

## A Case Study of Brownfield Revitalization in Taiwan

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**Abstract :** In the late 19th century, the Jinguashi ore deposit in northern Taiwan was discovered, and accompanied with flourishing mining activities. However, tons of contaminants including heavy metals, sulfur dioxide, and total petroleum hydrocarbons (TPH) were released to surroundings and caused environmental problems. Site T was one of copper smelter located on the coastal hill near Jinguashi ore deposit. In over ten years of operation, variety contaminants were emitted that it polluted the surrounding soil and groundwater quality. In order to exhaust fumes produced from smelting process, three stacks were built along the hill behind the factory. The sediment inside the stacks contains high concentration of heavy metals such as arsenic, lead, copper, etc. Moreover, soil around the discarded stacks suffered a serious contamination when deposition leached from the ruptures of stacks. Consequently, Site T (including the factory and its surroundings) was declared as a pollution remediation site that visiting the site and land-use activities on it are forbidden. However, the natural landscape and cultural attractions of Site T are spectacular that it attracts a lot of visitors annually. Moreover, land resources are extremely precious in Taiwan. In addition, Taiwan Environmental Protection Administration (EPA) is actively promoting the contaminated land revitalization policy. Therefore, this study took Site T as case study for brownfield revitalization planning to the limits of activate and remediate the natural resources. Land-use suitability analysis and risk mapping were applied in this study to make appropriate risk management measures and redevelopment plan for the site. In land-use suitability analysis, surrounding factors into consideration such as environmentally sensitive areas, biological resources, land use, contamination, culture, and landscapes were collected to assess the development of each area; health risk mapping was introduced to show the image of risk assessments results based on the site contamination investigation. According to land-use suitability analysis, the site was divided into four zones: priority area (for high-efficiency development), secondary area (for co-development with priority area), conditional area (for reusing existing building) and limited area (for Eco-tourism and education). According to the investigation, polychlorinated biphenyls (PCB), heavy metals and TPH were considered as target contaminants while oral, inhalation and dermal would be the major exposure pathways in health risk assessment. In accordance with health risk map, the highest risk was found in the southwest and eastern side. Based on the results, the development plan focused on zoning and land use. Site T was recommended be divides to public facility zone, public architectonic art zone, viewing zone, existing building preservation zone, historic building zone, and cultural landscape zone for various purpose. In addition, risk management measures including sustained remediation, extinguish exposure and administration management are applied to ensure particular places are suitable for visiting and protect the visitors' health. The consolidated results are corroborated available by analyzing aspects of law, land acquired method, maintenance and management and public participation. Therefore, this study has a certain reference value to promote the contaminated land revitalization policy in Taiwan.

**Keywords :** brownfield revitalization, land-use suitability analysis, health risk map, risk management

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