

**Information about the Work Package of the Partners of the SHAKTI Project**

Project Phase 1 - from 2005 to 2008

<b>Work Package No 2</b>	<b>Sewerage and Sanitation</b>
<b>Coordination:</b>	IWG
<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Developing a technically and economically viable scenario for Hyderabad</li> <li>• Defining Implementation strategies</li> </ul>
<b>Main Interactions</b>	WP1, WP3, WP7, WP8
<b>Description of Work</b>	
<p><b>Task 2.1: Analysis of today's wastewater situation</b></p> <p>Analysis of the today's wastewater situation with the aim of identifying existing infrastructure and its capacities as well as planned project and comparing it to presently recognizable requirements, thus analysing existing deficits and necessary actions. Presently there are installations for the treatment of some 40 % of all wastewaters (in part primary and secondary treatment), i.e. 133 000 m<sup>3</sup>/d while the Sewerage Master Plan projects that in the year 2006 the daily flow to be treated should be 630 000 m<sup>3</sup>/d and in the year 2021 an amount of 1456 000 m<sup>3</sup>/d should be handled. Further-more the efficiency and reliability of these treatment processes as well as the resulting emissions and their effect upon the quality of surface and groundwater are to be checked. In doing this a differentiation with respect to the effects of nutrients and (priority) pollutants as well as their origin from storm water runoff, industry and domestic sources (the latter one being preferably identified in terms of black water, grey water) as well as other wastewater streams.</p> <p>On the basis of this analysis the most urgently needed actions are to be identified and a prioritised list of such actions for the project phase II (i.e. the demonstration phase) to be formulated. The basis for such a catalogue of necessary measures, listed in two categories (category 1: immediate action needed and category 2: inter-mediate action) is amongst others:</p> <ul style="list-style-type: none"> <li>· (financial) expenditures</li> <li>· possible reduction and minimization of emissions</li> <li>· reduction of water demand in industrial production</li> <li>· improvement in the area of domestic supply, as well as</li> <li>· improvement in residential and hygiene quality within the city of Hyderabad.</li> </ul> <p>While we concentrate predominantly on the aspects of water protection and thus wastewater collection and treatment it must not be overlooked that one of the most serious problems of Hyderabad beyond the above described lack of capacity of the sewerage and wastewater treatment systems is the insufficiency of the (municipal) water supply system for the domestic sector (even residences connected to the central water supply system cannot be supplied throughout the whole day). Therefore new concepts are needed for a more economic use of water resources.</p> <p>These might be predominantly sought for in the industrial area with cleaner production concepts and installation of more and more water recycling, thus lowering the water demand on one hand and the wastewater production on the other. It is known that the use such concepts can be encouraged or even enforced by the setting of water tariffs. Any fraction of water saved in this way might well be used for domestic users. - Thus, all industry must be analysed in terms of its water usage as well as its pre-treatment (predominantly with respect to priority pollutants) prior to the return of these waters into the public sewerage system or into natural waters. A list of discharges into the public system as well as so-called sewerage inventories should be sought for and evaluated.</p> <p>An additional area of concern is the incompleteness of the sewerage system which presently serves not more than 60 % of the city's area. The structural and hydraulic characteristics of this system are to be evaluated and measures for preferably separate collection storm water runoff, both in industry and in the domestic area should be described.</p> <p>Such analyses of the water supply sector (including all relevant water quality aspects) and the wastewater collection and treatment aspects cannot be successful in terms of environmental protection if the problems of solid waste are neglected. We propose to analyse predominantly the situation of organic waste of domestic origin also in view of its utilization in a joint fermentation process together with bio solids fermentation with the aim of biogas production and generation of electric energy.</p>	

**Task 2.2: Developing a technically and economically viable scenario for Hyderabad (screening and ranking potential solutions)**

As a result of the above described analyses and taking into account Hyderabad's future plans reasonable and technically proven proposals for the solution of H's urban water management problems are to be described and evaluated in terms of their (short-term) feasibility, their acceptable and hopefully minimal expenditures and their again hopefully maximum reduction of emissions or usage of organic waste sub-stances. Such options could be:

- Increasing the capacity of existing wastewater treatment plants by integrating pre- and direct precipitation processes (using iron and aluminium precipitants aided by polymeric flocculants for volume efficient sludge production).
- Developing new (treatment) plants with the goal of plant volume minimization by making use of precipitation steps as well as supporting biological processes through the use of suspended and sessile biomass.
- Separate collection of storm water runoff and separate (high-rate) treatment, including disinfection in order to improve surface water quality or enhance the possibilities of direct (re)use or down-cycled re-use.
- Similarly the option of separate grey-water collection and treatment - in particular in densely settled areas is to be explored further. - Wastewater re-use in irrigation (amongst others in agriculture) is to be discussed and assessed in terms of the necessary (possibly also limited) reduction of the nutrients N and P and its disinfection with chlorine and its possible consequences.
- Generation and use of organic (domestic) waste is to be assessed and analysed in view of possible conversion and gas production processes as well as possible inactivation.

**Task 2.3: Implementation strategies**

Based on the prioritised list of actions and measures to be taken such measures are to be detailed in cooperation with the Hyderabad Metropolitan Water Supply and Sewerage Board (HWS&SB). There are significant interfaces to the work packages WP 1 "water(supply)" and WP 3 (energy). The work is to be done in close cooperation with the JNTU College of Engineering in Hyderabad, and Professor M. Vishwandadham of the Department of Civil Engineering. Thus Indian and even German diploma students can be involved and supervised on location by the Indian colleague Prof. Vishwandadham.

**Task 2.4. Input for WP 7 Monitoring & Evaluation**

Identification of relevant data for long-term groundwater monitoring and defining a set of indicators (economical, ecological and social) for monitoring and evaluation of the implementation projects.

**Deliverables**

- Analysis of today's wastewater situation
- Technically and economically viable scenarios
- Implementation Strategies
- Set of sustainable indicators and basic data for monitoring process