# Sector Guidelines

## for Pre-Feasibility Studies on

## WATER SUPPLY

*China Photo&Getty Images*

## 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 water supply and other related issues. These address the approach expected of consultants engaged at the PFS stage as regards water supply.

### 2. Objective

CDIA support to the formulation of any water supply 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 water supply* , including 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 safe and sustainable water supply system that is accessible and affordable to all regardless of income level, education, and gender in the targeted areas, and (ii) to minimize the risk of unfounded (investment) decisions and adverse impacts. Any risk of negative impact should be mitigated, 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 or lease revenue, microfinancing, grants and/or loans, community service obligation payments, carbon credits, or any combination of these must be capable of funding capital and operational costs of various components of the project, including long-term maintenance and capacity building (see section D);

4. Be *environmentally sustainable* in that the proposed water supply system must aim at an improvement of 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 Water Supply System

The vision for any city in Asia must include an environment-friendly, low-carbon, integrated, and inclusive development. The most basic need, access to water, whether for drinking, hygiene, or livelihood activities, must be secured for all people in the society. Rapid urbanization and economic growth put pressure on water resources, and climate change and extreme weather conditions add to the challenges of sustainable water supply.

To achieve this vision, it is imperative that both providers and water users—including households, commercial areas, government offices, hospitals, industrial sites, rural areas, and others—manage water resources in a responsible and sustainable manner. The PFS should suggest an integrated water supply system that makes use of existing infrastructure (if any) and build on sound visions, policies, strategies and plans, not limited to water supply 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. 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 discuss how these can be solved. An overall assessment of the current water supply system, 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**

Access to safe drinking water is a basic human right. The UN Millennium Development Goals on sustainable access to safe drinking water and basic sanitation include a goal for 2015, “access to improved source of water,” which can be interpreted in different ways. For CDIA, the PFS must include first, planning for provision of safe, sustainable, and affordable supply of drinking water to the people, and second, water supply for other functions in the city. The term “access to water” shall

as far as possible refer to convenient access to water, not including standpipes far away from the households. The term ”sustainable” must include a reasonable regularity in water supply and secured for future needs.

The PFS should carefully investigate, as far as possible depending on availability of data or other input, for the actual provision of services, particularly to marginalized areas. Special attention should be paid to the risk of water contamination from sewerage systems, and in cases of flooding. The reasons for non-service must be examined and solutions recommended.

- **Appropriate technology**

In an urban setting, water supply is often centralized and handled by a provincial or regional government or the private sector. The PFS should aim at investigating available sources and their future availability, and design a treatment plant (if applicable) that considers future capacity needs, urban growth patterns, and land use in the entire water catchment area. A water treatment plant and distribution system is a long-term investment in static construction that may be difficult to change or adjust at a later stage. Thus, careful consideration must be made in the PFS to allow for flexibility as far as possible, to enable increased capacity or combine piped or non-piped connections, for instance.

The concept of appropriate technology should be adopted. This is particularly relevant for possible reuse of water, for example in industries, or for commercial district cooling, public parks, and agriculture, the latter being one of the most water consuming activities in society. The choice of technology or system can also depend on visions for renewable energy, green (eco-) housing, climate change, etc., and include simple low-cost solutions such as rainwater harvesting. If surface water from a lake or river is used, the need for chemical treatment is greater than if ground water were the source. Another concern is the need for electrical power - water treatment is energy intensive. The PFS should strive at reduced energy and chemical consumption and maximum resource utilization.

Special attention should be paid to the challenges in water supply for the poor in informal settlements, where installation of a conventional water distribution network is difficult. Small piped water networks, standpipes, on-site treatment, or other flexible solutions may be considered to allow for rapid and partly uncontrolled urban sprawl.

- **Integrated water resource management**

The PFS should focus on the urban water supply—how the water supply system should be set up in an urban setting. However, water management is often a regional or even transnational issue that cannot be handled in isolation by a local government unit. Water rights have been and will continue to be a reason for conflict between governments and other water users.

Whether the water source is ground or surface water, the quality and behavior of the water will depend on external factors, such as the water catchment area and its geophysical conditions, proximity to mountains or coastal plains, soil conditions, built or rural environment, pollution, erosion, climate, among others. Thus, the PFS must be based on Integrated Water Resources Management (IWRM) or Integrated River Basin Management and make use of existing studies, to the extent that it is reasonable and applicable to the studied urban area. This includes the need for close coordination with other local, regional, or national government stakeholders. The PFS may suggest projects that will require involvement by external stakeholders, e.g., riverbank rehabilitation or storage dams.

Water management is a highly cross-sector issue in terms of government offices and other key players. It may combine issues on drinking water, sewerage, and drainage and has impacts on the whole society, especially through its vulnerability to flooding that can seldom be predicted or controlled. It is affected by poor waste management, such as leachate from dumpsites that contaminates ground water, or illegal waste dumping in water bodies. Thus, the proposed projects in the PFS should be an integrated part of the whole system in harmony with other existing and planned infrastructure development. Given the limited time frame, the PFS must investigate these other plans and coordinate with the relevant departments and other stakeholders and explore possibilities for the private sector and the community to come in. The proposed project must also not collide with other interventions, financed by a foreign body or otherwise, but rather complement this development.

- **Land use**

The proposed water supply project must be consistent with land use plans. Special attention should be given to risks of contamination of water sources or to water distribution network due to other urban (or rural) development. The increased attractiveness and value of land after extending water supply to that area should be considered. Any conflict in water rights should be addressed at a very early stage.

***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, urban road network, housing, etc.
- Identify prioritized projects and necessary investments.
- Demonstrate, and quantify where possible, how the proposed project will improve the environment, and the living conditions of people, especially the poor and women.

## C. Developing an Inclusive Water Supply Project

The basis for an inclusive project would be to identify and invite all stakeholders to actively participate already during the planning process and for the poor in particular, to benefit from the project components. Gender aspects are crucial—women and children are more vulnerable to lack of water supply and subject to waterborne diseases as well as diarrhea. In many countries, women and children are responsible for collecting water and the family's destiny relies on the amount and quality of water collected.

The overall aim is to develop a sustainable water supply system that accommodates all contributing flows and water consumers, and is accessible and affordable to all with minimal risk of unfounded (investment) decisions and adverse impacts.[1] The PFS should analyze how lack of water supply affects people, their health, livelihood, limitations in land use and urban growth, and how the proposed project can contribute to an inclusive, safe development. The PFS should include water supply solutions for both formal and informal settlements, and investigate possibilities for the poor to contribute in community-managed systems. Employment opportunities that are tied to project components should be examined. If relocation is considered, disruption in basic services to the

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

affected population must be examined and measures to minimize such disruption suggested. Furthermore, possible disruption to communities in terms of a relocation, division, noise, disruption of the visual context of important historic or scenic sites should be examined. The scale and cost of relocation should be estimated along with options for near-site resettlement (to minimize disruption to employment).

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).

Public awareness should be promoted for *all* water users to understand the implications and risks connected with discarding hazardous liquid waste into the sewerage system, into water reserves and river basins, and the benefits of hygiene and responsible water management and conservation.

***Summary***

- Identify stakeholders and invite them 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 people.

## D. Ensuring Financial and Economic Viability

### 1. Financial Assessment

The primary aim of the financial assessment is to make a realistic assessment 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, choice of technology for water treatment must 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 is worth pursuing. In case a community-based water management system is considered, it will be much less costly in terms of investment and O/M, but more complex and unpredictable during the planning and implementation phases.

It is vital for the viability of the project to investigate revenue streams for each investment with a direct cost recovery component. The assessment of affordability and willingness to pay on the part of each segment of the market in each investment should be rigorous and well documented. The level of fees must not necessarily be set at cost but based on demand estimates, taking into account how much people pay informal vendors and other informal waste supply systems. The possibilities of differentiated fee systems, cross-subsidy, or tariff blocks, may enable service provision to also to the most vulnerable population, and should be investigated. Equity should be strived at. The risk of noncompliance in payment of user fees, nonrevenue water, 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 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 water supply investments, and other credit and/or subsidies from international agencies should 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 as well as a 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.

The financial assessment must include an analysis of the cash flow of participating (mostly local) governments with project capital expenses and subsidies included to determine project sustainability 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. For water supply, the private sector may also have an advantage of not being tied to municipal boundaries, and are free to extend its services anywhere and thus have a better basis for revenues. 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. Economic Assessment

The economic assessment in a water supply project should include estimates of willingness to pay—the economic value of water (e.g., how much is paid for informal water supply systems), augmented by externalities such as cost savings resulting from public health improvement and reduced time (costs) for water collection, and livelihood and investment opportunities due to more efficient land use and increase in tourism. 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.

[2] ADB Clean Energy Facility can provide resources for assessments of Clean Development Mechanism.
[3] ADB. 1997. *Guidelines for the Economic Analysis of Projects.*

***Summary***

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

## E. Ensuring Environmental Sustainability

Urban water supply projects would typically strive at securing access to safe drinking water, and water for other uses, e.g., hygiene, agriculture, and industrial and commercial activities. With partly uncontrolled urban sprawl and economic growth, the need for and extraction of water resources lead to environmental risks. The PFS should assess the impacts or risks associated with the present situation and define how this will change after the proposed project is implemented. The objective of the proposed PFS intervention is to maximize 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 permit or similar. At 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. For water supply, considering the complex water issues in a water catchment area, a comprehensive risk assessment must be made in terms of water rights, land use, water quality and flooding, in coordination with all stakeholders and based on regulatory framework and disaster preparedness.

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: (a) potential environmental impacts to communities; and (b) 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 or needed measure related to climate change, e.g. renewable energy production from water/sludge and emissions of greenhouse gases.

***Summary***

- Identify the relevant environmental regulatory framework and its implications on project implementation.
- 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 the potential for mitigating climate change effects and/or reduction of GHG emissions (or increase).

[4] ADB *Rapid Environmental Assessment checklists for categorization of projects.*
[5] ADB. 2003. *ADB Environmental Assessment Guidelines*.

## 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 water supply projects, achieving social and environmental benefits, avoiding and mitigating adverse impacts, and achieving financial sustainability, depends on a sound governance structure and valid national and local policies. This also includes governance of the water source as environmental reserve, for future livelihood and ecological services.

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 water supply projects, good governance is vital for a number of things - clarity of water rights and water-use rights, discipline and reliability in the system performance, long-term protection of water resources and public awareness on responsible water use, among others. High quality system performance requires experienced and highly skilled technical staff, and it may be a challenge particularly for local and/or provincial governments to keep these human resources. The obvious connection between paying for water and getting water supply is well understood, thus this is a good fundament for revenue collection, but it may be ethically difficult for a provider to put disruption of services to a poor household, for instance, in case tariffs are not paid. This process can only be successfully achieved if an open and transparent relationship between the service provider (water supply company) and service user and beneficiary (communities, citizens, civil society) exists.

***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.

## G. Institutional Strengthening

The PFS team must at an early stage in the project, (i) identify water rights and water governance boundaries; (ii) identify and assess the valid regulatory framework for water supply, water quality

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

and other aspects relevant to the TOR; and (iii) identify the legally appointed actors in the area as well as the actual operators and stakeholders, which may be in a relatively large geographical area depending on the water catchment area. Institutional strengthening and the project's overall sustainability will require close inter-departmental interaction.

The client shall then, supported by the PFS team, design a reference group or other structure and a communication strategy to ensure key stakeholders' participation throughout the whole 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

The PFS must identify all stakeholders, define their respective rights, roles and responsibilities, present any potential capacity in water supply management, and suggest a capacity development program that will match proposed projects and measures. The overarching goal is to create a sustainable system and ensure that investments in the sector are properly handled. This includes technical and environmental expertise with operational staff, and the ability to manage and monitor the operation, especially in a PPP setup. It also includes public awareness addressing among others, the pollution of drinking water sources or tapping sewage pipes for irrigation purposes, and respective health risks.

For water supply, the jurisdictional area for water resources is not easily defined and as water resources become scarce, conflicts likely become more common. In the PFS, such conflicts can be investigated if there is a need to bring together stakeholders from a wider geographical and institutional area to learn more about water resource management and water governance, etc. Coordination between the local government and/or the private operation and international or national nongovernment organizations (NGOs) can give synergies and a better impact.

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 concretize its city development vision, examine alternatives to solve its water supply 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 meet the water supply objectives of a city and satisfy the needs of the people;
- *Impact*—the extent to which the investments impact, positively or negatively, the livability of the area, efficiency of land use, the local economy, air, soil and water, nearby natural resources, energy, the urban transport network and access to services, etc.;
- *Cost effectiveness*—the extent to which the costs of the investments are commensurate with their benefits;

- *Financial sustainability*—the extent to which the 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.