The SWITCH experience with strategic planning for Sustainable and Integrated Urban Water Management, using Quantitative Microbial Risk Assessment in Accra[1]

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Abstract

Increasing global change pressures require urban water managers to improve the overall sustainability of their urban water systems. This paper illustrates such an improvement process based on SWITCH demonstration city Accra. A multistakeholder platform (Learning Alliance) consisting of a cross-disciplinary team of academic experts and practitioners in Accra went through a process of strategic planning and health impact assessment. Case studies using quantitative microbial risk assessment are described and evaluated to test the hypothesis: ' *Design and management of the urban water system based on an analysis and optimisation of the entire urban water system (infrastructure and human organisations, water supply, sanitation, stormwater etc.) will lead to more sustainable solutions than optimisation of separate elements of the system'*. It was concluded that the applied assessment tool is instrumental in widening the boundaries of the system and as such it may help planners and decision makers to put investments in the right place to generate maximum benefits.

1 Strategic planning and assessment tools

SWITCH is aimed at the 'city of the future'. Therefore it includes a certain extent of re-design of the urban area in order to achieve the sustainability and health objectives. The emphasis is on developing strategies for the system as a whole. Its focus is on the development of an overall strategy and the translation of this into 'strategic planning'. Strategic planning is therefore the description of the major choices and what these choices mean for the city. And it is fed by data on the urban water system. The SWITCH strategic planning methodology

[1] This abstract is fully based on Van der Steen and Howe (2009) and Van der Steen (in press)

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was adapted from the EMPOWER project (Batchelor and Butterworth 2008) and Foxon et al. (2002). The different steps in this planning process are indicated in Fig. 2. Key elements are:

Visioning and sustainability objectives

A vision is ‘‘a concise description of a desired future. Visions provide a picture of how we would like the world (or our water resources and services) to be at some agreed future time’’ (Batchelor and Butterworth 2008). The next step in the process is that the vision is translated in a set of SMART objectives. We maycall these objectives ‘sustainability objectives’, since the overall aim is to reach a sustainable urban water system. Once the objectives have been agreed by the Learning Alliance, we could formulate one or more sustainability indicator for each sustainability objective. Health aspects obviously should be included in the sustainability assessment.

Scenario development

After the vision and the set of sustainability indicators has been agreed, the Learning Alliance’s will formulate a number of possible future scenarios. ‘‘Scenarios are stories about the way the world might turn out tomorrow. A scenario is a consistent description of a possible future situation as determined by those factors that are both most important and most uncertain’’ (Batchelor and Butterworth 2008).

Strategy development

Subsequently, the Learning Alliance will work out different strategies that are aimed to reach the vision under the conditions of a certain scenario. The scenarios and strategies that are being developed in workshops in the cities are at first instance to a large extent qualitative, without a data-based and in depth analysis. This in-depth analysis, using research and demonstration results of the SWITCH project, are added during the next stage. Finally, a City Strategy, based on solid data and in depth analysis will be agreed and adopted during a final decision makers workshop on the ‘‘City Strategy for 2030’’. Although the strategy development is presented here as a linear process, in reality its nature is much more cyclic. After every step in the process the planners need to check previous steps. Is the vision still the same and still achievable? Have scenarios changed, for instance due to the availability of new data? Have new strategies emerged, for instance due to the development of new technologies?

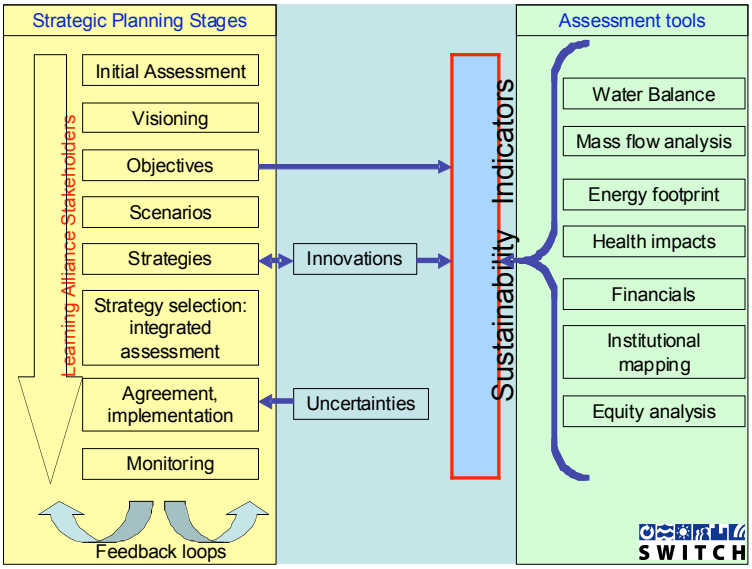

Figure 1. Overview of strategic planning exercise in SWITCH demonstration cities (Van der Steen, in press)

2. Application of QMRA to the entire urban water system

Contrary to most QMRA studies which are applied either to the water supply system or the sanitation system, the study by Labite et al. (2010) provides the health risks stemming from the entire urban water system in Accra (Ghana). The disease transfer pathways included drinking water supply, contaminated surface waters and open roadside drains. The analysis showed that 88% of the disease burden in Accra (expressed as Disability Adjusted Life Years - DALYs) were caused by shortcomings on the sanitation side of the urban water system, while only 12% was caused by shortcomings in the water supply system.

The effect of a number of interventions aimed at reducing the disease burden was assessed (see Figure 2) and it was found that interventions at the sanitation side of the system are more effective than interventions at the water supply system. The efficiency in terms of US$ per DALY averted, of the following 3 interventions of the Accra Sewerage Improvement project could be quantified (Intervention A: sewerage network and sanitation facilities; Intervention B: sewage network and sanitation facilities combined with treatment plant; Intervention C: coverage of the roadside drains). Intervention C had the highest efficiency. Further work (Machdar et al., in prep) showed that the efficiency of intervention D, further improvement of the water supply system, is significantly lower than interventions at the sanitation side of the system. Interventions outside the water system, such as hygienic food preparation, were in this case not considered.

The results of these studies seem to confirm the hypothesis concerning the advantages of an integrated or holistic analysis of the entire system. The recommendation one could derive from this work towards the urban water managers (planners, decision makers, policy makers) of Accra is to channel the available funds for investments towards the most efficient interventions. Here it is where theory conflicts with practice. Currently, the institutional set-up in Accra is that the Ghana Water Company Ltd. (GWCL) jointly with AquaVitensRand Ltd. is

responsible for the water supply system. The responsibility for sanitation and the drainage system is with the municipality (Accra Metropolitan Assembly - AMA).

If one would want to implement the recommendation of this scientific assessment tool, the institutional organisation would need to change. The AMA and GWCL would need to coordinate and prioritise the investment of available budgets. It is obvious that this is more easily said than done, for instance because mandates of the organisations are fixed and organisations would not like to transfer budgets to another organisation, even if this would mean that the same budget would have more positive effects for the cities' population.

Still, since the budgets are public budgets one would need to make sure that the benefit to citizens is maximised, irrespective of mandates or interests of organisations. The system boundary is the entire city and its inhabitants. An interesting example of such an approach is a QMRA study carried out by Yarra Valley Water in Melbourne, Australia. (Kelly, personal communication) The question was to whether investments should be made to provide (more) treatment for the drinking water of the city. To assess whether this was a justified expense of public money a QMRA study was carried out to compare the investment in drinking water treatment with a completely different action, namely spending the same money on a campaign for early detection of breast cancer. The result was that the latter action had a better efficiency in terms of health gain per dollar investment. Rational decision making and rational decision makers would need to take such considerations seriously, even if the system boundaries in this example are extending beyond the water system.

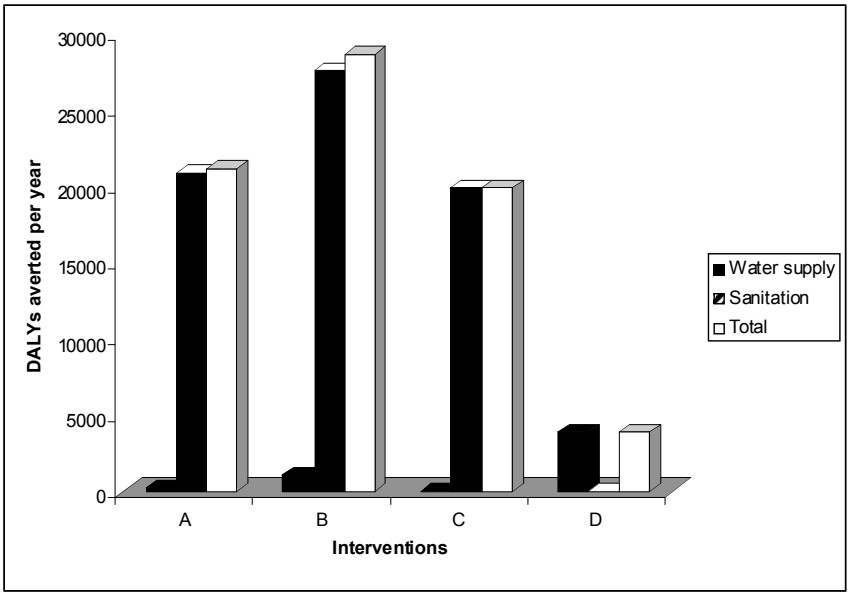

Figure 2. DALYs averted after the interventions in Accra's urban water system (A: sewerage network and sanitation facilities; B: sewerage network and sanitation facilities combined with treatment plant; C: coverage of the roadside drains; D: further improvement of the water supply system) (Labite et al. 2010)

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