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Water resources

Preservation and management

Household-scale purification system for arsenic-contaminated drinking water in Cambodia and Vietnam





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A project on the evaluation of the characteristics of underground water tables in zones contaminated by arsenic in Cambodia and Vietnam, in order to develop a householdscale water purification system (2009-2010, funded by the Agence Universitaire de la Francophonie) has been coordinated by the Cambodia Technological Institute (Pnom-Penh) and operated jointly with the Hochiminh Technological University (Vietman) and the CIRAD Analysis lab. The objective of the project was to design a simple, low-cost and efficient device to lower the arsenic content of water taken from the underground water table of the Mekong River in

The high concentration of this element in water (from 40 to 1,200 µg/l whereas the maximum concentration recommended by WHO for human consumption is around 10 µg/l) is partly of anthropogenic origin (pesticides) but essentially natural, through simple dissolution from arseniferous pyrites present in the upstream portion of this large Asian river. In these regions, the recently evidenced arsenic toxicity causes skin necrosis (arsenicosis) which can be lethal.

The device designed is a simple sand bio-filter, made from ordinary materials. It comprises an airing system in the shape of a watering syringe, a nail bed to enrich the iron content and foster the ferric hydroxide formation that traps arsenic, a sand filter with increasing granulometry and a final polishing device made of rice chaff. This device is easy to use, to maintain and efficient at household or small village scale. For this study, the CIRAD Analysis lab provided an analytical support for the characterisation of water sampled in different sites in the two countries and for the validation of the efficiency of the device, leading to arsenic concentrations below 10 $\mu g/l$ post-treatment.

Contacts: Daniel Babre, <u>daniel.babre@cirad.fr</u> & Karine Alary, <u>karine.alary@cirad.fr</u>

Cambodia and in Vietnam, used as drinking water by the village populations.

▲ Skin disease caused by drinking water contaminated with arsenic in Cambodia.

>TREATMENT OF WASTE WATER AND EFFLUENTS

CreativERU project: intensive treatment and valorisation of urban residual waters

The CreativERU project (collaboration between the research units IEM, LBE, the Laboratory of Engineering of Biological Systems and Processes of INSA Toulouse, Veolia Water Research and Innovation) is funded by the ANR "Ecotech" programme, open to French-Chinese collaboration. It concerns the development of advanced water treatment technologies, more specifically the treatment of urban effluents. The rather innovative aim is to reach very low carbon and water impacts.

This project should remove the last scientific locks and validate at the industrial pilot scale a new intensive path for urban waste water treatment. This treatment enables producing very high quality treated water suitable for direct reuse (as it is disinfected), while reducing the size of the facilities and the operational costs, or even the equipment costs.

The aim of the project is to define a new treatment concept, with the following differences from conventional systems:

 Production of quality treated water using a porous membrane filtration technology, enabling the resource to be reused directly;

- Strong reduction of the oxygen needs (hence of energy inputs), through the physical extraction of the organic fraction, that is further concentrated for easier fermentation;
- Optimisation of a significant biogas production;
- Optimisation of nutrients treatment to facilitate their elimination and/or recovery;
- Demonstration of the possibility to treat urban waste water to produce fresh water of a defined quality, with a positive energy balance and a minimal environmental impact within a context of sustainable development.

Such a technology would constitute a real breakthrough compared to existing intensive systems only taking into account the requirements for treated water quality, without consideration for the carbon release (linked to energy consumption) and the advantage of saving water.

Contacts: Alain Grasmick, <u>Alain.Grasmick@univ-montp2.fr</u> & Jérôme Hamelin, <u>jerome.hamelin@supagro.inra.fr</u>