Faecal Sludge Treatment and Management –
Research, Extension and Dissemination

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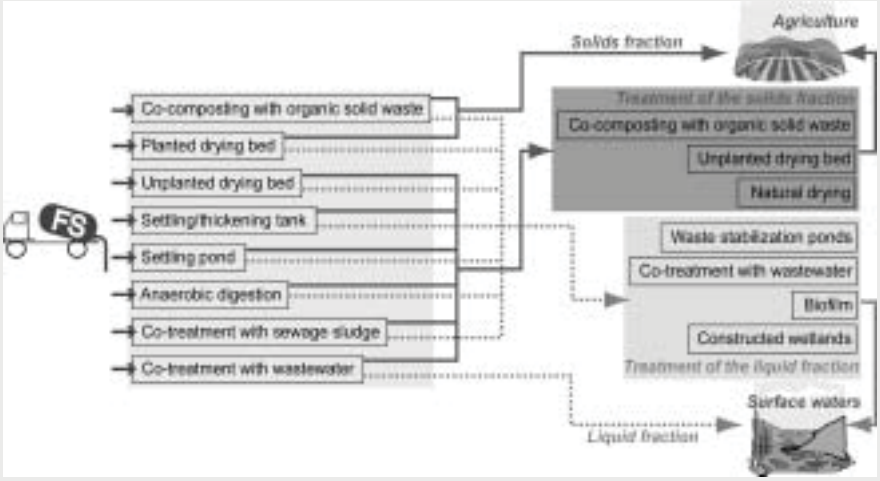
Programme Outline

The objectives of this programme are to establish guidelines for the management and treatment of faecal sludges; i.e., sludges from on-site sanitation systems (unsewered private and public latrines/toilets, aqua privies, septic tanks), and to strengthen the institutional capacity in this field. Collaborative field research on faecal sludge (FS) management and treatment is currently ongoing in Argentina, Ghana, Francophone West Africa, and Thailand. A planning guide for FS management is in preparation. Dissemination of acquired knowledge and experience, including an active exchange of experience gained by practitioners, will be a future target of the programme. Information on completed treatment option studies is available in SANDEC News 1-4, in various other publications, on our homepage or from the authors. Treatment options currently under investigation are outlined below.

Box 1 Treatment Options



Box 2 Constructed wetlands pilot plant at AIT with a core of accumulated and dewatered biosolids

Drained liquid	Accumulated biosolids
• Flow = 70% of loaded septage • COD, SS, NH_3-N removals = 97, 99 and 85%	• 50% of loaded solids retained • TS = 30% • Viability of helminth eggs ≤ 3 %

Suggested design for Bangkok-type septage (6-28 g TS/l) and climate (24-32 ºC): 250 kg TS/m^2/year

Box 3a Performance of septage pretreatment (sedimentation) pond in Alcorta, Argentina

Biosolids accumulation

- Solids accum. ratio = 0.016-0.02 m^3/m^3 of loaded septage
- TS of accumulated and thickened biosolids = 18%
- Depth of solids reached in 6 months loading = 50 cm
- In-pond dewatering to 60% TS in 7 months (T=9-24 °C, total rainfall = 540 mm)
- No conclusive results yet as to the inactivation of helminth eggs

Recent Field Research in FS Treatment

Choice and scale of investigated options

SANDEC has selected specific treatment options from an array of alternatives considered to be suitable for use in developing countries (Box 1). To date, two pond-based options, constructed wetlands, and co-composting have been or are currently investigated. One of the pond systems was studied in Accra, Ghana. It comprises settling/thickening tanks and a series of ponds to treat the separated liquid. The second pond scheme, currently in operation in Argentina, consists of septage settling/thickening ponds followed by two lagoons co-treating the septage liquid and municipal wastewater.

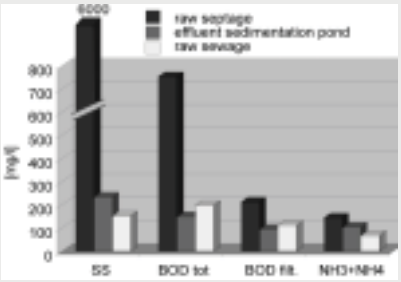
Constructed wetlands (CW)

A constructed wetlands pilot scheme planted with *Typha angustifolia* (cattail) and equipped with a natural venting system has been operated by AIT, Bangkok, since April 1997 (Box 2). Close to 1 m of dewatered and largely stabilised and hygienised biosolids have accumulated to date, thus, making bed emptying necessary in 2002. The equivalent of 80 m (!) of Bangkok's septage, loaded directly onto the beds during the 5-year period, did not lead to any bed clogging. Future investigations will focus on the need for ventilation, characteristics of the filter body after five years of septage loading, and on biosolids removal operations. Contact: Asian Institute of Technology, Environment & Resources Management Group, Dr. T. Koottatep and N. Surinkul, thamarat@ait.ac.th narongsurinkul@hotmail.com.

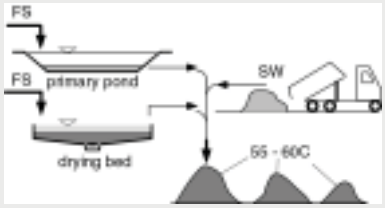
Co-treatment in ponds

Until 1998, the waste stabilisation pond system – 2 ponds in series – of Alcorta, Prov. of Santa Fé, Argentina, treated FS and wastewater by co-mixing. Excessive solids accumulation in the primary pond due to septage admixture led to the construction of twin, alternatively batch-operated pretreatment ponds for septage (Box 3a).

Box 3b Septage pretreatment in Alcorta, Argentina



Box 4 Co-composting process as used in the Kumasi, Ghana, pilot plant



These cater for the separation of the bulk of septage solids and for anaerobic degradation of the liquid during the loading period, as well as for in-pond solids dewatering during the resting/consolidation period. The effluent exhibits contaminant levels similar to those in the raw municipal wastewater. The two are co-treated in the original pond system. Box 3b shows the total and filtered BOD, SS and ammonia concentrations in the raw septage, in the effluent from the septage ponds and in the raw wastewater. Contact: Centro de Ingenieria Sanitaria, Univ. of Rosario, Prof. A.M. Ingallinella, cis@fceia.unr.edu.ar

Co-composting

A pilot plant for combined composting (co-composting) of FS and organic solid waste (sorted municipal waste, market waste, animal husbandry manure, wood chips) has been commissioned in Kumasi, Ghana in March 2002 (see Box 4 for functional sketch). FS, which will be composed of sludge from unsewered public toilets and of septage, will be dewatered to the required solids content by sludge drying beds or thickened in a primary settling pond. Dewatered FS will be mixed with the organic waste and windrow-composted for a period of approximately one month (thermophilic phase) followed by a maturing phase of 1-2 months. Mixing ratios of 1:3 are envisaged for dewatered FS and sorted waste windrows. Mature compost, produced at a rate of 2 tons/month, will be tested in cultivation experiments to ascertain its marketability. Contact: International Water Management Institute, Africa Office, Dr Olufunke Cofie, iwmi-ghana@cgiar.org

FS Management Planning

Nam Dinh (Vietnam) faecal sludge management planning study

In 2001, a study was conducted in Nam Dinh, North Vietnam, to devise a plan for improved long-term FS management strategies, and to propose an appropriate treatment option allowing marketing and use of hygienically safe biosolids. The study forms part of the Nam Dinh Urban Development Project (UDP), a joint endeavour of Nam Dinh authorities, the Governments of Vietnam and Switzerland, and the consulting company contracted for UDP. Sludges collected from on-site sanitation systems cause health hazards and drain clogging as they are still discharged untreated into drains and watercourses or used untreated in agriculture and aquaculture. Septic tanks are and will be the predominant form of excreta disposal system. The study proposes two management options to increase septic tank emptying frequency. Three potentially feasible options for treating septage were evaluated as to their treatment performance, operational requirements and safety, land use, and costs. All three options allow production of hygienically safe biosolids, suitable for agricultural use. Constructed wetlands were proposed as the favoured treatment option for Nam Dinh. The study report may be ordered from SANDEC. A conference paper, summarising the study's main features, can also be ordered or downloaded from SANDEC's homepage, http://www.sandec.ch/sos/references.html

Extension and Dissemination

Collaboration with CREPA

CREPA, the Regional Centre for Water Supply and Sanitation for Francophone West Africa, has launched a four-year action research programme on FS management and treatment. SANDEC, who is CREPA's discussion partner for this programme, provides technical assistance, while gaining additional knowledge in FS management and treatment, which it will disseminate in the future. The project, currently in its 1st phase, comprises a state-of-practice assessment of FS management, identification of gaps-in-knowledge on FS treatment adapted to the conditions of West Africa, and formulation of FS management plans for selected cities in Senegal, Ivory Coast and Benin. The 2nd phase will last from 2002-2004 and comprise action research in FS management and treatment, including production of stakeholder-directed guidance tools. Upon conclusion of this project, CREPA will have acquired the status of resource centre in FS management and provide planners and engineers with training and consulting activities on these issues. Contact: CREPA (Progeboue Project), Dr Amah Klutsé, crepa@fasonet.bf

Dissemination & extension activities

A complete listing of SANDEC's publications and reports on FS management, most of them downloadable, is now available on our homepage, htt://www.sandec.ch/sos/references.html
To assist practitioners in the field, we shall further enhance dissemination of literature by expanding our homepage with easily digestible and ready-to-use technical news. Capacity building in FS management will be a future focus.

Call for Information

Although **anaerobic digestion and use of the biogas produced** may offer a potentially viable option for FS treatment, it remains a debatable alternative. The option does in fact look attractive as it yields energy and contributes to reducing global warming. The technology is widely used in industrialised countries as treatment option for sludges from sewage treatment plants. Respective installations are, however, fairly sophisticated and may not be sustainable in developing countries. SANDEC has not yet come across any low-cost anaerobic digestion–cum-biogas plants operated with faecal sludges collected from urban on-site sanitation systems. We are interested in obtaining information on such schemes, as the option may warrant investigations and will broaden the knowledge on its sustainability under DC conditions. Respective information on such schemes should be sent to:
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Call for Collaboration

Institutions engaged in R+D, extension or training in the field of FS management or wishing to engage and build up respective capacity, are invited to contact SANDEC for further deliberations on possible forms of collaboration and extension,
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Document Retrieval and Selected References

Documents produced by SANDEC on FS management and treatment may be obtained free of charge from caterina.dallatorre@eawag.ch or downloaded from SANDEC's FS homepage, htt://www.sandec.ch/sos/references.html

Ingallinella, A.M., Sanguinetti, G., Koottatep, T., Montangero, A., Strauss, M. (2001). *The Challenge of Faecal Sludge Management in Urban Areas – Strategies, Regulations and Treatment Options*. Paper presented at the Specialised Conference on Sludge Management, Regulation, Treatment, Utilisation, and Disposal, Acapulco, Mexico, Oct. 25-27. [215 kb].

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Klingel, F., Montangero, A. and Strauss, M. (2002). *Faecal Sludge Management Planning Guide* (in press).

Koottatep, T., Polprasert, C., Oanh, N.T.K., Montangero, A., Strauss, M. (2001). *Sludges from On-Site Sanitation – Low-Cost Treatment Alternatives*. Paper presented at the IWA Conference on Water & Wastewater Management for Developing Countries, Kuala Lumpur, Malaysia, Oct. 29-31. [366 kb].

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