

Groundwater Quality in the Vientiane Plain

Groundwater use

- Lao PDR has abundant groundwater resources, which are used for various purposes, especially in rural areas.
- Communities in the Vientiane Plain depend heavily on groundwater mainly for domestic uses, drinking and household garden irrigation.
- Groundwater is accessed through private boreholes and open wells fitted with electric pumps or hand pumps.
- Groundwater is also the source for industries that produce and trade packaged drinking water for the public.

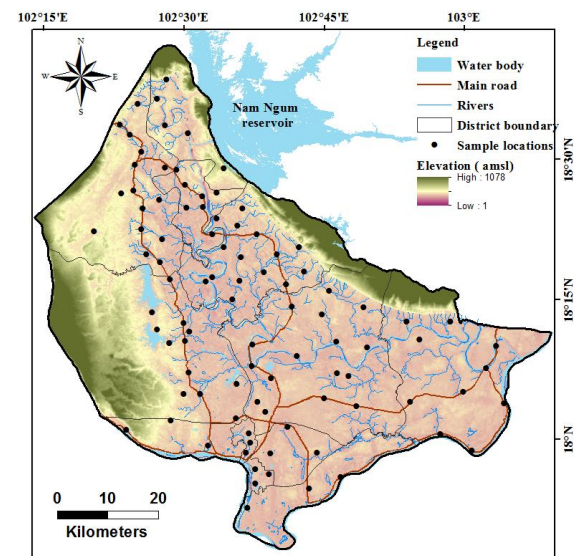


Groundwater quality status

- There is limited data on groundwater quality across the country, including the Vientiane Plain.
- Due to the shallow depth of the groundwater on the Plain, activities such as the application of fertilizers or the shallow installation of septic tanks can leach through the soil and potentially pollute the groundwater.
- If water containing hazardous substances through the leaching of pollutants is consumed, it can cause serious illness.
- As groundwater is commonly used for drinking, the levels of chemical and microbial constituents present must be within the permissible limits suggested by national authorities.

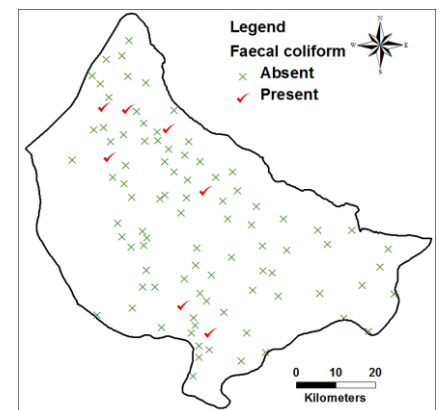
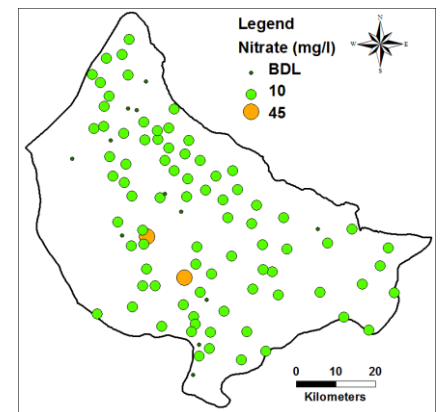
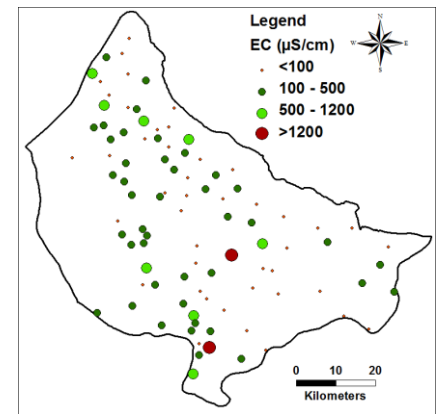
What was done?

- A team consisting of hydrogeologists and remote sensing experts from IWMI carried out an intensive sampling of groundwater quality in ninety five villages.
- The villages are located across twelve districts within two provinces – Vientiane Capital and Vientiane.
- Field kits were used to analyse hardness, chloride, arsenic, nitrate, iron, fluoride and fecal coliforms in groundwater.
- Electrical conductivity (EC), pH and groundwater level were also measured at each site.
- Results were compared against national drinking water quality standards of the Ministry of Natural Resources and Environment.



What did researchers find?

- In six of the villages sampled, a few households did use local groundwater for drinking (including cooking).
- The other households of these six villages and the rest of the 89 villages sampled used groundwater for household irrigation and domestic uses such as bathing, washing clothes and utensils etc.
- Groundwater levels were found at maximum depths of 9 metres even in hilly regions, indicating that such groundwater is at risk from pollution.
- Acidic groundwater is present in most villages with pH ranging from 4 to 8.2 (average 5.7).
- Salinity, as measured through electrical conductivity (EC), was within suitable level (1000 $\mu\text{S}/\text{cm}$) except in two villages. Leaching from marine rocksalt, present at shallow depths in these areas, is the likely source.
- Nitrate pollution, usually due to the impact of nitrogen based fertilizers, was recorded at two villages with settlements. Because these two villages are not irrigated agricultural areas, the nitrate pollution may not be attributed to fertilizers.
- Fecal coliforms were recorded in seven villages. If sewage pits were the source of pollutants then the groundwater would exhibit both fecal coliforms and



Recommendations to the Government

- Regularly monitor groundwater quality, at least in the villages that exhibited high salinity/EC, nitrate pollution and/or fecal coliforms, to determine if these were one-off or due to continued exposure to pollutants.
- Avoid using acidic groundwater for irrigation purposes. While acidic pH is not known to cause severe health issues if used for drinking, it may have an impact on soil and crops if used for irrigation.
- Agricultural practices have the potential to deteriorate groundwater quality, and thus, it is important to monitor the groundwater in all the villages to avoid health hazards. In the case of pollution, the field kits utilized in this study are a convenient tool for a rapid and inexpensive water quality assessment.

Recommendations for the community

- In areas with high salinity/EC, prevent use of groundwater for drinking and cooking and find alternative sources i.e. packaged drinking water.
- All regions should take caution to avoid sewage contamination of groundwater over time – use good building materials for septic tanks that prevent leakage and the mixing of wastewater with groundwater.
- In villages where nitrate pollution was encountered, reduce the use of chemical fertilizers during irrigation.