

# Financial Modeling of Public Private Partnership in Wastewater Treatment

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**Abstract**— As we know that many water resources are polluted the environment by anthropogenic sources like agricultural and household. As matter of fact Public think that the environmental impact of wastewater pollution has increased day by day many conventional wastewater treatment techniques like chemical adsorption, activated sludge are applied to remove the pollution but there are still some limitations which has high operation costs. The use of waste water treatment in public and private works as a different medium is receiving increased interest so that its low operation and maintenance costs. As per as the water treatment is concerned it is easy to have a good effectiveness and ability for degrading contaminant. Hence, this paper reviews is the use of waste water treatment technologies to remove contaminants from wastewater like a high oxidant which represent the main pollutants in wastewater as per as a financial modeling of public private partnership of wastewater treatment.

**Key words:** Public Private Partnerships Modeling, Wastewater Treatment, Financial Modeling

## I. INTRODUCTION

- Let us discuss about the water treatment system. Basically water treatments are low utilized to treat and dispose of household wastewater in public and private sections where sewerage systems is contain the loop and the system are unavailable. Septic tanks, aerobic treatment units and toilet are mostly used in the sectors.
- Hence On-site wastewater treatment systems are a cost effective and long term option for meeting public health and environmental health goals.
- If we assume approximately 200 L of wastewater per day a total of approximately 31 tons of nitrogen 8.4 tons of phosphorus and faecal coliform organisms will be discharged then nutrition and pathogen will go in atmosphere.

## II. ENVIRONMENTAL AND PUBLIC PRIVATE HEALTH IMPACT

- As matter of fact environmental impacts due to nutrients that may disrupt ecosystem balance
- Poor performance of sensitive water bodies and create algae
- Failing in causes of streams, lakes, rivers, wetlands, and groundwater contamination due to the release of nutrients and pathogens into the environment
- Resultant if failing the onsite public and private water treatment is degradation of soil and water quality

## III. THE EFFECT OF PUBLIC OR PRIVATE STRUCTURES IN WASTEWATER TREATMENT

### A. On the basis of design and construction

- Public or private structures, wastewater services have to effect with different framework conditions as regards planning, construction, financing and operation.
- In recent years there has been a push for privatisation on the water sector
- High performance and efficiency is not the legal or organisational form
- Major areas of other related tasks are reviewed as well as water treatment also

## IV. MUNICIPAL TREATMENT OF WATER IN PUBLIC AND PRIVATE MODELLING OUTPUTS

- Many technology will offer to compliment a complete treatment solution
- Meet the water demands of a growing population
- Output threat which will diminishing the sources Of available fresh water supplies
- Water confidence treat challenging source of water in regulatory requirements
- Provide high performance water treatment at the lowest life-cycle cost

## V. FUNCTIONS USED IN PUBLIC PRIVATE PARTNERSHIP FINANCIAL MODEL

- Leaders will be allowed for long term changes
- Investors had to calculate the values of their investment
- Budgeting tool off taker will calculate the refinancing gain and termination sums.

## VI. FORM OF CONCESSIONS IN PRIVATE PUBLIC MODELLING

### A. Build Operate Transfer

- Private investors are provided good concession finance and its maintainance
- On concession time the investor collects tool from users as a return to their investments
- In the end facility is transfer to the public authority

### B. Build Own Operation

- It is basically similar as a operate transfer but their ownership is condition work in regular manner

### C. Build Transfer Then Operate

- The private sector parties build a facility
- They transfer it to the public authority after the construction of water treatment programme

## VII. PUBLIC PRIVATE PARTNERSHIP WATER TREATMENT SOLUTIONS

- Cost of insurance directly related to the prevailing cost + contingency amounts
- Deduction and excess will refer who contribute in the water treatment pays
- Insurance market capacity and market participants will be consider as solutions

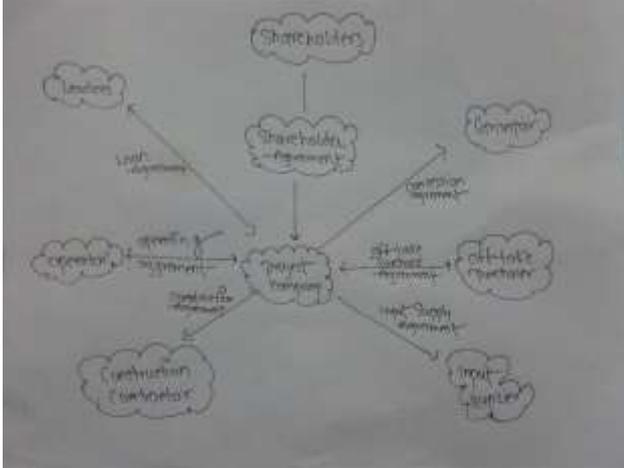


Fig. 1: Public Private Partnership Water Treatment Solutions

## VIII. ASSET AND PROFILE NETWORK USED IN FINANCIAL MODELLING OF WATER TREATMENT

- Sewage treatment plant and network
- Power plants water desalination plants
- Bridges road streetlights & signs
- School hospital govt. buildings

## IX. PUBLIC PRIVATE PARTNERSHIPS MODELING

- If we increase the public debt then 100 probability is funded initiative emerged and this will effect all the private sector of sanitation.
- As matter of fact momentum is the only prospectus which will lead the distribution between public and the private sanitation
- Public private partnership provides the facility which could be more efficient for the infrastructure sector like rail transport, hospitals, airports etc.

## X. RISK USED IN THE FINANCIAL MODELLING OF PUBLIC PRIVATE WATER TREATMENT

### A. Political and Legal Risk

Basically it depends on government with some rules and their guarantees.

- Depends on civil disturbance or act of war or forces
- Change of government policy

### B. Technical Risk

These are the risk which will concatenate the behaviour of construction which deals the quality of water quantity of water cost and delay etc.

### C. Commercial Risk

It will arise because of the uncertain demanding level due to the possible improvement for consideration of infrastructure.

### D. Economical or Financial Risk

this is effecter due to the economic growth and population risk of interest rate exchange rate etc. some changes cannot used due to the private sector circumstances

## XI. EQUIPMENT USED IN THE TREATMENT

Laboratory scale waste water treatment plant is designed for 50 lit/hr capacity and restricted four steps such as primary settling with cascade flow of water which has 20 liters capacity, aeration has 20 liters tank capacity whereas agitation has also 20liters and filtration unit of 20 liters.

### A. Sampling of Waste water

- Basically the wastewater has been collected in different cities and the canals at which The surface water quality changes as season to season and it will easily polluted. Due to this samples were collected from canals throughout the year on a monthly basis. Samples were collected during the first week of each month approximately between 7.30 am to 8.30 am but in a condition of clean plastic bottle sand brought to the laboratory for analysis.

### B. Methods of Sampling

- Municipal wastewater treatment will collected about 40-50 cm below the ground level as matter of fact the collection of surface impurities like oils then Before sampling, 30 L polythene bottles will be rinsed at 0.1N of chromic acid, than washed 2 times with distilled water. A separate sample will collected in bottle to measure the Dissolved oxygen.

### C. The effect of public or private structures in wastewater treatment on the conditions for the design, construction and operation of wastewater treatment plants

- Organised in public or private structures, wastewater services have to cope with different framework conditions as regards planning, construction, financing and operation.
- Basically this leads quite often to different modes of management. In recent years there has been a push for privatisation on the water sector in general
- Hence reasons for which are manifold, ranging from access to external know-how whereas capital to synergistic effects through integration of wastewater treatment into other tasks of similar or equal nature.
- Discussed are various models of public/private partnership (PPP) in wastewater treatment, encompassing for example the delegation of partial tasks or even the proportional or entire transfer of ownership of treatment facilities to private third parties.
- Decisive for high performance and efficiency is not the legal or organisational form
- As matter of fact but rather the clear and unmistakable definition of tasks which are to be assigned to the different parties, customers and all other partners involved, as well as of clear-cut interfaces.

- On account of the (of course legitimate) profit-oriented perspective of the private sector
- Some decision-making processes in relation to project implementation (design and construction) and to operational aspects will differ from those typically found on the public sector.
- This does apply to decisions on investments, financing and on technical solutions too.
- On the other hand, core competencies in wastewater treatment should not be outsourced, but remain the public bodies' responsibility, even with 'far-reaching' privatisation models.
- Such core competencies are all efforts geared to sustainable wastewater treatment as life-supporting provision for the future
- As contribution to the protection of health and the environment and to the development of infrastructure.
- Major areas of wastewater treatment and other related tasks are reviewed. The paper concludes with a list of questions on the issue of outsourcing.

## XII. PUBLIC PRIVATE PARTNERSHIP: TIRUPUR WATER PROJECT

### A. The Challenge:

- In the small, industrial town of Tirupur, located in the Coimbatore district of Tamil Nadu, the textile industry has rapidly expanded over the past decade.
- It is currently the largest exporter of knitwear in India and accounts for 75% of India's knitwear exports.
- This burgeoning textile industry faced a number of challenges in further enhancing its competitiveness in the market.
- Essential requirements such as steady water supply, good sewage systems and adequate infrastructure were a distant dream, and the lack of these requirements acted as a barrier to the expansion of this industry.
- The growth of leather and textile industries resulted in huge demand for water which could not be met in a water scarcity region.
- Besides, discharge of effluents contaminated ground water.
- As the industries caused pollution to the needed water, the resulted depletion of ground water forced industries and local communities dependent on water tanker facility.
- In the meantime, absence of water treatment facility deteriorated the ground water quality.

## XIII. PUBLIC PRIVATE PARTNERSHIP (PPP) MODEL

- In 1990, after tirupur Exporters Association (TEA) and the people of who live that side. The government of Tamil Nadu give this water supply project at cost Rs.4,000million.
- Due to financial problem of water resouce the project had to be convert on the public private partnership with Infrastructure Leasing & Financial.
- In August 1994 an organisation was signed between the government of Tamil Nadu TEA, which laid format for the formulation, development and implementation of that project.

- According to a report "the first integrated water supply proposed to be contraction in India at water sector."

## XIV. THEORY AND RESEARCH ON THAT PROJECT

The role of IL&FS, a private company, was to ensure the development of the project, by conducting and documenting studies, implementing frameworks and procedures, making institutional arrangements and proposing financial strategies to undertake the project

During the process of developing the project, TEA, IL&FS along with the Government of Tamil Nadu made the New Area Development Corporation Ltd. (NTADCL) the lead agency for project.

- The scope of the project has to be cover water and waste water treatment and was split into three different contracts:
- two contracts were given on an engineer, procure and construct (EPC)
- Basis and one on operate as well as manage (O&M) basis. With respect to water supply
- The scheme was designed to supply and meet "an ultimate demand of 126 million litres of water per day (MLD) from industries and 93 MLD from households".
- A water treatment plant was constructed and distribution systems were put in place to ensure an efficient distribution of water.
- The project also takes the provision of tertiary treatment facility to treat domestic sewage so it can be reused or recycled.
- The construction of the water treatment plant began in October 2002, and the majority of mechanical work was completed by December 2004.
- Basically it was finally made operational in February 2006 because of delay due to flooding.
- With respect to an improved sewage system, it comprised of a collection system, pumping stations
- Two sewage treatment plants and basic sanitation facilities such as septic tanks and water closets.
- The sewerage system aimed to serve 639,500 inhabitants of the town by 2030.

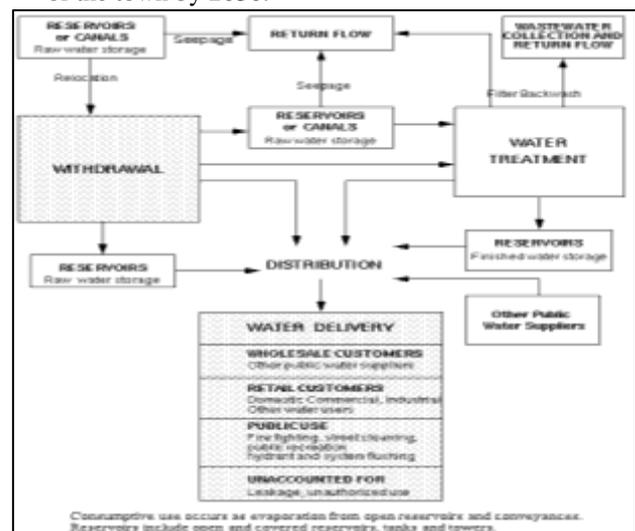


Fig. 2:

A. *Unique Aspects of the Project:*

- First Water & Sanitation Project in the country to be implemented on a PPP format.
- First water project in India to be funded on a Project Finance, non-recourse basis.
- Largest private investment in the Urban Infrastructure sector.
- Leverages State support by 19 times (Rs.550 million of state financing helps raise over Rs.10000 million for the project).
- Provides a viable model for implementing other projects in the sector.
- Tamil Nadu is the first State in the country to set up a PPP based institution in the sector, namely Tamil Nadu Water Investment Company.

B. *Beneficiaries of the Project:*

- Industries – 115 MLD
- TM Domestic – 33.7 MLD
- Way side Villages – 36.3 M
- 192 Rural habitations served – 4,50,000 (2001 population census)
- Tirupur Municipality – 4,50,000 (2001 Population census)
- Industrial Units covered – 900
- Households with Sewerage Connections – 22,300 (2005) / 31,000 (2014) □ Way side Villages – 36.3 M

C. *Important Beneficiaries of Project*

- Tirupur Municipality – 4,50,000 (2001 Population census)
- Industrial Units covered – 900
- Households with Sewerage Connections – 22,300 (2005) / 31,000 (2014)

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Fig. 3:

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