Identification and evaluation of reuse-oriented sanitation concepts for Massawa, Eritrea

Pre-feasibility Study

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Objectives

To initiate the inception phase for ecological sanitation activities in the town of Massawa

- **Specific objectives:**
  - To assess the actual sanitation and hygiene situation in the town.
  - To identify a series of suitable reuse-oriented sanitation concepts for the town.
  - To evaluate the feasibility of the different concepts considering the economic, environmental, social and technical context.

Methodology

1. Determination of local officials’s interest
2. Presentation of Terms of Reference
3. Informal presentation of the study (to national and local authorities)
4. Stakeholder analysis
5. Rapid assessment of the actual situation
6. First workshop presenting the results on the rapid assessment and receiving the official input (expectations on the project)

Methodology (2)

7. Information gathering, consulting and survey
8. Identification and evaluation of different ecological sanitation concepts
9. Discussion with supervisors and counter-parts
10. Second workshop presenting results of the study
11. Redefinition of concepts
12. Final Report

Information sources

- Secondary data
- Interviews with key stakeholders
- Observatory walks
- Field visits
- Household-based interviews
- Group discussions
- Workshops

Eritrea
Massawa

- Temperature: 29.5°C (maximum 46.5°C)
- Rainfall: less than 200 mm (nov – feb)
- Soil: sand dunes, coral dunes and evaporites (permeable soil)
- Groundwater level: 5-13 m.
- Population: 36,700 (census 2004)
- Main industries: Port, salt works, cement factory, quarry
- Agricultural activities: maize, sorghum, millet, watermelon, tomato (spate-irrigation)
- Energy sources: electricity, wood and coal

Major problems in Massawa

- Water shortage
- Lack of adequate sanitation
- Health effects of poor sanitation
- Groundwater and seawater pollution
- Food insecurity
- Increase of the urban population

Water shortage

- Depletion of actual groundwater sources due to overexploitation
- Salt water intrusion
- Constant droughts
- Increase of the water demand

Lack of adequate sanitation

- Lack of sanitation facilities in some areas.
- Sometimes toilets have to be shared by different households.
- Flush toilets do not work properly due to the shortage of water.
- All schools in Massawa lack of adequate sanitation infrastructure.
- Traditionally people in Eritrea do not care about sanitation aspects.

Sanitation (2)
Health effects of poor sanitation

- Even though the diarrhoea incidents have decreased in the last few years, it is still the second most common water-related disease in Massawa.
- 20% of the outpatients of Massawa hospital suffer diarrhoea.
- Many cases of malnutrition may be caused by a badly treated diarrhoea.

Water pollution

- Infiltration pits (called septic tanks)
- Discharges into the sea

Food insecurity

- Agricultural activities in coastal areas dependant on rainfall.
- 80% of food requirements comes from the highlands.
- Dependancy on food aid.
- Loss of valuable nutrients in human wastes and organic wastes.

Increase of urban population

- Population in Massawa has increased in 55% from 1994 to 2004, which represents 4.5% annually.
- New development areas and industries will generate more jobs and therefore more migration to Massawa town during the next years.

General considerations

- Reduce groundwater and sea water pollution
- Low water consumption
- Preferred decentralized systems
- Low costs
- Offer reuse options and nutrients recycling
- Adequate to climatic conditions of Massawa
- Accepted by the population

General considerations (2)

- Reliable, stable and robust (simple) process
- Simple operation and maintenance
- Low technical knowledge
- No need of external energy supply
- No chemicals are needed
- Availability of spares
Type of proposals

1. Hut areas
2. Concrete-constructed houses and buildings
3. New development areas

Technical proposals (Category II)

- Acceptance by users
- Reuse potential
- Flexibility
- Operation and maintenance
- Technical capacity
- Costs
- Climate and soil requirements
- Health and environmental impacts
- Water required for operation and wetland dehydration

Technical proposals (Category I)

- Greywater treatment
- Brownwater treatment
- Yellowwater treatment

Technical proposals (Category III)

- Composting of pre-treated faeces
- Dehydration of faeces

Evaluation criteria

- Water required for operation
- Health and environmental impacts
- Climate and soil requirements
- Costs
- Technical capacity
- Operation and maintenance
- Flexibility
- Reuse potential
- Acceptance by users

Analysis
### Recommendations for follow-up

1. Select the department or area responsible for coordinating.
2. Select people from the administration to be responsible for the follow-up.
3. Developing technical proposal for pilot project(s).
4. Apply for financing of pilot project(s).
5. Installation of pilot project(s).
6. Feasibility study on specific alternatives considering the experiences from pilot projects.
7. Implementation of the feasibility study and construction of the new sanitation infrastructure.
8. Monitoring and redefinition of the systems should be done during the whole process.
9. Educational campaign should be considered during the whole process.