Sector Guidelines

for Pre-Feasibility Studies on

SOLID WASTE MANAGEMENT

A. Introduction

1. Context

Cities Development Initiative of Asia (CDIA) Sector Guidelines describes the approach to pre-feasibility studies in the sectors most commonly encountered in CDIA support to cities. These guidelines are a sector-specific appendix to the overarching *CDIA Pre-Feasibility Study Guidelines* (CDIA 2011) that sets out the format, process, and output requirements in general.

The Sector Guidelines are not meant to replace terms of reference or to provide detailed technical input for consultants, who are assumed to be qualified and experienced professionals in their field and thus technically capable. These apply to the conduct of a pre-feasibility study (PFS) for a project or group of projects (hereinafter referred to as "the project") identified and prioritized in the plan and by the relevant authority for implementation.

These guidelines apply in the context of existing policies, visions, plans, and studies pertaining to solid waste management and other related issues. These address the approach expected of consultants engaged at the PFS stage as regards solid waste management.

2. Objective

CDIA support to the formulation of any solid waste management project aims to enhance the impact, sustainability, and inclusiveness of the project. This means that the project should

1. Comprise a viable component of *integrated solid waste management* that includes a holistic approach to provision of services and infrastructure, institutional capacity, environmental and social concerns, and economic and financial systems (see section B);

2. Be *inclusive* in the sense that stakeholders should be involved (i) to ensure a tailor-made and sustainable solid waste management system, accessible and affordable to all regardless of

income level, education, gender, etc. in the targeted areas, and (ii) minimize the risk of unfounded (investment) decisions and adverse impacts. Any risk of negative impact should be clearly communicated and measures taken to adequately compensate stakeholders (see section C);

3. Be *economically viable* and *financially sustainable* in that the economic rate of return on a project must be acceptable *and* that revenues, subsidies, taxes or levies, concession/lease revenue, microfinancing, grants/loans, community service obligation payments, carbon credits, or any combination of these must be capable of funding capital and operational costs, including long-term maintenance and capacity building in the various components of the project (see section D);

4. Be *environmentally sustainable* in that the proposed solid waste management system must aim to improve the existing environmental and health conditions *and* that adequate measures will be taken to mitigate any potential adverse environmental impacts of the project (see section E); and

5. Have *sound, transparent governance* arrangements enabling efficient planning, financing, design and construction, commissioning, and operation of the project (see section F).

B. Developing an Integrated Solid Waste Management System

The vision for any city in Asia must include an environment-friendly, low-carbon, integrated, and inclusive development. To achieve this vision, proper solid waste management is one central component. The introduction of an integrated solid waste management system must make use of the existing infrastructure and build on sound visions, policies, strategies and plans, not limited to waste management but all sectors that influence the performance of such a system. The proposed investment project must also be based on a sound policy and planning framework and within the relevant regulatory framework. There should be a user-friendly approach where the system is developed to meet the needs of people rather than focusing on the investment in advanced infrastructure as such. In case the framework is not adequate, or threatens the successful implementation of the project, the PFS should at an early stage identify the key issues and determine how they can be solved.

An overall assessment of the current solid waste management, strengths, weaknesses, and areas for intervention, should be made based on baseline data, and assumptions where data are not available. The PFS should address the following key considerations in an integrated system:

- **Service provision to all**

Waste collection services are vital to all and the PFS should carefully investigate, as far as possible depending on availability of data or other input, the actual provision of services, particularly to marginalized areas. The role of women in waste management should be recognized and the project adjusted thereto. The reasons for non-service must be examined and innovative solutions including alternative, tailor-made systems, and cooperation, for example, with the informal sector, nongovernment and community based organizations (NGO and CBO), and private sector should be encouraged.

The PFS should also, at least to some extent, study the mechanisms for waste collection and handling of waste from the private sector, hospitals, and other waste generators that are not part of the local (client) government's responsibility.

- **Appropriate technology**

The solid waste management project(s) proposed in the PFS should not be an isolated solution to a single problem, but be an integrated and logical part of a whole system, including the whole chain of events from the source to final treatment or disposal. Emphasis should also be put on the operation and maintenance of such a system, both in provision of funds and human resources, to ensure the sustainability of the project. The concept of appropriate technology should be adopted. This can include promotion of new, available technology (e.g., pyrolysis or gasification) and low-tech, labor-intensive solutions (e.g., composting) that meet the needs and suit the conditions of the area in question. The choice of technology or system can also depend on visions for renewable energy, green housing, climate change, etc.

- **Coordination with other development**

The solutions selected must also be coordinated with other infrastructure and development plans. For solid waste management, it is particularly vital to investigate the urban road network and conditions and how this will be developed or upgraded. The existence or plans of a wastewater treatment plant, for domestic or industrial effluents, will also have a bearing on decisions regarding the siting of new landfill or a biodigester, for example. As far as possible, given the limited time frame, the PFS must investigate these other plans and coordinate with the relevant departments as well as other stakeholders. Coordination with the private sector can lead to a mutual beneficial use of existing or planned infrastructure, e.g., energy supply from landfill gas extraction. By inviting the nongovernment or community based organizations (NGO/CBO) and informal sector, the choice of technology can be better founded, understood, and supported. The consultant should investigate if there is any other externally or nationally financed assistance in the sector and complement it.

- **Land use**

Strategic planning and the proposed projects in solid waste management must be coherent with land use plans for at least the next 15 years or more. Special attention should be given to the risk of locating a landfill or other waste treatment facility in an area that may be suitable and accessible today but will in a few years be too close to the expanding urban core, new housing development, an airport, etc. Any conflict in land use as well as the reduced value of land should be addressed and the proposed projects should be clearly presented, preferably with GIS.

Summary

- Review planning and regulatory framework to identify terms or gaps that may hamper the project and recommend approaches for policy to bridge these gaps.
- Identify the necessary building blocks in an integrated system—people's needs, appropriate technology, land use, human resources, and urban road network.
- Identify prioritized projects and necessary investments.
- Demonstrate, and quantify where possible, how the proposed project improves the environment, and living conditions of people, especially the poor and women.

C. Developing an Inclusive Solid Waste Management Project

The basis for an inclusive project would be to identify and invite all stakeholders to actively participate already during the planning process, for them, particularly the poor, to benefit from the project components. Gender aspects are crucial—women and children are more vulnerable to the adverse impacts of pollution, and women are often responsible for waste management in households, so they are vital to any development herein.[1] The overall aim is to develop a tailor-made and sustainable solid waste management system that is accessible and affordable to all, and to minimize the risk of unfounded (investment) decisions and adverse impacts.

The PFS should analyze the following:

1. Livelihood tied to waste management activities, particularly informal commercial activity connected to collection of recyclables at source or through scavenging the dumpsites, and how the project will affect this negatively or positively
2. New employment opportunities tied to project components and cooperation with and possibly formalization of the informal sector
3. Likely disruption to communities in terms of a relocation, division, noise, disruption of the visual context of important historic or scenic sites. The scale and cost of relocation should be estimated along with options for near-site resettlement (to minimize disruption to employment).

Changes to the design should be considered where (i) significant employment opportunities could be created and more easily accessed, particularly for low-income groups, or (ii) significant disruption could be reduced. Costs associated with the social impact mitigation measures should be included in the financial assessment (section D) and the associated management systems should be incorporated into governance arrangements (section F).

Summary

- Identify stakeholders for consultation at an early stage.
- Identify livelihood issues and design a project that will benefit as many as possible, especially the poor, directly or indirectly.
- Propose a project that will minimize disruption to the community.

D. Ensuring Financial and Economic Viability

1. Financial Assessment

The primary aim of the financial assessment is to make a realistic assessment, as far as possible, of the project costs in investment and operation and maintenance (O/M) project revenues, and possible financing schemes, either from own sources or external funds. It should be acknowledged that given the early stage in project design, it may be difficult to estimate investment costs in particular. For instance, the site selection and land acquisition have yet to be finalized, or the final choice of technology have yet to be further elaborated in a feasibility study or detailed engineering design study. However, the PFS should include this primary, early assessment to indicate to both local government and potential investors whether the project is worth pursuing.

[1] See ADB checklists on involuntary resettlement, indigenous peoples planning, poverty reduction, participation and gender and development.

It is vital for the viability of the project that consultants investigate revenue streams for each investment with a direct cost recovery component, whether it is based on user fees or revenues from energy production (landfill gas/biogas production), recyclables, compost, etc. Possible revenues should not be exaggerated. Recyclables may disappear before entering the formal system, and possibilities to actually sell organic fertilizer (from solid waste) may be limited. The assessment of affordability and willingness to pay on the part of each market segment in each investment should be rigorous and well documented. The possibilities of differentiated fee systems, based upon the polluter-pays principle and financial ability, should be investigated. The risk of noncompliance in payment of user fees and the possible measures should also be discussed.

Existing project cost estimates should be investigated so that new solutions, at reduced costs or better performance, etc., can be suggested. Costs should be benchmarked against average construction costs in country (preferably), or in a similar country. Costs should explicitly include social (e.g., relocation) and environmental mitigation measures.

Subsidies, cross-subsidies from leasing of property, community service obligation payments, and others should be assessed for their sustainability and legal enforceability. Clean Development Mechanism for investments, particularly for waste-to-energy/renewable energy through methane gas captured from landfills or biogas production should be investigated if considered viable and proven. Other credit/subsidies from international agencies should also be assessed based on prior experience with similar projects and, if necessary, on engagement of specialist expertise[2] to provide advice where such funding is crucial to the viability of the project.

The financial assessment should include cash flow, income statement, and balance sheet projections of any corporate or special purpose vehicle (SPV) entities involved in the financing and standard financial cost benefit analysis (CBA). The hurdle rate adopted for this latter should be the relevant weighted average cost of capital (WACC) for the sector and country, but where private investors are involved, market rates for return in equity and debt should be the benchmark for viability.

In particular, the assessment must include an analysis of the cash flow of participating local government(s) with project capital expenses and subsidies included to determine the sustainability of the project in relation to the likely revenue streams. Such an analysis should be the basis for discussions about alternate organizational structures for implementation (see section F). For example, public–private partnership (PPP) models can be used on unbundled, commercially viable, components of projects. Thus, such analysis should be done in a preliminary form early in the term of consultant engagement.

Summary

- Assess project investment and O/M costs, as far and realistically as possible
- Assess revenue generation, both direct and indirect revenue base, and willingness to pay.
- Adopt realistic return hurdle rates.
- Assess impact of project on (local governments) budget and use as basis for developing implementation options.
- Provide financial analysis for all relevant organization participants and adopt realistic return hurdle rates.

[2] ADB Clean Energy Facility can provide resources for assessments of Clean Development Mechanism.

2. Economic Assessment

The economic assessment in a solid waste management (SWM) project should include estimates of willingness to pay for services as a basic benefit yardstick, augmented by cost savings due to public health improvement, livelihood opportunities, more efficient land use, and increase in tourism among others. Special attention should be paid to the large informal sector in waste management and its economy, and how much people are paying for informal waste collection services. Livelihood issues should not be underestimated, but different models of engaging people in a comprehensive waste management system should be explored.

Benefits from reduced carbon emissions should also be shown in the PFS, adopting proxy values where necessary as set out in ADB's Guidelines for the Economic Analysis of Projects.[3] Care should be taken to avoid double counting, such as health and employment productivity increases. Shadow pricing of costs is standard and follows an established process in each country. Hurdle rates for economic assessment are routinely set by ADB and other agencies in each country. ADB standards should be adopted in the PFS where available.

Summary

- Estimate all significant benefits and disadvantages of the proposed project.
- Undertake economic assessment using established processes and hurdle rates in the country concerned using ADB standards where possible.

E. Ensuring Environmental Sustainability

Solid waste management projects would typically strive at improving the environmental and health conditions. The PFS should assess the impacts associated with the present system and how these will change after the proposed project implementation. The objective of the proposed PFS intervention is to maximize the positive impacts and minimize negative ones, if any.

Most infrastructure projects would eventually require the preparation of an environmental impact assessment (EIA) as a basis for an environmental or similar permit. At the PFS stage, a rapid environmental assessment (REA) or a rapid environmental impact assessment (REIA) may be required.[4] It is also vital that the requirements and the time frame for a full-blown EIA are identified already during the PFS stage to avoid delays in downstream work and unexpected investments costs for environmental protection measures.

In terms of reducing possible adverse environmental impacts, the process is similar to that adopted for social assessment. The proposed investments and facilities should be screened to determine (i) potential environmental impacts in terms of noise and pollution to communities; and (ii) potential impacts on water resources, forest resources, biodiversity, etc. as set out in ADB's environmental checklist.[5] Mitigation measures should be formulated and costed. The implications of these measures should be included in the financial assessment (see section D) and governance arrangements (section F) of the project. This includes the assessment of any positive or negative impacts related to climate change, mitigation through waste-to-energy approach, and needed

[3] ADB. 1997. *Guidelines for the Economic Analysis of Projects.*
[4] ADB *Rapid Environmental Assessment checklists for categorization of projects*
[5] ADB. 2003. *ADB Environmental Assessment Guidelines*. ADB. 2009. *Safeguard Policy Statement for environment, involuntary resettlement, and indigenous peoples.*

adoption measures, including alternative routes for waste collection or landfill design better adjusted to flooding risks.

Summary

- Estimate the environmental and health improvement expected from the proposed project.
- Estimate the proposed project's possible environmental and health-related risks and impacts, and the costs for mitigating these risks.
- Investigate possibilities to reduce greenhouse gas emissions or minimize the risk of increased emissions (mitigation), and if the project is part of adaptation measures.

F. Ensuring Good Governance

The institutional arrangements for implementing the project must be clearly described and agreed with the city government.[6] The ability to successfully implement solid waste management projects —achieving social and environmental benefits, avoiding and mitigating adverse impacts, and achieving financial sustainability - depends on a sound governance structure.

The PFS must include the following:

(a) Discussion of organizational options for design, construction/commissioning and operation, including the possibility of PPP options. Where such options are pursued, the organization structure for transparent oversight, monitoring, and regulating private operations needs to be considered. A monitoring system with clear and measurable key performance indicators must be discussed. In terms of services integration, the arrangements for coordination across sectors and facility providers need to be described. Stakeholders must be involved at an early stage, and their continued influence and input should be secured and institutionalized for the duration of the project.
(b) Consideration of how, and with what incentives, will the existing institutions and stakeholders change to the proposed arrangements.
(c) Consideration of the legal basis of each involved organization, its sources of revenue and responsibilities for expenditures (the two must match), and the hierarchy of authority across organizations (the legal basis of coordination).

For solid waste management projects, good governance and strong, long-term leadership commitment is crucial, considering for instance, that a landfill is often designed for a period of 30 years and needs monitoring for another 30 years. Fee collection (willingness-to-pay) and resistance to development of infrastructure (e.g., not-in-my backyard) are politically sensitive issues that will demand a good approach and responsible management in project implementation and long-term operation.

Summary

- Design of institutional arrangements must be thoroughly documented, encompassing the legal and financial bases of sustainable operation.
- A clear description of how we get from where we are now to the proposed arrangements is required.

[6] CDIA 2011 *Guidelines for Urban Governance and Institutional Development*

G. Institutional Strengthening

Solid waste management is an area where many actors in the public and private sector as well as nongovernment or community based organizations, academe, etc. are involved. The PFS team must, at an early stage in the project, (i) identify and assess the valid regulatory framework for handling of solid waste and possibly also wastewater sludge, industrial by-products, hazardous waste, and other aspects relevant to the terms of reference; and (ii) identify the legally appointed actors in the SWM area as well as the actual operators and stakeholders in the whole solid waste chain—from the source to final disposal. Note that the institutional strengthening and the overall sustainability of the project should benefit from a closer inter-departmental interaction, e.g., better coordination between various government offices as well as dialogue and synergies with external players.

The PFS team shall assist the client to design and form a reference group or other structure, and develop a communication strategy to ensure participation of key stakeholders throughout the duration of the project. Such a process will improve institutional capacity by fostering dialogue, setting joint priorities, and coordinating approaches to investment. Closer dialogue will enable faster and more accurate fact-finding and a possibility (for the local government) to elaborate on a better internal structure, including the extended lifetime of the reference group after the finalization of the project.

H. Capacity Development

Capacity development—on all levels from the top administration or governance level to households in informal settlements—is crucial in solid waste management.

The PFS must identify all stakeholders, define their respective responsibilities, present any potential capacity in the SWM area, and suggest a capacity development program that will match proposed projects and measures. This includes enhancing the skills in handling and monitoring an external operator in a PPP setup. The overarching goal is to create a sustainable system and ensure that investments in the sector are properly handled.

In many Asian cities, several international or national nongovernment organizations (NGOs) are active in public awareness and other capacity development programs. Although this is generally commendable and useful from an educational point of view, these activities are often isolated events and seldom coordinated with the local government programs on a long-term basis. The PFS team should strive to identify these actors and stimulate dialogue between NGOs, government, and private sector to ensure a common understanding and basis for action.

The PFS team should explicitly plan activities for capacity development and training, designed and conducted to address the local situation and needs, during the pre-feasibility study as well as part of a future capacity development program.

I. Conclusion

Although a PFS financed by CDIA will not support urban planning studies, it may help a city to concretize its city development vision, examine alternatives to solve its solid waste management problems, and recommend investments for further feasibility study and/or implementation.

The criteria for a successful CDIA PFS, derived from the above, can be summarized as follows:

- *Technical effectiveness*—the extent to which proposed investments solve the solid waste related issues and satisfy people's needs in a city;
- *Impact*—the extent to which the investments impact, positively or negatively, the livability of the area, efficiency of land use, the local economy, nearby natural resources, air quality, energy, and the urban transport network and access to services, among others;
- *Cost effectiveness*—the extent to which the costs of the investments are commensurate with their benefits;
- *Financial sustainability*—the extent that funds required to build and operate the preferred options are likely to be available and affordable; and
- *Equity*—the costs and benefits of the alternatives are distributed fairly across different population groups.