Water Quality along a Mekong Tributary in Northern Lao PDR

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Outline of Presentation

- Background on reality of water quality in Laos

- Presentation of case study
  - the catchment
  - the survey

- Results and conclusions
Drinking-water without sanitary protection?

- Surface water or shallow groundwater should not be used as a source of drinking-water without sanitary protection or treatment (WHO, 2006).

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WHO, 2006 - Guidelines for Drinking-water Quality FIRST ADDENDUM TO THIRD EDITION Volume 1 Recommendations
In 1998, the United Nations reported that **human activities have little effect on rivers water quality** in Lao PDR due to:

- Low population density of the country
- Small amount of wastewater discharged
- Self-purification before entering the rivers

The UN experts draw up their conclusion on 34 observation points located on **large rivers**
Does such large river-based survey reflects the community level reality?

- Besides the major tributaries of the Mekong, there are hundreds of small order streams that are used by many people...
According to World Health Organization, the most affected population by water related diseases live in rural areas of developing regions.

Lao PDR, with 78% of its population living in the countryside, and very limited coverage of sanitation infrastructures may be particularly affected.
During floods, there are often massive increases in turbidity and suspended solid loads, which are frequently interpreted as an indication of bacteriological contamination (e.g. Maniphousay and Souvanthong, 2004).

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A Case Study
ES in the uplands of Lao P.D.R.

- Riparian area management for stream water quality
- Wastewater discharge along the stream
- Suspended sediment loads during floods.
Study area: Houay Xon catchment

Cuny (2007)
Riparian zone management for water quality

The Houay-Xon catchment: a typical mixed land-uses environment

Riparian zone management for water quality

Location of the sampling points

UTM48 [m] WGS84

Campagne d’échantillonnage
Grande échelle:
1: de S2 à S32
2: de S32 à S76
Study area: Houay Pano catchment
Result and Discussion
Effect of spot household accumulation and wastewater discharge on oxygen content

- Domestic wastewater discharge combined with in-stream accumulation of household induced a sharp dissolved oxygen lowering.
- The protected area with its preserved riparian vegetation contributed to the oxygen level recovery.
Effect of continuous urbanization of the riparian zone on total bacteriological flora

- Total bacteriological flora increased considerably at the entrance of the first village following the protected area and remain at a high level onwards to the confluence with the Mekong.
Total colony variation in baseflow and stormflow

n=11 stations

Houay Pano

Low flow  Stormflow

1.2 ± 0.9  <<  43 ± 55

Total colony variation upstream during baseflow
Riparian vegetation clearance and tillage erosion

(modified from Dupin et al., 2002)

8 Mg/ha/an

70%

Houay Pano

Tillage erosion

Sediment trapping vs riparian vegetation

Gerlach trough system

In conclusion and perspectives
From land use to human health

1. Water quality
   - sanitary conditions
2. Food security
   - nutrition aspects

Land use management decisions

Human health and poverty

Government

1. Water quality
   - sanitary conditions
2. Food security
   - nutrition aspects

Human health and poverty

Land use management decisions

Government
Reduce soil erosion for what?

Not only to avoid nutrient losses in the upland
  ➔ on-site effect
or to preserve the storage capacity of dams
  ➔ off-site effect
but also to improve water quality and provide significant benefits to human health
  ➔ common interest for both upland and lowland communities
Improvement of water quality through market of water services?

Supply of services:
land use upstream can affect the **Quantity**, **Quality** and **Timing** of water flows

Demand for services:
Possible beneficiaries:
  • Domestic water use
  • Fisheries
  • Recreation

Stefano Pagiola, World Bank, 2003
Water services vary substantially

Rio Ocoa

Rio Nizao

Substantial potential payments

98MW

52MW

64MW

Hydropower Production

6 m³/sec

Potable water

Dominican Republic

Caribbean

San Jose de Ocoa

Minimal potential payments

Stefano Pagiola, World Bank, 2003
Concept of user vs supplier is poorly suited to the situation
Water extraction and contamination are diffuse along the stream
Lack of relationship b/w the location of users and water uses
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Thanks for your attention!

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