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Title	Sustainability of municipal solid waste management in Ulaanbaatar, Mongolia : benchmarking approach for systems improvement [an abstract of dissertation and a summary of dissertation review]
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Degree Grantor	北海道大学
Degree Name	博士(環境科学)
Dissertation Number	甲第12860号
Issue Date	2017-09-25
Doc URL	https://hdl.handle.net/2115/67637
Rights(URL)	https://creativecommons.org/licenses/by-nc-sa/2.1/jp/
Type	doctoral thesis
File Information	Byamba_Bolorchimeg_abstract.pdf, 論文内容の要旨

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学 位 論 文 内 容 の 要 旨

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学 位 論 文 題 名

Sustainability of municipal solid waste management in Ulaanbaatar, Mongolia: benchmarking approach for systems improvement
（モンゴル，ウランバートル市における固形廃棄物管理の持続可能性：国際的指標の適用によって示された途上国都市の改善策）

Drivers from resource value of waste to public health and environmental protection have been shaping the municipal solid waste management (MSWM) systems and how we view and handle waste throughout history. The example of developed countries demonstrates this evolution, where the systems have highly evolved in terms of technical and socio-economic aspects. However, the situation in developing countries is more complex than ever due to a growing number of challenges such as rapid population growth, informal settlements, inequality, lack of regulations and financial instruments. The solutions for improving the MSWM in developing countries need to be specifically designed to meet the needs of a given municipality/community, considering all the local features.

The capital city of Mongolia, Ulaanbaatar (UB) is facing unprecedented consequences of rapid urbanization and population increase coupled with economic growth and lack of proper regulations in place. A large population of UB resides in "*ger* districts", which lack basic infrastructure. The city's MSWM is becoming one of the most critical challenges, causing a threat to public health and the surrounding environment. In this study, "Wasteaware" benchmark indicators were applied to assess the current system for MSWM in UB according to its physical components: (1) public health, (2) environmental protection, and (3) resource management; and governance aspects: (4) inclusivity, (5) financial sustainability, and (6) sound institutions, proactive policies. The benchmark indicators' results revealed that UB had mostly surpassed the levels of low- and lower-middle-income countries for Public Health, Environmental Control and Institutional Aspects, and met the prerequisites for modernizing its waste management system. However, there are still major steps ahead to fully transition to a modern system including quality service provision in low-income areas, occupational

health and safety, environmental protection and integration of the informal sector. Access to capital for investment remains to be one of the biggest challenges. Availability and reliability of data is still a critical issue that requires priority as it is the backbone for planning of the MSWM and setting of targets with clear pathways to achieving them.

Waste management initiatives designed for one part of the city/community could potentially ignore the needs of other areas in the same region. Due to the two existing types of residential areas - apartment and *ger*, a public questionnaire was conducted in order to see the differences of the two types of residencies and their implications on the waste management service; and it is especially critical for policy formulations that will in turn affect the service users. The research generated essential baseline information regarding behaviours and attitudes held by both residential areas that could help improve the current service provision. The results of the public questionnaire revealed that there are significant differences between apartment and *ger* areas in terms of demographic and socio-economic aspects. Differences in waste handling and collection affect the cost of waste collection services, not in favour of the more socio-economically vulnerable residents. Willingness to pay more money for service improvement also varies based on the type of residency as well as the age of the respondents. The lack of systematic educational and behaviour change programs make it more challenging to improve the current situation through public engagement and support. Residents of both areas agreed that the citizens are the most responsible stakeholder in waste management, which reflects the public mentality and need for progressive actions towards public education and behaviour change.

This study brought significant contributions to the existing literature gaps for UB and identified its key strengths and areas for further improvement. Results of public questionnaire and benchmark indicators could inform decision makers on choosing the most effective policies. I conclude that an improvement in data collection and reporting, and widespread consultation with all stakeholders would impact positively on the systems improvement of the MSWM in UB.