

# Enhancing medical wastewater treatment



Enhancing the treatment of hospital wastewaters in Laos by improving plant operators' essential knowledge and skills and piloting advanced post-treatment systems to remove pathogens and pharmaceutical residues

## Project name:

HEALTH

## Duration:

June 2024 until May 2026



Federal Ministry  
for the Environment, Nature Conservation,  
Nuclear Safety and Consumer Protection



## Project partner

- German government Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) (program: Exportinitiative); principal funder
- Lao PDR, Ministry of Health, Department of Health & Hygiene Promotion (DHHP)
- Lao PDR, Public Works and Transport Training Institute (PTI)
- URBANWaters Consulting GmbH; project lead, co-funder
- aqua&waste international GmbH; international partner, co-funder





## Background

A wastewater sector that ensures a controlled collection, treatment, and discharge of wastewater is just emerging in Laos. Local expertise for planning, installation, and operation of wastewater systems and the supply chain for respective equipment is limited. Laos still relies heavily on imports and external services.

Almost all provincial and central hospitals in Laos installed advanced wastewater treatment systems to protect the surrounding communities and freshwater bodies. Besides a few nature-based systems, such as DEWATS installations, all advanced biological systems are imported.

The operators are often left with operational manuals in languages different from Lao, insufficient O&M training, and inadequate knowledge of the functionality and O&M requirements of the installed systems. As a result, almost all wastewater systems provide no or only partial treatment and release or bypass hospital wastewater into the environment.

**The overall objective** of the HEALTH project is to contribute to practical capacity development in the Lao wastewater sector and improve the treatment efficiency of existing hospital wastewater treatment plants.

**Main activities** are:

1. In collaboration with the Public Working Training Institute (PTI), establishing a wastewater training centre.
2. Conducting training courses for operators, including a 4-month on-the-job follow-up coaching. Up to 12 central and provincial hospitals are targeted.
3. Installing and monitoring a pilot plant addressing the removal of pathogens and pharmaceutical residues.
4. Conducting a national conference on the needs of the wastewater sector capacity development.





# Training course - Operation of wastewater treatment plants



**Hosted by:** Public Works Training Institute (PTI)

**Location:** PTI training centre, Vientiane

**Target group:** Technicians and engineers

**Technologies:** DEWATS, activated sludge processes & rotation disc contactors



## Module 1: Wastewater basics

Basic theoretical understanding of wastewater and treatment technologies

## Module 2: Sewer basics

Basic theoretical understanding and practical skills about wastewater pipes, materials, joint methods, and testing water tightness



## Module 3: O&M of wastewater treatment plants

Theoretical understanding & practical skills to operate & maintain different technologies



## Module 4: O&M of technical equipment

Theoretical understanding & practical skills O&M on technical equipment like pumps, valves, and sensors

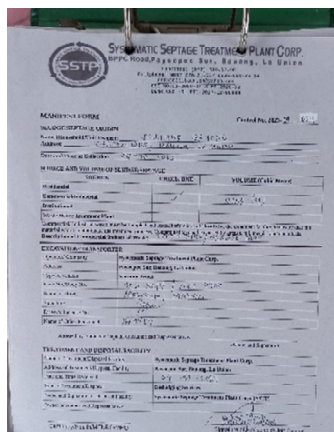


## Module 5: Self-monitoring wastewater treatment plants

Theoretical understanding & practical skills for effective monitoring of treatment plants and corrective actions

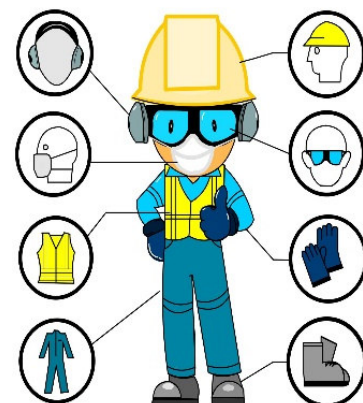
## Module 6: Documentation

Theoretical understanding & practical skills to record O&M activities and the type of documents needed



## Module 7: Health & safety of wastewater treatment plants

Theoretical understanding of the health and safety aspects of working in wastewater treatment plants





## Pilot installation

The common practice of disinfecting hospital wastewater in Laos is the uncontrolled application of chlorine (hypochlorite). Uncontrolled means that most hospital wastewater treatment plants provide ineffective treatment and do not control the amount of chlorine added into the wastewater stream. Based on common technical standards, when applied to hospital wastewaters, the free residual chlorine concentration should not exceed 1.5-2.0 mg/l (at pH 7-8 and after 30 min). Chlorine is an oxidant that breaks many pathogens but also creates so-called Disinfection By-products (DBPs) with organic matter (measured as TOC, COD, BOD) and ammonia. DBPs such as trihalomethanes (THMs) or nitroamines (NDMA) can migrate into bodies of water used for drinking water and accumulate in aquatic life, such as fish. Most DBPs are carcinogenic to humans. Recommended is a well-treated wastewater quality of COD < 40 mg/l and TSS < 10 mg/l for the application of chlorine in wastewater disinfection.<sup>1</sup> Many hospital wastewater treatment plants in Laos are either septic tank-based or imported advanced electro-mechanical treatment systems, and provide partial treatment with COD effluent quality > 200 mg/l only due to insufficient operation and maintenance.

**The overall objective** is to explore alternative post-treatment options to treat wastewater effluents with lower quality while safely addressing the removal of pathogens and pharmaceutical residues.

Under this HEALTH project, the process combinations of biological activated carbon (BAC) filters with either pure ozone or UV/ozone shall be tested in a pilot installation in the Setthathirath hospital (Vientiane/Laos), and an oxidative electrolysis process at lab scale at the municipal wastewater treatment in Reinfeld/Germany in cooperation with the Technische Hochschule Lüneburg. The pilot plant will be operated and monitored over 10 months, and the collected results shall help to prepare technical design and operation guidelines for upscaling.



### Technical figures of the pilot installation:

- Capacity 5 – 15 <sup>3</sup>/d
- Pre-treated effluent from a hospital wastewater treatment plant
- Land requirement 50 m<sup>2</sup>
- Electricity < 1.5 kWh/h

<sup>1</sup> Metcalf & Eddy (Wastewater Engineering: Treatment and Resource Recovery), 5<sup>th</sup> Edition (2014)