



Decentralized Wastewater
Treatment Solutions

PriSan | Sanitation for Prisons



**A promising concept for
prisons to lower infection
rates & environmental
pollution through advanced
sanitation**



BORDA

PriSan |
DEWATS Service Package

Developed and disseminated by
BORDA & BORDA BNS Network

High tolerance towards inflow fluctuations requires specific wastewater treatment in prisons

Poor health conditions in prisons

In many low-income countries, prison population suffer from chronic poor health, mainly caused by lack of clear water and hygiene; problems have changed little in the last years. Poor hygiene and sanitation facilities promote the spread of infectious and parasitic diseases like worm infections or diarrhoea. Insufficient wastewater treatment or even discharge of completely untreated wastewater are among the main reasons for poor sanitation and complaints from the neighbourhood.



Sampling of wastewater for analysing of parameter

Prison staff has usually no technical knowledge for dealing with the operation and the maintenance of wastewater treatment systems. Wastewater discharge options are limited (no or insufficient sewer systems) It is necessary that sewage systems throughout prisons need to be reorganised in order to avoid contamination of water resources and to improve health and hygiene conditions for prisoners.

Further problems resulting from insufficient sanitation

Beside the threat to health of prisoners, there are numerous further problems, which result from insufficient sanitation in prisons. Those are:

- o high pollution by huge amount of discharge
- o if the prison is situated near to housing areas, neighbourhood complains environmental pollution and health risk
- o environmental requirements can not be fulfilled because of unaffordable sewerage management applications
- o problems are not really publically "visible" because prisons are mostly situated outside a municipality
- o additional harmful substances in untreated discharge may appear because of possible production processes inside the prisons

Main challenge

In conclusion, prisons need an affordable, low-maintenance and decentralized wastewater treatment solution to manage the named problems arising from poor sanitation.

BORDA BNS Networks Mission

With a mission to improve the livelihoods of disadvantaged groups within societies and to sustain the functioning of eco-systems through dissemination of demand oriented Basic Needs Services (BNS), BORDA (Bremen Overseas Research and Development Association) and its BNS Partner Network develop and disseminate innovative solutions for facilitating the access to BNS.

DEWATS Service Packages

One Basic Needs Service is DEWATS, an effective, efficient, affordable and proven wastewater treatment solution for (sub-) tropical regions and low-income countries. DEWATS stands for "Decentralized Wastewater Treatment Solutions", but it is much more than just a technical approach. DEWATS Service Packages include not simply the design and construction of hardware but a whole set of integrated measures which are combined according to demand. One of those Service Packages is DEWATS PriSan that aims to advance sanitation conditions in prisons.

Measurement of existing sewerage system inside a prison



DEWATS PriSan as an affordable, aesthetically pleasing and totally adaptable wastewater treatment solution

DEWATS for Prisons

Most prisons are located beyond public housing areas. Thus there has been no proper wastewater treatment, yet. Furthermore, prisons, which are situated in peripheric areas, are not connected to a sewerage system.

However, prisons in particular do generate huge amounts of wastewater.

Certain substances within these wastewaters are discharged untreated from prison-owned production sites and can have a harmful impact on ground and surface water. Thus a decentral wastewater treatment solution for prisons is inevitable. DEWATS for Prisons offers facilities that are compact and easy to handle, without intricate technology/engineering and thus good solutions for the problem of wastewater of prisons. For construction local materials or locally prefabricated modules can be used. The facility's operability and functional efficiency at unsteady influents (differing numbers of prisoners) and its lowest operational efforts favours it for special requirements of such an application.

Key features of PriSan

In order to combat the consequences of the poor sanitation situation in prisons

- o demand-orientation
- o simple and low-maintenance construction
- o normally no need for additional energy supply
- o high load capacity and tolerance towards inflow fluctuations (changing number of prisoners)
- o able to meet limited space requirements because of subsurface construction
- o low-cost
- o appropriate for existing structures

Implementation steps of PriSan

The implementation of PriSan is carried out through several implementation steps that allow adequate and adapted planning, installation and operation of the wastewater treatment plant. Those are:

- o identification of wastewater characteristics, source and quantity
- o evaluation of existing sanitary and wastewater infrastructure
- o feasibility analysis of wastewater segregation at source
- o elaboration of feasible concepts
- o selection of suitable location
- o preliminary estimates
- o detailed design
- o construction
- o training on operation and maintenance
- o monitoring and warranty

Benefits of DEWATS for Prisons

The accomplishment of DEWATS for prisons provides a multiplicity of benefits as follows:

- o low-maintenance technology, so after being instructed, the prison staff and/ or occupants can operate and maintain the wastewater treatment plant easily on their own
- o simple construction, so that implementation can be realized by using local available materials and workmanship, prefab modules are available on demand
- o cost efficiency because of low operational costs as well as piping to the central sewer system is avoided
- o sensitizing of responsible public authorities for environmental issues
- o efficient dealing with natural resources and fulfilment of discharge standards

A sanitation program was implemented in one prison to treat scabies. This included training in efficient ways to clean clothes and cells, the building of a new kitchen, toilets and sewage systems, and education for prisoners as well as prison officers about general and personal hygiene.

Construction of an anaerobic baffled reactor



DEWATS PriSan – a promising solution

Additional Benefits

Another high-light of the DEWATS solution is the possibility for reusing products that occur during the treatment process:

- o Biogas can be used as an alternative energy source for cooking or lighting purposes
- o gardening (reuse of treated wastewater for irrigation); the sludge can be used as fertilizer for the garden and includes natural fertilizing solids

Therefore, electricity, water and fertilizer cost saving are possible.

Example Cambodia

In 2006, there were 8835 prisoners in 18 prisons across Cambodia

Notes on OHCHR 2002 Prisons Report

- Prioritize building and renovation work in Sihanoukville, Kampong Thom and Banteay Meanchey prisons
- Ensure provision of regular, uncontaminated drinking water in all prisons, with priority given to Banteay Meanchey, Preah Vihear and Sihanoukville prisons.
- Renovate the Monivong hospital prison wing, installing appropriate sanitary facilities

PriSan – a promising concept

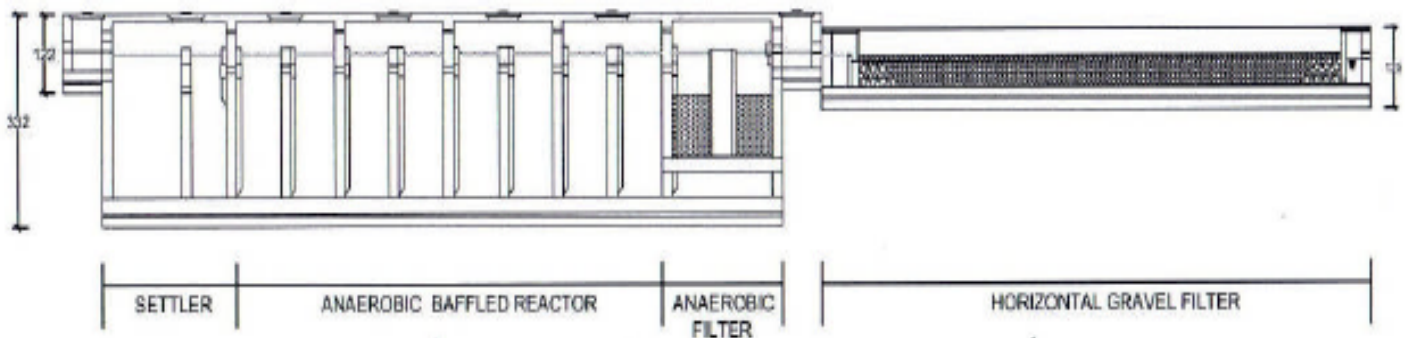
BORDA and their local BNS Partner Network are proving Basic Needs Services for more than 30 years. Until today, more than 900 DEWATS plants were implemented and are sustainably operating successfully.

Vietnam, Cambodia

As there is only one Ministry responsible for the Prisons countrywide and the safety requirements demand a short construction period the potential for standardisation and the use of pre-fabricated elements for prisons with comparable wastewater parameters should be guaranteed. Depending on the size the time needed for conventional construction is about 2-3 months, the average cost to be protected at 500 US\$/m3.

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Composing units of a DEWATS plant designed for a Cambodian prison: Two chamber settler, seven chambers anaerobic baffle reactor, one chamber anaerobic filter and horizontal gravel filter



DEWATS Service Packages

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|--|------------------------------------|--|
| o Treatment Systems | o Emergency Sanitation | o Health Impact Assessment & Hygiene Education |
| o Community Based Sanitation | o Sanitation for Prisons | o Capacity Development |
| o School Based Sanitation | o Sanitation for Real Estates | o Standardisation |
| o Sanitation for Hospitals & Hotels | o Sanitation Mapping | o Research & Development |
| o Wastewater Treatment for Agro-Industry | o Municipal Sludge Treatment Plant | |

DEWATS – Decentralized Wastewater Treatment Solutions

Developed & disseminated by BORDA and over 20 BORDA BNS Network Partners in South and South East Asia & Southern Africa

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