Financial Analysis for Up Scaling 24 X 7 Water Supply System in a Tier II City

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Comment by the Faculty

It is common knowledge that meeting the infrastructure needs of a country is a key criterion for putting economic growth on the fast track. For most of twentieth history, the infrastructure needs of a country were largely assessed, developed, financed and maintained by the government. While large-scale infrastructure projects of national importance–such as national highways, deep harbor ports and container terminals, and rail networks–were addressed by the central government, the regional infrastructure requirements–such as local transportations, water supply and waste management–were dealt with by respective local governments.

At the turn of the century significant changes have taken place with respect to infrastructure development. These changes are influencing the manner in which infrastructure projects are developed, financed and owned. The most noteworthy changes have been implemented through the Public-Private-Partnership (PPP) model of infrastructure development. The PPP model has ushered in a structure where the responsibility–ergo the risks and returns–of infrastructure development is shared between the government, private corporations and patrons. The model has in many ways contributed to de-aggregating financial risk at the individual market participant level and enhanced risk appetite for all. The basic idea behind it all is to understand the risks and cash flows inherent in a transaction so that it can be re-engineered to meet the needs of different parties to transaction.

Sponsors, when saddled with full responsibility of large project, are often intimidated by size, complexity and resource requirements. Even in case of financially feasible ventures where they choose to undertake it, they are often confronted by myriad setbacks and delays which have become a potential characteristic of large scale project. With the PPP model of project financing projects can be structured in a way so as to enable a viable outcome for all participants. In contrast to traditional finance's view of "black box" decision- making: simply stating "go" or "no go", project financing offers truly innovative approach to finding sources of value and risk. Stated simply, project financing is a way of distributing risks and rewards more efficiently. Different risks are distributed to people who are best able to manage them and are paid to do so.

Generally speaking, project financing through PPP model does offer innovative avenues for designing new revenue models and lowering the cost of capital for the project. However, revenues from infrastructure projects in the realm of water supply and waste management rarely cover costs undertaking such projects. In these cases the project needs to be structured around annuity financing technique.

This study by P. Apoorva illustrates a methodology to examine the annuity financing of water supply projects with alternatives to arriving at the lowest cost of financing.

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Infrastructure Sector in India

Infrastructure is basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to function.

The Indian economy is booming and this ongoing growth is due to rapidly developing services and manufacturing sectors, increasing consumer demand and government commitments to rejuvenate the agricultural sector and improve the economic conditions of India's rural population. Construction is the second largest economic activity in India after agriculture, and has been growing rapidly. The production of industrial machinery has also been on the rise – and the increasing flow of goods has spurred increases in rail, road and port traffic, necessitating further infrastructure improvements.

India's planning commission has projected an investment of US$ 1 trillion for the infrastructure sector during the 12th Five Year Plan, with 40 per cent of the funds coming from the private sector.

About iDeCK

iDeCK was incorporated as a public limited company under the Companies Act, 1956 in the year 2000. The shareholders of the company include the IDFC Foundation (49.5%), HDFC Ltd (1.5%) and Government of Karnataka (49%). It is managed by the Board of Directors without any one of these shareholders having complete control over the company.

Services provided by iDeCK can be broadly classified into 4 categories:

- Transaction Advisory Services & Project Development.
- Capacity Building.
- Engineering Services.
- Financial Analysis and project structuring.

Water Sector

Water supply is the provision of water by public utilities, commercial organizations, community endeavors or by individuals, usually via a system of pumps and pipes. Irrigation is covered separately. Water being the basic human necessity and a prime natural resource needs to be managed with proper planning. With increasing urbanization, the requirement for water for various purposes is increasing. Due to depletion of available resources of water at various places, there is an eminent need to improve ways in which water is abstracted from sources, optimally utilized and waste water disposed off, scientifically.

The urban water supply and sanitation sector in the country is suffering from inadequate levels of service, an increasing demand-supply gap, poor sanitary conditions and deteriorating financial and technical performance. In most cities, centralized water supply systems depend on surface water sources like rivers and lakes. Where surface water sources fail to meet the rising demand, groundwater reserves are being tapped, often to unsustainable levels.

Efficiency of Utilities

Two indicators of operating efficiency are non-revenue water and labor productivity.

Non-revenue water (NRW): It is water that has been produced and is "lost" before it reaches the customer. NRW is typically measured as the volume of water "lost" as a share of net water produced.

NRW has the following components:

- Unbilled authorized consumption
- Apparent losses (water theft and metering inaccuracies)
- Real losses (from transmission mains, storage facilities, distribution mains or service connections)

In most developed countries, there are no or very limited apparent losses. For developing countries the World Bank has estimated that, on average, apparent losses - in particular theft through illegal connections - account for about 40% of NRW.

Labor productivity: A survey of a larger sample of Indian utilities showed an average ratio of 10.9 employees per 1,000 connections.

Tariffs, Cost Recovery and Subsidies

Water and sewer tariffs in India are low in both urban and rural areas. In urban areas they were set at the equivalent of about US$0.10 per cubic meter in 2007 and recovered about 60% of operating and maintenance costs, with large differences between cities. Some cities do not bill residential users at all. In rural areas the level of cost recovery often is even lower than in urban areas. Subsidies were estimated at US$1.1 billion per year in the mid-1990s, accounting to 4% of all government subsidies in India. 70% of those benefiting from the subsidies are not poor.

Metering: Water metering is the precondition for billing water users on the basis of volume consumed. According to the results of a Service Level Benchmarking (SLB) Program carried out by the Ministry of Urban Development in 28 cities, the share of metering was 50 percent. However, meters often do not work so that many "metered" and unmetered customers are charged flat rates independent of consumption. Many other cities have no metering at all or meter only commercial customers. Users of stand posts receive water free of charge.

Tariff levels: According to studies the average tariff for all customers – including industrial, commercial and public customers – is INR4.9 (8.3¢ US) per cubic meter. The tariff for customers that are effectively metered is typically a uniform linear tariff, although some cities apply increasing-block tariffs.

Cost Recovery: According to the results of a Service Level Benchmarking (SLB) Program carried out by the Ministry of Urban Development, cost recovery in India is 67% on average.

Project

As part of a 24X7 water supply program, a multilateral investment guarantee agency assisted the state government for implementing the program in a demo zone of the city and it now intends to up scale the system to cover the entire city. iDeCK had been requested to provide assistance to develop a financial model and project structure based on the inputs provided by the technical consultants.

24X7 Water Supply

24x7 supply is achieved when water is delivered continuously to every consumer of the service 24 hours a day, every day of the year, through a transmission and distribution system that is continuously full and under positive pressure. The service Level Benchmarks proposed by Ministry of Urban Development has been provided in *Table 1*.

Table 1-Service Level Benchmarks by Ministry of Urban Development

Water supply data from 28 pilot cities:	
Continuity: Hours water supplied (average)	3.3 hours per day
Continuity: Range of hours supplied	1 hour/3 days to 18 hours per day
Per capita supply (average)	126.4 liters
Consumption metering (average)	49.8%
Nonrevenue water	44.1%
Cost recovery (average)	67.2%
Collection efficiency (average)	78.8%

Sources: WSP-World Bank data.

In the tier II city being considered for implementation of the project, the water supply service levels are considerably poorer than the levels recommended by the Government of India.

The service connections are not metered therefore, irrespective of the consumption, consumers in the same category, are paying the same fixed monthly charge. The Municipal Corporation of this city recovers only 36% of the actual costs of water supply through user fees. The deficit is met by the municipal revenues or any other funds available to the corporation/ water board.

Thus, extending this facility of providing 24X7 water supply throughout the city would be profitable both for the municipal corporation and also would be beneficial for the citizens of the city. This sets the need for implementing this project before which the financial feasibility needs to be analyzed.

Major water Supply Schemes

The Tier II city being considered for the project has two major water supply schemes. Details of these water supply schemes has been depicted in *Table 2*.

Table 2 : Water supply schemes in the Tier II city

Sl. No	Scheme	Source	Designed Capacity (MLD)	Present Drawl (MLD)
1	R1 Water Supply Scheme Stage-I Stage-II	R1 Reservoir	 27.28 27.20	 45.48
2	R2 Water Supply Scheme	R2 Dam	81.72	54.45
Total			**136.2**	**100**

Current Financial Scenario

Water services are currently financed by a mix of SFC grants (for staff and power), subsidies from the City's general fund, user fees, and with capital grants from the State or Central Government.

The current operating expenditure is recovered partially through user charges. The deficit is met with the help of SFC grants for electricity and subsidies from the general budget of the city's Municipal Corporation. The city is totally reliant on government grants for capital expenditure, therefore not able to invest in capital expenditure to keep up with urban growth. The result is low quality of O & M and poor water service.

Under the pilot project the operator's costs, and the capital costs, were financed as a grant by the State. The cost of providing bulk water to the demo zones was borne by the ULB which was in turn subsidized with SFC and other grants. The new project will follow the state government policy whereby the state government provides a grant of 50% of the capital cost, the city is responsible for operating costs (SFC power grants likely to continue and subsidize at current level) and 72% of the capital costs. Out of this, 9.4% of capital costs are provided as upfront cash contribution and 18.6% could be mobilized as a loan by the city.

This new project will build to expand 24x7 coverage to the whole city whilst fostering greater responsibility with the city government for both service delivery and financing, in line with State Government's policies on decentralization.

Demo Zone

As the demo-zone was selected in a manner that it would be representative of the city, the consumption pattern in the demo-zone has been used for projecting the consumption across the city the details of which has been provided in *Table 3*. This method has been adopted as the current network in the city is not metered and therefore, no record of the consumption pattern is available.

Table 3 : Water Consumption Patter in Demo Zone

Category	% of Consumption	Average No. of Consumers	% of Consumers	Consumption Monthly in KL
Domestic				
0-8000 2%	1017	11%	4.81	
8001-15000	11%	2189	24%	11.65
15001-25000	24%	2813	31%	19.50
>25001 63%	3099	34%	47.38	
Domestic Total	96%	9118	97.86%	25.45
Non-Domestic				
0-8000 1%	7	5%	3.92	
8001-15000	5%	21	15%	11.66
15001-25000	13%	36	26%	19.55
>25001 82%	73	53%	59.29	
Non-Domestic Total	2%	137	1%	38.72
Commercial				
0-8000 1%	6	10%	3.56	
8001-15000	2%	6	10%	10.21
15001-25000	5%	9	15%	20.66
>25001 93%	41	66%	85.07	
Commercial Total	2%	62	1%	60.59
Grand Total	100%	9317		

Financial Modeling

Financial analysis to find out the viability of the proposed project has been done by constructing a financial model.

Assumptions & Inputs

The financial model of the project needs to take into account the fundamental assumptions about the project such as costs, tariffs, interest rates, supply levels.

The general assumptions used for the purpose of the financial analysis are given in *Table 4*.

Table 4 : General Assumptions (Financial Model)

Parameter	Unit	Assumption	Remarks
First Year of Model	FY	2014	The financial year commencing from April 01, 2013 has been assumed as start date for undertaking the development activities Like DPR preparation etc.
Time Horizon of Model	Year	2041	The projections have been carried out till the year 2041-42
Construction Period	Years	4	It has been assumed that the construction would commence in 2014.
Inflation rate	%	6% 8% 9.2%	General Inflation Power Consumption Manpower

Project Cost: The construction cost, at 2011 price levels, is as indicated in *Table 5*.

Table 5 : Construction Cost

Description	Amount(Rs. Crore)
Water Treatment Plants	19
Elevated Level Surface Reservoir	17
Demolition of old ESRs	0
Ground Level Reservoir	3
Pumping Station	20
Pipeline & Other Costs	2
SCADA	10
Pipe Network	233
Construction Cost	304
Physical contingencies	21
Pre-operative Expenses	9
Total	**335**

The project cost has been estimated in order to meet the requirements of the city till 2026. It is assumed that further improvements/up gradation etc. that may be required post 2026, would be financed by the city depending the requirements as assessed at that point in time.

Project Phasing: The construction phasing for the project is as indicated in *Table 6*.

Table 6 : Phasing of the project

Year	2014	2015	2016	2017
Description	**Year 1**	**Year 2**	**Year 3**	**Year 4**
Water Treatment Plant	5.00%	20.00%	40.00%	35.00%
Elevated Level Surface Reservoir	5.00%	20.00%	40.00%	35.00%
Demolition of old ESRs	5.00%	20.00%	40.00%	35.00%
Ground Level Reservoir	5.00%	20.00%	40.00%	35.00%
Pumping Station	5.00%	20.00%	40.00%	35.00%
Pipeline & Other Costs	5.00%	20.00%	40.00%	35.00%
SCADA	5.00%	20.00%	40.00%	35.00%
Water Treatment Plant	5.00%	20.00%	40.00%	35.00%

Estimated Landed Cost: As the construction is expected to be spread over 4 years, the cost incurred for construction is escalated over the construction period. The base and landed cost of the project has been provided in *Table 7*.

Table 7 :Landed Construction Cost (Rs. Crore)

Description	Base Cost	Landed Cost
Water Treatment Plant	19	24
Elevated Level Surface Reservoir	17	20
Demolition of old ESRs	0	0
Ground Level Reservoir	3	4
Pumping Station	20	25
Pipeline & Other Costs	2	2
SCADA	10	12
Pipe Network	233	287
Construction Cost	**304**	**375**
Physical contingencies	21	26
Pre-operative Expenses	9	10
Total Construction Cost	**335**	**411**

Revenue Assumptions

Population: The population projections for during the project period is indicated in *Table 8*.

Table 8 : Population Projection

Year	Population
2011-12	4,88,292
2015-16	5,25,028
2020-21	5,74,859
2025-26	6,26,704
2030-31	6,80,610
2040-41	7,95,261

Tariff: The tariff structure assumed for the project is as per the state government order as indicated in *Table 9*.

Table 9 : Tariff Structure

Category	Government Tariff (Rs/KL)
Domestic	
0-8 kl	56
8-15 kl	9
15-25 kl	11
>25 kl	13
Non-domestic	
0-8 kl	112
8-15 kl	18
15-25 kl	22
>25 kl	26
Commercial/Industrial	
0-8 kl	224
8-15 kl	36
15-25 kl	44
>25 kl	52

Connection Charges: Connection charges assumed for the project is indicated in *Table 10*.

Table 10 : Connection Charges

Type	Charge(Rs.)	Details
Domestic - New	4,000	
Domestic -Poor paying Meter Charges only	1,250	
Domestic -Existing Connections	2,625	Half of full connection cost +Meter cost
Non Domestic - New	16,000	
Non Domestic-Existing Connections	8,625	Half of full connection cost +Meter cost
Bulk - New	32,000	
Bulk -Existing Connections	16,625	Half of full connection cost +Meter cost

Other Assumptions: Other assumptions considered for estimating the revenue have been indicated in *Table 11*.

Table 11 : Other Assumptions

Parameter	Unit	Assumption
Raw Water Available	MLD	136
Clear Water Supplied	MLD	68.2
Current WTP Capacity	MLD	68.2
Increase in consumption(y-o-y)	%	1%
Collection Efficiency	%	90% (capped at 97%)

O&M Assumptions: Some of the assumptions considered for estimating the O&M expenses for the project are as indicated in *Table 12*.

Table 12 : O&M Assumptions

Parameter	Description	Assumption
Power	Cost / unit (Rs.)	4.50
	Units consumed/ MLD- Raw water	599
	Units consumed/ MLD- WTP	91
	Units consumed/ MLD- Clear Water	93
Chemicals	Cost/ MLD (Rs.)	137
House Service Connections	Cost per HSC (Rs.)	5,000
Operator Fee	Margin over O&M expenses (excluding power)	15%
Technical Auditor	% of O&M Cost	5%
Royalty Charges	Rs. Lakhs per annum (in 2011 and escalated accordingly)	50
R&M (Pipeline & Mechanical Equipment)	Rs. Lakhs per annum (in 2011 and escalated accordingly)	217
Other Expenses (Telephone, Special Repairs, Uniform, etc)	Rs. Lakhs per annum (in 2011 and escalated accordingly)	162

It has been assumed that the cost towards electricity charges would be paid by the ULB through the SFC electricity grants it receives from the state government. Therefore, while the electricity charges forms a significant part of the O&M expenses, it would not have any impact on the project viability as it would be treated as a pass through item as far as the project is concerned.

Revenue & O&M Projections

The revenue and O&M projections for the project has been shown in *Tables 13 & 14* respectively.

Table 13 : Revenue Projections (Rupees Crore)

Year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Project Revenues											
From billing	13.51	16.55	21.67	30.32	35.81	36.89	41.80	43.06	44.33	45.62	46.94
From Bulk	5.67	5.73	5.79	5.85	5.90	5.96	6.02	6.08	6.14	6.21	6.27
From connection charges	0.00	2.14	3.66	5.23	4.20	4.14	4.23	3.38	2.52	2.61	2.69
With SFC Salary Support	24.50	26.61	28.91	31.37	34.03	36.94	40.10	43.54	47.23	51.24	55.61
Total Income	**43.68**	**51.03**	**60.03**	**72.75**	**79.95**	**83.94**	**92.16**	**96.07**	**100.23**	**105.67**	**111.51**

Table 14 : O&M Projections (Rupees Crore)

Year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
	2014-15	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**
Expenses											
Salaries-Operator	3.39	7.65	8.15	8.69	9.26	9.86	10.51	11.20	11.93	12.71	13.54
Salaries- ULB	1.64	1.88	2.15	2.46	2.81	3.21	3.67	4.20	4.80	5.49	6.28
Power charges	22.85	24.73	26.76	28.91	31.22	33.73	36.43	39.34	42.43	45.75	49.34
Chemicals	2.10	2.26	2.43	2.61	2.80	3.01	3.23	3.47	3.72	4.00	4.29
HSC	0.00	0.00	0.00	0.00	1.31	1.42	1.53	1.65	1.68	1.81	1.95
O&M	2.25	2.54	2.90	3.31	3.80	4.37	5.03	5.81	6.44	7.15	7.95
Other Expenditure	0.17	0.18	0.19	0.20	0.21	0.22	0.24	0.25	0.27	0.28	0.30
Royalty	0.60	0.63	0.67	0.71	0.75	0.80	0.84	0.90	1.09	1.33	1.62
Operator Fee	1.28	1.99	2.15	2.33	2.52	2.74	2.98	3.24	3.52	3.82	4.16
Technical Auditor Fee	0.43	0.66	0.72	0.78	0.84	0.91	0.99	1.08	1.17	1.27	1.39
Total Expenses	34.70	42.53	46.12	49.99	55.53	60.27	65.45	71.14	77.05	83.62	90.81
Write-offs	1.35	1.49	1.73	2.12	2.15	1.84	1.67	1.29	1.33	1.37	1.41
EBITDA	**7.63**	**7.01**	**12.18**	**20.65**	**22.27**	**21.83**	**25.03**	**23.64**	**21.85**	**20.69**	**19.29**

Summary of the Operational Performance

A summary of the operational performance of the project based on the projections is indicated in *Table 15*.

Table 15 : Summary of Operational Performance

O&M	Amount (Rs. Cr)	Revenue	Amount (Rs. Cr)
O & M expenditure for 20 years in PV terms, excluding power charges terms	263	User charges for 20 years in PV (tariff increase at the rate of 10% every 5 years)	433
Power charges	383		383
Total	646	Total	816
		Operating surplus	**170**

Output

Hard Cost of the Project = Rs 334.8 Crore

Total Project Cost (Total Construction Cost + Interest During Construction + Financing Charges) = Rs. 427.4 Crores

PV of revenues (Rs. Crore) = 1128.48

PV of Expenses (Rs. Crore) = 951.59

Project NPV (Rs. Crore) = (183.17)

Project IRR = -2.12%

Financial Analysis

As can be observed from the output, the total operating costs for the project are Rs. 646 crores over a twenty year period (in Present Value Terms), out of which power costs account for Rs. 383 crores and non-power costs account for Rs 263 crores.

The user charges provide revenue of only Rs. 433 crores and are not adequate to meet the total operating costs. As the power costs are currently being met by SFC power grants from the state government to the city's Municipal Corporation, it is assumed that these will continue to be available. This yields Rs. 383 crores (equal to the power charges). Thus, the total income from operations is Rs. 834 crores, thus providing an operating surplus of Rs. 170 crore. It has been assumed that this surplus will be set aside for ensuring sound Operation and Maintenance and that it would not be utilized for capital recovery.

Since the operating surplus is small (Rs. 170 crores over twenty years), which is not sufficient to service the debt. The repayment of 18.6% would be met from the general budget of the ULB. The primary source of funds for repayment is SFC untied grants, and revenue surplus from the general fund (which also includes the SFC untied grants).

It has been assumed that up to 35% of the SFC untied grants in any year can be used for repayment. The SFC untied grants are assumed to grow at 12% per annum, which is a conservative assumption as compared to the growth rates witnessed in the recent past. The required amounts for repayment (for the two ULB financing options and the private finance option) are summarized in the table below and are compared with the limit of 35% of SFC untied grants that are available to be used for repayment. The repayment feasibility has been indicated in *Table 16*.

Table 16 : Repayment Feasibility

Fund requirement to finance to repay 18.6% raised through Commercial Loan												
Year	1	2	3	4	5	6	7	8	9	10	11	12
Support required from ULB	-	-	-	-	19.7	18.4	17.1	15.8	14.5	13.2	11.9	10.6
Fund Available to meet the support (35% of SFC untied grants)	7.0	7.9	8.8	9.9	11.1	12.4	13.9	15.6	17.4	19.5	21.9	24.5
Surplus/Shortfall in repaying on cumulative basis												
Base Case	**7.0**	**15.2**	**25.1**	**36.8**	**31.1**	**28.3**	**28.0**	**30.4**	**36.1**	**45.6**	**59.3**	**78.1**

* Unutilized fund is assumed to be invested at return of 9% per annum.

Considering the base case scenario, project would need additional support from ULB to service debt obligation. Funding from 35% of SFC untied grant would be available to bridge the funding gap. However, ULB would need additional revenue to meet the further shortfall, which could be sourced by further increase in tariff or by collecting additional revenue from the users. ULB may take a call and propose any option to increase the revenue from the operations.

Conclusion

The objective of Summer Internship Program to provide PGDM students an exposure to the corporate work culture has been very fruitful.

The project assigned to me by the company (iDeCK) – "Financial analysis for up scaling 24X7 water supply system in a Tier II city" gave me a very good opportunity to apply the concepts learnt in first year of PGDM and also learn some concepts of project finance.

With the assistance of corporate guide, the researcher was able to successfully develop a financial model.

Apart from the project assigned, I was given an opportunity to evaluate bid document for two projects and also assisted the company evaluate tourism properties and suggested ideas to develop them for better revenue generation.

Site visits, interaction with clients and superiors at iDeCK has helped expand my horizon.

It was a great experience to work from the scratch for the assigned project, which gave me a holistic view of how projects are handled in consultancies, like iDeCK.

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