## About the Project

The FP7 project "Saph Pani - Enhancement of natural water systems and treatment methods for safe and sustainable water supply in India" addresses the improvement of natural water treatment systems such as river bank filtration (RBF), managed aquifer recharge (MAR) and wetlands, building on a combination of local and international expertise. The project aims at enhancing water resources and water supply particularly in water stressed urban and peri-urban areas in different parts of the sub-continent. The project focuses on a set of case study areas in India covering various regional, climatic, and hydrogeological conditions as well as different treatment technologies.

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## Our Partners

- University of Applied Sciences Northwestern Switzerland (Coordinator), Switzerland
- Uttarakhand Jal Sansthan, India
- National Institute of Hydrology, India
- IIT Roorkee, India
- Veolia Water, India
- Anna University, India
- SPT consultants (SME), India
- Raipur Municipal Corporation, India
- Akshay Jaldhara (SME), India
- National Geophysical Research Institute, India
- IIT Bombay, India
- DHI (India) Water & Environment Pvt Ltd, India
- Competence Centre for Water Berlin, Germany
- BRGM Service Eau, France
- Centre of environmental management and decision support, Austria
- University of Applied Sciences HTW Dresden, Germany
- UNESCO IHE Delft, Netherlands
- International Water Management Institute, Sri Lanka
- Commonwealth Scientific and Industrial Research Organisation, Australia Land and Water
- Freie Universität Berlin, Germany

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# Bank filtration for drinking Water production in India Selected case study sites

Bank filtration site in Srinagar with the production well and control-panel (left) and back-up generator (right)

## Did you know ...

- that bank filtration is a natural process to treat water?
- that it is used in some places in India?
- that four sites in North India are being
- investigated in Saph Pani?
- what the main issues being investigated at these sites are?
- and what solutions are being developed?

Curious...? Then take a look inside to learn more!

## Haridwar

Haridwar is one of the most important Hindu pilgrimage sites in the world, with an extremely dynamical population figure. 22 bank filtration (RBF) wells ensure a sustainable water supply.

RBF well, flood-embankment & Ganga river (L-R) in Haridwar

Qualitatively, the major concern is to ensure a pathogen-free supply of water from the wells. Fortunately, under prevalent natural conditions in Haridwar, 90 – 99.99 % of pathogen-indicators are removed from the water during its subsurface passage, even under extreme conditions during monsoon. However, floods, extreme pathogen-loading in rivers landside groundwater contamination, can cause pathogen-breakthrough in wells.

Apart from other relevant parameters, the pathogen indicators Total Coliforms and E. coli were regularly monitored in the wells and the river. These and similar results from Srinagar, supported by column experiments have resulted in the preparation of guidelines for flood-risk management of BF schemes in India.

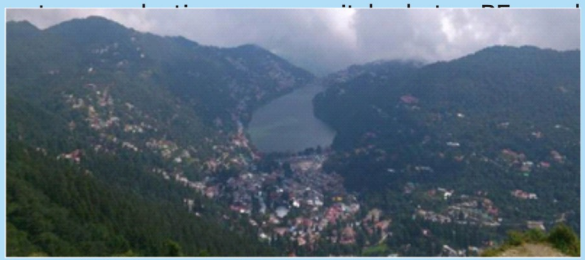
Srinagar

Srinagar is one of the largest towns along the Alaknanda river en-route to the major Hindu shrine of Badrinath and is the main commercial and administrative centre in the region. Water has traditionally been pumped-out of rivers, undergone rapid sand-filtration and disinfected conventionally by chlorination before distribution. But in monsoon, this system cannot remove the high turbidity, thereby risking contamination from pathogens and blocking the water pipes. In pre- monsoon, low surface flows reduce the quantity of available raw water for drinking. As an alternative, a new RBF well was commissioned in 2010 in Srinagar.

The water quality was regularly monitored in the RBF well and the river. Unexpectedly high concentrations of nitrate were found in the well-water. Furthermore the site was severely affected by the Uttarakhand flood in June 2013. In context of these, the project partners are developing plans to optimise the portion of bank filtrate in the well and flood proofing the well.

## Nainital

Nainital is a popular hill station situated around Nainital Lake in Uttarakhand. Lake water used to be abstracted and was treated, similarly to Srinagar. In recent decades the water quality of the lake is deteriorating due to increased human activity in the catchment area. Consequently the



BF well-field is situated on the north lake-shore (bottom)

Water quality was regularly monitored, especially the removal of pathogens and organics. Results indicate a good removal of these parameters by the BF system and optimisation strategies are being prepared.

## Delhi

In Delhi the Yamuna river is strongly influenced by partially treated and untreated sewage. Wells located along the central Delhi stretch of the Yamuna flood plain produce bank filtrate which in some cases shows elevated ammonium concentrations. As water with high ammonium levels requires special treatment before distribution, it is important to predict the future development of ammonium concentrations in order to plan appropriate treatment options.

In an aquifer, ammonium does not move with groundwater flow velocity but is retarded due to interactions with the sediment. These interactions are dependent on site-specific sediment and groundwater parameters.

Sediment sampling at the Yamuna river

Within Saph Pani an assessment of the ammonium contamination was conducted and the sediment characteristics were determined using laboratory experiments. The results are used to set up a hydrogeological transport model, which will help to determine possible ammonium concentrations in the short and long term.

### References

Saph Pani Deliverable 1.1 (2012) Database of relevant pollutants in urban areas and their attenuation at RBF sites. Available: http://www.saphpani.eu/downloads

Saph Pani Deliverable 1.2 (2013) Guidelines for flood-risk management of bank filtration schemes during monsoon in India. Available: http://www.saphpani.eu/downloads

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