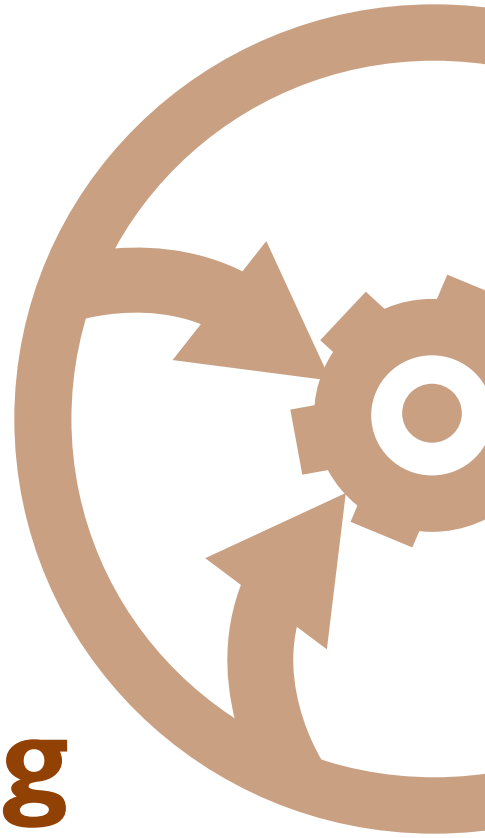
Chapter 5



Developing Commercially Viable Infrastructure Projects

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Developing Commercially Viable Infrastructure Projects

Developing infrastructure projects in a commercially viable format helps improve management efficiency, mitigate implementation risks, and attract commercial investment. Project development is the process of turning broad planning concepts for infrastructure into implementable designs. A *commercially viable format* (1) ensures that adequate revenues from project services and from other dedicated sources will cover project capital costs and operations and maintenance (O&M); (2) is socially inclusive and operates in a systemic and sustainable basis; (3) is environmentally sustainable; and (4) has a regulatory framework to enforce quality of service, preservation of public interest, and economic sustainability.

Strengths. A commercially viable infrastructure project addresses residents' demand for basic services in an economically and environmentally sustainable manner. The project structure will more effectively mitigate risks of implementation and provides better long-term management. As a result, the private sector is more interested in investing resources in projects structured in commercially viable formats than in projects relying on traditional, government-led methods of service delivery.

Weaknesses. Since commercially viable projects require in-depth studies, credit enhancements, and institutional structuring, they are more time consuming and costlier in their initial stage than traditionally structured government projects are, but their long-term benefits are far greater. Even with a project development process that encourages commercial viability, special consideration to include the poor in service provision is necessary, particularly in the absence of a regulatory framework that safeguards social and environmental public interests. Substandard government regulation and low implementation capacity create opacity that translates into unquantifiable risk for project developers and investors.

Key Things to Remember

1. **Identify the needs and objectives for improving service delivery.** A community's service delivery needs are crucial for developing a project concept. For infrastructure services, communities may want improved coverage (spatially across the city as well as hours of operation), better quality of service, and sustainability and efficiency of provision over the long term.

2. **Up-front analysis of local market conditions determines feasibility of commercial services and informs detailed project design.** Technical design needs to be based on the market demand for services, the willingness to pay tariffs for sustainable infrastructure services, physical development patterns, land values, and environmental sensitivities. The complexity of design needs to take into account long-term O&M, relative to local agencies' management capacity. These are key to defining a sustainable project structure. If these issues are not taken into consideration, investment could be wasted.

3. **Involve users and other stakeholders, including the poor, in the decision-making process. In many cases, the poor can afford, and are willing to pay for, improved municipal services.** And in most cases, the wealthy are willing to help cross-subsidize coverage for the poor. Both formal and informal parts of the city will continue to grow, and therefore, all parts of the city should be considered in infrastructure design for achieving true city-wide coverage. Increasing the customer base also generates more sustainable revenue streams to cover the full costs of services.

4. **Financial sustainability means that the full cost of services will be paid over the useful life of the infrastructure.** The financial structure stems from market demand and the willingness to pay for services. Tariffs need to be revised over time to reflect total costs, including compliance with defined environmental standards, service expansion and quality, ongoing operation and management, and depreciation and replacement of assets. It may be necessary to augment project revenues with other funding commitments from general revenues, governmental grants, and transfers.

5. **Consider private and public participation by assigning tasks to each party based on the best way to manage risks.** Large-scale infrastructure has many risks—technical, financial and operational—throughout the development, construction, and operation periods. Different institutional arrangements exist for allocating risks to the public or private parties that are best at managing them.

6. **Introduce competition, where feasible, to improve services and increase the operational efficiency of the service providers.** Competition generally produces better and more cost-effective services, so long as government considers the best value for money, rather than simply the lowest cost bidder, in its selection process. Because many municipal services are considered natural monopolies, not all service aspects can be bid competitively. But where a project mode can utilize competition, it is worth using a competitive selection process.

***This chapter** describes a standardized approach to developing commercially viable urban infrastructure projects in India, and describes the steps involved in identifying and managing critical risks. It highlights policy and regulatory issues, project-specific risks, and municipal capacity constraints, all of which affect project viability and sustainability.*

Articles in this chapter:

ARTICLE 5.1

Introduction to Developing Commercially Viable Infrastructure Projects

There is a wide spectrum of approaches to developing commercially viable infrastructure projects, from a narrow one that focuses on engineering design to a wide one that addresses ambitious goals, like city-wide coverage of all urban residents, including the poor. Some of the most ambitious projects may seek higher environmental performance and "green," energy-efficient technologies.

Commercially viable projects are capable of attracting private and institutional investment to pay for the capital costs. Repayment of this initial investment occurs over many years, and therefore, an owner needs to pay special attention to the long-term sustainability of the O&M of the infrastructure. For this reason, project risks need to be identified and addressed up front. Market demand is equally important to sustainability from the point of fully utilizing the services and paying user charges.

Even if private investment is not required, a rigorous project development process will help produce better infrastructure in Indian cities. This chapter presents the key issues that need to be considered when developing commercially viable projects. The chapter does not discuss technical specifications of projects because that is primarily an engineering exercise that emerges from the parameters outlined in this chapter.

Ask Yourself

If you are responsible for implementing projects

- What is the environmental and social impact of underinvestment in basic services? What are the main objectives for improved infrastructure services (coverage, quality, efficiency)?
- What are the financial and tariff implications of new infrastructure investment? How will O&M be paid for over time?
- Are commitments in place for ensuring cost recovery? Are project revenues supplemented with other commitments from the general revenues and/or governmental transfers?
- Does the proposed institutional arrangement allocate risk to the parties best suited to manage them? Does the structure encourage private sector expertise and commercial investment?

If you are responsible for setting policy

- Does the project have support from the public, government agencies, and private interests?
- How will the threats of political instability and special interests be handled?
- Are legal and regulatory frameworks in place to support efficient project structure, and do those frameworks address risks? Does capacity exist to enforce regulations?
- How can environmental protection and social inclusion be ensured?
- Does policy encourage more investment and accountability by local government? If not, what can be done to change that situation?
- How can government encourage user charges that recover full system costs on a sustainable basis?
- Are diverse public-private arrangements allowed under current legislation?

The Challenge for Project Development in India

Urban infrastructure projects routinely experience uncertainty and delays. Although the urban sector is growing tremendously, with investment demands near US$1.2 trillion over the next couple of decades, private investment is still limited. Financial professionals explain that weak local governments (discussed in Chapter 4) and high-risk projects are to blame. The main challenges to developing good projects in India are imperfect data, minimal tariff reforms, frequent transfer of senior officials, and limited municipal capacity. These are compounded by poor enforcement of environmental regulations and standards, and the absence of legal consequence for cities. Air, water, and soil pollution continue to increase. Poor communities continue to be excluded from city-wide service networks.

Traditional Project Development Is Outdated

Although large infrastructure projects are often risky by nature, certain structures can help mitigate risk better than others, thereby increasing the chances of success. Unfortunately, India's traditional method of developing projects does not adequately address project risk. Under its centralized development model, from independence to the mid-1990s, the central government earmarked money for specific sectors. State governments also provided budget allocations for urban infrastructure, and both politicians and civil servants decided how the funding would be spent. Budget allocations accounted for more than two-thirds of the money spent on urban services. The other third came from government-backed financial institutions that made loans based on a national credit scheme, directed to priority sectors. Centrally directed credit, along with state guarantees, acted as a disincentive for employing rigorous financial analysis on project proposals. In addition, service providers adjusted annual revenue shortfalls against next year's budget transfer, further undermining good financial management and tariff structures.

Engineers in state-level agencies or local governments developed technical proposals and submitted them to state government for funding. With erratic budget transfers, funding requests often fell short of the estimated cost, and projects would have to be curtailed or spread out over many years. As a result, work tended to be implemented piecemeal, through many small contracts. Over time, numerous, overlapping contracts led to coordination problems, delays, and cost overruns. It also made performance monitoring very difficult, as was the case in Navi Mumbai's water and sewerage operations before the FIRE (D) Program helped them develop a performance-based contracting system in 2003.

Consequently, the system was inefficient and risk-prone. This became particularly apparent when, on the one hand, there were not enough funds for projects, while, on the other hand, agencies could not absorb the funding already available. Fund utilization was approximately 80% in 1997.[1] Projects were limited in scope and focused primarily on crucial needs or high-profile areas of the city.

The system unraveled as urban populations grew disproportionally to dedicated budget allocations for infrastructure. For many years, central and state governments focused on rural development and missed the urbanizing trends unfolding across the country. Now, government resources, including staff capacity, have difficulty confronting the infrastructure needs. The alternative that the FIRE (D) Program promotes is to develop projects that can attract commercial investment and private sector participation.

Determine True Costs of Services

If local infrastructure projects are to access commercial investment from financial institutions, capital markets, and private firms, it is important that services be delivered on a sustainable basis. Central to this is the need for determining the true cost of service provision after factoring in O&M costs, asset depreciation, environmental degradation, and social objectives. Ironically, tariff subsidies are justified in the name of poor, although the poor are not usually connected to the city networks as legal users (despite often having the ability and willingness to pay). Further, since revenue shortfalls from low tariff rates are met through general taxes and grants, resources get diverted away from necessary pro-poor programs, such as primary health and education.

Given scarce resources, city managers not only need to plan and prioritize projects better (see Chapter 3), but projects have to be designed more efficiently and self-sustainably. Many Indian cities are trapped in a vicious cycle of weak finances producing low investment in services. This results in inadequate service delivery, and then limited ability to charge users. The challenge is compounded by high levels of poverty throughout the country.

While no institutional arrangement can substitute for general economic conditions, a well-structured project that adequately manages risks can still attract private expertise and commercial investment. The vicious cycle of weak urban performance can be broken.

1 National Institute of Urban Affairs, 1997, *Financing Urban Infrastructure in India,* New Delhi, India.

Uncertainty Leads to High Project Risk

Whether or not private sector financing and management of infrastructure is desired, holistic project development has become very important. This is underscored by the fact that new projects are slow to take off, have spotty implementation rates, and have difficulty achieving the desired performance. These common problems are traditionally handled in a very reactionary crisis mode, rather than anticipated from the onset. The Sangli case discussed in Chapter 2 is just one of many challenging examples across the country. Pune's US$185 million water supply and sewerage project that the FIRE (D) Program helped structure is another example. The project was cancelled after the commissioner, who was the local champion, got transferred. The local government council reviewed the project costs and expressed concern that they were too high. The council thought consumers would have to pay too much to ensure that a private operator received a sufficiently high rate of return. Furthermore, there was apprehension that an international firm would potentially win the contract. Ultimately, neither the political establishment nor the public understood the project structure, even though it was viewed as a model for the country.[2]

There are big challenges in each step of the process of developing infrastructure projects. Many arise before the detailed design stage. Well-developed projects identify risks up front, and then design the institutional arrangements, the financing package, and the contractual agreements to best mitigate and manage those risks. Risks vary across project type and location, but the five basic categories remain consistent, as shown in Table 5-1.

2 Water and Sanitation Program, 2000, *The Cancellation of the Pune Water Supply and Sewerage Project*, Case Study 23723.

Table 5-1. Major Risks Associated with Infrastructure Development

When in the development process these risks are most important →				
Private Partner Selection Risks	**Pre-Development Risks**	**Financing Risks**	**Construction Risks**	**Market Risks for Users and Developer**
Track record in use of public and bank funds	Difficult to finance early design work	Commercial viability of project	Cost/time overruns	Local economic conditions/ demand uncertain
Track record on other projects	Political opposition	Capacity of lender to evaluate project	Changes in labor/ material costs	Rising interest rates and inflation
Internal business operations/processes	Government stability over life of project	Repayment from developer	Contractor failure	Tariff/user charge revisions
Financial strength of project sponsor	Environmental problems	Credit available on viable terms, i.e., financing costs	Developer goes bankrupt	Customer relations, including expanding users
Appropriateness of designs for local market	Community participation/opposition		Developer's access to funds on a timely basis for construction	Maintenance of new assets
Contract management strength	Site selection and regulatory approval delays			

Project risks can be categorized by when they occur in the infrastructure development process. For example, although the financing risk occurs when a project is ready to seek funding (whether government or market), the funding considerations should be analyzed while designing the infrastructure and implementation structures to better match resources and costs. Similarly, long-term sustainability of the infrastructure will depend on the O&M system, including tariffs and customer relations. Considering the risks up front, even for those that occur later in the implementation process, helps to plan for and mitigate the most commons ones. It also allows risks to be allocated to the institutions that can best manage them. For example, it would make sense for a public agency that authorizes construction to also manage the permit process and access the required land. That agency can manage the risk of delays in this sphere much better than a private sector partner.

Overall, the risk categories are well understood, but many governments neither analyze them in the local context nor have the capacity to do so. In many cases, a proposed project structure is based more on local tradition or current trends than on the best modality to mitigate these risks and achieve the best results. This is why the FIRE (D) Program and its partners have tested many project structures over the last 17 years and disseminated the experiences throughout the country. As awareness improves, and others try to replicate project models, the sector as a whole can deepen and become more sustainable.

Technical Diagnostic on Project Development

Know the Local Market Conditions

One of the main reasons that project risks threaten the development process is the lack of attention to local market conditions at the onset. By not incorporating market demand into project development, infrastructure becomes reduced to an engineering exercise that overlooks how the community will utilize the services, how good O&M will be ensured, and how the system will be financially sustainable. If local risks are identified early, they can be addressed more substantially. Since 1994, the FIRE (D) Program has focused heavily on these aspects and promoted key reforms. Over time, the project expanded its focus on commercially viable demonstration projects to encompass policy and governance issues, such as enhancing municipal financial and managerial capacity. The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) has expanded much of the FIRE (D) Program's agenda into more than 60 cities.

With time, a working definition (see the following section on "Defining Commercial Viability") of commercial viability for municipal infrastructure projects emerged based on practical experience and a growing understanding of municipal governance, infrastructure, and financing. The FIRE (D) Program advocates for projects to be framed within the context of a city's overall investment decisions for service improvements. For example, in the water sector, it is likely that immediate benefits would result from reducing the non-revenue water. Initiatives to improve system efficiencies must complement efforts to augment capacity. Considering both types of investments together will influence the sequencing of projects, the levels of investment required, and the need to revise user charges. The success of these decisions, however, requires clear linkages to improved efficiency in operations and institutional management. Project development with a commercial format requires an analysis of these issues up front, and provides flexibility to undertake institutional reforms.

Defining Commercial Viability

- Investment structures generate adequate revenues from project assets and services and from other dedicated sources to cover project costs (capital, O&M, and obligations arising from any debt).
- Projects must be socially inclusive (e.g., cover the poor and other marginalized segments of the city) and be conceptualized within the context of a systemic and sustainable management approach for service provision. Services for the poor should be supported with a mix of targeted subsidies, output-based aid, microfinance, and awareness programs.
- Projects must be environmentally sustainable and ensure a proper risk management framework.
- Institutions operating on a commercial basis require a proper regulatory framework to ensure quality of services, preservation of the public interest, and economic sustainability.

After building national consensus on these issues, the FIRE (D) Program utilized this definition of commercial viability as a main objective for developing infrastructure. Progress has been made. By helping local governments and utilities raise Rs. 126 crore (US$27 million) in the Indian capital markets from 2005 to 2010, the FIRE (D) Program has demonstrated commercial viability of the sector; a substantial portion of projects can be financed through commercial investment.

Clarify Project Objectives

Project development faces unnecessary challenges when the objectives are not clearly defined and prioritized. Listing the objectives of a proposed project from the onset will help inform which challenges pose the greatest risks. Although each project has specific objectives, some common objectives for consideration include:

- City-wide coverage versus expanding services to targeted areas, such as slums
- Improvement of quality of services from health, safety, or environmental perspectives
- Efficiency gains from streamlining costs of services or reducing system wastages
- Reform of tariff structures, billings, and payment collections to achieve better cost recovery
- Creation of more customer-friendly operations by responding to complaints more quickly and adopting simple connection, payment, and grievance procedures.

Not every desirable objective can be attained in one project, since some solutions could represent tradeoffs in required investments versus sustainable financing. Examining local conditions vis-à-vis desired objectives will help define a good project concept and subsequent engineering design. For example, although expanding piped water supply to 100% of a city may be desirable, a dispersed layout and uneven development pattern of a city may make it cost-prohibitive in the near term.

There are good toolkits[3] available for defining and assessing local conditions that inform the project concept and risk identification. Table 5-2 illustrates some of the key variables for local analysis.

3 See Antonio Vives, Angela M. Paris, and Juan Benavides, 2006, "Financial Structuring of Infrastructure Projects in Public-Private Partnerships: An Application to Water Projects," Inter-American Development Bank, available at http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=904262. This provides an excellent toolkit on project development issues, including local risk assessment, structure modalities, and additional risk mitigation tools. Also see Ministry of Urban Development, Government of India, 2008, "Toolkit for analysis of Urban Infrastructure Projects for Public-Private-Partnerships under JNNURM," available at http://jnnurm.nic.in/nurmudweb/toolkit/10.ToolkitPP.pdf.

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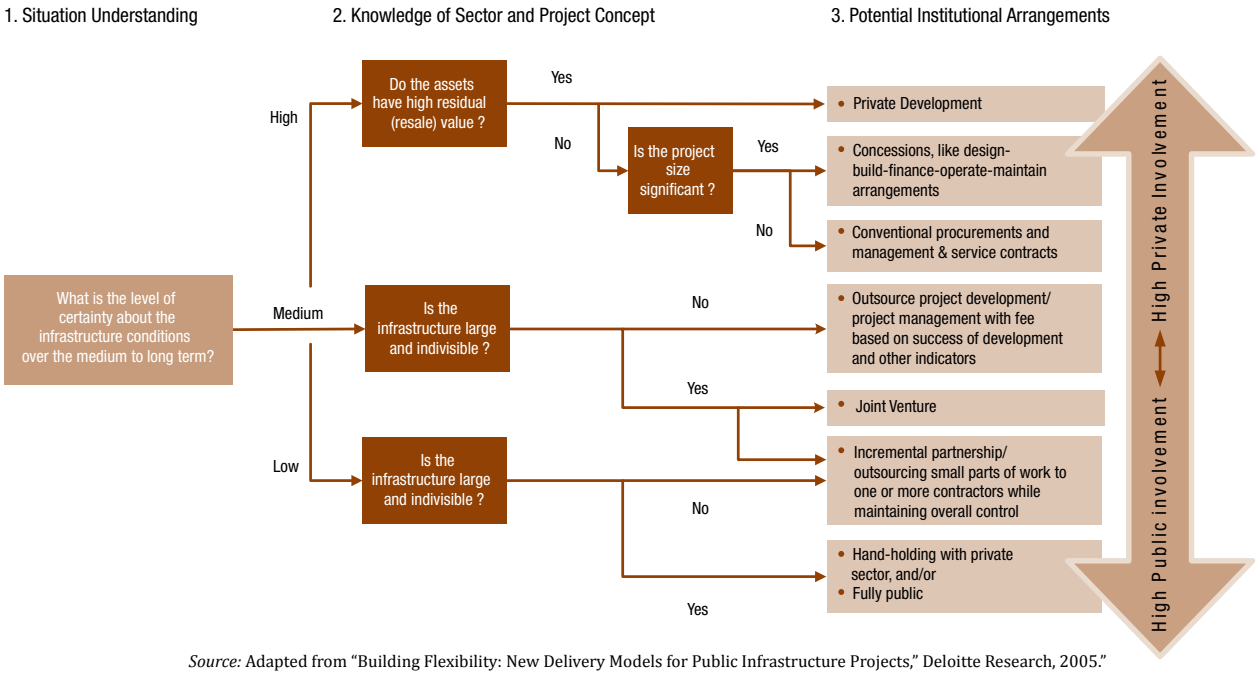
Table 5-2. Local Conditions Affecting Project Development

Variables	Defined As	Area of High Impact
Legal Framework	The capacity of the courts, the body of laws, regulations (including the existence of alternative resolution mechanisms) to enforce contracts	• Conflict resolution mechanisms • Legal treatment of water, water and sanitation infrastructure, and property rights, including collection rights and ability to enforce service suspension in the case of non-payment • Ability to seek recourse for breach of contract • Contract enforcement
Political Risk	The likelihood that a project will be significantly affected by a change in the political conditions of a given country or municipality	• Political interference with projects, including expropriation or partial expropriation, breach of contract, transfer, and convertibility issues • Collateral impacts due to civil unrest or war
Fiscal Space	The financial capacity and creditworthiness of the national and/or subnational entities to provide sustainable and credible support to a project	• Availability of public capital to expand service provision to new areas • Ability to finance ongoing maintenance of the infrastructure • Ability to support a project with a government-funded subsidy stream
Macroeconomic Factors	Economic volatility that includes the possibility of currency devaluations or high inflation as a consequence of international shocks or unsustainable macroeconomic policies	• Devaluation and other macroeconomic events that affect the economic viability of a project as well as its value
Institutional Capacity	Institutional capacity refers to four general topics: (1) the existence of a reliable water and sanitation sector regulator; (2) its capacity to implement the regulatory framework; (3) the quality of sector authorities to provide technical support to evaluate and develop projects; and (4) the prevalence of corruption in the country and water and sanitation sector	• The ability to set, enforce, and monitor a rational regulatory regime, including the tariff regime • Lack of local capacity and technical knowledge that can affect how the project is implemented • Corruption levels affect accountability, transparency, and trust, reducing investor confidence
Willingness to Pay	The beliefs and attitudes regarding water as a naturally free commodity, the acceptance of private services for utilities, and/or acceptance of foreign investment; this definition goes beyond the existence of an economic demand for water and sanitation	• Ability to pay • Ability of service provider to collect and set tariffs on a cost recovery basis • Additional resources available to "lifeline" tariff rate and service levels for the poor
Tariff Sustainability	Consumer ability to afford the full cost recovery tariffs for water and sanitation provision	• Affordability of tariffs for consumers will have an impact on the long-term sustainability of a project and the method used for structuring it (e.g., to involve shadow tariffs, subsidies, output-based aid)
Size and Location	The effects of the size of a project and its location on decisions regarding asset ownership, project modality, exit strategies, and configuration of a specific project's structure	• Size can affect access to investors and to business resources provided by a sovereign or sub-sovereign government • Location in urban, peri-urban, or rural areas can define the type of providers that efficiently supply water and sanitation services

Identifying these and other local risks establishes an initial diagnostic, which eventually feeds into the technical design of infrastructure and the broader implementation structure. The diagnostic or situation assessment describes key parameters affecting infrastructure development. Figure 5-1 applies this understanding to determine how much government versus private sector is appropriate. This initial assessment helps narrow the options for an institutional arrangement—whether fully public, managed through a public-private partnership (PPP), or handled completely by the private sector.

Figure 5-1. Determining the Level of Public versus Private Involvement in Infrastructure



Source: Adapted from "Building Flexibility: New Delivery Models for Public Infrastructure Projects," Deloitte Research, 2005."

Although illustrative in nature, the decision tree in Figure 5-1 helps narrow the structure options before engaging in detailed analysis. Engaging the private sector effectively, no matter what type of institutional arrangement, requires good contract formulation and management on the side of government. To fully benefit from private sector participation or even to take full advantage of more traditional implementation modes, government officials need to ensure that the terms of a contract are fulfilled, first by understanding the contract and then by monitoring the progress and evaluating results. A contract can be properly managed if the manager has a very good sense of the project parameters, even if all the associated technical skills do not exist in-house (see Article 5.8).

The ability to "outsource" multiple parts of a project is one reason why PPPs can be attractive for infrastructure development. However, a very limited understanding of the infrastructure parameters can mean that public agencies will actually have to be more involved in the process, because key decisions can only be made once new information arises. As is often the case, imperfect information lengthens the project development process and makes it less efficient (or even subject to failure). A slow, publically led process could be a necessary step for institutional learning. As Figure 5-1 shows, there are good hybrid examples of private sector experts leading local partners through the project development process and helping institutionalize the lessons.

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Pilot Projects: Design, Implementation, and Policy Reform

Although India had some experience in developing commercially viable projects in the power, transport, and telecommunication sectors by the middle 1990s, environmental urban infrastructure still utilized traditional public sector approaches. Now there are good demonstration cases in water, sanitation, and solid waste management, but substantial private sector participation and commercial investment is still not the norm. The FIRE (D) Program has tested several institutional arrangements and risk mitigation strategies to structure commercially viable projects over the last 17 years. Based on these lessons, the FIRE (D) Program established some useful tools for practitioners and policy makers.

Demonstration Projects Utilizing Commercially Viable Structures

- Local government implementation through an engineering, procurement, and construction contract and commercial finance in Pune, Maharashtra's water and sewer project
- Regional utility board accessing capital markets through a state infrastructure fund in Bangalore, Karnataka
- Concession contract for private sector delivery of bulk water supply in Tiruppur, Tamil Nadu
- Performance-based management contracting with private firms for water and sewer services in Navi Mumbai, Maharashtra
- Corporatization of public sector agencies in the states of Maharashtra and Orissa
- Unbundling solid waste management services for assigning individual components to private companies and public agencies in Asansol and Durgapur, West Bengal

The most important lessons of this pilot experience were highlighted in the "Key Things to Remember" section at the beginning of this chapter. No matter what institutional arrangement is chosen, local government needs to be more involved in infrastructure to make urban service delivery accountable to city residents and local politicians. Politics can play both negative and positive roles in the process, and systems need to be in place so that political pressure helps improve service delivery. For this reason, (1) stakeholder participation, with a focus on social inclusion; (2) market-oriented design; and (3) local government accountability are all important governance features of developing commercially viable projects. But without technical capacity, local and state agencies cannot be expected to replicate the pilot activities on a larger scale. To facilitate this replication, as an essential first step, the FIRE (D) Program created several project development tools.

- **Financial Prefeasibility Study.** To help identify a project concept, and to rapidly assess whether it can be developed in a commercially viable format, the FIRE (D) Program created a concise toolkit that provides a standardized approach to conducting prefeasibility studies, along with specific considerations for water and sanitation projects.
- **Market Demand and Willingness to Pay Study.** To determine the preferences of residents, how they value improved services, and what they are willing to pay for them, a market demand study needs to be conducted. This study surveys various customer classes and helps establish detailed tariff categories and rates.
- **Appraising Commercial Viability.** In partnership with financial institutions, the FIRE (D) Program established an appraisal format that incorporates the project concept and market demand study to assess risk. Here, the focus is an institutional credit assessment and a risk mitigation plan.
- **Environmental Impact Assessment (EIA).** It is often assumed that environmental infrastructure projects have only positive impacts on the environment. However, large-scale projects can be very disruptive to the environment in both the short and long terms. An EIA develops strategies to mitigate negative externalities and encourage positive design elements.
- **Procuring Urban Services.** It is important that local governments can access the technical support they need to augment their internal capacity. Procurements utilizing the best-value-for-money approach help ensure access to the best services at the right price.
- **Contract Management.** Even if local governments decide to procure external support for developing infrastructure and managing services, in-house staffs still need to be heavily involved in the work to ensure that all parties are adequately fulfilling their obligations. Good contract management helps resolve problems as they arise and keeps the work progressing in the most efficient and effective manner.

Table 5-3. Confronting Project Development Challenges in India

Pilot Work	Lessons Learned	Pending Issues	See Article
Prefeasibility Study	Provides an invaluable rapid assessment tool, but often requires data that are not readily available locally. Even at this early stage, there needs to be political commitment, stakeholder involvement, and a funding mechanism to build support.	Donors utilize this tool more than local governments at this point. With legally fragmented institutions providing urban services, local government has not taken the initiative required to lead this.	5.2
Market Demand and Willingness to Pay	Essential part of any quality infrastructure project, no matter whether it is implemented in a commercial format. However, there is no guarantee that economic conditions will not change in the future to affect the customer base.	More time and effort needs to be made surveying the community, identifying different income groups, and understanding legal issues affecting service connections.	5.3
Appraising Commercial Viability	The appraisals analyze the lessons of the market studies to provide government and financial intermediaries with an assessment of the proposed project. It is useful for building support for a project and attracting commercial investment. It is also helps focus the design team on critical issues that they might not have otherwise considered.	Might be viewed as an exercise that financial institutions undertake, not the project team. Engineers benefit from the studies but are not necessarily the right people to conduct them. Quality varies tremendously.	5.4
Environmental Impact Assessment	Should be completed as a complementary exercise with engineering work so that design can anticipate and mitigate environmental impacts. This avoids delays due to any extensive technical revision. Public engagement during the EIA process helps prevent social conflict.	Not required for most environmental infrastructure. Assumption of solely positive environmental impact is ill-founded. Environmental improvement should be a core objective of many urban infrastructure projects.	5.5
Testing Project Structures	Fully private concessions, especially with international bidders, are politically difficult at this time. There needs to be an appropriate transition out of entrenched public agencies delivering low-quality services. Corporatization, performance management, and other hybrid structures provide feasible combinations of private sector efficiencies and government involvement.	Changing the institutional arrangements is challenging due to unstable leadership, lack of required resources, and inhospitable legal backing. Multiple levels of government and parastatal agencies add complexity. A mechanism for long-term technical support is required.	5.6
Procuring Urban Services	A good procurement process, based on best-value-for-money, helps access the right services at the right price. However, no process is foolproof, and its integrity depends on the people involved.	Low- or least-cost approach commonly used by government entities often leads to the selection of inferior providers, particularly when procuring technical services.	5.7
Contract Management	Most local governments are not good at managing contracts, although it is necessary in modern cities. Staff require sector knowledge to manage contracts well and guide the work adequately.	Needs to be a key aspect of urban training for staff. Good contract management may require organizational changes in decision making and conflict resolution.	5.8

Policy and Regulatory Reform

Policy and regulatory structures vary across Indian states. Environmental infrastructure projects are affected by policies and regulations pertaining to the environment (e.g., water abstraction, pollution, and land planning and zoning), social issues (e.g., subsidies, slum rehabilitation, and land acquisition), and economics (e.g., grants, tariff-setting rules, and predictable revenue base). Many of the state and central policy reforms that the FIRE (D) Program supported—including local government authority to enter into contracts, legal and practical recourse for contract changes, access to capital markets, municipal finance, reforms under the JNNURM program, and even slum upgrading—affect how infrastructure projects are structured. In many ways, project development is defined by the policy environment, and, therefore, the institution responsible for coordinating project development needs to be well versed in legal and regulatory issues.

Since state governments, instead of central government, retain much of the regulatory and policy authority relating to local infrastructure development, the central government requested states to establish their own PPP-enabling legislation rather than create a national framework. Some states—Andhra Pradesh, Gujarat, and Punjab—introduced cross-sector PPP-enabling legislation. However, PPP provisions vary greatly across states and should still be considered fledgling. Under JNNURM, states have the option to pursue PPP reforms. If desired, one of the first steps, as articulated in the JNNURM PPP reform primer, is to establish enabling legislation in accordance with the Model Municipal Law, supported by the FIRE (D) Program.[4]

4 Hitesh Vaidya, 2009, "Encouraging Public Private Partnership" under JNNURM Optional Reforms, FIRE (D) Program/Ministry of Urban Development, http://jnnurm.nic.in/nurmudweb/Reforms/Primer.htm. For an assessment of PPP experiences in water supply and sanitation, see Philippe Marin, 2006, *Public-Private Partnerships for Urban Water Utilities: A Review of Experiences in Developing Countries,* Washington, DC: World Bank and the Public-Private Infrastructure Advisory Facility (PPIAF).

Highlighted FIRE (D) Program Policy Work

Sector Reform under Maharashtra's Water and Sanitation Committee, 2000

The FIRE (D) Program supported the Sukhtankar Committee (Maharashtra State Water and Sanitation Committee) to prepare a sector reform agenda with the following emphasis:

- Performance measurements of existing assets
- Institutional restructuring
- Tariff revisions
- New capital grants transfer program to encourage rehabilitation works
- Reducing non-revenue water and improving energy efficiency in water pumping and distribution

In September 2000, the state government directed its municipal corporations and Class A cities (cities with more than 100,000 residents) to first conduct water and energy audits, and then to develop action plans to reduce unaccounted-for water. In the same resolution, the state announced a restructured capital grants program to fund this rehabilitation work. The new policy encouraged cities to utilize private sector participation and introduce a double-entry accrual-based accounting system.

Government of India, Supreme Court Case on Solid Waste Management, 2000

The FIRE (D) Program supported the Supreme Court-mandated, National Technology Advisory Group on solid waste management to analyze environmental protection, financing, and private sector participation. The work included a comprehensive evaluation of existing PPP experiences in the sector and lessons learned in delivery efficiency, existing private sector capacity, levels of commercial investment, government funding schemes, and legal impediments (including labor).

This report was used to prepare the Government of India's Tenth Five-Year Plan, which offered special central assistance for developing sanitary landfills and waste composting facilities under a newly announced Urban Sanitation Mission. Municipal waste management finally gained traction after the Ministry of Environment and Forest introduced the Solid Waste Management Rules, which mandated sanitary landfills. Many cities sought project funding under JNNURM, and a number of sanitary landfills are under construction (see Article 5.6).

Integrated Solution: Developing Commercially Viable Projects

The project development approach that the FIRE (D) Program recommends stems from pilot experiences over the past 17 years that have tested various institutional arrangements, all of which were embedded within the local Indian context. No matter whether the resulting project was fully public or privatized, the issues described in this chapter remain relevant. A project may not use outside investment, but following a commercially viable format for project development greatly increases the chances of successful implementation.

No strict separation exists between the planning activities discussed in Chapter 3 and the formal project development process discussed here. It is a continual and iterative process that depends on the level of detail required. The level of detail required at a city-wide planning stage is more conceptual because the purpose is to see how discrete projects fit together, how they contribute to the city's overall development, how local economic and land markets affect service demand, how to prioritize and phase long-term investments, and how to broadly finance the projects. As discussed in Chapter 3, the capital investment plan provides broad investment requirements based on conceptual scopes. During project development, the costs are detailed and reflect actual implementation requirements.

For the most part, the FIRE (D) Program structured infrastructure projects within a municipal finance framework with recourse to the city's general revenue sources, in specified situations. In this framework, cost recovery for the infrastructure service is linked not only to a specific project's revenue streams (e.g., water user charges), but also to the overall municipal finances. Therefore, revision in property taxes, connection charges, and other non-related fees can still enhance project viability. The municipal finance framework is justifiable on the grounds of high economic rates of return of environmental infrastructure, due to considerable public health gains affecting the whole city. In contrast, financial rates of return based solely on project revenues tend to be unviable due to historically low tariff levels. A municipal finance approach needs to be combined with gradual tariff reforms to improve financial sustainability, with the recognition that user charges should at least pay for O&M costs.[5]

When initiating project development, more than one project concept may exist; each has to be tested for feasibility. Alternatively, a project concept might still need to be defined. In either case, the issues discussed in the diagnostic section of this article provide a transition into the project development steps:

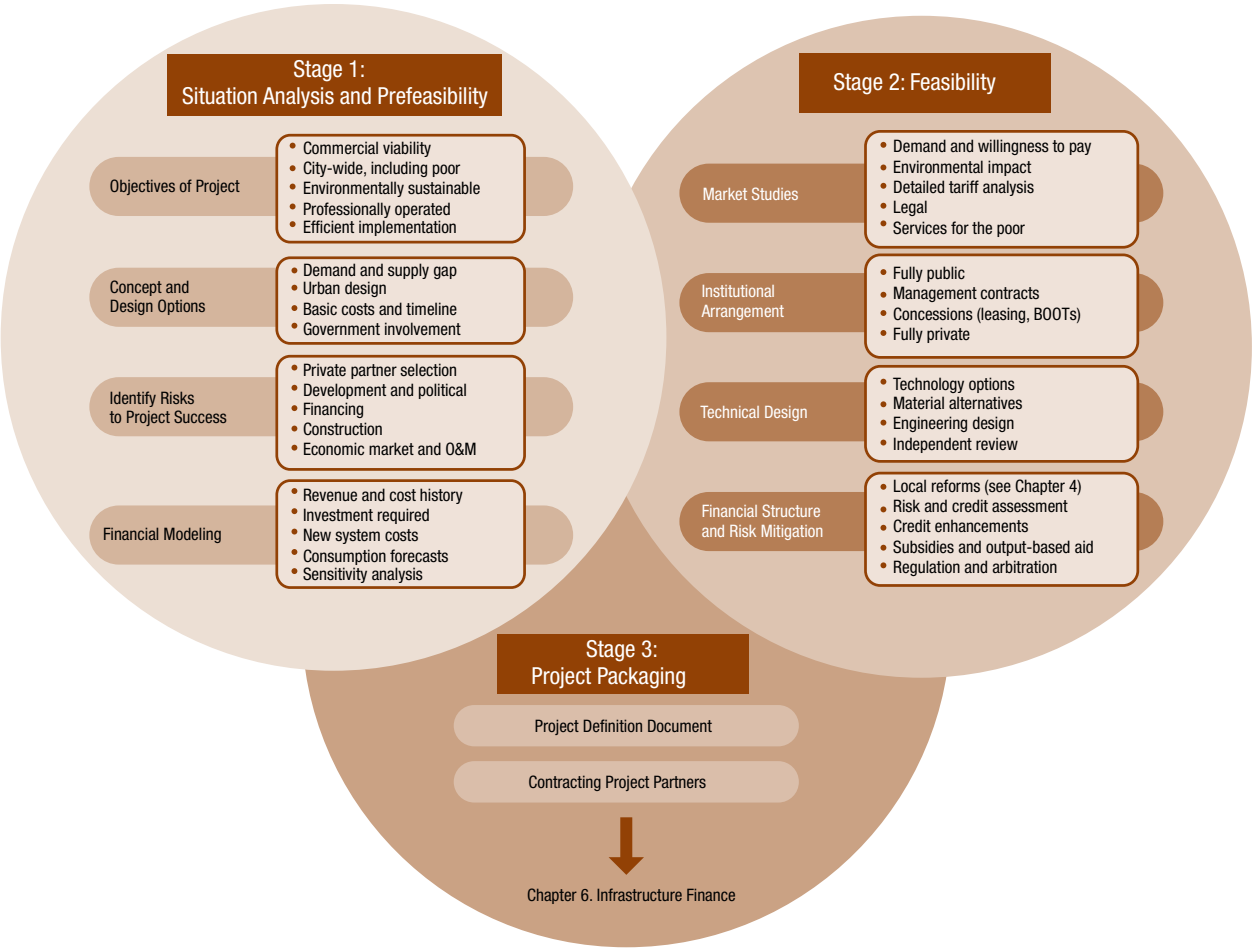
- Defining project concepts with basic costs
- Understanding that local conditions matter, and that varied risks exist with infrastru cture development
- Defining the objectives of the project clearly, with prioritization of those objectives
- Considering the appropriate decree of government and private sector in implementation
- Committing to exploring commercially viable project structures, with special consideration on how the poor will be served

The FIRE (D) Program's experience clearly shows that in addition to technical detailed project reports (DPRs), stronger situation and risk assessments should provide input into overall design. Furthermore, projects can significantly be enhanced by utilizing **market information** and **risk mitigation tools**. The combination of these elements defines much **stronger institutional arrangements** for developing better infrastructure services.

The process can be divided into three stages, as illustrated in Figure 5-2. The first is a situation analysis, which includes most elements that international finance institutions (e.g., the World Bank) refer to as prefeasibility. This takes the project concept and tests whether a commercially viable structure seems appropriate from a financial perspective. Based on the prefeasibility results, the second stage involves in-depth market and risk studies. These provide the necessary details for the technical engineering design and for structuring the institutional arrangements. From this work, a risk mitigation plan and financial plan are put in place for appraisal by potential investors. If investors express interest, the third stage "packages" all the project information for financial closure (see Chapter 6) and implementation. If the project is soliciting commercial investment, a legal review is also required before preparing bid and contract documents (see Chapter 7).

5 This is a key goal of the JNNURM reforms for service delivery.

Figure 5-2. Project Development Process for Commercial Viability



Stage 1: Situation Assessment Prefeasibility

Project Objectives. This stage relies heavily on inputs from the development planning process introduced in Chapter 3, particularly if a recent sector study has been completed (e.g., city sanitation plan). A sector study should provide project alternatives with a preferred option and broad costs. The project concepts stem from sector research—both secondary sources and field measurements—that includes: (1) demographic trends of the city, (2) economic development patterns with a focus on demand for services, (3) past performance of the service sector (coverage, quality, O&M, provision for the poor), and (4) current institutional arrangements for service delivery. It is very helpful to provide historical trends for all of these items to gain a better understanding of how the situation has changed. If this type of analysis has never been conducted, it should be the first step for a project development team, along with defining clear project objectives.

Concept and Design Options. A project concept emerges when there is a preliminary sense of the major challenges, performance trends, and objectives for improvement. The challenge will be to estimate the new investment required in a relatively accurate manner, while avoiding too much detail that could waste time. Basing a cost estimate on accurate network maps and a survey of similar projects (in other cities) will help the engineering team. Additional costs for servicing the poor and for environmental mitigation should be included at this stage, if possible.

Identify Risks. All potential risks should be listed and described at this point, based on the project concept, the scale of required investment, and past performance trends of the sector. This is also the point where the constraints and benefits of public and private delivery systems should be considered (see Figure 5-1). Altogether, the situation analysis provides a realistic project scope and explains what the major challenges are for implementation.

Conduct Financial Modeling. Financial modeling tests the potential for commercial investment. It incorporates the cost estimates of one or more concepts with performance trends of the sector, including historical revenue and expenditure patterns. Demographic and economic projections of the city provide an estimate of future required revenues and subsidies. To complete an initial financial snapshot of the project, typical lending and profitability parameters are specified. Any model might rely on potentially risky assumptions. Therefore, variations of the "base" scenario should be tested. The variations would likely include tariff revisions, cost and time overruns, and worsening economic/demand of services. The FIRE (D) Program refers to this as sensitivity analysis (see Article 5.2). The resulting report, called the prefeasibility study, should be discussed with all major stakeholders of the project, including potential project sponsors and financial intermediaries.

The FIRE (D) Program's approach emphasizes the need for "multiple champions" across all levels of government and within the urban community. In practice, a city commissioner's term might vary between 6 months and 3 years, and a commissioner's transfer, which can happen on a moment's notice, poses a serious challenge to the entire project development process. Thus, it is necessary to build broad support for the project among all relevant institutions. For urban services, this will include the local government (e.g., public works department, municipal commissioner, mayor, and standing committees); the state government (e.g., secretary of housing and urban development department, law department, finance department, and state cabinet); the relevant service provider, if not directly a government office (e.g., development authority and utility); and any local community that is directly affected. Discussing the prefeasibility study with the key stakeholders will test public support and political interest. This may help determine whether to move forward to Stage 2 (if there is a high degree of enthusiasm), or it may influence the type of market studies that will need to be completed. For example, if skepticism exists on whether residents would pay higher service charges, a rigorous demand and willingness-to-pay study would be a priority during the next stage.

Stage 2: Feasibility and Commercial Viability Appraisal

Market Studies. Some market studies are required to obtain detailed information for appraising a project's commercial viability. Other studies depend on specific local conditions or identified risks. For example, an EIA is not required by the Government of India for most water and drainage projects, but might be recommended if the project is large scale. A commercial investor may or may not require an EIA. The most typical studies include:

- Market demand and willingness to pay (see Article 5.3)
- Detailed tariff analysis (could be part of a market demand study and will be finalized during the project's financial structuring in Step 8 below)
- Environmental impact assessment (see Article 5.5)
- Institutional credit assessment to evaluate creditworthiness of existing/sponsoring institutions; this is not a formal credit rating, but instead, it informs the degree to which debt can be mobilized and whether a new institution, such as a special purpose vehicle, would have to be part of the project structure (see Article 5.4)
- Legal review of sector policies and enactments for service provision, regulation, and resource mobilization
- Service delivery mechanisms for the poor

Delivering Services within Slums

There are two angles for improving service delivery within slums. On the supply side, the FIRE (D) Program facilitates improved access by ensuring that city-wide infrastructure designs extend within slums and are coordinated with a city's slum upgrading program. In cities such as Thane, Dewas, and Bhubaneswar, the FIRE (D) Program conducted surveys within slums, prepared engineering designs for tertiary networks, and planned appropriate solutions. The project also works with local governments to explore options for subsidizing service connection charges for slum dwellers.

Secondly, on the demand side, the FIRE (D) Program works at the slum level to organize communities, assess demand, and mobilize household resources. Many households would like to improve their community's living conditions, but formidable legal, social, and financial constraints exist. Community mobilization helps organize slums to articulate their priorities, identify local solutions, work with government agencies on implementation, and access micro-financing. An example of this is the ongoing work in Bhubaneswar, in partnership with the Michael and Susan Dell Foundation and a local microfinance institution called BISWAS, to upgrade slum infrastructure within pilot communities.

Institutional Arrangements. Even in rich countries, most environmental infrastructure like water, sewer, drainage, and solid waste management cannot rely solely on project revenues. The revenue streams, even among well-run and independent utilities, are not usually adequate to pay for full capital investment and O&M. Government involvement continues to be important in many aspects of service delivery. Information from the market studies, along with the identified risks, helps determine the most appropriate institutional arrangement for service delivery. A full range of institutional arrangements, from fully public to fully private, is possible (see Table 5-4).

Appropriate Institutional Arrangements

- Targeted to current problems and based on better technical solutions
- Compatible with legal and regulatory framework prior to implementation
- Financially appropriate with realistic tariffs and other dedicated subsidies to cover costs
- Politically sound with broad support

Risk management in infrastructure projects is critical because the financing terms, management structure, and implementation process all reinforce one another. *The most appropriate institutional arrangement delineates and allocates risk to parties that exercise the most control over it, and are best suited to mitigate and manage it.* This step should describe how risk will be allocated to project partners and how the institutional arrangement will enhance service delivery. Once the preferred project structure is identified, a legal review and commitments from the participants are required.

Table 5-4. Description of Private Sector Participation Arrangements

Type of arrangement	Operator duties	Typical cost structure	Typical risks borne by operator	Operating asset ownership	Infrastructure asset ownership
Management contract	Manages services for the utility for a fee	Material costs + fixed fee + incentive bonus	Small—depends on the nature of performance bonus	Contracting authority	Contracting authority
Affermage	Runs the business, but does not invest	Fee based on volume of water sold + O&M costs	Significant—operating and commercial risks	Operator	Contracting authority
Lease	Runs the business, retains user fees, pays lease fee to owner, but no investment	Revenue from customers—lease fee	Significant—operating and commercial risks	Operator	Contracting authority
Concession	Runs the business and finances investment, but no ownership	Revenue from customers—concession feew	Major—operating, commercial, and investment risks	Operator	Contracting authority
Divestiture	Runs the business, finances investment, and owns the infrastructure	Revenue from customers—any license fee	Major—operating, commercial, and investment risks	Operator	Operator

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Technical Design. The proposed project should be feasible from the market demand, financial, and institutional points of view, before conducting a detailed, technical design, which is a resource-intensive exercise. The proposed project should also be widely vetted and supported before the engineering or architectural work begins. Some grant programs do not require full engineering specifications prior to funding applications,[6] but commercial investors do. Furthermore, in some of the institutional arrangements listed in Table 5-4, such as concessions, the private partner will be responsible for technical design. If this is the case, the technical design step will occur after tendering and contracting.

Most local governments and utilities do not have enough in-house design expertise to complete large-scale projects in-house. Procured technical consultants can prepare the engineering work that also includes a site-specific EIA (see Article 5.5). If outside services are procured, the local government's or utility's role is to oversee and guide the consultant's work. In addition, it is highly recommended to undertake an independent technical review of both the acceptability of all engineering specifications (technology, design, cost, and maintenance requirements), and the reasonableness of the project context (market demand, economic variables, and management structure). Although the FIRE (D) Program has provided design services, it usually acted as an independent reviewer of the engineering designs. Many times significant alterations in technology and design had to occur after an independent review so that project objectives could be met or findings of the market studies could be adequately incorporated. For example, in Thane's sewerage project, the FIRE (D) Program realized that the city's slums were not even labeled on a map, much less included in the project. The team showed how sewers could be successfully expanded to all the city slums, and how that addition was only a marginal increase to the overall funding requirements. In so doing, the FIRE (D) Program provided detailed design for each of the slums, along with a comprehensive financial plan.

Key Design Parameters

- Are design, layout, and locations sensible?
- Have technical alternatives been considered?
- Is the solution environmentally and socially acceptable?
- Are the technologies, equipment, and processes appropriate for the local conditions?
- Can O&M be properly carried out under the proposed design?
- Are materials locally accessible and cost-effective?
- Are cost estimates realistic, and have adequate contingencies been made?

6 JNNURM project funding does, but, as of 2010, Rajiv Awas Yojna for slum upgrading, under the Ministry of Housing and Poverty Alleviation, does not.

Financial Structuring. The technical design will change the estimated project costs used in the initial financial assessment. The results of the market studies and the preferred institutional arrangement will also affect the financial model, as will the initial feedback from financial intermediaries. As a result, the final step of the Stage 2 feasibility study is to integrate all the information together to ensure that the project is implementable and that the risks are mitigated.

A financial *pro-forma* integrates the information and is used to mobilize resources. It ties together a project's capitalized cost, implementation plan, construction and operational regime, and cash draw-down schedule into the anticipated financing structure. The financing will likely incorporate a mix of grants, equity, and debt, including necessary security arrangements, such as an escrow account, credit guarantees, etc. A financial advisor can help structure all these items.

This step includes a plan for financial risk management during construction, service start-up, and ongoing implementation. Before securing financing for the project, a city typically obtains a credit rating. Where a tax-free municipal bond issue is planned, the city is required to obtain approval from the Ministry of Finance, and to secure necessary clearances from the Securities and Exchange Board of India (see Chapter 6 for more detail on financing infrastructure). Most transactions structured with the help of the FIRE (D) Program have incorporated limited recourse to municipal finances as well as credit enhancement mechanisms, such as a project escrow account, transfer intercepts, or a United States Agency for International Development (USAID) Development Credit Authority (DCA) guarantee (partial credit insurance).[7]

In the case of the Tiruppur water project, the Government of Tamil Nadu committed a reserve fund to cover revenue shortfalls in periods of water shortages. It was set up as a non-lien account with an initial corpus equivalent to 6 months of revenue. In addition, the risk of collecting tariffs was mitigated through an escrow account under the New Tiruppur Area Development Corporation Limited (the special purpose vehicle created for the project). It included a revolving security deposit equivalent to 4 months of receivables. The local government provided an irrevocable letter of credit for 1 month. And industrial users, who represent most of the revenue base, provided 3 months of receivables as an up-front contribution.

In the case of the Greater Bangalore Water Supply Project, it is understood that the USAID DCA guarantee of $11.5 million over the 15-year term provided the final endorsement necessary to proceed with the pooled finance bond issue. The guarantee, which in particular facilitated the lengthening of the bond issue, demonstrated confidence in the Indian institution's ability to show fiscal restraint and better project management.

Credit Enhancement Techniques

- *Raise tariffs*
- *Decrease O&M costs through organization reform*
- *Increase equity investment*
- *Establish a reserve account*
- *Create additional sources of revenue*
- *Provide financial performance guarantees*
- *Create "mezzanine" financing/subordinated debt*
- *Extend debt term*
- *Obtain a government guarantee on a tranche or project debt*
- *Borrow with a grace period*
- *Defer principal repayments*

Source: Institute for Public-Private Partnerships

Stage 3: Project Packaging

Project Definition Document. The feasibility study helps make the decision to proceed with implementation, and defines the project structure. Before mobilizing financing or contracting with a private partner, all the components need to be packaged appropriately. Also referred to as a offering memorandum, the project definition document (PDD) incorporates: (1) all the market input from technical, financial, environmental, and legal consultants; (2) technical engineering designs, the construction schedule, the O&M system, and cost estimates; and (3) the financial and operating structures, including the institutional arrangement with a risk management plan, and a description of donor and commercial interest in the project. The PDD is used to solicit commitments from commercial investors. It is also the basis for developing a detailed contract with a private partner.

However, take note that the detail in the PDD would vary if an anticipated private partner is not already procured and in place. To mobilize construction and long-term financing (see Chapter 6), all contracts necessary to build and operate the project would have to be in place and ready to proceed. There is no rigid line between project development and infrastructure financing.

Contracting Project Partners. If the decision has been made to implement a project with private partners, the tendering and contracting process is completed before mobilizing finance. It is possible the private partner will invest its own equity into the project, although this has not been the main benefit of PPPs in India or globally. The main benefit has been more efficient and professionally run services. Depending on the contractual arrangements, either the public or private partner could access debt finance.

7 See Antonio Vives, 2006, "Financial Structuring of Infrastructure Projects in Public-Private Partnerships: An Application to Water Projects," Inter-American Development Bank, available at http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=904262. See pages 16-19 and Appendix C for details. For information on DCA guarantees, see USAID website, http://www.usaid.gov.

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With more substantial involvement from the private sector, it will be increasingly important for local governments to facilitate and oversee—rather than directly implement—projects. Better procurement, contract management, and performance monitoring are integral to institutionalization and forward progress in the sector. In the absence of effective regulation, both risk management and performance quality has to be governed through contracts. Negotiating and structuring appropriate contracts adds risk and time to the project development process (see Article 5.8).

Capacity Requirements for Developing Commercially Viable Projects

In recognition of the fact that few cities and states in India currently have the in-house capacity to conduct the type of analysis discussed in this chapter, many state governments have been setting up specialized project development entities to provide support in structuring viable infrastructure projects. These agencies have, in most cases, been structured to cater to all types of infrastructure projects, cutting across sectors. Some of these institutions are program management/implementation units under JNNURM, while others are more independent "funds" that combine finance with project development support. The most well-known Indian examples are the Tamil Nadu Urban Development Fund (TNUDF) for urban infrastructure and the Karnataka Urban Infrastructure Development Finance Corporation (KUIDFC) for the urban sector, both of which the FIRE (D) Program has supported.[8]

The FIRE (D) Program also helped establish state-level infrastructure funds in Maharashtra, Madhya Pradesh, Rajasthan and West Bengal, all of which are at various stages of start-up operations (see Article 6.5). Furthermore, the Asian Development Bank (ADB) supports several PPP cells within the Ministry of Urban Development.[9] The ADB also provides these cells with technical advisory support, which demonstrates an ideal role for donors moving forward. With consensus on much of how this project development process should work, the next challenge is building the capacity of cities and states through long-term technical support.

8 Other Indian examples include Punjab Infrastructure Development Board, UP Infrastructure Development Board, AP Project Development and Promotion Partnership, Gujarat Urban Development Company Limited, I-DECK, and Feedback Urban Infrastructure Fund.

9 In 2005, the Ministry of Finance instituted a Viability Gap Fund to demonstrate commitment to PPPs and to attract private capital and techno-managerial efficiencies to infrastructure projects that are economically justified but not necessarily commercially viable on user fees alone (see Chapter 6). In 2006, the Ministry of Finance established India Infrastructure Finance Company Ltd., a wholly government-owned financial institution to promote long-term debt for PPP infrastructure. (Both initiatives identify water as an eligible sector.)

Table 5-5. Capacity Requirements for Project Development

Functional Capacity Required	Personnel Required
Technical design and supervision	Environmental and civil engineers
Construction, operations, and maintenance	Contractors, environmental and civil engineers, O&M staff, and internal accountants
Credit rating	Credit rating agency
Loans and guarantees	Commercial banks, development financial institutions, bilateral and multilateral development banks, export credit agencies, capital markets, and private investors
Adequate insurance coverage during construction and operation	Infrastructure insurance providers
Economic, tariff, and regulatory issues	Economic/public finance experts, accountants, financial advisors, merchant or investment banks, and bond counsels
Procurement documents and contract agreements	Engineering, financial, and legal advisors
Security arrangements	Financial and legal advisors, and a fund trustee

Resources

National Institute of Urban Affairs and Fire (D) Program, 2002, *Project Development for Urban Local Bodies*, Training Manual, 16222, New Delhi, India.

FIRE (D) Program, 1996, *Pre-Identification Report for Urban Environmental Infrastructure Projects: Water Supply, Sanitation and Solid Waste Management*, New Delhi, India.

Mehta, M. and V. Satyanarayana, 1995, *A Rapid Appraisal Framework to Assess Commercial Viability of Urban Environmental Infrastructure Projects*, FIRE (D) Program: New Delhi, India.

Mehta, M. and V. Satyanarayana, 1995, *Pre-Feasibility Analysis and Report Formats: Volumes 1 and 2*. FIRE (D) Program: New Delhi, India.

Vives, Antonio, et al., 2006, *Financial Structuring of Infrastructure Project in Public-Private Partnerships: An Application to Water Projects*, Inter-American Development Bank: Washington, DC, http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=904262.

Ministry of Urban Development, Government of India, 2008, *Toolkit for Analysis of Urban Infrastructure Projects for Public-Private Partnerships under JNNURM*, New Delhi: India, http://jnnurm.nic.in/nurmudweb/toolkit/10.ToolkitPP.pdf.

The Way Forward

The process for developing commercially viable projects is now standardized and well known by financial intermediaries and investors, largely due to good experience in the power, transport, and telecommunication sectors. This experience has not universally translated to environmental infrastructure because the traditional government institutions that deliver services are financially weak and politically ingrained. This is changing slowly with several landmark demonstration projects, described in the pilot project section above. Furthermore, the project development process described in this chapter can help strengthen the sector. With application across multiple sectors, the process should become a mandatory training component for all municipal and state officials. This is not to say that officials will be able to, or even should, undertake the financial analysis or market studies in-house, but the process should be well understood by all.

Even if projects are not taken up with commercial investment, the project development process will help both policy makers and practitioners identify the risks and local conditions affecting successful implementation. Making the connection between up-front analysis and subsequent implementation can only improve infrastructure results over the long run.

The central government and the relevant regulatory authorities can encourage a commercially viable format for project development by requiring it for funding applications and clearances. This would necessitate revising DPRs and differentiating the more traditional engineering and construction documents from other key aspects of a PDD, such as market analysis, institutional assessments, and risk mitigation. To ensure a more efficient process, project development is divided into three stages with increasingly more detail. The stages correspond to the level of detail required for various funding applications. Grant sanctioning under JNNURM, for example, requires Stage 1 analysis (minus the financial modeling).[10] On the other hand, large infrastructure projects now expect contributions from local government. If local government tries to access commercial investments, the full project development process (Stages 1–3) will be required, with legally binding financial commitments.

Issues on the Horizon

Funding Project Development

- The project development process described in this chapter is relatively long and costly compared to the traditional approach (3%–5% of the total project costs). For large-scale projects, however, it is not a relatively huge cost. Still, project development is an up-front outlay that few investors will fund. Local governments may find it difficult to allocate the necessary amount from annual budgets. The FIRE (D) Program has supported institutional structures, namely, the national pooled finance fund and state-level infrastructure funds that include project development grants (see Chapter 6). However, these are not widely utilized to date. They need better integration into the infrastructure development process, although this may be difficult unless commercial viability is a main objective moving forward.

10 The 2010 revised guidelines for City Development Plans under JNNURM does include more rigorous financial analysis found in City Investment Plans (see Chapter 3), but not the project-level detail of Stage 1, Prefeasibility.

Better Regulations

- Environmental regulations need stronger enforcement mechanisms to drive investment in water, sewerage, and solid waste management. According to government estimates, only 63% of sewage in cities is collected. Two-thirds of all sewage is then released untreated into rivers, which has contaminated 75% of all surface water in the country.[11] In most cities, collected solid waste continues to be dumped in open pits. Although the environmental costs are staggering, it will remain a problem until a robust regulatory system is in place to regularly monitor performance and enforce better standards.

Professional and Accountable Management

- Without a commitment for professional and accountable management of urban services, developing projects in a commercially viable format will be a wasteful exercise. This is why improvements in urban financial viability are prerequisites (see Chapter 4). Performance monitoring, cost accounting, human resource development, and financial strengthening are all necessary inputs for building efficient organizations. Public accountability and regulatory oversight channel public demand for improved services. Over time, revisions in user charges have to build financial sustainability commensurate with improvements in service level and efficiency.

Pro-Poor Orientation

- Social inclusion and services for the poor should be approached in a city-wide and systematic manner. Although special assistance is necessary for the poor, infrastructure expansion into slums should be integrated into larger projects so that market demand analysis, supply augmentation, and financing can all be coordinated effectively. As necessary, use output-based aid, targeted subsidies, microfinance, and water-sanitation-hygiene education programs.

11 Central Pollution Control Board, India, 2009.

Recommendations for Developing Commercially Viable Projects

- Set clear goals and orient project development to achieve these goals. The project objectives need strong support and commitment from key stakeholders and the public at large.
- Base project structures on market conditions to achieve commercial viability and long-term sustainability. Combine normative goals with an assessment of market conditions to define the design concept. Ensure market demand and emphasize good project economics.
- Include all segments of the population, including the poor, in project design. Most people value improved urban services. The poor are usually willing and able to pay for services, although special considerations need to be taken, including flexible payment mechanisms, minimum tariff categories, and alternative legal arrangements for delivery.
- The optimal institutional arrangement and delivery system is based on local issues, like politics, regulation, legal enactments, and historical system performance. The prefeasibility and feasibility studies should convey helpful information about the appropriate project structure. The best institutional arrangements seek to mitigate risks while improving service delivery. Select a project structure that allocates risks to the parties best suited to manage them.
- Commercial viability means that O&M and capital costs are fully funded without jeopardizing service quality, customer coverage, or environmental protection. Ensure financial sustainability, and supplement project cash flows with alternative revenue sources. Finances have to be analyzed up front so that there is time to pursue necessary reforms and mobilize resources as appropriate.
- Incentivize management and delivery of services by utilizing contracts more effectively, and by strengthening institutional accountability and professionalism. Introduce competition where possible.

ARTICLE 5.2

Financial Prefeasibility of Proposed Projects

Financial prefeasibility examines the project parameters that are critical to establishing *commercial viability*.[1] When assessing prefeasibility of urban environmental projects, the FIRE (D) Program uses a two-stage process.

- Stage 1 examines the basic financial information related to a proposed project, within the context of the overall service network. Stage 1 provides an initial, rapid assessment. This article focuses on Stage 1 financial prefeasibility.
- Stage 2 is more time consuming and detailed. It undertakes studies on market demand, institutional arrangements, and risk mitigation. Based on these studies, more detailed financial models are developed to determine whether the infrastructure project can be implemented with commercial investment. Articles 5.3, 5.4, and 5.5 discuss the components of Stage 2.

Financial Prefeasibility: Rapid Assessment (Stage 1)

Stage 1 is a rapid financial assessment based on the proposed project concept and currently available information about the sector. It models what the financial impact will be on the overall service sector, in light of new investments. Since new investments in infrastructure usually affect existing parts of the system, it is imperative to assess the impacts relative to the overall sector. For example, most mass transit projects seek to relieve road congestion and increase mobility options for residents. The prefeasibility study assesses a project's impact on the overall transportation network. It should evaluate project costs relative to other modes of transportation and show how the new system will affect other modes (e.g., whether a metro rail reduces overall car usage). The prefeasibility study shows whether the project will fulfill its objectives, offer a cost-competitive and convenient alternative to commuters, and provide sufficient return on investment to support commercial financing.

Evaluating a project proposal within a broader context helps shape its technical design and financial structure to best match market demand. Financial intermediaries review the analysis to see if the proposed project will interest investors, and, if so, under what conditions. This analytical process is divided into the six steps shown in Table 5-6. It determines how a project can accomplish its objectives in a sustainable manner. In India, special emphasis is required for tariff revision, as the present levels are too low and do not usually cover operations and maintenance (O&M) costs of services.

1 Commercial viability means:
- Project or investment structures generate adequate revenues from project-specific assets and other general sources, including explicit and sustainable subsidies, to cover project costs, including the obligations arising from market-based debt.
- Projects must be socially inclusive (i.e., cover the poor segments of the city) and be conceptualized within the context of a systematic and sustainable management approach for service provision.
- Projects must be environmentally and socially sound and ensure a proper risk management framework.
- Institutions operating on a commercial basis require a proper regulatory framework to ensure quality of services, preservation of the public interest, and economic sustainability.

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Table 5-6. Steps to Determine Financial Prefeasibility

1. New Investments Required	Develop project concepts, and shape them based on service objectives and user preferences. This should be followed by a preliminary estimation of project costs for each option identified.
2. Consumption Forecasts	Identify consumer groups and estimate market demand, such as the number of connections (current and future) resulting from the project. Market demand will determine supply requirements. At this point, system inefficiencies (e.g., water losses) should also be estimated to arrive at a total consumption forecast.
3. Annual System Costs	Estimate annual system costs for both the existing and new systems. Specific line items include O&M; debt servicing of outstanding loans; debt servicing for the new project; depreciation all fixed assets; and other requirements, such as taxes and unanticipated major repairs.
4. Initial Revenue Requirements	Determine revenue requirements, given system costs and proposed investments. Indicate what the average tariffs would need to be to generate the required revenue. Compare the resulting figure to current tariff levels. While making this calculation, it is necessary to consider standard financial ratios, such as internal rate of return, return on equity, and debt service coverage ratio.
5. Gap Analysis and Additional Revenue Measures	If the initial tariff analysis is unrealistic (i.e., significant tariff revisions cannot occur in the short term), a subsidy will have to cover the shortfall to make the project feasible. Identify other revenue sources that will serve as the subsidy. These could be dedicated grants, general funds, or special revenue streams from local, state, or central government. This needs to balance the dual considerations of what the consumers will bear (for upper-, middle-, and low-income groups), as well as what subsidies are realistic.
6. Sensitivity Analysis	There are many risks associated with infrastructure development, such as time and cost overruns, which may undermine the project's financial feasibility. Test what the financial impact would be if project costs increased, construction was delayed, or expected revenues did not materialize.

Stage 1 findings are based on estimates about local economic conditions, consumption forecasts, and project costs. Past experience in the sector, as well as a survey of similar projects in other cities, can be very helpful. Because prefeasibility is rapid, much of the data might derive from the development planning process discussed in Chapter 3. With better planning practices, project assumptions become more valid, and it will be easier to evaluate commercial viability. Financial intermediaries appreciate this up-front work and use it to determine how the proposed project fits current lending and/or grant criteria. In fact, both the project development team and financial intermediaries use similar computer models at the prefeasibility stage to conduct the appraisals.

Calculating Financial and Economic Returns to Assess Performance

At the rapid assessment stage, the project development team models the performance of an infrastructure project to see if investors may be interested in participating. The initial assessment helps shape the project's structure and design to make it more commercially viable. There are four generally accepted indicators used to access financial viability and returns on investment for infrastructure projects.

1. **Internal Rate of Return** (IRR) measures the maximum financial return, as a percentage of total project investment, that would result in a net present value of zero (i.e., the level of return that would cause a zero cash flow in the project). The IRR covers the life of the project, and a project with a higher IRR is more desirable than a project with a lower IRR. Decision makers compare the IRR of a project against the prevailing cost of capital (discount rate) in the market for projects of similar risk profiles. At the prefeasibility stage, the IRR is an indicator of the potential profitability of a project, gauging the attractiveness of an investment given general market conditions and investment trends at the time. It can also provide insights into the need for subsidies. For example, a higher IRR may be required to attract capital for a project in a new sector that is perceived as risky compared to other sectors/projects. Subsidies or credit enhancements may be required to lower project costs, thus increasing cash flows and the IRR. Over time, as the image of the sector improves and is better understood, a lower IRR may be acceptable. IRR calculations can help evaluate different scenarios of cost, revenue, and other project variables (e.g., tariff changes, delays, technology, and subsidy availability) through sensitivity analysis.

2. **Return on Equity** (RoE) is a financial indicator of particular interest to private sector investors in public-private partnership (PPP) infrastructure projects. It differs from IRR in that RoE estimates only the return on the equity contribution of invested capital, after meeting all O&M costs, as well as depreciation and debt service payments. It also differs from IRR in that it is a measure only for a given period of time (specified number of years), rather than for the entire life of the project. Investors use RoE to indicate the performance of equity invested in a project, that is, whether it generates adequate returns compared to other projects in the same sector. As with IRR, investors will likely expect a higher RoE for new projects or those perceived as having higher risks, while a lower RoE may be acceptable for projects or sectors with a proven track record. Project developers will also evaluate RoE using financial models and sensitivity analysis to assess how changes in cost, revenue, and other project variables (e.g., depreciation rates, debt structure, and longer investment periods) affect the profitability of the equity contribution.

3. **Economic Rate of Return** (ERR) is a more complex indicator used to evaluate the social performance of a project, or how the project contributes to the wealth of a society.[2] It is different from other performance indicators because it considers how project costs and benefits affect society more broadly.[3] Governments and donor agencies use ERR to evaluate the opportunity costs of contributing scarce resources to one project/sector versus others. The project development team can use ERR to evaluate how changes to project costs and revenues will affect society rather than the investors, as is the case with IRR and RoE. For example, an increase in user charges may improve the project's IRR and RoE, but the additional costs to the beneficiaries (or government) may reduce the ERR[4] if that money could be better spent elsewhere. Conversely, certain projects can improve ERR even when users pay more for a service, such as the net health benefits of improved water and sanitation. Better public health reduces water-borne disease, and in turn leads to higher economic productivity. ERR parameters vary by sector, but analysts often examine a project's potential effect on personal income, job creation/retention, business output, or property values to evaluate the benefits of a proposed project over time, and in comparison to other projects.[5] An ERR evaluation can be used to modify a proposed project to improve its social performance, such as targeting marginalized communities or improving environmental outcomes.

4. **Debt Service Coverage Ratio** indicates the extent to which the operating profits/surpluses of a project (project revenues less O&M expenditures) cover debt service obligations in 1 year and over the life of the project. It helps potential lenders determine the credit risk associated with the project. A higher debt service coverage ratio means that there is more operating surplus to cover debt service payments, and therefore less risk for lenders. Investors and lenders will want to see a slightly higher ratio in sectors that are perceived as risky. Maintaining a particular debt service coverage ratio may also be a stipulation in a loan or bond covenant, and a reduction in it could trigger either a tariff increase or some other legal remedy.

Resources

Mehta, M. and V. Satyanarayana, 1995, *Pre-Feasibility Analysis and Report Formats: Volume 1: Stage I Financial Pre-Feasibility*, FIRE (D) Program: New Delhi, India.

2 Glen Weisbrod and Burton Weisbrod, 1997, *Measuring Economic Impacts of Projects and Programs*, Economic Development Research Group: Boston, Massachusetts.
3 Celicia Pérez de Castillo, 1998, *Economic Analysis of Social Investment Fund Projects*, World Bank: Washington, DC.
4 Aurelio Menendez, 1998, *Constraints and Opportunities for PPP Transport Projects*, World Bank: Washington, DC.
5 Glen Weisbrod and Burton Weisbrod, 1997, *Measuring Economic Impacts of Projects and Programs*, Economic Development Research Group: Boston, Massachusetts.

ARTICLE 5.3

Assessing Market Demand and Willingness to Pay for Infrastructure Services

Traditionally, urban services have not been subjected to market study because they were regarded as non-market, public goods. However, private sector provision of services is slowly emerging in many cities, in response to under-supply and poor-quality infrastructure. Private sector investment in the power and telecommunication sectors led the way in the 1990s, following regulatory reforms. Now, transportation has received considerable private sector attention. In a similar fashion, environmental infrastructure would benefit from in-depth market demand analysis. The water sector is the focus of this article.

Commercial investors are very concerned with market demand and customers' willingness to pay because these data can signal profit opportunities. Market demand studies are standard tools applicable to most urban services. Because they utilize surveying work and data collection, in-depth market studies require some resource expenditure. Therefore, the studies can be pursued if initial financial prefeasibility (Article 5.2) is favorable. Market studies provide valuable inputs for designing infrastructure in a more commercially viable way.

A standardized methodology now exists to help determine market viability for urban services by: (1) forecasting future demand levels, (2) identifying user preferences, and (3) determining customers' willingness to pay. This assessment helps identify the type of service improvements preferred by different consumer groups and provides accurate guidelines for tariff setting. It is therefore a key tool for service providers and politicians for initiating tariff reform. Nevertheless, it still remains politically challenging to reform tariffs and user charges in accordance with JNNURM.[1]

1 User charges need to be reformed to cover at a minimum O&M costs and potentially also capital costs.

2 The price elasticity of demand is a measure that describes the degree of responsiveness of the quantity of water to a given price change and is defined as follows:

$$ep = \frac{\textit{percentage change in the quantity of water demanded}}{\textit{percentage change in the price per unit of water}}$$

Undertaking a Rapid Market Assessment for Water Projects

Step 1. Identify Different Consumer Groups

The demand for water needs to be analyzed among relatively homogeneous user groups. In many cases, a distinction is made between domestic and non-domestic users. Furthermore, the demand from domestic users is separately analyzed for those already connected to the system (existing connections) and those to be connected under the proposed improvement project (new connections).

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While the price elasticity of demand[2] for water is normally negative, i.e., an increase in price is expected to a reduce demand and consumption, the degree varies significantly across user groups. For many industrial and commercial users, as well as upper-income households, the price is largely inelastic, meaning that an increase in price will have little effect on demand. In contrast, other domestic users, especially low-income households, experience steeper demand elasticity. For them, price changes have a significant impact on consumption.

Household surveys confirm that those with higher incomes are more able and willing to pay for a given quantity of water as compared to households with lower incomes. However, in relative terms (as a percent of income), higher-income households pay much less than the poor.

Willingness to Pay for Improved Water Services in Bangalore

The Greater Bangalore Water Supply Project aimed to improve the supply and distribution systems in the eight, separate municipalities surrounding the city center. During project development, a study of current water supply deficiencies, coping strategies of households, and willingness to pay for improved services was conducted. Through household surveys, information was collected from 8,000 residential units, 500 industrial units, 10,000 commercial establishments, and 500 institutional consumers. Additional insights into how cost-sharing arrangements could help the poor were gained through focus group discussions in slums. Results included:

- Only half of the consumed water comes from municipal sources. The other half is privately accessed from tanker trucks and bore wells.
- Seventy-five percent of the water in slums is delivered through public stand-posts (free of charge). Slum dwellers also pay Rs. 8–10 per kiloliter (kl) for other private sources of water.
- The quality of water varies across the city; some areas are contaminated with f-coli and e-coli bacteria, while others experience unhealthy levels of nitrates and fluoride.
- O&M costs, resulting from the improved system, are planned to be Rs. 16/kl. Currently, high-rise apartment residents and wealthy households pay twice that amount, and the average household cost for water (public and private sources) is Rs. 24/kl. Non-domestic users typically pay far more than this.
- Apart from middle- to lower-income households (including slum dwellers), the various user groups expressed a willingness to pay the Rs. 16/kl cost envisioned under the project, and many users were willing to help cross-subsidize the poor.

Source: Ahmad, J.K., S. Misra, and S. Zaheer, 2004, *Demand for Improved Water Supply and Sewerage Services in 8 ULBs in Greater Bangalore*, Draft Report, World Bank: New Delhi, India.

Step 2. Understand Service Demand for Each Consumer Group

In addition to price and income, other factors influence the demand for water. Refer to Table 5-7 for a checklist of some of the factors influencing demand for domestic and non-domestic users.

Consumer preferences can be ascertained by collecting data during field observations and representative household surveys. Household surveys should include:

- Family size, occupation, income, etc.
- Level of current consumption,[3] water quality, and costs of all regularly used sources
- Preferences for future water supply, with regard to the quality of service, type of facility(ies), and willingness to pay for the preferred level of service

3 The quantity of water consumed through the connection and non-connection sources.

Table 5-7. Water Demand Determinants for Domestic and Non-Domestic Consumers

Domestic	Non-Domestic
Population. The overall population (especially the growth rate) is very important. Population growth may consist of natural growth and migration. Small differences in demographic trends have large effects on water consumption.	*Size and Type of Industry.* Logically, the size and type of industry will affect the quantity of water consumption.
Access and Costs of Alternative Sources. If water from other sources is of good quality and is readily available, people are generally less interested to replace them.	*Industrial Growth.* Economic development, construction patterns, and regional growth strongly influence future demand for water.
Availability and Quality of Service. If the existing municipal service is generally satisfactory, unconnected households will usually be more interested in connecting to an expanded system.	*Legal Requirements.* In certain special economic zones, industries must apply for a permit to use any alternative sources (e.g., groundwater), and are often required to connect to piped systems, if available.

Assessing the ability and willingness to pay is essential for price-setting. Two approaches are used for making reliable estimates of a household's willingness to pay.

- The direct approach, also known as the *contingent valuation method*, uses stated responses when an individual/family is surveyed about preferences and costs.
- The indirect approach uses data on *observed water use behavior (revealed preference)*. Measuring the quality, quantity, and costs of alternative sources of water, such as tankers, bore wells, and bottled water, is a good estimate of how much additional money people are willing to pay for improved municipal services.

Since private markets for urban services have begun emerging in many Indian cities, the demand study should include a reconnaissance survey of prices being charged by other private operators to get a better sense of the overall market.

Furthermore, the study should examine various types of charges that can be levied on the user groups. For example, an unserviced area that would need network expansion could be levied a development charge, as well as normal connection and consumption charges. For low-income users, in particular, the study should establish an affordable "lifeline" rate (i.e., the minimum-accepted quantity of water that everyone should receive and can afford).

Step 3. Develop Detailed Tariff Categories

Detailed tariff categories need to be established for the various user groups. Though a wide variety of charges could be levied, most service providers do not adequately tap this diversity. Tariff categories will depend to a great extent on existing tariff charges; the complexity of the system; and the management capacity of the utility to set appropriate charges, bill customers, and collect payments efficiently.

Step 4. Make Demand Forecasts

Estimate the increase in the number of connections and consumption of water within each user group by collating urban growth trends with the project design.

- Estimate the number of total connections across user groups during the project's life, based on past growth trends, network expansion, facility standards, and institutional capability.

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- Estimate overall consumption and production requirements for each user group, based on current use and stated preferences. In this calculation, include unaccounted-for water that results from leaking pipes and illegal connections.
- Set targets for service improvements by comparing forecasted demand to current capacity. Specific targets may include increased number of supply hours, improved water quality, higher water pressure, and a shift from public taps to piped house connections.
- Integrate the findings within the tariff categories to understand how new price-setting will affect consumption of water and demand for new connections. This will help in conducting revenue forecasts.

Step 5. Initial Tariff-Setting and Demand Adjustment

Initial tariff proposals for each user category can be identified based on the market study, the willingness of different user groups to pay, and the proposed service improvements. The feasibility of each proposal must be tested against political implications, affordability, existing price levels, and the past experiences with tariff revisions. Based on these proposals, it must be determined whether tariff changes will have an impact on demand. Consumption forecasts can be adjusted based on the price elasticity of demand. While price elasticity estimates should be worked out for a detailed market study, notional adjustments for the main user groups can be made based on good judgment.

Resources

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ARTICLE 5.4

Feasibility Study for Appraising Commercial Viability

After the initial financial prefeasibility assessment (Article 5.2), the project development team will have a sense of whether the project can move forward and be structured in a commercial format, or whether it will have to rely on more traditional public approaches. Feedback from financial intermediaries would also be beneficial at this point. If the decision is to proceed with a commercial format, other studies—market demand, environmental, institutional arrangements, and risk—are necessary to help structure the project appropriately. This article discusses institutional arrangements relative to risk mitigation. Article 5.5 discusses the EIA's impact on project development, and Article 5.6 highlights institutional and risk mitigation structures of some of the projects the FIRE (D) Program supported.

Institutional Arrangements

The optimal implementing structures should be based on the agency best positioned to:

- Mobilize resources, including capital market borrowings
- Deliver the services over the long term, including authority to set prices, collect revenue, operate the system, and make repairs
- Manage risks occurring in the project development and construction phases

A study covering all three aspects (resource mobilization, risk management, and service delivery over the long term) will be necessary when appraising commercial viability because the institutions mobilizing resources from commercial investors might be different from the institutions delivering services. For example, in Bangalore's pooled bond issuance in 2003, the Karnataka Urban Infrastructure Development Finance Corporation (KUIDFC) acted as a financial intermediary on behalf of eight local governments (the borrowers) to issue debt on the capital markets. However, the bond proceeds were utilized by the Bangalore Water Supply and Sewerage Board (BWSSB), which is the service provider for the metropolitan region and project implementer.

Institution to mobilize resources. Four institutional options for accessing capital markets exist, namely: (1) an independent project entity like a private company or public corporation, (2) a national- or state-level financial intermediary (e.g., KUIDFC), (3) a state-level statutory and functional authority (e.g., BWSSB), and (4) a municipal authority/local government. A rapid credit assessment framework is suggested to help choose among these possible alternatives. In Bangalore's case, it was clear that KUIDFC would be the best candidate, since its main mandate was to mobilize finance for infrastructure and because the eight participating local governments were individually not very creditworthy. BWSSB was itself able to borrow, but has never done so for capital works since local and state governments typically deposit funds with them.

In case more than one arrangement appears possible, the size and complexity of the project should be considered, as well as opportunities for enhancing credit in the short run. The credit assessment helps determine the best-positioned institutions to mobilize resources by examining their track record of meeting financial obligations and their efficiency in fulfilling their statutory mandates. Because commercial debt could be part of the project's financing, it is necessary to determine whether the institutions can meet overall financial obligations (principal and interest) in a timely manner. For example, it would be a problem if an institution has a history of diverting project operating revenues to general agency requirements.

Also, fiscal performance trends help determine if the institution can meet project equity requirements and mobilize additional debt. It is important to know what the potential revenue surplus of the institution is over the medium and long terms, after meeting its committed expenses and debt servicing. The credit assessment also requires a qualitative probe into the procedures for decision making on important financial matters.

The notion of a credit assessment for government-related institutions was new to India in the middle 1990s because past borrowing had largely been through state guarantees. The credit assessment must also incorporate the potential of institutional restructuring and improving performance within a short time period, before implementing the project and issuing debt. In addition to following the FIRE (D) Program's credit assessment (see resources below), it would be worthwhile to have a recognized credit rating agency conduct an assessment and suggest short-term improvements.

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Institution for service provision. With respect to the institutional arrangements for service delivery, a wide variety of options exists, and it is almost impossible to suggest a specific institutional arrangement without analyzing the local context.[1] The policy and regulatory environment of the state government will also influence the choice. Possibilities include a municipal enterprise, a statutory functional authority, a service contract, concessions through a number of build-own-operate-transfer (BOOT) variations, and community provision (see Table 5-4 in Article 5.1).

The most important criteria for choosing an appropriate mix of service delivery options are: (1) efficiency in service provision, (2) fiscal autonomy in conducting operations, and (3) willingness to levy commercial prices for the given service. Past practices, as well as overall understanding of the sector, must also be taken into consideration. For example, every service sector has separate components that can either be bundled together for greater efficiency and economy of scale or unbundled to isolate one or more critical aspects. Two types of unbundling are possible. *Vertical unbundling* helps separate different service components in a value chain. For example, solid waste management systems begin with door-to-door collection (primary collection), followed by transport to disposal sites (secondary collection), segregation of waste and recyclables, and then appropriate disposal of the waste. Different types of waste can be disposed of through recycling facilities, incinerators to generate power, or scientific landfills. The best institutions for managing these services could all differ from one another. Unbundling the services might make them more financially viable and efficient.

In contrast, *horizontal unbundling* separates the service geographically into zones of administrative significance due to the capacity of the service provider. Technical complexity of the service and the size of the zones will also influence unbundling. For example, a community service, such as door-to-door garbage collection, could be most suitable for a neighborhood-based organization. In a large-scale service, it might be exceedingly difficult for one utility to deliver water and sewer to an entire state with diverse geography, varying population centers, and different priorities. In this case, horizontal unbundling might make sense.

Consider the institutional arrangements for service delivery based on the local service sector and desired project objectives. It should be considered in combination with a project risk assessment.

Project risk assessment. One of the main constraints in accessing capital markets for urban environmental infrastructure is the market perception that risks in the sector are very high. This is especially true for risks during development and construction. In the post-completion stage, there are also large risks related to market demand and ensuring timely revenue flows to service debt. It is thus essential to assess potential risks and propose a risk management strategy through proper mitigation.

An overall list of possible risks for infrastructure projects is long (summarized in Table 5-1 in Article 5.1). However, for appraising commercial viability, three risks are most critical: (1) the project concept and estimated costs, (2) the project completion period, and (3) market demand for services (see Table 5-8). The assessment of these risks should be from the perspective of commercial investors, whose perception of risks determines the cost of capital lending. These risks are the most typical issues causing changes to project costs and revenue streams that would negatively affect debt servicing and sustainable O&M.

1 However, international experience suggests that corporatization of services (with public and/or private ownership) helps enhance efficiency and ensures adequate fiscal autonomy to operate services on a commercial basis, so long as adequate regulatory arrangements monitor performance and encourage minimum services for all residents.

Table 5-8. Key Risks for Appraising Commercial Viability*

Type of Risk	Risk Assessment and Measures
Project Concept and Estimated Costs	• Review similar projects in the region. • Use "thumb rule" norms for cost comparisons. • Review recently completed tenders for similar works in the region. • Check to see whether necessary permissions for raw water, effluent, or solid waste disposal have been taken.
Project Completion Period	• Check on the status of site possession for infrastructure works. • Review reasons for delays of past projects of the same (or similar) agencies. • Understand the current institutional experience and management capacity for projects of similar nature (implementation and management). • Survey sector to see if other experienced providers exist in the region, i.e., separate contractors that may be suitable for various concession frameworks. • Assess proposed contract framework and construction timeline. • Determine the necessary insurance arrangements.
Market Demand for Services (Revenues)	• Verify demand forecasts based on trends, consumption practices, and discussions with major user groups (derived from market study). • Check to see if necessary agreements or legal provisions are in place for improving market and customer access. • Investigate status and structure of contracts with bulk consumers or any current debt obligations. • Verify whether essential permissions for (immediate and longer-term) tariff revisions have been granted. • In case of poor credit assessment of borrowing agencies, determine whether alternative guarantees or other credit enhancements could help ensure timely debt servicing.

* For assessment format please refer to Mehta, M. and V. Satyanarayana, 1995, *Pre-Feasibility Analysis and Report Formats: Volume 2: Stage II Comprehensive Pre-Feasibility Analysis,* FIRE (D) Program: New Delhi, India.

The likelihood and scale of these risks will affect the rate of return on project investment, which can be tested for financial sensitivity. The financial models, initially developed in the prefeasibility stage, will have to be modified at this point, in light of the new information derived from the in-depth studies of market demand, credit strength, institutional arrangements, and project risk.

The risk assessment (see listed resources for format) will also inform the institutional arrangements for the project. Alternative project structures might have to be explored. In case some of the risks seem too high and/or too difficult to alleviate or mitigate, the project may be rejected for development on a commercial format. It may be emphasized that it is important to create a favorable market image for the project at this stage. It would thus not be advisable to develop overly risky projects with unproven technology or demand.

Resources

Asian Development Bank, Handbook for the Economic Analysis of Water Supply, 1999, Manila, Philippines, available online at http://www.adb.org/Documents/Handbooks/Water_Supply_Projects/default.asp.

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ARTICLE 5.5

Environmental Impact Assessments for Urban Infrastructure Projects

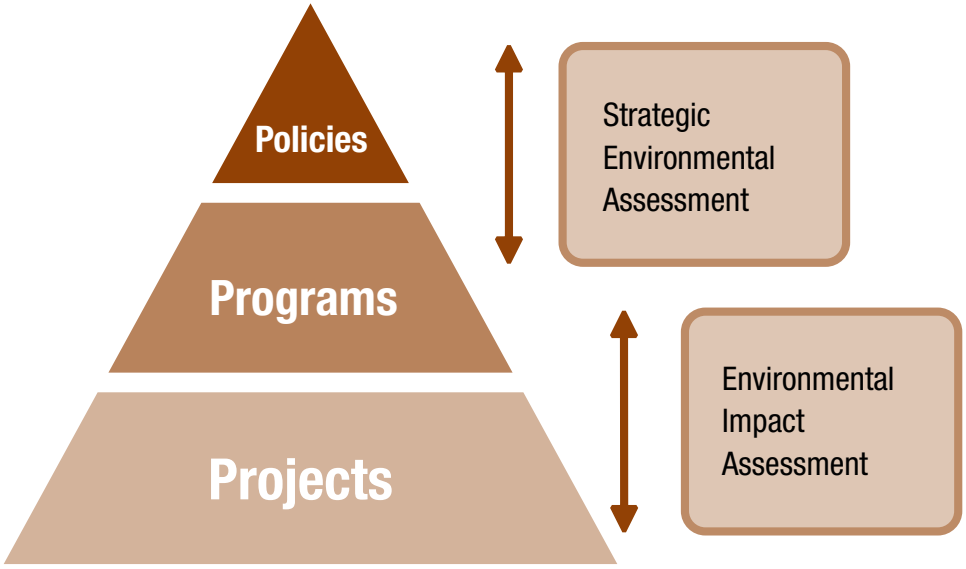
Infrastructure plays an essential role in human development and the functioning of cities. However, its development can have negative impacts on the natural environment in both the short and long terms. Infrastructure should be sustainably designed, meaning the resources used to build and operate the services will not be depleted or damaged for the use of future generations. From this perspective, sustainable infrastructure minimizes the use of non-renewable resources and minimizes the negative impacts it has on the environment, while also promoting economic and social development.

Various tools are used globally to promote sustainable infrastructure development, including the Strategic Environmental Assessment (SEA), the Environmental Impact Assessment (EIA), and the Environmental Management and Audit Scheme (EMAS). Many countries have adopted these to achieve the environmental goals of sustainable development and to integrate environmental protection in their development initiatives. The focus of this article is the EIA framework in India.

Strategic Environmental Assessment. The SEA is a process of anticipating the consequences of *policy and program initiatives* on the environment. Its purpose is to ensure that environmental considerations are addressed as early as possible, and are on par with economic and social factors in policy and program development. The SEA, therefore, allows decision makers to consider the environmental effects of public policies prior to developing specific projects.

Environmental Impact Assessment. The EIA is a process of identifying and evaluating the likely impacts of a *proposed project* on the environment, and thereby to work out remedial action plans to minimize any adverse impacts. The EIA should be conducted before detailed technical design because it provides invaluable inputs into the process. For this reason, EIAs are part of the Stage 2 feasibility studies presented in this chapter.

Figure 5-3. Environmental Governance



Legal and Policy Framework for Environmental Protection in India

In India, the Ministry of Environment and Forest (MoEF) is responsible for the protection of the environment. The most relevant national law is the Environment Protection Act (1986). It establishes a framework for ensuring that all development projects incorporate environmental protection measures. In addition, the Water Prevention and Control of Pollution Act (1974) and the Air Prevention and Control of Pollution Act (1974) establish baseline thresholds for water and air quality.

In 2006, a notification related to the Environment Protection Act listed eight categories of projects (applicable for new or expanded projects) that are required to gain environmental clearance (refer to Table 5-9) before implementation. The notification also created two subcategories, "A" and "B," to differentiate the level of risk of typical projects. Large-scale projects (e.g., large township) or those with high environmental and health risks (e.g., nuclear power plants) fall under category "A," and require central government clearance from the MoEF. Smaller-scale projects with more localized risks fall under category "B," and have to obtain a clearance from a State Territory Environment Impact Assessment Authority (SEIAA).

Table 5-9. Categories of Projects That Need Prior Environmental Clearance

No.	Category of projects
1	Mining, extraction of natural resources, and power generation
2	Primary processing (e.g., coal washeries, mineral beneficiation)
3	Materials production
4	Materials processing (e.g., petroleum refining, coke oven plants, asbestos milling)
5	Manufacturing/fabrication (e.g., chemical fertilizers, pesticides, petrochemicals)
6	Services sector (e.g., oil and gas transportation pipeline passing through sensitive areas)
7	Physical infrastructure, including environmental services (e.g., airports, ship-breaking yards)
8	Building/construction projects/area development projects and townships

The only environmental infrastructure projects that require EIAs are effluent treatment plants and municipal solid waste management facilities. It is assumed that all other environmental infrastructure projects, such as water supply, sewer, and drainage, only contribute positively to the environment. This assumption, however, neglects two important characteristics of large-scale infrastructure development projects: (1) most create significant short-term disruptions to the physical and social environment during construction, and (2) many create localized, long-term environmental impacts. For example, Mumbai's land reclamation and storm water system, built over many decades, has negatively affected the natural drainage capacity of the area. This contributed significantly to the city's 2006 flood disaster, as well as smaller cyclical problems during the monsoons. The FIRE (D) Program recommends conducting an EIA for all major works (see Table 5-10 for an explanation of the process for conducting an EIA).

A four-phase environmental clearance process has been established by the MoEF, in accordance with global best practices, for all projects listed in Table 5-9.

Phase 1. Screening

While all projects in category "A" require an EIA, those listed as category "B" do not necessarily need a full assessment. The first phase is an initial screening to determine whether or not the proposed category "B" project requires an in-depth EIA. The screening is managed by the state-level environmental authority. The SEIAA rapidly assesses if any environmental clearances are required, based largely on the nature and location of the project. The projects requiring an EIA are termed category "B1," and the remaining projects are termed category "B2." The latter can immediately fill out an application form and submit it to the SEIAA for clearance.

Phase 2. Scoping

For projects requiring an EIA, the MoEF (for category "A" projects) and the state-level SEIAA (for category "B1" projects) outlines an assessment scope that the project's applicant will need to address. The scope is referred to as a terms of reference (TOR), and is derived from information about the project's design, its area of operation, and typical risks that have risen in similar projects. The responsible agency often conducts a site visit prior to preparing the TOR.

Phase 3. Public Consultation

Public consultations are required for almost all EIAs so that locally affected communities can express their views on the environmental risks of a proposed project. The State Pollution Control Board (SPCB) or the Union Territory Pollution Control Committee (UTPCC) organizes a community meeting near the proposed project site within 45 days of the applicant's request for environmental clearance. Other concerned persons or environmental groups can respond in writing. After public consultation, the applicant makes appropriate changes to the draft EIA, and resubmits it to regulatory authority for appraisal.

Phase 4. Appraisal

The MoEF and SEIAA appoint expert committees to scrutinize the application form, EIA report, and proceedings from the public consultations. The applicant is invited to furnish any necessary clarifications. The committees then make recommendations to the regulatory authority (the MoEF or SEIAA) for granting environmental clearance (potentially with stipulated terms and conditions) or rejecting the application.

EIA Methodology

An EIA is supposed to systematically assess how a proposed project will affect the surrounding natural and built environment. It should consider alternative project designs to help meet environmental standards and to address any concerns that communities may have. Using an EIA as a mechanism to ensure community participation is becoming increasingly important. Local residents generally have intimate historical knowledge about local environmental conditions and cultural resources. Therefore, their active participation often leads to design solutions that are better suited to local conditions, socially acceptable, and more effective and long-lasting.

EIAs should not weigh positive elements of a project against negative environmental impacts, like a balance sheet. Instead, all significant negative impacts need to be identified clearly and mitigated to acceptable levels. There should be rigorous standards for EIAs so that negative environmental impacts are addressed prior to a project moving forward, and to encourage project designs that have more positive outcomes.

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Table 5-10. Conducting an Environmental Impact Assessment

Steps	Details
Initial Scoping	• Determine all potentially significant environmental impacts. Through field work, gather qualitative and quantitative data on the potential impacts of the proposed project (positive and negative). • Scoping should establish spatial and temporal bounds of the proposed project and potential risks. • Inventory the biological, geophysical, and cultural resources located within the spatial bounds of the project area. • Hold informal discussions and meetings with nongovernmental organizations (NGOs) and environmental groups about the proposed project and risks.
Alternative Options	Based on the initial risk analysis, examine alternatives options for achieving the same project objective. Alternatives could include design and technology modifications to facilities, using alternative routes (e.g., in a road building project), or designing special environmental elements (e.g., a river-run hydropower plant rather than a reservoir). Canceling the project is also an option for consideration.
Mitigation and Impact Management	Develop an environmental management plan to mitigate or eliminate negative impacts and to monitor future impacts. Mitigation generally includes structural and non-structural interventions that reduce the negative impact of the proposed project (e.g., grasses along steep slopes to prevent erosion). Monitoring requires establishing baseline conditions for key environmental parameters prior to a project, and then measuring those indicators after implementation. Appropriate EIA measurement parameters include: • biological resources (e.g., wildlife habitat, plant, and animal species) • physical/chemical aspects (e.g., air, water, and soil quality) • social factors (e.g., religious sites, schools, and homes)
Monitoring	When designing a monitoring plan, it is important to isolate the parameters to be measured in a scientific manner. This will minimize the effect that external factors could have on the results. For example, water quality should be measured immediately upstream and downstream from a new manufacturing facility to isolate the impact of its discharge on the environment, and prevent comingling of other sources of effluent in the vicinity.

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Ministry of Environment and Forests Rules on Environmental Impact Assessments, 2006, http://envfor.nic.in/legis/eia/so1533.pdf.

ARTICLE 5.6

Testing Project Structures

The preceding articles in this chapter illustrate key aspects of developing commercially viable infrastructure projects. Although this guidebook does not cover technical design of infrastructure, since that is predominantly an engineering input, the FIRE (D) Program has found tremendous benefit in independently reviewing technical designs to better fulfill city objectives, find the most appropriate technologies for the local situation, and access alternative funding sources. The result is often a more sustainable project structure that facilitates expanded service coverage (e.g., a larger number of slum residents or a larger geographic area) and that better addresses environmental concerns. For local and state governments, more financially sound and commercially viable infrastructure also frees scarce public resources that can then be used to meet other important needs.

Sometimes the benefits of infrastructure have no relation to engineering design. Efficient operations, user friendliness, sustainable maintenance, optimal cost structure, and city-wide scope all rely heavily on management and business administration. Getting these aspects correct is an ongoing effort that begins with the project development process and continues through financial close and operation. This article examines two delivery structure cases in India that the FIRE (D) Program supported. The cases represent significant milestones in their respective sectors, and highlight important considerations in the design and development of commercially viable projects.

Case Study: The Tiruppur Area Development Program

The Tiruppur Area Development Program (TADP), which was initiated in the mid-1990s, is well known for its innovative public-private partnership (PPP) model, and more recently, for its project development shortcomings. The water and sewerage component of the TADP became the first PPP in this sector in India, and successfully attracted approximately Rs. 470 crore (US$110 million) in private equity from diverse stakeholders (government, financial institutions, industry beneficiaries, and a private water utility). The project structure provided a commercial format where industrial user fees cross-subsidized residential tariffs. Networked infrastructure expanded to industrial areas and outlying villages for the first time, and the project greatly increased residential water supply across Tiruppur, including coverage to a hundred slums. The city's first sewer system was also a central part of the project.

Despite connecting nearly 20% more residential customers than originally anticipated, the project ran into financial trouble due to insufficient industrial demand. The trouble began as soon as the project came online in 2005; by 2009, water off-take reached less than half of the design projections, revenues could not service debt, and the project completely used up its government-established debt reserve fund of Rs. 50 crore (US$10 million).[1]

These troubles are not simply a case of unexpected economic stagnation or industry decline. Most, if not all, of the contributing factors were well known to the project stakeholders and should have been more thoroughly analyzed and incorporated into the proposed project structure. This case shows how important it is to study ground realities in detail, identify the full range of risks when designing a project, and then adapt the implementing structures as required. Failure to do so can undermine a project's capacity to be implemented in a commercially viable and sustainable format.

Background. In 1991, the Tiruppur Exporters Association (TEA) and the Tiruppur Municipality (TM) requested that the Government of Tamil Nadu (GoTN) improve the area's infrastructure, since the region had become a global exporting center for garments and other textiles. One of the critical inputs in this sector was a large volume of consistent, high-quality water for bleaching and dyeing textiles. However, the industrial area, which lay immediately outside the local government's jurisdiction, completely lacked water and appropriate wastewater infrastructure to accommodate the increasing industrial growth and economic development.

Instead, industrial users relied on bore holes in the vicinity for extracting and then treating groundwater. Ever-increasing usage, as well as a severe drought in 1993-1994, constrained

TADP "Firsts" for India

- *First water supply and sewerage project structured in a* ***commercial PPP format***
- *First* ***project-specific public limited company*** *for water and sewerage with* ***equity participation*** *from all major stakeholders*
- *First* ***water concession*** *by a state government for domestic and industrial water extraction and revenue collection*
- *First* ***index-based user charges*** *and direct* ***cost recovery*** *for developing environmental infrastructure*

1 P. Kothandaraman and K. Kumar, 2007, "Water for All: New Tirupur Area Development Corporation Ltd.," UNDP.

Cross-Subsidized Tariff Structure

- *Industry price is Rs. 48/kl and residents pay Rs. 5/kl at launch*
- *Price Review Committee composed of GoTN, New Tiruppur Area Development Corporation Limited (NTADCL), and a retired High Court judge*
- *Tariff reviewed every 3 years using a price revision formula based on the inflation-indexed cost of production*
- *TM tariff increases 6% per annum*

groundwater supply and caused a spike in salinity, which directly threatened industrial output capacity. As onsite sources became depleted, industrial units started purchasing from private operators, via tankers. At the same time, dyeing units discharged an increasing volume of untreated effluent, causing severe groundwater and river contamination and affecting downstream agricultural land.

Project Development and Institutional Structure

A private sector approach seemed appropriate for developing the water infrastructure, partially, because the most vocal demand stemmed from industry users who were accustomed to paying for water. The industrial area extended beyond the city, outside the local government's jurisdiction. And since the main challenge consisted of collecting and treating bulk water from two rivers with adequate flow, it seemed attractive for private investment. The water sector could be unbundled, similar to electricity production and distribution: A bulk supplier (perhaps regionally based) sells the service to utilities for distribution.

Still, considerable skepticism of PPPs existed among GoTN politicians and bureaucrats at the time, and even more so in the provision of water—considered a basic human right requiring public subsidy. However, politicians provided their support when the proposed project expanded beyond the water needs of industry users to include system upgrades in TM. Their insistence that residents not incur severe tariff hikes prompted the cross-subsidization scheme where industry subsidized residential water supply.[2]

TADP emerged to address industry and residential water supply, as well as sewerage and other infrastructure needs. Responsibility for implementing TADP lay with a newly formed entity, the Tamil Nadu Corporation for Industrial Infrastructure Development Limited (TACID). It initially focused on solving the immediate water and sanitation crises through a PPP structure. In 1995, for the water and sanitation component, TACID created NTADCL as a special purpose vehicle to mobilize investment in infrastructure. NTADCL was a holding company for attracting project partners that eventually included the Government of India, GoTN, TEA, Infrastructure Leasing and Financial Services Limited (IL&FS), several financial institutions, and the infrastructure service operator. GoTN and IL&FS participation was through the Tamil Nadu Water Investment Corporation (TWIC), a joint venture formed to pool resources of both parties and direct them as equity into NTADCL. The institutional structure facilitated both public and private sector institutions—including the principal beneficiaries and eventually the private operator—to collaborate in financing and implementing the project.

GoTN granted a 30-year concession to NTADCL to extract and sell water from the Cauvery River, after which the rights and any infrastructure assets created would be transferred back to the state government. Since NTADCL only existed as a special purpose vehicle, it contracted the construction and maintenance of the system on a build-operate-transfer (BOT) basis to Bechtel-Mahindra and United Utilities Consortium through an international bidding process. The BOT operator is responsible for water extraction, treatment, and distribution to industries outside the city limits. The operator also supplies bulk water to the TM, which manages its own distribution system within the city limits.

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2 Narayanan Edadan, June 2000, "Public-Private Partnership Initiative in Urban Environmental Infrastructure Finance," Real Estate and Land Management Institute and P. Kothandaraman and K. Kumar, 2007, "Water for All: New Tirupur Area Development Corporation Ltd.," UNDP.

While political skepticism of PPPs is commonplace, the difficulties in attracting private sector participation should have been the first sign of problems in project concept and design and commercial viability. On one hand, GoTN was reluctant to provide financial guarantees to investors and the private service provider (and when GoTN finally did agree 4 years later, the initial bids had long expired). On the other hand, the requirement for such substantial financial guarantees might have been an indication that the project was not entirely viable or not adequately examined.[3] The financial guarantees included:

- A debt service reserve fund of Rs. 50 crore (US$10 million) equivalent to 6 months, in case of default to project lenders
- A Water Shortage Period Fund of Rs. 71 crore (US$14 million) to cover 6 months of project costs, in case of drought
- A return on total project cost of 20% guaranteed for equity investors
- An escrow account for water tariff with 3 months of security deposit from TEA and an irrevocable letter of credit from NTADCL covering another month
- Gains from future productivity investments that would get shared among the equity investors, the service operator, and customers

In addition to these and other provisions, GoTN provided a state guarantee to lenders, in case of NTADCL default or termination of the service operator's contract. Although the risk exposure to private lenders and equity investors was quite limited, it still took a long time to mobilize enough equity investment.[4] In the end, all the security provisions did allow NTADCL to raise the capital required for implementation from diverse investors, approximately Rs. 470 crore (US$110 million) in private equity and nearly Rs. 900 crore in debt (US$210 million).[5] As part of this, the BOT operator contributed about 10% of the equity stake.

Project Risk Analysis

The initial project design and implementing structure responded to specific conditions in the early 1990s, but those conditions evolved considerably over the long project development period of 10 years. The long, drawn-out process resulted from wavering political support, the need to adopt new policies (e.g., authorizing PPPs, providing a concession to NTADCL, and establishing a tariff mechanism), and the time it took to reassure private sector investors that the project warranted their consideration. During this period, conditions on the ground changed considerably. However, the project structure did not adjust accordingly. The major risks, which have since undermined the project's financial viability, were well known at the time, but never adequately incorporated into the project.

Environmental contamination. The prevailing industry practice of discharging untreated effluent directly into the seasonal river that fed downstream agriculture had been going on for decades. In 1996, the impact on the environment became so severe that a court order mandated that the bleaching and dyeing units treat the effluent.[6] Effluent treatment had been envisioned as one of the objectives in the early project design, but the deadlines imposed in the court order ultimately caused the treatment component to be removed, and left to the industry to solve. This change in scope actually increased the operational and financial risks, producing serious repercussions by the time the project came online in 2005.

Several large companies joined together to invest in common effluent treatment plants (CETPs), where several dyeing units are served by the same plant. Still, effluent discharge continued, especially from smaller units, and additional court orders were imposed in 1998 and 2005. The 1998 order mandated that individual units treat the effluent, and that burden forced many of the smaller bleaching and dyeing units to shut down. The 2005 court order, only months before TADP was inaugurated, imposed an even stricter "zero discharge" mandate to be enforced by the Tamil Nadu Pollution Control Board (TNPCB). This resulted in the shutdown of even more units. The larger units that did comply installed technology so effective that up to 90% of treated effluent could be reused, significantly reducing demand for TADP water off-take.[7]

Industrial demand. Despite the court orders that resulted in a decrease in the number of industrial users, the overall demand for clean water still grew, as the local groundwater became more depleted and contaminated. In response, private tankers filled the service gap, by going further afield to find adequate water supply. Tamil Nadu's farmers, over 60 km away, found it more lucrative to sell water

3 For example, the lack of geo-technical data on soil conditions, topography, and water supply in the request for proposals (RFP) for procuring a service provider prevented bidders from accurately estimating construction costs and their accompanying fees.
4 Narayanan Edadan, June 2000, "Public-Private Partnership Initiative in Urban Environmental Infrastructure Finance," Real Estate and Land Management Institute.
5 Debt lenders included USAID Housing Guarantee loan funds, State Bank of India, IL&FS, and Life Insurance Corporation (LIC).
6 http://www.indiankanoon.org/doc/197754/.
7 http:/www.projectsmonitor.com/WATTREAT/tirupur-cetps-aim-at-zero-discharge.

to industries than to use it for crops. The impact of deficient infrastructure and TADP delays reached beyond Tiruppur and affected the economy of the surrounding region. The emergence of this new supply market undercut the project's initial tariff structure, causing additional reduction in water demand from TADP. The project had to temporarily reduce the industrial tariffs by 38% to protect its market share.

Not only did the effluent treatment and reuse, and the initial tariff reduction, jeopardize the financial sustainability of the project, but the original water demand estimates were simply too high (four times actual demand at the time). So, although the financial model assumed 60%–70% of industrial demand would be met by TADP off-take, it was still not a conservative figure. It is likely that demand estimates were based on government standards for industrial water usage, and not actual industry usage. In fact, one private company decided not to invest in the project after conducting a survey of units in Tiruppur that concluded industry demand would be 30 million liters per day (mld).[8] The project design placed demand from industry at 125 mld.[9] By the end of 2010, industries are consuming only 35 mld.[10] In addition to TEA, 21 other trade associations operated in the industrial area,[11] and more active participation with them could have provided better insight into the demand risks, as well as a broader pool of resources for TADP to explore alternative solutions.

Garment and textile industry factors. The garment and textile industry is extremely competitive globally, and firms have to guarantee on-time delivery, at a specified quality. TEA members in the Tiruppur cluster had demonstrated this ability and were profitable, but several factors emerged in the 1990s that threatened the cluster's competitiveness. Key industry dynamics included:

- As a vital industrial input, the scarcity and increased costs of water threatened the manufacturing process and cluster competitiveness.
- Effluent treatment plants are costly and take time to develop. Although the Government of India provided a considerable subsidy, not all units could install the plants in time to meet increasingly strict compliance rules. The resulting unit closures adversely affected the viability of the cluster supply chain.
- As units consolidated and became more experienced, they adopted advanced technology, including improved water treatment plants and more efficient processes and equipment. This reduced the water demand from TADP.[12]
- As child labor became a global issue, leading apparel brands started inspecting suppliers and requesting independent certification that the practice of child labor abuse was stopped. This caused some TEA units to lose market share and/or increase labor costs.
- The end of the international multi-fiber agreement, giving preferential trading rights to developing countries, necessitated a more complex and thorough sensitivity analysis. As an export industry, currency fluctuations also should have been examined. While rupee appreciation—dampening international price competitiveness—might have been hard to anticipate, the potential risks should have been understood and mitigation strategies planned for during the project development process.

Regulatory enforcement. Many aspects related to project implementation, such as construction and operation, were successfully executed within the PPP arrangement. However, weak water regulation has undermined the project. Restrictions on local tanker trucks and farmers from extracting water for sale should have been enforced.[13] Enforcement would have prevented the downward pressures on the industrial water tariffs that eroded the financial viability of the project and would have partially addressed the environmental pressure. Only the state government had the authority to mitigate this risk through enforcement.

8 Based on a conversation with an industry professional involved in assessing the project for a private investor that chose not to invest.
9 P. Kothandaraman and K. Kumar, 2007, "Water for All: New Tirupur Area Development Corporation Ltd.," UNDP.
10 "Tirupur water project runs up a 200 crore loss," *Deccan Chronicle*, December 5, 2010.
11 Narayanan Edadan, June 200, "Public-Private Partnership Initiative in Urban Environmental Infrastructure Finance," Real Estate and Land Management Institute.
12 http://www.projectsmonitor.com/WATTREAT/tirupur-cetps-aim-at-zero-discharge and interviews with industry professionals responsible for assessing the project during project development.
13 A report noted a GoTN regulation to restrict abstraction of groundwater within a radius of 30 km from the project service areas for a period of 15 years from day of operation (see Narayanan Edadan, June 2000, "Public-Private Partnership Initiative in Urban Environmental Infrastructure Finance").

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Conclusion

As the first PPP in the water and sanitation sector in India, and a unique project internationally due to industry taking the lead, it is no surprise that this project faced numerous challenges during its development. The problems that emerged in this case were largely based on an inadequate up-front situation analysis and an unfeasibly long project development period (over 10 years).

The failure to identify and mitigate important risks, or to change the project design to accommodate them once known, proved to be a major shortcoming. If the demand dynamics were better understood, the project could have been redesigned to meet these challenges. For example, the project could have negotiated with regulators to build the centralized effluent plant that was dropped, or the state government could have tried to attract other water-intensive industries to Tiruppur. The bulk water could also have supplied other nearby cities. Indeed, in the face of Rs. 200 crore (US$44 million) in losses as of 2010, the project has considered supplying Coimbatore, via a 60 km pipeline extension, at a cost of Rs. 120 crore (US$27 million).[14] However, in the near term, a revision to the residential tariffs could more easily save the project. TEA has noted that Chennai charges Rs. 48/kl for water supply to ensure the city's desalination is viable.[15]

The oversights in up-front analysis led to a highly vulnerable financial model that could not be sustained as off-take foundered. The risks to the cross-subsidized tariff structure should have been better assessed to capture the full scope of market and operational risk in the sensitivity analysis. Industrial demand for water could decline further from the global recession, increases in worldwide cotton prices, and new technologies in the industry. According to a July 2010 report, there is a plan to use man-made fibers in Tiruppur if TEA can secure enough government support for the upgrades.[16] Although technology upgrades are usually a positive development, man-made fibers require less water for processing than cotton fibers. Depending on the product mix, this development could further erode off-take.

Case Study: Unbundling Solid Waste Management Services, Identifying Project Risks, and Introducing New Technology

The 2006 city development plan (CDP) for the Asansol Urban Area (AUA)[17] articulated the following solid waste management (SWM) vision:

"To put in place an effective solid waste management system aimed at minimizing manual handling, 100% waste collection and transportation of the waste, recycling of the waste and conservation of the environment, 100% compliance with various regulatory stipulations."

The Asansol-Durgapur Regional Solid Waste Management project (ADRSWM) was developed to bring this vision to fruition in a commercially viable manner. The FIRE (D) Program provided technical support to the local stakeholders to conceptualize and develop the project for Jawaharlal Nehru National Urban Renewal Mission (JNNURM) funding and procurement of a private operator for the first regional sanitary landfill (SLF) in the country. The FIRE (D) Program completed the detailed project report (DPR) in late 2006, and the project received its first tranche of JNNURM funding in early 2007. Local elections in May 2007 briefly delayed project implementation, but SWM remained a high priority. During the delay, the FIRE (D) Program suggested examining an alternative SLF technology—bioreactors—to further enhance the design. A third-party technical review of the DPR also evaluated the feasibly of bioreactor technology to capture methane produced by decomposing organic waste disposed of in the regional landfill.

By the time the technical review was presented to local, state, and national officials in the fall of 2007, the project, which had already received JNNURM funds, was under considerable pressure to move forward without the new technology. Although the bioreactor technology was deemed viable, there was insufficient time to effectively vet the technology vis-à-vis the prevailing municipal solid waste (MSW) rules[18] or to garner sufficient support to implement it on a pilot basis. Nevertheless, the final scheme addressed many concerns raised in the DPR technical review, and the private sector concessionaire incorporated enhanced processes and technologies that resulted in more comprehensive recycling of waste, increased landfill capacity, and additional revenue generation that lowered project costs.

14 http://www.thehindubusinessline.com/2009/08/29/stories/2009082951561700.htm.
15 "Tirupur water project runs up a 200 crore loss," *Deccan Chronicle*, December 5, 2010.
16 http://www.governancenow.com/news/regular-story/govt-urged-continue-tuf.
17 The AUA is composed of five local governments: Asansol Municipal Corporation; Durgapur Municipal Corporation; and the municipalities of Ranigunj, Jamuria, and Kulti. The AUA is one of the most rapidly urbanizing areas of West Bengal.
18 Municipal Solid Wastes (Management and Handling) Rules, 2000. Ministry of Environment and Forests, Government of India.

Unbundling of SWM in the Original Project Design

In 2005, the Government of West Bengal (GoWB) set up a Solid Waste Management Mission under the Municipal Affairs Department with a broad SWM mandate that included developing regional SWM facilities under public-private partnerships (PPPs) and providing technical support and seed capital for infrastructure. The Asansol-Durgapur Development Authority (ADDA)—the nodal agency under JNNURM projects for the AUA—located an abandoned open-cast mine pit, in Mangalpur, as a suitable site for the first regional SLF in the country. The site would also house one of the three planned processing facilities (the others were planned for Asansol and Durgapur).

The FIRE (D) team planned an integrated solution from point of waste generation to safe disposal and recycling. To encourage commercial viability and to service several local governments in one project, the FIRE (D) Program recommended unbundling various aspects of SWM, including (1) the labor-intensive activity of door-to-door (D2D) collection, (2) the logistical challenges of transporting waste to disposal sites, and (3) the capital-intensive processing of waste and sanitary disposal at a centralized location. The unbundling plan requires that local governments own and maintain equipment and vehicles for waste segregation at the source. Self-help groups (SHGs) contract with households, welfare societies, and the local governments for D2D collection to reach 100% coverage. The SHGs aggregate the household trash in strategic collection points (e.g., one per neighborhood) that are easy for the local government to reach with their trucks and that are conveniently located near the processing plants. The local governments also collect directly from bulk waste generators (e.g., industries, bigger institutions, and markets) and transport the waste to one of the three processing plants. JNNURM funds are used mostly to pay for the capital costs of the transport vehicles and other equipment related to waste collection.

ADDA planned to procure a private operator to finance, construct, and operate the three processing plants, as well as the SFL regional disposal components (through a build-operate-transfer [BOT] arrangement). ADDA and the five local governments will jointly award the 25-year concession, followed by post-closure maintenance for 15 years. *MSW processing* involves sorting of materials for windrow composting and recycling, and the *regional disposal* site is a scientific landfill where only inert MSW is disposed of. The local governments are responsible for providing the necessary land for all facilities, and an "assured quantity" of MSW[19] to the private operator. The private operator finances and maintains the processing facilities through the revenue generated from selling recycled products and from a "tipping fee" that the local governments pay for disposal of inert waste in the SLF. To reduce the tipping fee burden on the local governments, the BOT contract stipulates that the operator assumes all financial, operational, and commercial risks, and provides a performance security for 5 years. The operator is also required to pay the local governments a penalty (a percentage of tipping fee) for waste that is not in compliance with the MSW Rules and is not acceptable for SLF. Ten percent of the tipping fee is paid into a post-closure performance account to be released to the service provider, quarterly, during the post-closure period. In addition to the tipping fee, the local governments compensate the operator in the case of a shortfall of MSW at a cost of 20% of the tipping fee per ton of shortfall (the financial viability of the processing and disposal depends on the volume of waste and recyclables generated).

19 DPR, 2007.

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Commercial viability. Commercial viability is anticipated through user charges that the city/SHGs collect from households for D2D collection and from bulk generators. The user charges pay for the costs of collection and transport, as well as a tipping fee for final disposal at the SLF. Rejects from processing (and associated tipping fees) are reduced by the private operator to sort, recycle, and compost waste at the processing facilities. The private operator also accrues revenues from the sale of compost to the extent possible, although this was not anticipated to be significant. Recycled materials can also generate revenue for the private operator. The SLF receives all inert, non-recyclable material for safe, long-term disposal: It collects and treats leachate and storm water, vents gasses from any residual organic waste, and provides an environmental monitoring system. There was no plan for methane capture, since the gas generation was originally expected to be minimal. Based on the anticipated volume of waste requiring long-term disposal, the geo-technical parameters of the SLF site, and the extent of land available for the same (167 acres), the DPR indicated that the project would be viable for 40 years.[20]

Third-Party Review Identifies Key Risks and Alternative Technology

The original DPR called for three processing facilities to compost and recycle all possible materials, and to then send the rejects (i.e., non-recyclable inert matter) to the SLF. However, a third-party technical review of the project,[21] supported by the FIRE (D) Program, identified several oversights in the development process and potential pitfalls of the processing scheme. The research and related field visits revealed the following key risks of the original project design:

- Close proximity of population centers to the processing plants and likely objections to odor and vehicular movement
- High operating costs of windrow composting and lack of market for the sale of compost
- Challenges of segregation at source (e.g., regulatory weaknesses at the local level, rapid wear and tear of equipment, and transport inefficiencies)
- Limited understanding of characteristics and composition of waste based on secondary data
- Lack of preprocessing and waste load projections exceeding system capacity
- Inadequate/incomplete financial modeling and sensitivity analysis
- Weak compensation and performance standards for the private operator and cumbersome payment mechanisms
- Poor environmental and social safeguards
- Lack of stakeholder participation in planning, with little input from the smaller local governments
- Inadequate public awareness and communications strategies in project implementation

The review presented detailed recommendations to reduce the processing and other risks, and to improve the concessionaire agreement. It also outlined various technologies for methane capture and proposed an improved composting technology (a static aerated pile)[22] and alternative bioreactor technology that combines processing and disposal of MSW in the SLF. It highlighted the potential to generate revenue from the sale of methane gas to nearby industrial units, electricity production, carbon credits, and future mining and processing of the stabilized organic material from the bioreactor SLF. The review asserts that adopting bioreactor SLF technology would be feasible, eliminate the risks of composting, and improve the cost structure of the project.

In August 2007, the FIRE (D) Program briefed key Government of India officers involved with MSW in ministries and the Central Pollution Control Board on the principal findings of the DPR review. Central government officials expressed interest and were open to considering new technologies for MSW processing and disposal, including the bioreactor SLF. This positive feedback prompted the FIRE (D) Program to commission an international specialist in landfill design and operation to review the project and to formulate a concept for design of a pilot bioreactor SLF, as part of the ADRSWM project. The analysis estimated that the costs savings could be 40% when compared to the costs of compost-centric processing and that there were potential gains of 15% from the sale of carbon credits.

In September, the FIRE (D) Program briefed the stakeholders from ADDA, the local governments, and the State of West Bengal on these findings. The local officials expressed initial interest, but requested more information on the economics of the bioreactor and methane capture, and how it compared to the technology approved in the DPR. The state-level officials were less enthusiastic with regard to changing the processing and disposal solution, particularly due to their regulatory mandate to comply with the MSW Rules (state-level responsibility). Ultimately, the stakeholders decided to move forward with the project, as per the approved and funded DPR.

20 Ibid *and* FIRE (D) reports.
21 ADDA, June 2007, "Exploring Methane Capture Options under the Asansol Urban Area Municipal Solid Waste Management Project," Draft Report.
22 For a description of this technology, see http://www.green-ensys.org/site/publications/Static_Aerated_Pile_Composting.pdf.

Final Project Implementation

The third-party technical review exposed real deficiencies in design and therefore added value to the project development process. Although it made a solid case for bioreactor SLF technology and methane capture, it did not fully appreciate all the local issues and the overall project objectives defined in the 2006 CDP for "100% compliance with various regulatory stipulations." The project stakeholders decided to take a narrow interpretation of the national MSW Rules that precluded deviating technology. Reports at the time document the prevailing favorable attitude regarding composting as per the MSW Rules,[23] as well as recent failures of other waste-to-energy technologies in India, and likely factored into the local position.[24]

Although bioreactor technology was not ultimately adopted, changes were made to the original DPR, particularly in the processing component. ADDA awarded the BOT concession to the consortium of Gujarat Enviro Protection Infrastructure Limited and Hanjer Biotech Limited. The processing facilities implemented by Hanjer Biotech produced refuse derived fuel (RDF) that includes a portion of organic material, thereby reducing compost to 20% of total output (down from estimates as high as 50% as per the DPR). Hanjer Biotech also deployed a comprehensive recycling program that pulverizes concrete and granulates plastics for resale, also not detailed in the DPR. The combination of composting, RDF, and enhanced recycling increased revenue generation, have strong potential to diversify the risks of relying too much on composting for commercial viability, and reduce the final reject waste from 50% to 25% of total waste for the landfill (which consequently extends the life of the landfill).[25] Thus, although composting remained a part of the waste processing, it was no longer the central feature (as in the original DPR).

Conclusion. The ADRSWM case demonstrates that third-party technical reviews can add significant value to the design process. However, the project's objectives and regulatory framework, as well as the local political and financial contexts, must be carefully weighed when new technologies are proposed. If they are not, as the previous Tiruppur case shows, risks of delays and unsuccessful implementation increase.

At the time of the ADRSWM project development, the benefits of bioreactor landfill technology were being researched in India,[26] but remained new and untested successfully.[27] A strict reading of the 2000 MSW Rules concluded that only inert (non-organic) materials could enter a SLF. In contrast, a more liberal interpretation of the MSW Rules could have allowed a pilot bioreactor. For example, the MSW Rules indicate that landfills with mixed waste were acceptable if the materials were "unsuitable" for waste processing/recycling (on financial or environmental grounds).[28] The DPR noted that JNNRUM stipulated adherence to the SWM Rules, and JNNRUM funds had already been released by the time that the alternative technology was proposed to be piloted. The local officials wanted to move forward with the project and not risk delays in navigating uncharted regulatory waters of multiple institutions with the new technology.

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World Bank. 2007. *Improving Municipal Solid Waste Management in India, A Sourcebook for Policy Makers and Practitioners.* World Bank: Washington, DC.

World Bank Water and Sanitation Program. 2007. *Implementing Integrated Solid Waste Management Systems in India: Moving Toward the Regional Approach.* World Bank: New Delhi, India.

World Bank Water and Sanitation Program. 2008. *Secured Landfills: The Bucket at the End of the Solid Waste Management Chain.* World Bank: New Delhi, India.

23 A 1999 Supreme Court committee report states that "…all food waste and bio-degradable waste shall be composted…and only rejects shall be landfilled in a scientific manner." It further advised decision makers to take "caution against using unproven technologies" (http://www.karmayog.com/cleanliness/swmcc.htm).

24 Mrs. Almitra H. Patel, Member Supreme Court Committee for Solid Waste Management, "Municipal Waste to Energy: Failures & Opportunities," http://www.almitrapatel.com/docs/042.doc.

25 DPR and FIRE (D) reports, DPR Review, and Public-Private Partnership Projects in Urban Infrastructure, Dept. of Urban Development, Government of West Bengal, 2008 p. 22 (http://www.wburbandev.gov.in/PPP_2008/).

26 Sneha Gupta, Narendra Choudhary, and Babu J. Alappat, 2007, "Bioreactor Landfill for MSW Disposal in Delhi," Proceedings of the International Conference on Sustainable Solid Waste Management, http://www.swlf.ait.ac.th/IntlConf/Data/ICSSWM%20web/FullPaper/Session%20VII/7_08%20_Dr.Babu%20J.%20Alappat.pdf and http://www.swlf.ait.ac.th/NewInterface/India-AnnaUniversity.htm.

27 No plants in operation as of June 2008: http://www.thehindubusinessline.com/2008/06/17/stories/2008061750442100.htm

28 Ministry of Environment and Forests Notification, 2000, http://www.almitrapatel.com/docs/214.doc and World Bank Sanitation Program, 2008, Secured Landfills: The Bucket at the End of the Solid Waste Management Chain, World Bank: New Delhi, India.

ARTICLE 5.7

Procurement: Getting the Best Value-for-Money

Good procurement practices help government agencies access the support they need to improve their operations and provide better services. The procurement process should be timely and cost-effective for the government agency. It should be transparent for all participants so that each knows what to expect and when. Transparency in the process not only helps minimize fraud, it also encourages better proposal responses and more competition. How the procurement process is handled demonstrates how serious a government is about improving urban services. Good procurement also sets the stage for good contract management (see Article 5.8).

No matter what procurement method a local government chooses, the integrity of the process is central to what produces good (or bad) results. Using the best procurement methodology will be little consolation if the process gets undermined by special interests or lack of seriousness. That being said, the FIRE (D) Program recommends open competition as the most effective method for government procurements, particularly for large projects. And the objective of procurement should not necessarily be to find the lowest cost contractor, but to find the contractor who offers the best **value-for-money**. Key principles of good procurement are:

- Equal opportunity for similarly qualified firms
- Procedures based on objective criteria
- Transparency in the process
- Conformity with all laws
- Best product at the right price

Adherence to these principles helps ensure a high-quality process that solicits the best expertise at a reasonable cost: the value-for-money approach. At the same time, accessing quality consultants and services is only worthwhile if the government agency can utilize them appropriately, and, consequently, good contract management (see Article 5.8) is an essential follow-on activity.

Although procurement is common at all three tiers of government (i.e., central, state, and local), the process may vary depending on nature of work—procurement of technical services or construction works, or ordering physical goods. Furthermore, even for similar types of procurement, the specific process may differ between departments.

In India, a substantive portion of local government work (approximately 30%–50% of the budgets) is completed through external procurement. This figure has increased significantly with the capital works under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and other development schemes. Local governments usually follow state or central government procurement guidelines, which are based on selection through a *low-cost basis*. The concept of value-for-money is generally missing in government procurement guidelines. Also, there are no standardized procedures for the procurement process, which results in delays and non-transparency. It is therefore imperative that local governments review their existing policies relating to procurement and make appropriate changes to ensure transparency in the bid process, standardize tender documents, streamline decision making, handle complaints fairly, and publish large tenders widely.

Table 5-11 presents a standardized procurement process that can be followed to ensure both transparency and the best results possible. However, the steps do not give detailed instructions for every procurement situation. The table outlines the basic steps on which decisions should be based in an effective, transparent, and efficient manner.

Table 5-11. Steps for Procuring the Best Value-for-Money

1. Plan the procurement

- Define the activity and sector, as well as the purpose and justification for procurement.
- Quantify and qualify what is required.
- Choose a title for the procurement.

2. Define the requirements

- Describe the services for which procurement is being conducted.
- Define the desired outcomes and deliverables very clearly.
- Ensure terminology is clear and generally accepted.
- Define the stages and process of procurement. Unless small in size, the process should comprise two stages: (1) an expression of interest and (2) a request for proposal. This encourages more bidders to participate initially and eliminates unsuitable bidders from submitting full proposals.

3. Set up the procurement process

- The expression of interest (EOI) is a prequalification solicitation.
- The request for proposals (RFP) seeks detailed proposals with specific personnel and costing information.
- For both stages, the procurement agency forms a committee with relevant stakeholders to ensure that the procurement follows an agreed upon due process and records all actions.
- The procurement committee decides on the type of procurement—whether limited, national, or international—depending on the type of experience required for the project.
- The committee defines the selection method for the procurement, depending on the type, size, and scope of the project.
  (a) Quality and cost-based selection (QCBS)
  (b) Quality-based selection (QBS)
  (c) Fixed budget
  (d) Least cost
  (e) Single source
- In consultancy projects, QCBS should be followed because it provides the right mix of both technical and cost factors for consideration.
- Note that a selection based on least cost has to utilize a high-qualifying, technical threshold so that the variation in technical competence of the final bidders is small. A low qualifying threshold runs the risk that an unqualified firm will win with an unrealistically low financial proposal.
- All rules and procedures for bidding and selecting a winner need to be defined and clearly described, including a minimum threshold for the total score.

4. Prepare procurement documents

- Develop a Terms of Reference (ToR) based on the above information. The ToR should include the objectives of the assignment, the scope of work, activities and expected results tied to milestones, and specific outputs/deliverables to be submitted.
- Prepare a cost estimate internally, based on the ToR. The procurement committee may need to discuss reasonable costs with industry experts. (These experts will not be permitted to bid on the work.)
- Define eligibility and qualification criteria for bids. Define a threshold for the technical score for the bidder to have its financial proposal considered. Specify all factors, in addition to price, that will be taken into account in bid evaluation.
- Prepare tender documents (EOI and RFP) for both technical and financial aspects based on the ToR. It is essential that the bidding documents provide all the information necessary for bidders to respond.
  (a) RFP bidders must submit technical and financial proposals in separately sealed envelopes.
  (b) Technical proposals often vary in content, but usually include a description of the bidder's organization and experience on similar assignments, the proposed approach for executing the assignment, the staff who will be assigned to each task with the proposed personnel members' curricula vitae (CVs) or other statement of qualification, and an estimate of the level of effort (person-months) for each part of the service.
  (c) In a separate envelope, the financial proposal should list all costs associated with the assignment, including tax liabilities. Other information may be required, such as a subcontracting plan or small business participation plan.
- Decide on a strategy for publishing the tender documents, including website postings. Explain how bidders can obtain the documents and submit a response.

5. Publish documents to interested bidders

- EOI advertisements should be placed in leading newspapers and websites. They should give the broad scope of work and inform potential bidders where detailed bid documents can be found.
- Mandatory EOI information includes name and address of bidder and any consortium members, a detailed capability statement relevant to the specified work, and a summary of relevant experience. This helps eliminate unqualified bidders relatively easily.
- Bidders that qualify under the EOI are then considered shortlisted. Issue the RFP to all shortlisted bidders.
- Most RFP documents contain the following:
  (a) Letter of invitation
  (b) Instructions for preparing the RFP response
  (c) Guidance on submitting the proposal
  (d) Evaluation criteria, selection method, and procedures that the evaluating committee will use

(e) Any forms that need to be submitted
(f) Type of contract envisaged and payment procedures

- Undertake a prebid meeting to answer any questions from bidders. The clarifications should be published for others to access easily.
- There can be a nominal fee associated with bidding, if desired, to help recover the cost of undertaking the procurement.

6. Receive bids

- The date and time that each bid was received, opened, and reviewed must be properly recorded.

7. Evaluate technical bids

- Technical subcommittees undertake evaluations of the technical proposals, per the criteria defined in the RFP.
- Technical proposals should be opened, reviewed, and scored first to determine overall responsiveness. Evaluators use the already agreed upon criteria to determine the score.
- The committee may ask bidders for additional information, request an interview/presentation, or arrange a site visit to verify claims made in the bid.
- All evaluation procedures need to be recorded, approved, and safely stored (with electronic backups). The minutes of evaluation subcommittee meetings should be signed by all members.

8. Evaluate financial bids

- Finance subcommittees undertake evaluations of the financial proposals, per the criteria defined in the RFP.
- Financial proposals are only opened for bidders whose technical proposals are scored at or higher than the threshold score, as defined in the RFP. The remaining financial proposals shall be returned, unopened to the respective bidders.
- The financial evaluation subcommittee shall determine if the financial proposals are complete, reasonable, and without computation errors.
- The most competitively priced bid will be awarded the highest score for the financial evaluation. The other technically qualified financial proposals will be scored on an inversely proportional basis to the highest score (see footnote in Column C of Table 5-12).
- All evaluation procedures need to be recorded, approved, and safely stored (with electronic backups). The minutes of evaluation subcommittee meetings should be signed by all members.

9. Rank bidders and negotiate contract

- The combined technical and financial subcommittees write a comparison statement for each proposal that met or exceeded the technical proposal score threshold, including the combined technical and financial scores.
- Under QCBS rules, the proposal with the maximum awarded combined score (technical and financial) will be ranked number one (see example in Table 5-12).
- After final ranking, the top bidder should be invited for contract negotiations.
- All the technical and financial scores should be disclosed to each bidder so that the rankings are clear to everyone.
- Negotiations should not deviate from the scope of work in the RFP. The committee and winning bidder reach an agreement on a draft contract by the conclusion of negotiations.

Table 5-12. The QCBS Scoring Process: Bidder 3 Wins with an Overall Score of 87.5[1]

	Technical Evaluation		Financial Evaluation			Total (100%)
	(A)	(B)	(C)	(D)	(E)	(F)[2]
	Technical Score (out of 100)	Points (B = A * 75%)	Price Quoted (Rs. lakhs)	Financial Score (D = 100 * *lowest quoted price/ price quoted)*	Points (E = D * 25%)	Overall Score (F = B + E)
Bidder 1	70	52.50	1,000	80.00	20.0	72.5
Bidder 2	80	60.00	800	100.00	25.0	85.0
Bidder 3	95	71.25	1,200	66.66	16.5	87.5

1 In this case, the technical score is worth 75% of the overall score, and the financial score is worth 25%. Another common split is 70% technical and 30% financial. This will need to be decided up front based on how important the technical expertise is required for the specific project.

2 Bidder 2 quotes the lowest amount at Rs. 800 lakhs. The financial score for bidder 2 is therefore the best, and equal to 100 (100 * 800/800). Bidder 3 quotes the highest amount, and therefore, receives the lowest financial score of 66.66 (100 * 800/1,200). However, bidder 3 is the most technically qualified and will deliver the best services to the local government, relative to the cost (receiving the highest combined score in Column F).

ARTICLE 5.8

Improved Contract Management Helps Local Governments Achieve Better Urban Services

Introduction

This article addresses the practical issues that local governments[1] face in contract management. It also provides the necessary steps for good contract management based on traditionally executed projects, where government agencies take the lead role. The principles work equally well for public-private partnerships (PPPs), but it is important to remember that the agency roles may differ depending on the PPP project structure. It is possible, especially with PPP projects, for a local government to form a permanent contract management structure/team that reflects the long-term requirements of developing infrastructure.

What can a local government expect from good contract management?

1. **Achieve expected outcome.** For all contracts, whether it is for physical works or a service like information technology (IT) upgrades, the local government expects a certain quantity of work, at a specified quality, to be completed within a certain amount of time and for a certain amount of money. The best outcome for contract management is achievement of all of these specifications. But it is reasonable to assume that, in India, this is not regularly the case.
2. **Manage variations.** As the on-the-ground situation changes, the nature of work may also require modifications. For example, a local government may wish to change the layout of a water supply network from what is mentioned in the contract, or unexpected pipeline work may increase the cost of road construction. These modifications are frequent, if not inevitable, and managing them smoothly, within the guidelines of a contract, is something local governments have to be able to do.
3. **Resolve disputes amicably.** Disputes are also inevitable, due either to a claim by the contractor or to an objection from the local government. Well-written contracts do not usually satisfy the claims of both parties, but they can help resolve them amicably and speedily.

To achieve these three expectations, local governments need to take active responsibility for managing urban development. Areas of responsibility that will affect contract management include (1) fulfilling all specified project commitments, such as clearances, timely approvals, and access to land; (2) conducting thorough city financial planning; (3) training technical staff to supervise site works and monitor project progress; and (4) making decisions quickly, using a mature approach to resolve issues as they arise.

What should local governments not expect?

1. A local government should keep in mind that it is taking a risk when signing any contract. It should take a commercial approach to contract management, instead of perceiving itself as a party with authoritative negotiating powers, which has little relevance under a contract.
2. A contractor may be well qualified and may have sufficient experience. But this alone does not guarantee performance. Many things, some within a contractor's control and some external, can affect performance. Therefore, in any contract, a local government exposes itself to the risk of underperformance. In some cases, the original objective can still be achieved, but the cost of doing so is not practical (e.g., time delays, extended legal disputes, or funds blocked).
3. Though a contract provides legal remedies, pursuing them may be too costly. Therefore, deciding when to compromise and resolve disputes collectively is an important feature of good contract management. A local government needs to be aware of this and should be prepared to compromise. Rather than win legal battles, a local government should consider a practical balance of costs and benefits.

1 Any number of agencies with responsibility for project implementation can be substituted for local government.

What are the prerequisites for good contract management?

Good contract management begins with a quality drafted contract. Since this article does not cover contract drafting, only the broad principles are covered below.

1. The procurement team needs to clearly specify the expected output in objective terms, covering both quality and quantity.
2. The procedure for measuring the quality and quantity should be specified. This will include timing of tests, sampling procedures, measurement procedures, and testing methods.
3. Payment should be explicitly linked to progress milestones and outputs (e.g., delivery of pipes at the construction site or placing a purchase order for meters).
4. The consequences of not meeting the specified outputs have to be clear. The contract should explicitly state the actions that a local government can take, and those it cannot undertake.
5. The remedies for addressing contractor underperformance—in time, quality, and quantity—must be explicit.
6. A robust mechanism for resolving disputes, before resorting to a judicial process, should be included. This normally entails amicable dialogue, an expert panel, and arbitration.

Many local governments continue to use old contract formats simply because of tradition. Local government staff view revising contract formats as risky, since they may be questioned later. To address this perception, a local government should review contracts periodically, and standardize them during the process. Many standardized forms, such as internationally recognized Fédération International des Ingénieurs Conseils (FIDIC) contracts,[2] are well received by national and international contactors. These are a good starting point for a local government.

Local governments should bear in mind that to contractors the costs of underperformance (e.g., the performance guarantee and outstanding payment amount) are relatively limited. But to a local government, the cost of a contractor's underperformance can be many times the value of the contract itself. For example, a local government may recover only 10% of the contract value as damages if a water treatment plant fails.[3] But the local government's loss is likely to be much higher (e.g., total value of the plant that does not work, cost of upstream transmission projects, and loss of revenue due from the treated water). Therefore, it is in the interest of the local government to have a contract that is unambiguous and to work closely with the contractor during the entire implementation process. This mitigates the risks of unforeseen problems.

Certain types of contracts are inherently easier to manage. For example, in performance-based billing and collection contracts, a contractor earns higher revenue when bills and collections increase. Thus, the interests of a local government and a contractor are broadly aligned. It is possible to create such incentive structures in many contracts. A contractor could receive bonus payments if construction is completed ahead of schedule. Similarly, there could be damages for delays in construction. In such contracts, a local government would find it easier to manage the time variable. Contracts that contain a performance element and those that have incentive structures are easier to manage. However, a contract that perfectly aligns the interests of the contractor with those of the local government never truly exists, and thus, it is always beneficial for a government to be active in managing the contract.

2 FIDIC is the leading body for the development of model standard forms of contract for use in the international construction industry.
3 Most contracts cap damages at about 10%.

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What are the common problems that local governments face?

Pressure to ignore deviations and provide concessions. Many contractors have personal relations with government staff and elected officials. As a result, contract managers can face enormous pressure to waive deviations and overlook shortfalls. If such situations are anticipated, it is best to have very few discretionary powers in the contract. For example, normally a contract manager is provided discretion to ignore delays, if the delays are within a limited time period or are not the fault of the contractor. In some situations, it would be safer not to provide this discretion, since the contract manager might experience increasing pressure. Under other circumstances, the contract needs to specify the exact situations in which delays are acceptable. It may also be useful to have a third-party monitoring system, which may be less susceptible to internal pressures. These are not foolproof measures. Ultimately, if a local government is not vigilant about enforcing a contract, support to the contract manager will not be forthcoming and contracts will yield poor results.

Local governments delaying or failing in their responsibilities. Local governments are responsible for many things under a contract (as highlighted on the first page of this article). Failure or delays on these counts, such as accessing land or providing clearances, is a common cause for timeline delays.

Poor financial planning leading to payment delays. Most local governments do not integrate contract management and capital planning (defined in Article 3.7). Often, contracts in progress far exceed annual budgets, especially when funds flow from the state and central governments. Unfortunately, local governments do not usually control the timing of the flow of funds. Such delays can affect implementation and can escalate the contract costs.[4]

Lack of expertise to test and approve progress in a timely manner. Many contracts require interim testing and inspections by the local government before progressing to the next stage. This is critical when the contractor has design responsibility (architectural or engineering designs that need approval) or in service contracts (e.g., IT implementation approval). In many cases, the technical aspects are new to the local government, and the staff are not prepared to review and approve the progress.[5] Normally, this leads to delays. It is vital that a local government recognizes the skills it does not possess and seeks appropriate external assistance, such as a third-party technical review.

Inability to make decisions. Contract management, including contract modification, requires discretion and flexibility because the situation on the ground changes quickly, and the development process needs to respond to ensure good results. Internal controls and statutory audit systems of local governments can stifle such decision making. Staff will be apprehensive of making efficient judgments if they are not protected. This could lead to delays and disputes in contract execution.

Poor documentation. A contractor's management system is usually well geared for variations and disputes. Although local government systems do create documentation, it may be insufficient when it comes to critical aspects of contract management, such as recording contractor delays and shortfalls in service quality.

Poor choice of arbitrators. The poor choice of experts, defense lawyers, and occasional arbitrators can be a fatal flaw. It can compromise valid objections that a local government may have. Contractors are usually better geared for dispute management and arbitration than governments are.

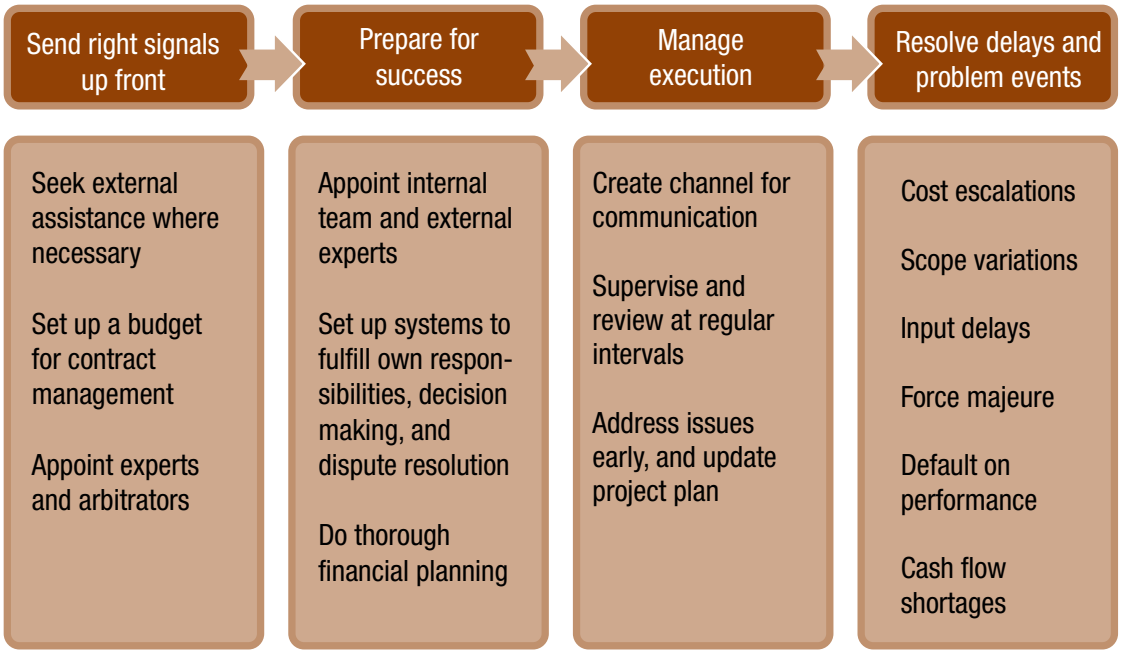
4 This point highlights the need for better financial management and financing mechanisms, like working capital loans or lines of credit from a bank.

5 This highlights the need for continued professional training of staff and for engaging third-party technical reviewers.

The Contract Management Process

Good contract management starts well before project execution. Sending the right signals, initial preparation, ongoing monitoring, and resolving problems are all critical parts of a contract management process. Figure 5-4 summarizes the various stages and likely issues involved in each.

Figure 5-4. Stages of Contract Management



1. Send the Right Signals to the Contractor

Effective contract management begins by sending the right signals to contractors during the bidding stage. Proper bid documents, along with a transparent and efficient bid process, convey professionalism (see Article 5.7). In addition, a local government can show it is well prepared to manage the contract.

External professional assistance. If there is a need for third-party audits or other technical support, the agencies can be appointed beforehand, or concurrent with, the bidding process. The choice of third-party agencies sends a strong signal to bidders. If a truly independent agency is appointed up front, bidders understand that any claims or variations will be objectively assessed. Therefore, bidders avoid the competitive pressure to initially under-quote and rely on a claims process to gain additional revenue (currently a common practice). When third-party agencies have been appointed up front, it is common for contractors to provide a more realistic price for their bid.

Creation of a budget for contract management. Making clear provisions for contract management expenses can send a strong signal to bidders that the local government is serious about contract performance. The budget for contract management includes, as appropriate, third-party quality monitoring, temporary experts, staff allowances, project site office expenses, and dispute resolution expenses.

Choice of experts and arbitrator. Another strong signal is the up-front choice of experts for contract review or conflict mediation, as well as the choice of arbitrator.

2. Prepare for Successful Contract Execution

Contract management is a full-time activity. Rather than wait for an event to happen and then deal with it, local governments should be active participants (even when project execution is fully outsourced).

Set up the team. A management team that has sufficient strength and skills is the first requirement for success. The size of the team depends on the project. Nevertheless, a project management team for reasonably sized projects should have a minimum of five technical staff (2–3 for site-level monitoring, 1 supervisory/quality control staff, and 1 managerial-level officer). Legal and finance officers can be included when required. Depending on the technical nature and total number of activities, the team can increase with external support.

The local government needs to determine if it has sufficient staff for day-to-day contract management. When new facilities or new technologies are being constructed, it is usually safer to rely on external expertise for oversight. For simple projects, such as road or pipeline construction, a local government may have capable and qualified staff. However, if the local government expects conflicting demands on staff time (e.g., other routine work), it would be less risky to utilize external help.

In addition to technical staff, it is important to include legal and finance staff in the contract management team. This helps the team understand all the key aspects and decreases their response time when legal and finance issues arise. Therefore, it is important to form cross-functional teams: The respective department heads need to provide staff with adequate time to work on the cross-functional activities of contract management.

Large local governments set up dedicated project implementation departments, whose primary focus is capital works planning and implementation. There are advantages and disadvantages to this approach. While it provides specialized skills, it also artificially compartmentalizes contract management operations and dilutes ownership (which should remain in each functional department). Regardless of whether a local government has a separate department, it is important that each contract receives adequate attention and cross-functional competence.

Determine the responsibilities and implement cross-departmental coordination. The local government will often have several responsibilities to fulfill in a timely manner, such as site transfer, supply of materials, and regulatory clearance. It is common for local governments to try to transfer all of these responsibilities (and often the consequences) to the contractor. This is unpractical and will cause delays.

At the same time, contract management staff may not have sufficient authority over these functions. For example, sewage construction requires coordination with both the roads department and the water supply engineers. All necessary steps for executing projects should be clearly identified, and each one assigned appropriately. The contract management team (with assistance of the contractor) needs to ensure that all partners fulfill their roles at the right time. A calendar of required activities for each stakeholder is very helpful. The deadlines for completing each activity should match the milestones under the contract. Project monitoring follows the same process calendar.

Set up the decision-making systems. In the case of variations and disputes, decisions need administrative approvals. Local governments already have established decision-making processes, but it would be helpful to review them to make sure they are appropriate for the current project. For example, a local government might be familiar with variations to a bill of quantities (BoQ) contract, but might not be familiar with variations to a service contract. It is useful to set up a decision-making system that corresponds to the specifics of current projects.

Conduct financial planning and cash flow forecasting. Financial planning is a critical exercise related to contract management. It is important to simulate the payment cycle under the contract and assess if the local government has matching cash flows. If it does not, it may be better to delay the start of the project, rather than risk suspending work after it has begun. An honest assessment can address potential delays and cost escalations. This step can also indicate if the local government will require short-term borrowing. A system where the contract management staff regularly provide feedback to the finance department on anticipated payments and cost escalations is useful.

Manage the supporting contracts. When the local government manages overall project implementation (as opposed to contracting it out), many contracts will be in place—some for supply of materials and some for services. It will be important to match the terms of the different contracts. For example, the milestones under a material procurement should match the relevant milestones for construction or operation. In addition to matching milestones, the financial consequences of delays or shortfalls have to be considered very carefully.

3. Manage Contract Execution

A distinction exists between good contract management and a good outcome. Contract failures can occur irrespective of whether a good management system is in place. However, the presence of a good system can help mitigate the consequences when a contract starts failing. With the right resources, systems, and team the contract management exercise is poised to operate well.

Matching channels of communication. The local government should establish smooth lines of communication at various levels. The local government's contract management team should interface with the contractor's team regularly, including the business managers. It helps anticipate problems at the working and business management levels. It also builds familiarity, which is useful when disputes arise.

Regular reporting from the contractor. Regular reporting should cover all major works at the project site, the status of outstanding procurements, and all technical testing. The contract monitoring unit should ensure that the contractor conforms to the frequency and detail expected in these reports. They establish a strong source of documentation to monitor progress and address variations and disputes.

Onsite supervision. Onsite supervision by the local government has to be part of contract management. It establishes a formal monitoring mechanism. And active interest in direct monitoring establishes seriousness.

Review timetable and adherence. The local government should set up three levels of reviews: (a) joint progress review every month or fortnight between the contract management team and the contractor's team, (b) internal reviews of contract milestones by the contract managers and higher local government officials (also monthly or fortnightly), and (c) status reviews between the contractor's business managers and the higher local government officials (normally on a quarterly basis). This framework allows for strategic assessments and resolution of problems when they arise.

In addition to periodic reviews, key milestones (e.g., ordering equipment) will also be reviewed on a scheduled basis. These reviews allow the contract management team to constantly update the progress calendar and cash flow requirements.

4. Resolve Delays and Problem Events

A smooth-running contract is the desired outcome, but, unfortunately, it does not happen very often. Inevitably, there are events that need resolution.

Cost escalations and price adjustments. Changes in the prices of key inputs—materials, labor, and fuel—are usually incorporated into construction contracts using an escalation formula, linked to independent price benchmarks in the market. The contract management team needs to monitor these benchmarks and verify the claims submitted by the contractor. This type of event is the least troublesome, since it is objectively quantified in the contract.

Variations in scope. Variations in scope can be a little more complex. Contracts with "piece" rates or defined by a BoQ should accommodate changes in scope. Normally, the changes are approved using pre-agreed prices. A technically capable contract management team can interact with the contractor to resolve these claims before the problem escalates. Advice of an external panel of advisors can also help the contract management team make decisions.

Input delays. Delays in the execution of local government responsibilities (e.g., land transfers and clearances) frequently occur. Often, this threatens project timelines as well as costs. Contractors may make financial claims based on these delays. Contracts that rely on inputs from many parties should specify what happens in case of delays or cost escalations. Changes to the project should still match key milestones on the progress calendar (although dates might be altered). Although the contract management team needs to ascertain some facts on the impact of such delays, equally important is maintaining good documentation of the process to understand the implications. When the contractor makes a claim, a technically strong team with enough decision-making powers should be able to resolve it appropriately.

Unforeseen events. Unforeseen events, such as force majeure, can critically affect project execution. A contract normally documents the procedure for determining if an unforeseen event has occurred and what remedies are available to both parties. However, the actual use of remedies is often subjective. For example, a project site may become flooded for a few days, but restoring the site and equipment to good working condition could take several weeks. The appropriate modification to the construction timeline becomes a subjective judgment in such cases. The trust that the respective teams establish becomes vital to reaching an amicable solution.

Contractor default. In the event of a material/performance default, the local government has several contractual remedies. Pursuing them is necessary to signal the seriousness of the situation. However, the most practical resolutions are always based on dialogue. Along with dialogue, legal remedies can be pursued to increase the local government's negotiating power and, in some cases, to force a contractor to come to the negotiating table. The FIRE (D) Program recommends (1) closely involving higher levels of management, (2) documenting all activities and communication, (3) pursuing available legal remedies when necessary, and (4) keeping the process of dialogue alive. This last stage is often the most delicate, since an impasse usually affects the local government more than the contractor.

Cash flow shortages. If a local government realizes that cash flows are not adequate to meet payments, it is best to alert the contractor immediately to provide the contractor with enough time to defer certain commitments. At the same time, the local government should explore short-term loans. In many cases, even an expensive loan would be better than suspending a project.

The local government has to make judgments on which concurrent projects are top priorities. Many times, the decision is based on the overall importance of the project. However, it would be useful to compare the relative costs of delaying each project. For example, a road contract is certainly important for political visibility, relative to an IT project. However, if an IT project is in its final stages and does not get tested, all the prior investments could be negated. Therefore, the relative importance of various projects, as well as specific consequences of delaying each, should be considered.

Using Negotiating Power to Improve the Contract Process

Potentially winning future contracts is a strong influence on contractors. While it is true that all contracts go through a tendering process, a contractor wants favor based on a successful working relationship and on high-quality past performance. All contractors consider this when discussing business with their clients.

Positive referrals and, conversely, blacklisting provide strong incentives to perform under a contract. The poor performance of a contractor is often exploited by its competitors, and adverse feedback or blacklisting can be an effective deterrent. Local governments need to recognize this and use it effectively to encourage good performance.

Empanelment is another strong negotiating tool for a local government. For small projects, most local governments invite financial bids from prequalified, listed contractors. The local government can maintain various categories of prequalified panels. This procedure works well for small contracts when only local firms are expected to participate. For large contracts, the procurement utilizes national bidding, in which case it becomes difficult for each local government to maintain a national panel of contractors. If the local government has a practice of empanelment, contractors consider the implications of being left out of the empanelment. It is easier for a local government to leave a contractor out of a standing panel than it is to disqualify the firm from a specific project.

Most contractors accumulate a number of small deviations that are not material. When negotiations on something significant stall, a local government can use its power to escalate or waive the many small deviations. Needless to say, chronicling and documentation of the entire process are important for exercising this power.

Finally, making payments ahead of their final due date provides a large impact. In construction projects, the cost of working capital for a contractor is particularly high, and is often the most critical parameter affecting his business performance. Prompt payments represent a small cost for the local government but provide a big benefit to the contractor. This should be leveraged effectively.

FIRE (D) PROGRAM

Conclusion

A local government bears significant risk of a contractor's nonperformance in urban infrastructure projects. A local government should expect to achieve the stated quality and quantity of work, within the stipulated time, and at the agreed upon cost. But it should be reasonably prepared to face variations throughout the development process. Its statutory powers and legal remedies do not provide practical assurance of contract performance. Good contract management can provide assurances that risks are reasonably mitigated, even if not always avoided.

Ultimately, the perception of a local government weighs on the minds of contractors, and is partially the result of good contract management (see Table 5-13). A textbook approach to contract management can be safe, but will make contractors overcautious in their relationship. A liberal approach can seriously compromise local government interests. A commercial approach, combined with practical solutions that respect the business interests of the contractors, is the right balance. It improves the performance of the local government, increases trust, and provides a platform for fruitful engagement with contractors. Developing this culture is difficult, especially since municipal commissioners have a short term in office, but it can have an enduring benefit.

Table 5-13. Good Contract Management Improves Results in Pimpri Chinchwad Municipal Corporation (PCMC) Road Projects

Results achieved	Send the right signals	Prepare for success	Manage contract execution	Resolve problems
Contractors are now aware of expected quality requirements.	Quality benchmark (roughness index of 2,500 mm/km for city roads).	Contractors submit quality assurance plan for approval.	PCMC and project management consultants jointly monitor results against milestones.	PMC levied damages for delays in setting up proper on-site facilities.
PCMC met its road construction targets at desired quality.	Assigned project management consultants, third-party inspectors, and auditors before tendering.	Trained staff in technical and contract management aspects at nearby research institute.	Project management consultants remained on construction site continuously.	PCMC withheld clearances until the contractor deployed specified technical expert for site review.
Increased capital expenditure capacity by 100 times (from Rs. 54 crore in 2004 to Rs. 540 crore in 2007).	Bid stipulations show commitment: specific technology, on-site testing, and on-site office for PCMC.	On-site laboratory testing linked to data tracking and PCMC project monitoring (in central office).		