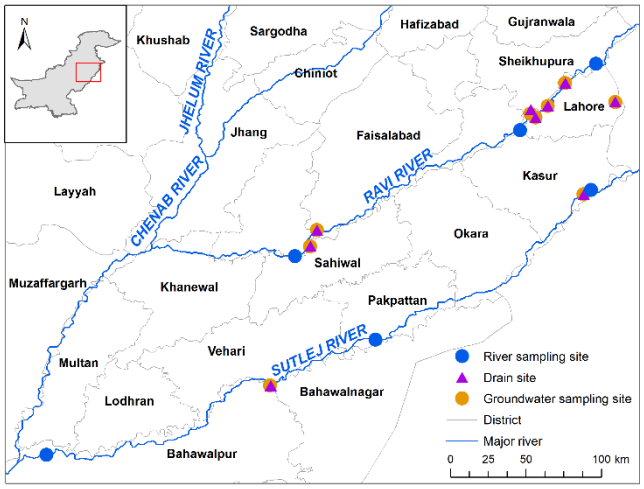
Water quality data to support cross-sectoral dialogue: case study from the Ravi and Sutlej Rivers, Pakistan

Access to safe water for all is an aspiration that can inspire and motivate change. In this way, water quality issues can be an entry point for cross-sectoral dialogue on complex issues of health, food security, environmental sustainability, poverty alleviation and gender equality. This study provides water quality data from the Ravi and Sutlej command areas in Pakistan to contribute to that dialogue.

Background

Increasing population and expanding urban, industrial and agricultural activities in Pakistan all rely upon access to safe water. These same trends are degrading water quality, so jeopardising that very access. Water quality monitoring provides a vital knowledge base for water quality management in the face of these rapid changes in Pakistan. A joint collaboration between CSIRO and the Pakistan Council of Research in Water Resources (PCRWR) conducted a water quality monitoring program in the Ravi and Sutlej Rivers.

These rivers were chosen because already high population levels are increasing in these areas, placing pressure on available water resources. The Ravi and Sutlej rivers receive lower flows than other rivers in Pakistan because the Indus Waters Treaty gives India first right to the waters of these rivers. Water quality management is more challenging in these low flow conditions.



Sampling locations in the Ravi and Sutlej Rivers

Water quality monitoring program

River water was sampled by PCRWR each month from August 2015 to July 2016, and groundwater and drain water were sampled each month from January–July 2016. These monthly samples were analysed for physico-chemical, trace metal and microbiological parameters. Samples in August 2015 (high flow) and January 2016 (low flow) were also analysed for organic pollutants in addition to these other parameters.

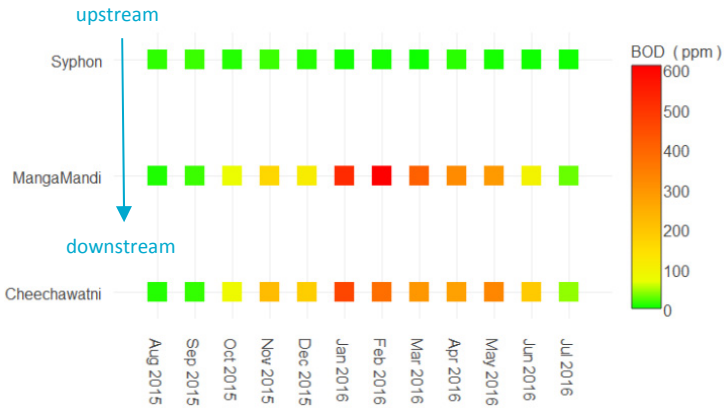
Sample collection, Shahdara drain

River water quality

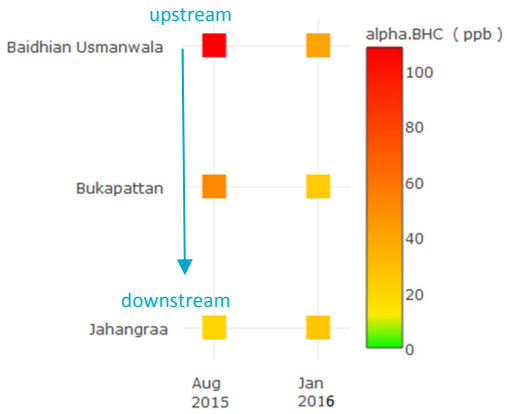
Ravi River water quality was more degraded than the Sutlej River, and lower water quality was observed in low flow conditions (October to June) than in high flow conditions (July to September). Water quality typically declined further downstream.

The Ravi River Dissolved Oxygen (DO), Biological and Chemical Oxygen Demand (BOD and COD) all failed to meet the water quality standards for effluent waste streams.

In such low oxygen conditions the river is unsuitable for fish and other aquatic life forms. Other water quality parameters such as Total Dissolved Solids (TDS) and heavy metals also increased markedly from upstream to downstream locations. Microbiological contaminant levels (e.g. faecal coliforms) were high in all samples, posing serious health risks.



Ravi River biological oxygen demand (BOD) increases downstream and in low-flow conditions. (Yellow: National Environmental Quality Standard for industrial effluent)



Example of a Persistent Organic Pollutant (α-BHC) measured at Sutlej sampling sites

All samples were contaminated with Persistent Organic Pollutants (POPs). In the Ravi River under high flow conditions the concentration of most POPs were found to be highest at the most upstream location near the border with India. In the low flow season lower concentrations were found at this first sampling point and concentrations were higher at the second location downstream. In both low flow and high flow seasons, the Sutlej River was found less contaminated in comparison to the Ravi River for physico-chemical parameters, but very high concentrations of POPs were detected at the most upstream location of the Sutlej River, with lower concentrations at more downstream locations.

Groundwater quality

Groundwater is the primary source of drinking water.

Most shallow ground water sources monitored were contaminated with physico-chemical and microbiological contaminants, heavy metals and even pesticides

For example, the shallow ground water near Kasur Nullah has shown high contamination of heavy metals and POPs as compared to deep groundwater sources in the same area.

ACKNOWLEDGEMENT

This fact sheet designed and produced by CSIRO contributes to the South Asia Sustainable Development Investment Portfolio (SDIP) and is supported by the Australian Government.
It summarises the work of a collaborative partnership between the Pakistan Council of Research in Water Resources (PCRWR) and CSIRO.

Drain water quality

The Ravi River acts as a wastewater drain carrying sewage from Lahore and industrial effluent generated from many industrial establishments.

Not a single drain in the monitoring program complied with the Pakistan National Environmental Quality Standards (NEQS) for effluent waste streams.

Conclusions and next steps

- Many sectors are contributing to Pakistan's water quality challenges: the water quality data provide evidence of sewage, agricultural, municipal and industrial sources of pollution.
- Even though Pakistan has well informed water quality standards, business-as-usual practices are not complying with these standards, overwhelming any efforts of regulatory authorities.
- The alarming water quality situation presents an opportunity for constructive, well-informed dialogue across municipal, industrial and agricultural sectors to take collective responsibility for providing safe water to current and future populations in Pakistan.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e csiroenquiries@csiro.au
w www.csiro.au

FOR FURTHER INFORMATION

CSIRO Land and Water
Dr Mobin-ud-Din Ahmad
SDIP Indus Project Leader
+61 2 62465936
mobin.ahmad@csiro.au

PCRWR
Dr Muhammad Ashraf
Chairman, PCRWR
Ministry of Science & Technology
Government of Pakistan
+92 51 9101275
muhammad_ashraf63@yahoo.com