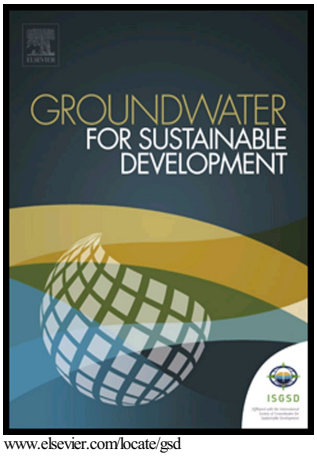

www.elsevier.com/locate/gsd

Environmental assessment of water and soil quality in the Vientiane Plain, Lao PDR

K. Brindha, Paul Pavelic, Touleelor Sotoukee

PII: S2352-801X(18)30106-1
DOI: https://doi.org/10.1016/j.gsd.2018.08.005
Reference: GSD154

To appear in: *Groundwater for Sustainable Development*

Received date: 1 June 2018
Revised date: 24 August 2018
Accepted date: 24 August 2018

Cite this article as: K. Brindha, Paul Pavelic and Touleelor Sotoukee, Environmental assessment of water and soil quality in the Vientiane Plain, Lao P D R , *Groundwater for Sustainable Development,* https://doi.org/10.1016/j.gsd.2018.08.005

Environmental assessment of water and soil quality in the Vientiane Plain, Lao PDR

K. Brindha[1*], Paul Pavelic and Touleelor Sotoukee

International Water Management Institute, Vientiane, Lao People's Democratic Republic.

brindhakarthikeyan@gmail.com
brindha.karthikeyan@fu-berlin.de

[*]Corresponding author.

Abstract

A water and soil quality baseline study was carried out across the ~4,500 km^2 of the Vientiane Plain in Lao PDR. Eight water quality and nine soil parameters were analysed using field kits at 95 sites in March 2015. Elevated electrical conductivity and chloride were apparent at two sites due to geogenic leaching from the marine rock-salt present in some areas. Groundwater was acidic in most locations. Nitrate and faecal contamination were also observed from nitrogenous fertilizers (diffuse) and from leaky sewage pits (localized) respectively. Soil quality is neither nutrient deficient nor does it pose a threat to plant growth. Where groundwater is used for drinking, removal of bacterial contamination by simple filtration or boiling is sufficient. In the absence of a functional monitoring network in the Vientiane Plain, periodic surveys of this kind should be performed. The results should be made widely available to the Government departments and public for better management of the land and water resources.

Keywords: Groundwater; total dissolved solids; chloride; faecal contamination; nitrate; Laos

1. Introduction

Groundwater is generally a safe and reliable source of drinking water in many developing nations, particularly in rural areas. The maintenance and protection of groundwater quality is thus given high importance and also studied widely. The Lao People's Democratic Republic (Lao PDR or simply 'Laos') is a small Southeast Asian country of almost 7 million people with high per capita water resources (53,747 m^3/capita/yr) (FAO, 2016). Lao watersheds contribute to 35% of the Mekong River flow (UNEP, 2001). This has led to significant number of hydropower project developments. Along with hydropower, agriculture and mining form the three major economic sectors driving the country. Despite the abundant water resource availability, drinking water supply through piped connections is available only to 86% of the urban and 69% of the rural areas (WHO/UNICEF, 2015). Rural areas thus depend on groundwater as an important water resource.

Though groundwater is less susceptible to pollution than surface water, the local geology, lack of proper sanitation and other factors can affect the water quality. Most studies on water quality in Laos are restricted to reports on environmental projects implemented and status reports (JICA 1993, UNEP 2001, ADB 2010). In recent times, few detailed studies on groundwater quality have focused on heavy metals (Chanpiwat et al. 2011, 2014) and on distinguishing salt affected groundwater from freshwater aquifers using geophysical methods (Olowokudejo 2007; Perttu et al. 2011 a, b). Bacterial contamination of streams in northern Laos (Ribolzi et al. 2011) have raised concerns over the possibility of similar contamination in groundwater. Major processes controlling the groundwater quality at a village level and potential threat to human health was also studied (Brindha et al. 2017). Quality of bottled

[1] Present Address: Hydrogeology Group, Institute for Geological Sciences, Freie Universität Berlin, Germany.