

Heavy metal concentrations in rice and crop plants in the vicinity area of Mekong River

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Since rice and crop plants are the major source of energy in worldwide diets and consumed by more than 3 billion people, these soil–plant pathways are regarded as a prominent route of heavy metal exposure to human. This study provides an overview of heavy metal concentrations in paddy rice and crop plants from the potentially impacted areas in several Mekong River countries and related health data of residents who are primary rice and crop plants consumers. Heavy metal concentrations in rice and crop plants in these regions may be generally explained by the background of geochemical processes, but the accumulation and flood-related transport potential of heavy metal concentration from anthropogenic sources (e.g., dams, mines) in floodplain areas is unknown yet. Therefore, we investigated the heavy metal concentrations and flood-related transport potential in floodplain areas situated downstream of industrial sites along with the Mekong River. Especially its tributaries in Southern Laos was surveyed in detail with the comparison of a non-industrial area as the reference area.

Over a decade, Laos has encountered to many natural disaster, especially flooding event of different magnitude and duration, which mostly happened in the central and southern provinces causing by heavy rainfall. Some of the Mekong River and its tributary flow through the hydropower dam, mining, and industrial areas, which might transport large amounts of industrial pollutants, either dissolved or suspended solids into downstream area. There have been reports that dam building and gold mining dredging (Vangtat mining) at Attapeu province influenced the water quality and the health condition of local people who live in downstream on the Mekong River tributary such as Sekong and Se Kaman River. It also affected the areas not only in the Laos but also in nearby country like Cambodia. This report pointed out that the villager has developed rashes on their skin after swimming in the river, and the water has been muddy which villager are no longer able to drink or use. Previous researches of heavy metal concentrations in groundwater at Champasak province, a floodplain area along the Mekong River, has shown that at Pathoumphone district, Kiet Ngong and Thoang Beang villages showed 90 ug/L and > 40 ug/L of As concentrations respectively.

In summer 2022, various type of rice and crop plants samples were collected in the floodplain area along with the Mekong River in Champasak province, and the area along with Sekong and Se Kaman River (which later drain into the Mekong River in Cambodia) at Attapeu province where industrial inputs (dam or gold mine) are also located. The multi-environment media were also collected to investigate As and heavy metal concentrations. Collected rice and crop plants with groundwater were analysed to assess the health risk through food and water pathways with a health risk assessment model from USEPA. Data were interpreted with the multivariate statistical method to identify the possible source of heavy metal concentrations in alluvial soil, sediments and surface water.