

論文 / 著書情報
Article / Book Information

題目(和文)	インドシナ半島の主要廃棄物処分場の浸出水特性と地下水汚染
Title(English)	Leachate and Groundwater Contamination from the Major Solid Waste Landfills in Indochina Peninsular Region
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学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary

論文要旨

THESIS SUMMARY

専攻 : Civil and
Department of Environmental Engineering

専攻

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申請学位 (専攻分野) : 博士
Academic Degree Requested Doctor of (Philosophy)

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要旨 (英文 800 語程度)

Thesis Summary (approx.800 English Words)

In this study, leachate, sediment, groundwater and surface water samples were collected to investigate and assess the level of contamination regarding both basic biological and chemical parameters, especially the heavy metals; the future risks to the groundwater of surrounding areas base on the current site conditions were described. The samples were mainly collected from 3 different landfill sites, namely Nonthaburi landfill located in Nonthaburi province, Bangkok metropolitan area, Thailand, Dangkor landfill in Phnom Penh, Cambodia and KM-32 landfill in Vientiane Laos.

In-situ and laboratory measurements were conducted along with the landfill site investigation and related information gathering. The in-situ or on-site measurement was mainly for the basic parameters, such as temperature (Temp), pH, electrical conductivity (EC), dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity (Turb), total dissolved solids (TDS). In the parallel, the laboratory works were focused on both biological parameters and heavy metals; the biological parameters including Chemical oxygen demand (COD), biochemical oxygen demand (BOD₅), Nitrite (NO₂), nitrate (NO₃), total Kjeldahl nitrogen (TKN) and ammonia (NH₃), as well as the concentration of chloride (Cl). As for heavy metals, this study was focused on five significant harmful heavy metals; arsenic (As), lead (Pb), Cadmium (Cd), chromium (Cr) and zinc (Zn). Moreover, the landfill site condition and management were also intensively investigated in order to discuss their effects on leachate quality, as well as to the surface water and groundwater. At the end, the simulation study based on the current site conditions and management together with the possible changes of the site conditions (Pit depth, leachate height) and the ranges of important parameters (hydraulic conductivity, partitioning coefficient) were assessed to see the potential future risk to the surrounding groundwater.

The results of the investigation can confirm that almost biochemical parameters of the fresh leachates were greater than the effluent standards and showed higher concentrations than those measured for the leachate in large storage ponds. The concentrations of those parameters were higher in the dry season than the wet season for all fresh leachate samples of none-covered pit areas, but no significant seasonal difference was observed in the covered areas and large leachate storage ponds. The total heavy metal concentrations were many times larger than those dissolved in the liquid part of leachate and showed higher than the effluent and environmental standard, respectively. The majority of heavy metals were partitioned in the suspended solids, while the heavy metal content of sediment was higher than the suspended solids, and no clear seasonal change of heavy metal contents was confirmed for both suspended solids and sediment samples. The leachate qualities were mainly affected by the landfill site conditions and its management practices, e.g., soil cover, the waste compaction level, waste thickness, dumping method, and leachate storage, and these conditions lead to different levels of dilution.

There was no clear evidence of groundwater contaminated by the landfill leachates from this study results, and existing heavy metal concentrations in the ground waters were confirmed and lower than the environmental standard limit for

all heavy metals of all landfills, except the high arsenic concentration as background value at KM-32 landfill site. The merged location of observation well (OSW1) at Nonthaburi landfill was found to be high and increasing trend of chloride, as high as the same level of leachate, but the leakage could come from the horizontal direction not from the aquifer. Regarding the surface water of Dangkor landfill, the high concentration of physical parameters was confirmed. It can be concluded that the surrounding surface water of Dangkor landfill was influenced by the landfill leachate with the seasonal effects and similar trends to the leachate. Also, some of the heavy metal concentrations were found higher than the effluent standard limit.

Generally, the results of simulation study show groundwater and contaminant transport in underground were highly depended on the several landfill site conditions and management, such as groundwater level, relative pit depth (pit height), clay barrier layer thickness, leachate height and other geological condition i.e. hydraulic conductivity (Kc) and partitioning coefficient (Kd). The pith height of the current landfill conditions should not be lower than the depth of 30m and 15m below ground surface as for Dangkor and Nonthaburi landfill case, respectively. Also, the suggestion of the leachate high inside the dumped pits should be controlled with the appropriate level for safer groundwater risk as compared to the current site conditions.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note: Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).

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