Drinking Water Quality in the Lao People's Democratic Republic

Country Report prepared by
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Introduction

The Lao People's Democratic Republic or Lao PDR is a landlocked country covering an area of 236 800 km². The country shares its borders with the Socialist Republic of Vietnam, Kingdom of Thailand, Kingdom of Cambodia, People's Republic of China and Myanmar. Mountains cover about two thirds of the land area with altitudes ranging from 200 to 2820 m. There are 16 provinces, one municipality and one special region, 142 districts, and 10 912 villages. Lao PDR has a population of 5.3 million. The urban population constitutes 20% of the total population. The high mortality rate and low life expectancy reflect a low level of overall health conditions in the country. Malaria is the most serious public health problem. Acute respiratory illness and diarrhea also remain major causes of child mortality. About 55% of the total population has access to safe water, and 40% to proper sanitation facilities. Diarrhea, cholera, hepatitis and intestinal parasites are all listed as important communicable diseases. Most of these diseases are transmitted by the faeco-oral route and are, consequently linked to poor sanitation and water quality, poor hygienic practice and to inadequate available quantities of water.

Surface and ground water contamination

A quality survey of existing water facilities was completed in 1999. A test program over 50 samples from ten provinces was carried out by Ministry of Health with support from UNICEF. The main conclusions were the following:

Community health problems
In 60% of the communities that were using dug wells as their source of water, frequent outbreaks of diarrhea and related diseases occurred. This suggests that the source of the disease may be water borne and originate from the dug wells. Many of these wells were not protected. In comparison, the level of diarrhea and similar diseases in communities using hand-pumps or gravity fed systems (GFS), was much lower; 23% where hand-pumps were used and 16% for communities with GFS.

Water quality problems
It was noted that water from the dug wells had a higher turbidity than recommended in the WHO guidelines. This is probably due to external contamination. All the water pumped by the India Mark III hand pumps had a red iron coloration originating from the hand pump itself. The water from the GFS systems occasionally produced a scum when boiled.

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This is due to the calcium carbonate hardness of the water, likely to be related to the rock units underlying the mountainous areas in which GFS systems are installed.

**Level of risks**

Seventy percent of dug wells were found to pose intermediate risks to health while twenty percent were considered high risk. Causes of contamination to dug wells are several, with the main causes being the absence of fencing or covers thus allowing the water quality to be directly influenced by surrounding sources of pollution including nearby latrines. Poor drainage or faulty drainage, inadequate sealing and cracks around the wells similarly allow pollution to enter. The use of individually owned buckets and ropes is another obvious cause of contamination. Using hand pumps the risk of contamination was lower with 76% considered low risk, 19% intermediate risk and just 5% high risk. The main risks came from sources of contamination surrounding the pump and from poor drainage. The absence of fencing was of much less importance than in the case of dug wells. In the case of GFS systems, 4 out of 6 of the systems were rated at low risk of contamination. The only recognized problem was ‘ponding’, this can be solved by improving the drainage around the facility.

**Elemental concentrations and other measured parameters**

Most of these are within the recommended WHO guidelines for drinking water with minor exceptions.

**Acidity**

Specifically in the south of the country the water is slightly acidic.

**Odor**

The odor of the water was generally good. Where an odor problem did exist, it was usually due to contamination from an inorganic or organic source.

**Iron**

In 80% of cases where the concentration of iron was above the WHO standard, it was due to the India Mark III hand-pumps. The only health risk due to excessive iron concentrations is that the community may seek another water source as they think that water source is contaminated or dangerous to health because of its red coloration and strong taste.

**Manganese**

Two of the fifty water samples had concentrations above the WHO guidelines, it was noted that these were two India Mark III hand-pump facilities.

**Chromium**

All samples analyzed were above the WHO guidelines. There have been limited studies into the health effects of elevated chromium levels in drinking water.

**Barium**

All samples analyzed were above the level of 0.7 mg l⁻¹. Limited epidemiological studies have been conducted to investigate the health impact of elevated levels of barium.
Naturally occurring arsenic in groundwater
Recently the threat of naturally occurring arsenic in groundwater associated with certain geological formations has been investigated. UNICEF has organized testing of some 200 wells of perceived risk areas within the provinces of Attapeu, Savannakhet, Champassak and Saravan. Some wells have shown levels above the WHO guideline of 10 µg l\(^{-1}\). Only one of the wells exceeded the 50 µg l\(^{-1}\) limit proposed for Lao PDR.

Industrial and agricultural chemicals
These were not significantly present except for minor problems reported from close to some factories e.g. tanneries.

Soil erosion and run off
In the wet season these are mainly natural but there were possibly some human activities affecting this. This mainly affects surface water, with turbidity increasing markedly during this period. The main impact in urban schemes was the need for additional treatment.

Conclusions and recommendations
Currently the environmental risk to water quality caused by human activity is low. The government-led actions on water standards and other national actions such as integrated water resources management and river basin development planning, when fully developed and implemented, will have a marked impact on maintaining a healthy environment. The disease burden in Lao PDR is markedly affected by water quality and water management. Improvements in access to water in remote and near-urban areas plus improvements in drinking water quality will have a positive effect on reducing the burden. A community water quality surveillance system and public health risk assessment are needed in Lao PDR in order to systematically analyze the quality of the water and to know how to prevent public health hazards from different pollution sources. A system of health risk evaluation should be created to target the high-risk systems and as a result improve the health status of the population.

A set of recommendations to provide safer water options, not all just for Lao PDR, but some equally recommended for the countries of the region include:

- Information about the public health risks and hazards should be shared among the countries in South East Asia
- Knowledge and experience in public health risks assessment should be upgraded.
- Public health risk assessments should be conducted in some provinces and an action plan on public health risk control should be formulated.
- Community water quality surveillance programs should be initiated and a National Water Quality Standard should be established.
- The high concentrations of barium and chromium found in the earlier survey should be investigated and an arsenic mitigation program in some affected areas should be launched. The program of test boreholes should be continued.
- Communication for awareness creation should be encouraged and hygiene and health promotion should be brought to remote areas.