

**ATTACHED TECHNICAL ASSISTANCE:
WATER FINANCING PARTNERSHIP FACILITY FOR THE MANAGEMENT
AND REUSE OF SEWAGE SLUDGE FROM ON-SITE SANITATION FACILITIES
AND DECENTRALIZED WASTEWATER TREATMENT PLANTS**

A. Introduction

1. The safe disposal of sewage sludge¹ generated by urban on-plot sanitation systems (mainly pit latrines) and decentralized wastewater treatment facilities is becoming increasingly problematic in Mongolia. This is due to (i) the rapid increase in urban population, and thus in the volumes of human fecal waste and sewage generated and consequently sewage sludge produced; (ii) The increasing difficulty for householders in *ger areas*² to find space for new pit latrines within their *Khashaas*,³ without having to dig out old pits;⁴ and (iii) the increasing volumes of domestic sewage generated and treated in small decentralized wastewater treatment plants. Solid waste products include both (i) fecal contaminated waste, which requires further treatment, and then disposal or reuse, and (ii) fully digested and mineralized sludge, which has the potential for immediate reuse without further treatment.

2. There are potential beneficial uses of sanitation and sewage sludge – for instance as a soil conditioner – dried sludge is currently either disposed of to open land, dumped into solid waste disposal sites, or stored at decentralized wastewater treatment plants before being disposed in the landfills. While in many *aimags* and *soums* the decentralized treatment system involves the use of waste stabilization ponds, sludge accumulated over many years of operation still lies in the ponds. This is the case in the Southeast Gobi Urban and Border Town additional financing project *aimag* centers of Avairkheer (Uvurkhangai), Dalanzadgad (Umnugovi), Erdenebulgan (Arkhangai) and Sainshand (Dornogovi), where sludge drying beds form part of conventional activated sludge plants (such as in Ulaanbaatar and Darkhan) these are full of dried sludge which has not been disposed of.

3. Most of the sewage sludge generated in Mongolia is either from pit latrines or from decentralized domestic wastewater sources, and so once treated and dried, can safely be used as a soil conditioner and fertilizer, or possibly for other uses.⁵ Sludge which is contaminated by industrial waste (and particularly heavy metals) may have other reuse possibilities, but, depending on the level of contamination, may not be generally suitable for use as a soil conditioner or fertilizer used to grow crops to be consumed. However, while a new national standard was introduced in 2015 which enables the use of composted sludge for fertilizer for tree planting, the legislation, regulations and standards required to fully regulate the reuse and

¹ In this case “sewage sludge” is used as a generic term to cover: (i) fecal sludge, (ii) digested sewage sludge, (iii) digested sludge excavated from pit latrines, and (iv) other solids products from sanitation and decentralized wastewater management facilities such as screenings and fecally contaminated settled silt and sand.

² All Mongolian cities present two very different and distinct patterns of residential development. The first comprises planned areas, encompassing medium-density multi-family apartment housing surrounding public open space. The second comprises the low-density *ger areas*. These are legal but informal settlements that are characterized by long strips of large, (usually 700 square meters) un-serviced or under-serviced plots (*khashaas*) accessed along wide dirt roads. Each *khashaa* may contain a number of structures – often *gers* - but in better established *ger areas* also often houses of wood (widely used in the project *aimags*), masonry, or concrete construction.

³ The area of land allocated for construction of a *ger* or house for residential purposes – normally 700 square meters in urban areas.

⁴ Households based in one location for years often have no more space in their yards to construct new latrines and neither the resources to clean and disinfect pits, nor an understanding of the options available for the disposal or reuse of the excavated digested fecal material.

⁵ E.g. for biogas recovery, as a fuel, or in construction.

disposal of sludge more generally, does not currently exist. Furthermore, other solid waste products generated as a result of sewage treatment – such as screenings and settled silt and sand, which are not generally suitable for reuse, need to be safely disposed of. Again, there are currently no legal and regulatory frameworks or associated standards governing the handling and disposal of these wastes in Mongolia.

4. Historically, the most common resource recovery from sludge globally has been as a soil conditioner and organic fertilizer, as excreta contain essential plant nutrients and organic matter that increases the water retaining capacity of soils. There are however several other treatment options that allow for resource recovery. For example, biogas can be produced during anaerobic digestion of fecal sludge, with the remaining sludge also being used as a soil conditioner. Novel developments are underway to recover end products such as a biofuel, for example through pyrolysis, gasification, incineration and co-combustion or as resource recovery of organic matter through growth of insects for protein production. This highlights the need for evaluating the market demand of potential end products prior to deciding on a treatment and end-use scheme which can be piloted and adopted.

5. The use of fecal and/or digested sludge as a soil conditioner can range from deep row entrenchment of untreated fecal sludge, to bagged compost that is sold as a commercial product for household level use in horticulture, or in agriculture. Using sludge as a soil amendment has many benefits over using chemical fertilizers alone: The organic matter in sludge can increase soil water holding capacity, build structure, reduce erosion and provide a source of slowly released nutrients.

6. However, when using sludge as a soil conditioner, the fate of and exposure to pathogens and heavy metals needs to be taken into consideration, and social acceptance can be closely linked to potential commercial value. Other factors that need to be considered include nutrients, which may or may not be available in the ratio required by soil and crop systems. It is important to determine the appropriate agronomic rate for the land application of treated sludge to maximize benefits, and to prevent environmental contamination from excessive application of nutrients. Nutrients in sludge are present in both organic and inorganic forms. Inorganic forms are more readily available than organic nutrients for plants and microbes to assimilate. Nutrients bound to organic matter are slowly released over time through mineralization to become biologically available. If nitrogen is applied in excess of plant and soil microbial demand, ammonia can be lost due to volatilization, and nitrates by leaching through the soil profile. Leaching can lead to the eutrophication of surface waters, and nitrate contamination of drinking water. This reinforces the need for (i) increasing the understanding of reuse options available; and (ii) based on likely handling, reuse and disposal options, preparing and enacting a suitable legislative, regulatory and standards framework to govern this activity in Mongolia.

7. The focus of the proposed project is motivated by the fact that sludge generated both by decentralized wastewater treatment plans and on-plot sanitation is currently not reused. Furthermore, there is no legislation and regulation or associated guidelines and standards which govern the reuse of sludge from these sources. In addition there is a general socio-cultural resistance to the reuse of sewage sludge and other fecal sludge, particularly for horticultural or agricultural purposes where agricultural products have the potential to be used for human consumption. **The optimization and alignment of a legal framework and standards** is needed as a first start to improve sludge handling and optimize the potential for its reuse. **Advocacy on sound sludge management** has to be strongly encouraged as a tool that can work at different levels. In the first instance, advocacy and training at central government and

aimag/soum level has to be carried out **to feed the political will and prioritize the sludge management agenda.**

8. At all levels, there is a need to strengthen the sustainability of initiatives which address the requirements and opportunities for sludge disposal or reuse. Once options are developed, advocacy and training is required across stakeholders, to prioritize the sludge reuse agenda (at the government level) and improve local hygiene practices and achieve the long-term operation and maintenance of on-site facilities (at the *aimag* and *soum* levels). There is currently no strategic action plan to prioritize and implement measures for sludge reuse and support the scaling-up and replication of measures across *aimags* and *soums*.

9. Support for sewage and fecal sludge disposal and reuse will also complement ongoing efforts by the Asian Development Bank (ADB) to improve sanitation and wastewater management in urban areas in Mongolia. ADB's technical assistance project *Ulaanbaatar Water and Sanitation Services and Planning Improvement* (2010–2011) resulted in the inclusion of the *ger* areas, for the first time, in city planning, and a geographically targeted and integrated approach for urban planning and water and sanitation infrastructure.⁶ Between 2016 and 2024, ADB's *Ulaanbaatar Urban Services and Ger Areas Development Investment Program*⁷ will improve access to water, sanitation, and heating services for around 50.0% of the population in project areas and contribute to reducing the incidence of waterborne diseases by 50.0%.⁸ The *Darkhan Wastewater Management*⁹ Project will provide enhanced sanitation and wastewater management facilities in Darkhan between 2016 and 2019. The proposed additional financing under the *Southeast Gobi Urban and Border Town Project* will improve wastewater management in four *aimag* centers.

10. Efforts to improve the handling of sewage sludge, encourage its economically beneficial reuse, and improve final disposal (where necessary) will directly contribute to Mongolia's Green Development Policy 2014 (which aims to increase access to improved sanitation to 80.0% of the population),¹⁰ and national action program. The project will support ADB's interim country partnership strategy, 2014–2016 for Mongolia,¹¹ and Environment Operational Directions, 2013–2020,¹² for inclusive and sustainable growth and water security. In Mongolia, a major source of public health risks and soil and water pollution comes from the improper and inadequate disposal of sludge.

11. Improving the management and potential reuse of sludge requires addressing at least four areas. These are: (i) strengthening the policy and planning frameworks and programs to support sludge management and reuse; (ii) developing and implementing *soum*- and household-level fecal sludge management measures; (iii) strengthening the acceptability and sustainability of sludge reuse, through clear procedures for operation and maintenance of facilities, advocacy, training, and possible payment systems for sludge reuse and co-composting; and (iv) planning for the replication and scaling up of successful approaches.

⁶ ADB. 2011. MON-43361: *Ulaanbaatar Water and Sanitation Services and Planning Improvement*. Manila. The *ger* area redevelopment strategy supported by the TA is now a main component of *Adjustments to the Ulaanbaatar City Urban Development Master Plan 2020 and Development Directions 2030*, approved by Parliament in 2013.

⁷ ADB. 2013. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranche Financing Facility Mongolia Ulaanbaatar Urban Services and Ger Areas Development Investment Program*. Manila.

⁸ See: http://adb.org/projects/details?page=overview&proj_id=45007-003

⁹ ADB. 2014. *Report and Recommendation of the President to the Board of Directors: Proposed Loans and Technical Assistance Grant to Mongolia for the Darkhan Wastewater Management Project*. Manila.

¹⁰ Government of Mongolia. 2014. *Green Development Policy, 2014–2030*. Ulaanbaatar.

¹¹ ADB. 2014. *Interim Country Partnership Strategy: Mongolia, 2014–2016*. Manila.

¹² ADB. 2013. *Environment Operational Directions, 2013–2020*. Manila.

12. The Technical Assistance (TA) will be executed jointly with the proposed Southeast Gobi Urban and Border Town Development Project additional financing, and will include the following activities (i) determine current quantities and characteristics of sludge and other fecal waste generated from sanitation facilities in Mongolia; (ii) assess current impediments (regulatory, socio-cultural, lack of information etc.) to sludge reuse in Mongolia; (iii) determine potential beneficial uses for sewage sludge in Mongolia, with a focus on the project *aimags*; (iv) recommend measures to enhance sludge reuse – with a particular focus on the regulatory framework and measures to overcome socio-cultural objection to reuse; (v) prepare the necessary legislative and regulatory instruments to appropriately manage sludge and fecal waste disposal and reuse in the country; and (vi) from among the project *aimags*, select one or two locations to implement a pilot fecal waste and sludge reuse and disposal project, including evaluation and assessment of impacts and results.

B. Outputs and Key Activities

13. The expected project impact is that the urban environment will be improved through reduction in soil, surface and groundwater pollution; fecal sludge will be fully treated, and food production will be supported and enhanced.

14. **Output 1: Legislation, Regulation and Standards for Sewage Sludge Management and Reuse established and adopted.** This output will involve the following: (i) establish national contact group for sewage sludge management, reuse and disposal; (ii) conduct assessment of current legislation and regulation which may impact on sludge management and disposal; (iii) based on this review, and options identified through the review of potential reuse and disposal options, develop draft legislation and supporting regulations and standards for sludge and fecal solids handling, reuse and disposal; (iv) present draft to contact group and other stakeholders, discuss and amend on basis of comments and field experience; and (v) finalize legislation, regulation and standards and support submission to Government for enactment.

15. **Output 2: Development and establishment of viable sludge disposal practices and reuse pathways and related technologies.** This output will involve the following: (i) conducting an assessment of sources and nature of sewage sludge and other fecal solids generated from on-plot sanitation facilities and decentralized wastewater treatment facilities in Mongolia; (ii) an investigation of potential sludge management reuse and disposal pathways under Mongolian conditions based on regional and international experience, and determining optimal approaches; and (iii) development of management, disposal and reuse models for sludge management lifecycle and develop and associated action plan for their introduction and implementation.

16. **Output 3: The design and implementation of pilot projects to establish the agricultural production value of sewage sludge used as a soil conditioner.** This output will involve the following: (i) agreement on the location for pilot projects for sewage sludge reuse based on discussions and agreements reached with project *aimag* centers; (ii) agree on scope of pilot projects and implementation arrangements, and commence and oversee implementation; (iii) prepare stakeholder communication strategy and local media campaign and execute; (iv) conduct training and advocacy activities in pilot centers; (iii) monitor and evaluate performance of pilot project and determine lessons to be learned; (iv) prepare knowledge products generated on the successful pilots; (v) prepare operation and maintenance manual for the reuse operations; and (vi) disseminate findings from pilot activities.

C. Cost and Financing

17. The project is estimated to cost \$1.00 million. The Gates Bill and Melinda Gates Foundation through The Sanitation Financing Partnership Trust Fund under the Water Financing Partnership Facility (WFPPF) is requested to finance \$1.00 million to cover the cost of project activities to provide assistance in developing proposals for fecal sludge and sewage sludge handling, management and disposal or reuse.

Table 1: Cost Estimates and Financing Plan
(\$million)

Item	Amount
A. Asian Development Bank ^a	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	160.0
ii. National consultants	270.0
b. International and local travel	140.0
c. Reports and communications	80.0
2. Training, seminars, and conferences	110.0
3. Surveys	90.0
4. Contingencies	150.0
Total	1000.0

Note: The technical assistance (TA) is estimated to cost \$1,000,000, of which contributions from the Asian Development Bank are presented in the table above. The government will provide counterpart support in the form of counterpart staff, office accommodation, office supplies, secretarial assistance, and other in-kind contributions.

^a Financed by the Bill and Melinda Gates Foundation under the Sanitation Financing Partnership Facility and administered by the Asian Development Bank.

Source: Asian Development Bank estimates.

D. Implementation Arrangements

18. The project will be implemented over a period of 2 years, tentatively from October 2016 to October 2018. ADB will be the executive agency and the management and execution of the project will be supported through the PMU for the Southeast Gobi Urban and Border Town Development Project – additional financing.

Table 2: Summary of Consulting Services for Individual Consultants

Area of Expertise	Consulting Inputs (person-months)
A. International	
1. Project Advisor: Environmental and Waste Reuse Specialist	7.0
Subtotal (A)	7.0
B. National	
1. Team Leader: Community Development Specialist	24.0
2. Waste management/environmental specialist	12.0
3. Legal specialist	6.0
4. Financial Economist	8.0
5. Human resource development specialist and trainer	6.0
Subtotal (B)	56.0
Total (A+B)	63.0

Source: Asian Development Bank.