of: (1) engineering consultants as in Open Wastewater Planning (OWP) (Kvarnström & af Petersens 2004; Bodik & Ridderstolpe 2007) and (2) sanitation researchers/experts involved in international development, example of Household-Centered Environmental Sanitation (HCES) (WSSCC/Eawag 2005).

The focus of this study was Burkina Faso (population 14.7 million), a land-locked Francophone country in the semi-arid savanna of West Africa. It is a semi-presidential republic, although there is a progressive movement towards decentralization, and most infrastructure decision-making remains within national institutions. Burkina Faso ranks 178 out of 182 countries on the Human Development Index (UNDP 2009a), with GDPs per capita of US\$1083.

The field projects were chosen because they represent both the non-governmental organization (NGO) and national government perspective on sanitation delivery, which are the primary means of sanitation service delivery in Burkina Faso. Although these case studies give a wider picture of how different actors practice sanitation planning in the local context, the small number of cases does make for some limitations regarding the ability to draw conclusive generalizations. It should thus be kept in mind throughout the analysis that this paper offers an entry point for discussion and that many more cases at all scales would be necessary to draw definite arguments regarding local practices. The first is a project supported

by CREPA (Centre Régional pour l'Eau Potable et l'Assainissement à faible coût), an inter-state institution and the leading applied-research institute for appropriate and affordable sanitation in French-speaking West Africa. The second is the highly regarded Strategic Sanitation Plan for the city of Ouagadougou (PSAO) in Burkina Faso.

RESULTS AND ANALYSIS

Analysis of the guidelines and projects involves dividing the respective planning processes into the five generic planning steps and then categorizing each step based on which planning mode appears to be dominant. The results presented below give a brief description and analysis of the guidelines and field projects, as well as explain the classifications presented in Table 2.

Open wastewater planning

The OWP guidelines seek to include a wider range of selection criteria and possible options by encouraging a participatory approach that is lead by an independent expert who has a good knowledge of both sanitation solutions and of the local policy context (Bodik & Ridderstolpe 2007).

The first step emphasizes sharing individual viewpoints and building a basis for civic action, making this step a *post-modern* planning mode. The second step moves from sharing viewpoints to reaching consensus on criteria for designing appropriate systems, thus using a *collaborative* approach to planning. The third step has limited participation and high degree of expert control in the design process, making this a *rational-comprehensive* approach. When the expert has prepared a choice of options, these are presented to the community for selection of the most appropriate solution. Although there are some rational-comprehensive (expert) elements in the selection process, the level of participation and pragmatic decision-making is more typical of *incremental* planning. Unlike the other processes used in this analysis, the Open Planning approach does not go into detail on how a selected system should be implemented, therefore planning for action is not part of this approach.

Household-centered environmental sanitation

The HCES approach is a multi-sector approach for service delivery in poor urban areas. It integrates water supply, storm-water and sewage management; facilitates the incorporation of input from diverse actors; and utilizes the concept of urban zones for enhancing the

implementation of decentralized options (WSSCC/Eawag 2005). The HCES guidelines have been subsequently field tested and revised, including reducing the number of planning steps from 10 to 7. The new, renamed 'Community-led Urban Environmental Sanitation (CLUES)' guidelines will be published in 2011 by SANDEC and WSSCC.

The identification of problems and objectives in the HCES approach are focused on ensuring community participation and giving a voice to the people who will benefit from the services, which classifies these first two steps as *advocacy*. Similar to Open Planning, the design and selection processes are led by experts who identify service combinations that meet the levels of service desired by the users. Once possible service plans are identified, the planners assist the community in reaching agreement on which option makes the most sense to implement. Again, the expert-led design of options followed by the facilitated community selection process makes these two steps first *rational-comprehensive* and then *incremental*. The action plan is developed through an open dialogue with stakeholders regarding the best way to achieve implementation, a style which is most in line with *collaborative* planning.

CREPA program for basic community services, Burkina Faso

CREPA runs a program to support the development of basic community services, including sanitation. This study examines a project initiated in the small town of Tougan (population ca 16,000) in northwest Burkina Faso (CREPA 2006). The project started after a request for assistance from the Mayor who wanted to prioritize sanitation in the town.

Similar to the process recommended by HCES, CREPA conducted the processes of problem identification and defining objectives in a participative way using an *advocacy* approach to give a voice to community members. A day of public dialogue was held where community members were asked to discuss town problems, possible solutions and/or objectives for action. However, the designing step that followed the collection of community viewpoints and priorities used a more expert-driven approach. Based on the baseline studies and community defined objectives, CREPA experts prepared a project document, including the design and selection of appropriate technologies for community-identified problems. The focus of the project document is aimed at offering a comprehensive package of sanitation services with technology choice based on the analyses performed by experts, which gives both the design and selection steps a *rational-comprehensive* feel.

It is somewhat harder to classify what planning mode is used in the action plan implemented by CREPA, since there is a mix of rational-comprehensive, post-modern and

incremental elements. The main efforts of project implementation were focused on the social marketing campaign, which was to create demand for sanitation (i.e. selling the expert-defined rational-comprehensive plan) through awareness-raising techniques and then offer the households a choice of sanitation technologies (post-modern individual choice). In addition, a CREPA intern had daily contact and communication with the field workers and users, and worked to verify results and remedy problems as they arose (i.e. incremental problem-solving). Despite the elements of expert rationality and post-modern individual choice, the dominant focus of the action plan was still getting things built. It is thus mainly based on a pragmatic, *incremental* planning mode that focuses on trial-and-error learning and patch-work implementation in the households most willing to buy into the project.

Strategic sanitation plan of Ouagadougou, Burkina Faso

The initiative for a sanitation plan in the capital of Burkina Faso started in the early 1990s through collaboration between the National Office of Water and Sanitation (ONEA) and the regional UNDP-World Bank Water and Sanitation Program (WSP). The Strategic Plan for Sanitation in the city of Ouagadougou (PSAO) rests on two innovative concepts: financing of sanitation infrastructure through surtax on water provision and recognition that conventional sewerage is not an affordable option for the entire city. The planning process used for the PSAO has subsequently been recommended for other urban areas in Burkina Faso (ONEA 2007).

The PSAO started as an action-oriented program under the leadership of high-level officials and expert staff at ONEA. The principles outlined in the PSAO project document are related to short-term planning with an emphasis on immediate actions (WSP 1994). Although this get-it-done focus is typical of an incremental approach to planning, both problem identification and setting of objectives were highly expert-driven and far-reaching. Project documents contain expert studies on urban habitat and geology, capacity and willingness-to-pay of the local population, and institutional studies for financial mechanisms and partners for executing the program. The resulting problem description and program objectives outlined in the planning document give a comprehensive view of the problem and specific objectives for improving sanitation services. Consequently, these first two steps are classified as *rational-comprehensive*.

As far as could be understood from interviews conducted and documentation available, the designing and selection steps were carried out within the ONEA planning team, but with

some feedback from the main stakeholders involved in the initial dialogue. Similar to the CREPA case, the diversity of options in the project document appears aimed at offering a comprehensive package of sanitation service options. The design and selection of which technologies to offer remained under the control of experts, with limited wider stakeholder participation, indicating that a *rational-comprehensive* mode of planning also dominated these steps of the process.

The action planning step, however, focuses more on an *incremental* approach as a means of getting things done. The execution strategy was planned to be implemented and refined in a step-wise process, starting with a pilot phase from 1992 to 1993, where the selected sanitation options were demonstrated in two neighborhoods. In addition to assessing technical feasibility, the pilot project was a means to clarify the roles and responsibilities of different institutions involved in the process. After the results of the pilot projects were found to be positive, the strategy was scaled-up and formalized as sanitation policy for the entire city.

DISCUSSION

The analysis of the selected guidelines and field projects highlights several interesting similarities and differences in how they outline sanitation planning processes. By using a planning theory typology it becomes clear that the two studied planning guidelines tend to propose communicative approaches to sanitation planning (e.g. post-modern or collaborative) whereas the field projects are significantly more inclined towards working in a rational-comprehensive way.

One reason for this divide may be that it is too early yet to see evidence of an ongoing shift in planning practices globally, from rational-comprehensive approaches towards collaborative ones. Tewdwr-Jones & Allmendinger (1998) argue that changes towards a practical application of collaborative or post-modern modes of planning are often made at the individual level by planners eager to try a new approach, but that their actions are undertaken within an institutional structure that is still “top-down”. A more significant shift to collaborative planning will thus require a redesign of institutions so as to overcome existing power structures (Tewdwr-Jones & Allmendinger 1998). For example, interviews with sanitation planners and practitioners in Burkina Faso make it clear that ideals of participation and communicative theory have infiltrated significantly into their perspectives and rhetoric (McConville *et al.* 2010). Perhaps it is simply a matter of time before the activities in local projects will begin to more fully reflect the theories espoused in the planning guidelines. At

the same time it is critical to recognize that power structures and institutional bureaucracy do exist and may limit the potential to successfully apply collaborative approaches to sanitation planning (Kvarnström et al. 2006).

On a more detailed level of analysis there are differences to be found in the focus and approaches taken by the sanitation development researchers (HCES), on the one hand, and the sanitation engineering consultants (OWP), on the other. For example, HCES favors the advocacy planning mode for their work in developing countries, while OWP focuses on creating dialogue through collaborative and post-modern modes. Similarly, there are differences between the field projects, so that one can suspect that differences in planning styles may be traced back to conflicting perspectives on development programs between different lead agencies, such as a national sanitation agency and an inter-state organization.

According to this analysis, the process of designing options (e.g. type of toilet) in the field of sanitation remains expert-led and uses a rational-comprehensive mode of planning in all of the studied guidelines and field projects. Essentially, all four of the guidelines and field projects studied involve the experts coming up with a handful of possible designs that are then offered to the stakeholders (either in the selection or implementation step). Some would argue the need for expert guidance to manage the complexity of sanitation systems and to assure proper containment and treatment of excreta (WHO 2006). However, rational-comprehensive approaches have been criticized for resulting in plans that are all too simplified versions of reality and therefore impossible to implement in real world contexts (Allmendinger 2009). In a situation where drastic change is needed to meet the needs of the un-served, it can also be argued that such technocratic approaches end up lacking critical connections with the socio-economic reality of the situation (Tiberghien *et al.* 2011). An example from the PSAO case is how households theoretically could choose any on-site system they desired, but where households, nonetheless, most frequently chose the least expensive options saying it was all they could afford (McConville personal observation 2007).

This study thus highlights a tension within the sanitation sector between rhetoric for community-based and participatory approaches and the need to meet strict treatment standards. On one hand it could be argued that more communicative and participatory approaches in the design step would have increased the range of feasible choices, thus opening up for more adaptive and sustainable sanitation provision (WSSCC/Eawag 2005). On the other hand, it may be argued that the need to meet treatment standards implies that this step should remain dominated by the tried-and-tested technologies that experts can vouch for, regardless of the potentially weak compatibility of these technologies with the local cultural

and socioeconomic context. Even if it is not yet clear how to achieve a balance between potentially conflicting needs, this study points to the design options and select solution steps as key entry points for significantly changing how sanitation planning is perceived and practiced.

Another key point is that none of the studied guidelines and field projects used a single planning approach throughout the whole planning process. One interpretation may be that this is a result of a haphazard use of different planning styles rather than a deliberate shaping of the planning process. However, another explanation could be that the guidelines and projects do adapt to the diverse needs of the different planning steps, even if this is not discernible in the discourses present in the actual guidelines and field projects (McConville 2010; field observations). This would seem to indicate a weak knowledge of planning theory in the sector of sanitation provision, and hence a critical opportunity for learning and improving the understanding of the planning process itself. Previous studies suggest that a combination of different planning methods might be needed to better adapt to local context (Lüthi *et al.* 2009). However, it should be noted that this cannot be a matter of coincidental ad hoc mixing of different planning modes but rather needs to be about an intentional mixing with the aim to maximize effectiveness of the process. Increasing knowledge regarding available planning approaches thus offers an opportunity to constructively deal with the complex challenges of the local situation.

CONCLUSIONS

One of the key starting points for this study was the question whether bridging the disciplines of planning and engineering could contribute to a better understanding of the practice of sanitation provision. As an analytical framework, the use of planning theory has been a useful tool for identifying differences and trends in both sanitation planning guidelines and sanitation practice. In addition, planning theory could also prove valuable for sanitation planners to become more consciously aware of the pros and cons of different planning modes and to deliberately apply them in the design of their planning processes, for improved effectiveness of processes for sanitation provision, as well as for better sustainability of the system once it is in place. There is no right or wrong answer to these questions; rather it is about choosing the right approach for the specific context. Here, the use of planning theory can help engineers ask critical questions about the objectives of the planning process, about the best way to reach these objectives and, not least, about their own role within it. By understanding the potential variation in planning styles along a planning process, linking it to

engineering design, and acknowledging that this process is not necessarily uniform; the practitioner can start to identify areas of weakness and better adjust the process to match local needs. This could mean exploring ways to make the designing step of the process less expert-driven or recognizing opportunities early in a process for integrating a wider variety of stakeholders' criteria. In conclusion, by focusing on procedural aspects of planning, this paper contributes to an improved understanding of the importance of the structure and objectives of the sanitation planning process itself.

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Table 1 Comparison of trends and focus in the five planning theories presented (Adapted from Allmendinger 2009).

	Planning Focus	Role of Planner	Planning Method	Participation	Outcome
Rational-Comprehensive	Achieving far-reaching global objectives	Objective expert	Based on quantitative analysis	Limited	Master Plan
Incremental	Getting things done – no set objectives	Facilitator: helping others act of ideas that make sense	Agreement after weighting specific options and outcomes	Generally by strong or well articulated players	Compromise patch-work plans
Advocacy	Solutions to address power inequalities	Advocate: giving a voice to interest groups	Debate and discussion	Through representatives	Political debate
Collaborative	Agreement through free and open discussion	Moderator: enabling communication between stakeholders	Open dialogue leading to consensus	Decentralized: invitation to everyone who wishes to communicate	Consensus for action
Post-modern	Understanding and sharing fragmented visions – no great vision	Narrator: allowing individuals to express their viewpoints	Iterative and participatory, but individualized	Network for those who can engage in planning	Civic culture, but individual action

Table 2 Overview of how planning is carried out during each step of the planning guidelines and the field projects.

	<i>Planning Frameworks</i>		<i>Field Projects</i>	
	OWP	HCES	CREPA	PSAO
<i>Problem identification</i>	Post-Modern	Advocacy	Advocacy	Rational-Comprehensive
<i>Define objectives</i>	Collaborative	Advocacy	Advocacy	Rational-Comprehensive
<i>Design options</i>	Rational-Comprehensive	Rational-Comprehensive	Rational-Comprehensive	Rational-Comprehensive
<i>Select solutions</i>	Incremental	Incremental	Rational-Comprehensive	Rational-Comprehensive
<i>Action plan for implementation</i>		Collaborative	Incremental	Incremental