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Exploring alternative sources of funding for deploying sustainable sanitation technologies and services in Mongolia

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ABSTRACT

One of the major challenges for deploying sustainable sanitation technologies and services around the world is financing. The present study applied both qualitative (key informant interviews) and quantitative (household survey) methods to explore sources of alternative financing in Ulaanbaatar, Mongolia, towards deploying sustainable sanitation technologies and services. Microfinance organizations, government subsidies and mining industries may represent potential sources of financing for the implementation of sustainable sanitation technologies and services in Mongolia. Moreover, building social capital among Ger residents and reinventing the idea of 'corporate WASH responsibility' could constitute new directions for the future.

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Sustainable sanitation; finances; community perceptions; WASH; stakeholders; Mongolia

Introduction

An immediate and global concern in attempting to achieve universal access to sanitation is financing/investment (UNICEF & World Health Organization, 2015). At present the financing of such water and sanitation projects occurs mainly through external funding from various donor and development agencies (Sahooly, 2003). Worldwide, some 2.4 billion people still use unimproved sanitation facilities and 946 million still practice open defecation (UN, 2015). In order to achieve universal access to sanitation by 2030, particularly for the world's poorest people, local and global inequalities must be resolved through the implementation of a range of policies and strategies, such as cost recovery within the system (UNICEF & World Health Organization, 2015; Van Dijk, 2012). Financial factors have proven to be crucial in improving sanitary conditions and promoting the supply and maintenance of sanitation facilities and services (Arku, Angmor, & Seddoh, 2013). However, along with some sort of local funding, involvement of both the private sector and the community may, at the local level, prove to be

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the catalyst to installing, maintaining and operating such facilities (Global Water Partnership, 2012; Uddin, Muhandiki, Fukuda, Nakamura, & Sakai, 2012; Uddin, Muhandiki et al., 2014).

In some low- and middle-income countries, local-level microfinancing has allowed individuals to create savings/credit groups to aid in improving their health and sanitary conditions, e.g. in Nepal (Annamraju, Calaguas, & Gutierrez, 2001) and some other parts of the world (Habitat, 2006; Tremolet, Kolsky, & Perez, 2010). Microfinancing has been proposed as an ideal community-based financial contribution plan for deploying and managing sustainable sanitation (SuSan) facilities at the local level (Roma, Bukley, Jefferson, & Jeffrey, 2010; Uddin et al., 2012; Uddin, Muhandiki, et al., 2014), particularly since the private sector alone cannot fill the investment gap in the water and sanitation sector (Annamraju, Calaguas, & Gutierrez, 2001).

Although current trends show strong investments of central governments and a large-scale private sector in the fields of water and sanitation (Evans, Haller, & Hutton, 2004), perceptions of stakeholders and local communities are largely ignored when seeking alternative sources of financing. Moreover, exploring alternative financial sources is rarely documented in the wider literature, particularly with respect to deploying SuSan technologies. However, it has been proposed to create methods of loaning, saving and managing funds to solve the financial constraints towards sustainability in the water and sanitation sector in general (Montgomery, Batram, & Elimelech, 2009). Werner et al. (2009) suggested innovation-friendly investors and new financial instruments to adopt ecological sanitation (closed-loop sanitation) around the world. Therefore, possible alternative pan-sectoral funding sources (e.g., government, non-government, community and household) may require a local-to-global reinvention to achieve universal access to a safe water supply and SuSan systems.

Seeking to address both world and low-income regions' sanitary, health and environmental issues through resource recovery, SuSan has drawn increasing attention over the last decade as an alternative to conventional sanitation systems (e.g., Uddin et al., 2012; Uddin, Muhandiki, et al., 2014). With the advent of climate change (Adamowski, Adamowski, & Bougadis, 2010; Nalley, Adamowski, Khalil, & Ozga-Zielinski, 2013; Pingale, Khare, Jat, & Adamowski, 2014) and other issues, approaches such as SuSan are important to explore to facilitate the transition to more sustainable water resources planning and management (Halbe, Pahl-Wostl, Sendzimir, & Adamowski, 2013; Butler and Adamowski, 2015; Inam, Adamowski, Halbe, Prasher, & Zaman, 2015). In Mongolia, especially in the peri-urban Ger areas¹ of Ulaanbaatar, most residents face a range of challenges in the water, sanitation and hygiene (WASH) sector. These include pit latrines and soak pits in unhygienic conditions, disposal of hazardous greywater into the environment, and unsafe water supply systems (Uddin, Li, Adamowski et al., 2015; Uddin, Li, Gaillard et al., 2014). As a result, hepatitis A and diarrhoeal diseases are still prevalent (Davaalkham, Enkhoyun, Takahashi, Nakamura, & Okamoto, 2009), and 3.5% of the annual deaths in Mongolia are WASH-related (Caldieron & Miller, 2010; UN WATER, 2013). These health risks are especially prevalent in a peri-urban context, where the risks of water resources contamination are high due to population density, the area's hydromorphic status, and limited access to water (especially in the winter), as well as the poor hygienic education and thus practices of the resident community. Relatively low average household incomes and a high influx of new residents to the peri-urban areas of Ulaanbaatar pose additional challenges to improving conditions in the WASH sector (Uddin, Li, Gaillard et al., 2014).

In the world's low- and middle-income regions, in addition to socio-cultural and geographical factors, one of the greatest challenges in scaling up SuSan technologies (e.g.,

urine-diverting dry toilets, or greywater treatment technologies that reduce environmental pollution and health hazards and also help in resource/nutrient recovery) and services (e.g. emptying, collection, transportation and treatment of wastes) is finding financing to build new infrastructure and maintain existing infrastructure. In many parts of the world, coupled with this financial limitation to widespread replication of SuSan technologies and services are high construction costs, dependency on external funding, lack of political willingness to carry out large-scale investments, and lack of proper cost-benefit analysis (Uddin et al., 2012; Uddin, Muhandiki, et al., 2014). Perceptions of stakeholders and local communities may trigger efforts to overcome these challenges by exploring viable alternative financing mechanisms and sources for widespread replication of SuSan technologies and services from the local to the global scale. In this article, several concepts such as microfinance (Hadi, 2002), social capital (Bridger & Luloff, 2001), and corporate social responsibility (Smith, 2003) were re-explored in the field of SuSan in Mongolia to assess their potential for reinventing alternative financial sources targeted to scaling up SuSan technologies and services.

This study was carried out between June 2013 and October 2014 under an ongoing doctoral research project jointly implemented by Action Contre la Faim (ACF) Mongolia and the Beijing University of Science and Technology (Uddin et al., 2013). Supported by various international and national universities, including the Mongolian University of Science and Technology, the Mongolian State University of Agriculture, the Technical University of Berlin and the Martin Luther University Halle-Wittenberg, it was funded by ACF France. Its purpose was to assess the perception of peri-urban nomadic-cultured communities and stakeholders regarding the exploration of sources of financing for scaling up SuSan technologies and services in the study area, so that this can potentially be replicated in other parts of the world.

Materials and methods

Household surveys were conducted with the local, peri-urban community (residents of Ulaanbaatar's Ger area), while interviews were held with key informants from institutional stakeholders (e.g., banks, governmental and non-governmental organizations, and service providers) and local communities. In addition, secondary data were collected from the wider literature.

Questionnaire surveys with the local community

Three different household surveys were conducted in the WASH programme intervention areas (i.e., Ger areas of Ulaanbaatar, Mongolia) of ACF Mongolia between June 2013 and August 2014 (see Appendix 1 in the online supplemental data at <http://dx.doi.org/10.1080/07900627.2015.1121137>):

- Based on a structured questionnaire, an interview-based socio-economic household survey was conducted in the Songinokhaikhan and Bayanzurkh Districts of the Ger areas of Ulaanbaatar, Mongolia, among both users (72 eco-toilet users) and non-users (72 pit latrine or other users) of SuSan technologies. The survey assessed community perceptions on financing SuSan, income generation, willingness to pay for the technologies and services, and their benefits.
- Perceptions and willingness of eco-toilet users to pay for the installation of a house or community greywater treatment system were assessed.

- A knowledge, attitude and practice survey was conducted among 210 households in the Ger areas to assess socio-cultural relationships between neighbours, support received from each other during periods of need, and willingness to pay for improving the water supply and sanitation system (Appendix 1 in the online supplemental data).

Cluster random sampling methods were applied for all surveys due to the study area's scattered households.

Semi-structured key informant interviews with stakeholders

In order to ensure triangulation of household survey results, 20 stakeholders/key informants from government and non-government organizations, healthcare institutions/hospitals, insurance companies and banks, and service and business providers, as well as companies who construct toilets, were interviewed. The semi-structured questionnaire employed through 2013 and 2014 served to assess views and perceptions on existing financial sources, future financing in the WASH sector and willingness to provide finance and business opportunities to scale up SuSan technologies and services in the study area. In addition to the semi-structured questionnaire, the interviews with the stakeholders were recorded by using a voice recorder for ease of data input and analysis after the interviews.

Results and discussions

Benefits and costs of eco-toilets and services

The benefits of introducing SuSan systems are well documented in the literature and are related *inter alia* to the improvement of health and avoidance of environmental damage through a safe management of human excreta, reuse of nutrients, and intangible user impacts such as comfort or aesthetics (Uddin et al., 2012; Uddin, Muhandiki, et al., 2014). The results of the first socio-economic household survey among the eco-toilet users in the study area confirmed that eco-toilets generate strong benefits at the household level, even though these cannot be systematically quantified in monetary terms. Comfort and cleanliness were stated by 48% of eco-toilet users as notable advantages compared to their old latrines. Other advantages, such as the absence of odour and flies, the presence of a toilet seat, good design, existence of an emptying service, and health benefits, were highlighted by the remaining respondents (52%). As these benefits are usually not expressed in monetary terms and therefore likely to be neglected, efforts have been undertaken to estimate the monetary value of the introduction of eco-toilets. Health benefits (avoided health-care costs and avoided productivity loss due to improved sanitation) have been estimated to be about MNY 13,500 (USD 8) per capita (annually).

The full costs of eco-toilets can be divided into capital costs and operational and maintenance costs. The first survey interviews among eco-toilet users and non-users showed that in this region an eco-toilet costs 10 times as much to build as a pit latrine (about MNT 272,000/USD 155 versus MNT 30,000/USD 17), due to its specific technology (i.e., urine diversion, double pit, and separate container for excreta). The mean monthly household income in the area is MNT 600,000 MNT (USD 341); therefore, willingness to pay for eco-toilets is still low in the local communities. In the first survey among non-users of eco-toilets, only 12% of respondents stated they would be willing to pay MNT 200,000 (USD 114) for an eco-toilet, and only 3% would pay MNT 300,000 MNT (USD 170). This represents a significant challenge to replication and coverage.

With regard to operational and maintenance costs of eco-toilets, in the first survey among the eco-toilet users, a negligible number of respondents among eco-toilet users said they would agree to pay MNT 10,000 (USD 5) per emptying (Uddin, Li, Mahmood et al., 2015). Other maintenance costs, such as a yearly supply of sawdust for the eco-toilet, range from zero to MNT 200,000 (USD 113).

Exploring alternative sources of funding for scaling up SuSan technologies and services

Since buying an eco-toilet involves high up-front costs, which pose a barrier to low-income households, and since the willingness to pay for eco-toilets is still low in the study area, several options were explored in order to improve the financing of eco-toilets and other SuSan technologies.

Microfinancing

Interviews of stakeholders, particularly bank officials, who have an interest in the WASH sector and in collaborating with ACF Mongolia revealed that microcredit and loan systems are still new to Mongolia and the Ger residents of Ulaanbaatar, who have migrated from the countryside. Lending schemes like microcredit have only been available, especially to low-income families, for the last decade. However, the financial sector has been growing and spreading fast in recent years and there are now a variety of microfinance institutions in Mongolia.

Key informant interviews with XacBank – the largest provider of microfinance in Mongolia – showed that activities around microfinance have started to spread and can potentially become an important component towards better financing for SuSan. XacBank started as a small non-banking microfinance institution in the 1990s and became a bank when two microfinancing institutions merged. Since then it has followed a triple-bottom-line approach, which focuses on people, the planet and profit. In the Ger areas of Ulaanbaatar, XacBank is involved in traditional microfinance in a number of different ways, including providing conventional small loans to local residents of Mongolia, particularly low-income people, including the residents of Ger areas. The focus of the loans has been mainly on small businesses and green lending (e.g. for insulation and energy efficiency), but as of 2012 Mongolia's XacBank has offered loans of up to USD 5000 for water and sanitation.

Results from the key informant interview with XacBank also showed that in the Ger areas, the vast majority of residents have access to financial institutions and their monetary assets are housed in a bank. The majority of the people do not have a very developed lending history, but most have some sort of financial relationship with financial institutions. In general, the loan system is new for Mongolia and for the Ger residents, since Mongolia has only very recently become a capitalist economy. Lending schemes have only been available, especially to low-income families, for the last 20 years. However, the sector has grown substantially and rapidly, and a range of initiatives and a variety of microfinance institutions have sprung up.

In order to explore a range of opportunities to facilitate access to improved sanitation through financing, XacBank has, since 2012, collaborated with ACF Mongolia in the sanitation sector. XacBank has also been looking to work with local latrine producers who cater to the Ger districts, so as to provide more comfortable and cleaner latrines. They have also started to initiate effective collaboration with an international company that has experience

in producing materials for latrines and are very interested in producing latrines specifically designed for the Mongolian climate and socio-economic settings. So far, XacBank has provided loans for the installation of a few ventilated improved pit latrines. These latrines will be sealed to avoid soil contamination and the waste will be collected by a vacuum tanker. The initiative of XacBank and ACF offers a new possibility to invest and provide loans for scaling up SuSan technologies and services in the target areas.

Since significant work needs to be done in introducing microfinancing for sanitation to Ger area residents, it is still too early to assess the potential benefits of the initiative. During interviews with communities, respondents' knowledge of the microcredit loans for eco-toilets offered by XacBank (up to MNT 7,000,000, at a monthly interest rate of 1.8–2.2%) and their willingness to pay back such a loan, particularly with respect to paying by monthly instalments over the period of one year, were assessed. Both questions were not easy for respondents to answer since knowledge about microcredit for eco-toilets is still not widespread in Ulaanbaatar. In the first survey among eco-toilet users and non-users, only 30% of respondents knew about this loan opportunity from XacBank.

However, given the challenges inherent in spreading knowledge and awareness about microcredit, it is doubtful that microfinancing reaches the poorest households. These households need other financial sources, such as government subsidies. Alternatively, if the providers/donors create effective networks with microcredit organizations and poor stakeholders (i.e. low-income stakeholders), this might trigger replication of SuSan technologies and services in the study area and other low- and middle-income regions. It also might reduce the hazards and vulnerability of people to disease arising from the risks of existing unhygienic traditional water supply systems and sanitation technologies.

The proposed financial mechanism and network includes the connection of microfinance organizations with other major active and poor stakeholders towards scaling up SuSan technologies and services (Figure 1).

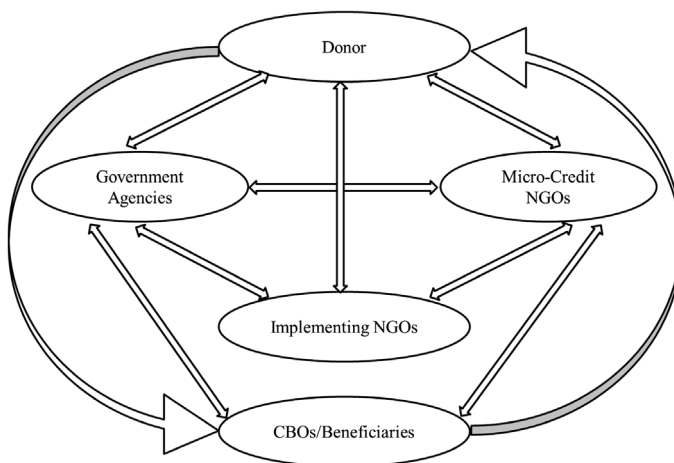


Figure 1. Proposed networking and coordination for fund-raising. (Adapted from Uddin, 2011). Note: CBOs = Community-based organizations. The flow-diagram indicates the networks and communication among the actors for fund-raising to deploy sustainable sanitation technologies and services.

Making SuSan self-financing in terms of infrastructure and services

Creating a self-financing mechanism (i.e. community financing) and developing cost-recovery strategies (e.g. reuse aspect, including composted fertilizer) within the SuSan system may be feasible options for deploying SuSan technologies and services in low- and middle-income countries. In Mongolia, opportunities for organic fertilizer production exist (ACF, 2012); however, establishing the actual benefits and quantifying them in monetary terms remains a challenge.

Interviews with government and non-government stakeholders revealed keen interest in improving the situation of the Ger areas in terms of WASH, but very limited interest in the SuSan concept. The obstacle to their investment in such technologies can be attributed to the fact that SuSan systems are a new and emerging field in Mongolia, whose communities and stakeholders are not well informed about this field and the concepts that underpin it. On the other hand, several private companies have shown interest in managing the emptying services, installing eco-toilets and treating human faeces through composting (Uddin, Li, Mahmood et al., 2015). These types of business possibilities can enhance the process for self-financing mechanisms in the study area and in other parts of the country.

Another opportunity could be to explore financial sources among national and international companies and banks to develop biogas systems using faecal sludge and other organic wastes for the generation of electricity. Key informant interviews among the non-government stakeholders revealed that demand for organic fertilizer is high in Mongolia. Faecal compost and other organic fertilizer production for animal fodder could be a future solution (Mahmood, Li, Uddin, Mang, & Germer, 2014).

A great deal more initiative from the private sector is needed to produce and market SuSan products. Right now ACF is intervening in several small-scale research programmes on SuSan, and developing advocacy tools to convince more people in both the governmental and non-governmental sectors of the need for such programmes (Uddin, Li, Mahmood et al., 2015). However, if SuSan can be turned successfully into viable business opportunities, it will be in the self-interest of companies to increase the demand and to scale up SuSan technologies.

Towards corporate WASH responsibility

The idea of *corporate social responsibility* (CSR) is not new, and many theories, definitions and characteristics of CSR are well documented in a wide range of business and management literature (e.g., Aguilera, Rupp, Williams, & Ganapathi, 2007; Lindgreen & Swaen, 2010). In addition, the concept of *corporate environmental responsibility* has evolved from CSR in recent decades to address the environmental impact of companies and other stakeholders (Kovács, 2008). Many companies implement a range of programmes/initiatives to improve the environment and conserve natural resources by using part of their profits for the betterment of society (e.g., American States Water Company [ASWC], 2011). However, only very recently has CSR been identified as one of the potential drivers to solve global sanitary problems (Abey Suriya, Mitchel, & White, 2007) and to significantly enhance financing targeted to improving global WASH conditions. In the current study, informant interviews with stakeholders (non-government) showed that CSR as an external funding source is absent from the field of WASH in Mongolia. A department of corporate environmental responsibility at the Trade and Development Bank of Mongolia has only

recently begun to deal with the mining industry, making loans to companies conditional on an environmental assessment.

Following the same logic, *corporate WASH responsibility* could be considered an important component of CSR in banking and non-banking sectors, as well as small, medium and large-scale private sector, in terms of raising awareness among institutions and communities regarding the sustainable improvement of both local and global WASH issues. To improve the adoption of WASH principles and proceed towards SuSan services in a country where governmental interventions are limited by meagre funding, low individual income and lack of interest, CSR can be one of the drivers to bring all actors to the same table in improving the WASH situation. This would occur particularly through the deployment of SuSan technologies and services, through a contribution of their CSR funds as a part of a social welfare programme.

Since the government may not always be able to improve the situation alone, the implementation of CSR could support the government in a drive to improve the situation from the community to national level. Qualitative interviews among stakeholders revealed that in Mongolia the principal companies (e.g., mining companies) allocate a portion of their budget towards local residents. These funds could be used for wider sanitary improvement and to replicate SuSan technologies and services. The interviews among the local communities revealed little support from various companies in forms of CSR in the Ger areas, particularly in the field of WASH.

A proposed linkage between these three components of corporate responsibility (Figure 2) could enhance the WASH sector, particularly with respect to deploying SuSan technologies and promoting services to improve and create funding for continuing programmes in intervention areas.

Towards government subsidies

Investment in the water and sanitation sectors has been proven to yield significant economic benefits: 1 dollar invested in both improved water supply and sanitation can yield an economic return of between 3 and 34 dollars depending on the geographic area (WHO, 2004). The significant public benefits such as resource/nutrient recovery, improved living conditions, and reduced pollution, as well as reduced environment and health hazards (Uddin, Li, Adamowski et al., 2015), from improving sanitation could encourage the Mongolian government, as any other, to perceive sanitation as a public responsibility rather than a private good and therefore responsibility. Improving sanitation reduces public and private health-care costs and effectively increases the population's productive days.

In Mongolia, the coverage of improved sanitation (no resource recovery and reuse aspects are considered in the existing system) is 60%, while for an improved water supply it is 64%. Progress during the last 25 years has been 'moderate', and the country did not meet the water and sanitation target for the 2015 Millennium Development Goals (UNICEF & World

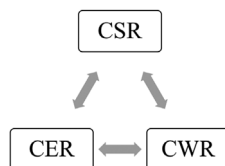


Figure 2. Proposed interconnection of corporate social responsibility, corporate environmental responsibility, and corporate WASH responsibility.

Health Organization, 2015). Although progress in terms of improving drinking water supply and sanitation has been considered 'moderate' by the WHO/UNICEF Joint Monitoring Programme, the safety of existing sanitation facilities and water quality is still not ensured (UNICEF & World Health Organization, 2015).

However, almost all respondents in stakeholder interviews explained that the Mongolian government has recently shown greater interest in actively supporting the sanitation sector in Ger areas. The municipality of Ulaanbaatar is working with UNICEF and the Mongolian Red Cross on ways to identify sanitation gaps and improve sanitation (latrines in particular) in Mongolia. This kind of outreach and public support is a positive indicator. The government has shown in the past that it is supportive of environmental programmes, especially in the Ger districts, because it recognizes the problems related to infrastructure and public health in those areas. This could motivate the government to raise funds and provide subsidies for deploying SuSan technologies and services in the study area and other parts of the country.

Key informant interviews among the stakeholders (both government and non-government) also revealed that the Mongolian government has expressed support so far. That has not yet turned into a subsidy or a tangible programme, but there could be some sort of government programme in partnership with an NGO to focus on on-site sanitation. So far the priority of the government has been the central sewage system, but the wastewater treatment plants are in low functional condition and they have to be renovated if not replaced, which would be a very capital-intensive project. Furthermore, the government has been providing funding to combat air pollution by providing subsidies of up to 90% for clean stoves. These government initiatives may be an indicator that the political will to spend on environmental issues exists. However, even if the government does turn out to give financial support to SuSan systems, it will be challenging to design suitable financial tools, as the range of instruments is broad – from hardware and software subsidies to more market-related instruments such as lowering taxes for sanitation-related material or acting as a contracting party to sanitation businesses (e.g., paying them for their public service of collecting waste).

Social capital towards generation of funds

As many researchers have noted, in any society successful cooperation for long-term mutual benefit depends on the cultivation of social capital (bonding, bridging and linking through neighbourhood relationships). Applied to a wide range of fields, such as health, disasters, sociology and engineering (e.g., Elgar et al., 2011; Franklin, Bruegel, Lister, & Morrow, 2005; Harpham, Grant, & Thomas, 2002), social capital is considered a source of 'co-productive' capacity for public service delivery (Andrews, 2012). However, such research is very limited in the WASH sector, particularly with respect to exploring the scope of funding for SuSan.

Key informant interviews among the stakeholders in the study area showed that social capital is lacking in the peri-urban settlements of the Ger areas due to people's traditional nomadic roots and rapid migration to the city and its peri-urban Ger areas. This may be one of the challenges to generating community funding mechanisms that should be applied to pay for SuSan technologies and services. This challenge can possibly be overcome by designing various community-based programmes and interventions such as awareness, education, training, and community drama executed by a range of governmental and non-governmental organizations. In the second survey among the eco-toilet users, who were also the targeted greywater customers, 69% of the respondents said they know about

their neighbours, and 79% said they are willing to help their neighbours, if required, in both monetary and non-monetary forms.

On the other hand, the recent knowledge, attitude and practice survey among the Ger area residents in the ACF WASH programme intervention areas indicated that 89% of the respondents know about their neighbours on a scale of 'a lot' (58.1%), 'some' (14.8%) and 'little' (16.2%). In terms of support received, 66% of the respondents expressed that they received both monetary and non-monetary support from their neighbours. This can be explained as a positive trend in the bonding, bridging and linking of the neighbourhoods in the Ger areas, and it may increase the strength of the social capital of the study area. This can ultimately contribute to support the up-scaling of SuSan technologies and services in the study area. This can be also encouraged through various initiatives and programmes in the WASH and health sectors, through a range of non-governmental organizations, including ACF Mongolia.

In the second survey among the eco-toilet users (also greywater customers), roughly two-thirds of respondents said they were willing to invest in greywater treatment (Uddin, Li, Adamowski et al. 2015; Uddin, Li, Mang, Ulbrich et al., 2014) and monthly payments totalling MNT 10,000–115,000 (USD 5.45–62.65) over two years. To save money, 69% of the respondents were ready to share the installation and maintenance costs with their neighbours. The remaining respondents enumerated some factors for not sharing the system with neighbours: lack of a good relationship, not wishing to depend on their neighbours, wanting to obtain full ownership, and not being exposed to neighbours' diseases. This may be also applicable to other SuSan technologies and services in the study areas and beyond.

Involvement of informal institutions such as co-operatives, community-based organizations, and other social associations can provide another path for networking within the social capital boundary. Such institutions may play a leading role towards the introduction of innovations and fund-raising targeted at solving social issues, including sanitary problems and natural resources management (Pretty, 2003). Key players under the informal institutions include natural leaders (i.e. persons respected by the community who are not elected or politically influenced), religious leaders, traditional community leaders and school teachers (Uddin, Muhandiki et al., 2014). Local community groups, such as women's groups, can also play a leading role in a society's development of socio-cultural capital, by raising awareness and alternative funding or enhancing non-monetary contributions to improve sanitary and health conditions in their communities (Uddin et al., 2012). Social capital may increase the society's socio-cultural resiliency to develop SuSan systems, and keep such systems well maintained and monitored, so as to achieve sustainability of the SuSan technologies and services.

Conclusions and recommendations

This study investigated various options for exploring alternative funding sources at both community and institutional levels to scale up SuSan technologies in the study area and other parts of the country. Based on the perceptions of stakeholders and local communities (and secondary sources), several options for increasing future funding of SuSan have been identified. Microfinancing schemes for SuSan technologies are available in the study area and can help in overcoming constraints related to the high up-front costs of these systems. Community awareness and understanding of such systems must be increased; however, it is questionable whether such public information programmes can reach the lowest-income households. Introducing technology to co-compost faecal matter in Mongolia's cold

climate has stimulated interest in creating businesses that deal with the recovery of nutrients from human faeces. Also, the successful introduction of a service fee for the collection of human faeces through an emptying service could be directed toward a self-sustained business model for the collection of human faeces from eco-toilets, which could significantly contribute to increase coverage of eco-toilets.

While no government-funded programme yet supports SuSan technologies, financial support from the government and political willingness to improve the infrastructure in the Ger areas are perceived as important factors in improving sanitation. Much effort in advocacy and awareness-raising activities is recommended to stimulate government support. In this regard a proper disclosure of all benefits and their monetary value could be very important in demonstrating that investments in SuSan can pay off. Building social capital among the Ger residents may also have added value in generating community funds for monitoring and maintaining the technologies and services at scale.

Although eco-toilets present potential benefits, their affordability and individuals' attendant willingness to pay is much lower than for pit latrines. Microcredit loans are available for installing eco-toilets, but communities have negligible awareness or understanding of them. It is recommended to further assess health-care costs and other hidden costs of unimproved sanitation to encourage government agencies to provide subsidies for scaling up SuSan technologies and services country-wide. Microfinance organizations, government subsidies and mining industries in Mongolia may be considered as potential sources of funding for replicating SuSan technologies and services. We recommend further exploration of the reinvented concept of corporate WASH responsibility in future studies on SuSan, developing a proper health-care system, and water resources management.

Note

1. A Ger is a yurt or felt tent which is a traditional house in Mongolia. Most people in the peri-urban areas live in such a Ger house, hence they are normally described as Ger areas.

Disclosure statement

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