Workshop 4: OPTIMISING WATER USE BEYOND URBAN BOUNDARIES

Session 2: Wastewater Management to Support River Basin Water Quality: Improving water quality: Are centralised solutions cost effective?

Organized by Specialist Group on Sanitation and Water Management in Developing Countries

Moderator and introduction: Dr. Markus Starkl, BOKU University, Vienna, Austria

Presentation 1: Centralised versus decentralised management options (Ir. Dorai Narayana, Indah Water Konsortium Sdn Bhd, Malaysia)

Presentation 2: River quality impact and cost assessments of different wastewater management options in the Melana catchment, Malaysia (Prof. Zulkifli Yusop, Technical University Malaysia)

Presentation 3: Potential for small and large scale solutions: costs and quality aspects (Mr. Pierre Flamand, Japan Sanitation Consortium, Japan)

Panel discussion: Improving water quality: Are centralised solutions cost effective?
Ir. Dorai Narayana, Indah Water Konsortium Sdn Bhd, Malaysia
Prof. Zulkifli Yusop, Technical University Malaysia, Malaysia
Mr. Pierre Flamand, Japan Sanitation Consortium, Japan
Prof. Thammarat Koottatep, Asian Institute of Technology, Thailand

Introduction:
This workshop has aimed at discussing the rational behind centralized and decentralized solutions for water management. The arguments for both are well known. Whereas worldwide there is a trend towards decentralized solutions, this workshop tried to critically reflect this trend and look at potential and limitations of both options.

Presentation 1:
Ir. Dorai highlighted that the question of centralised vs decentralised sewerage management has been debated often. In most instances, costs, both Capital and Operational – would be cited as the main criteria in the selection. While this is to some extent valid, the issue is far more complex:
Sanitation is high priority primary concern for urban areas, basically to address Public Health issues. The focus is initially on providing toilets, and educating people to use them. The waste is usually treated in rudimentary on-site systems, often a pit or pour flush latrine. With time, the slightly more effective septic tanks began to be used. And while these were more effective in preventing ground water pollution and also producing reasonably acceptable effluent, the septic tanks had to be desludged periodically, leading to a septage problem. Then came piped water-borne sanitation, transporting the sewage away from the premises to a remote location. These

treatment facilities were usually small scale communal facilities. Issues included nuisance due to proximity to residences and also difficulties of managing them due to large numbers and logistics. As cities grew, regionalised sewerage systems began to e built. These are capital intensive and are expensive to build operate and maintain. Moreover building such system in an existing city and connecting all the sewage sources is extremely challenging.

In Malaysia, all of the above systems co-exist, as remnants of the evolution of the sewerage infrastructure in the country. Catchment Strategies are used to ascertain the best strategy for a given urban area, considering such factors as existing systems, issues, growth rates, land availability, Capital and Operating costs and NPV, affordability, suitability as well as other non-cost considerations in deciding whether to go for regionalisation, and when to implement it. Usually the strategies are staged, to allow for flexibility to cater changing conditions.

Presentation 2:

Prof. Yusop presented a case study from the Melana catchment located in Johor Bahru in South Malaysia. The overall objective of this study was to assess the performance of different wastewater management options by carrying out the following tasks:

- calculate a design capacity based on the predicted population equivalent in the area
- predict the river water quality based on the current and future development scenarios
- identify feasible wastewater treatment options
- assess environmental and economic impacts

The river quality was analysed for pH, temperature, dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), Ammoniacal nitrogen (AN), nitrate, phosphate, lead, cadmium and copper. TSS was selected as indicator of soil erosion and sedimentation, BOD as indicator for organic pollution, nitrate and phosphate for nutrient contents that may lead to eutrophication and the heavy metals represent industrial sources. QUAL2E was used for modelling the river quality. The model is widely applied for evaluating river water quality and can be applied in various conditions for different parameters (Ghosh, 1996). In this analysis QUAL2E was used to simulate Melana River quality and predict the present and future river quality over 30 years time span. Options were proposed to upgrade the existing wastewater treatment performance. The proposed options were based on factors such as site suitability for treatment plant, accessibility, availability of new area, consumer demand, technology and cost.

Based on the QUA2E modelling results, both the decentralised and centralized option are expected to exhibit quite similar river quality pattern. However, the centralized option may perform even better in the upstream because there is no discharge. The cost modelling showed that the centralized option is cheaper by about 15% compared to the decentralized options.

Presentation 3:

Mr. Flamand discussed the aspects that would favor centralized or decentralized wastewater treatment systems in the quest of improving water quality at river basin level, and whether

centralized systems are cost-effective solutions. In terms of treatment quality, Japan has the particularity of having developed both centralized and decentralized technologies (so-called "johkasou") that can achieve the same level of treatment. This is a specific and important feature that is not found in many countries, where septic tanks and centralized wastewater treatment systems achieve very different performances. Mr. Flamand detailed the characteristics of the major wastewater treatment systems in Japan, and the criteria for the selection of centralized or decentralized systems. This was emphasized by the introduction of a case study at river basin level in Japan, including a cost comparison between different options. This gave a concrete example on how selection is made, mainly based on population density and cost per capita. Finally, he highlighted that the combination of both centralized and decentralized systems enabled Japan to achieve full sanitation coverage in a relatively short period of time, and also to protect water resources, as demonstrated by the constant quality improvement in water bodies, especially rivers.

Panel discussion:

After the presentations the advantages and disadvantages of decentralized and centralized solutions were discussed and questions from the audience taken up. The discussion has shown that there is a general tendency to favor decentralized systems (a question to the audience about their general preferences has shown that the large majority preferred decentralized systems). However, the argument of economy of scales and capacity of operating the systems supported centralized systems. As a conclusion, the question whether decentralized or centralized solutions are better depends on the local contexts e.g. socio-economic conditions, user perceptions and participation, regulatory enforcement, etc. whereby the byproducts from either systems shall be properly managed and/or recycled A feasibility study should compare centralized, decentralized and mixed solutions in order to identify the most suitable one for a specific case.