

## **UNIDO's response to Scientific & Technical Advisory Panel (STAP) review on project "Environmentally Sound Management of Medical Wastes in India"**

### **I. Consent:**

We thank the STAP for the explanation and action proposed. We deem it a privilege to be offered the opportunity to seek the advice of STAP during the further development of the project.

### **II. Minor revision required :**

### **III. Further guidance from STAP :**

**Remark 1: "STAP would appreciate when project proponents provide more explicit information about the impacts of project interventions on management of mercury, photo-chemicals, pharmaceuticals and radioactive waste."**

Impacts of project interventions on management of mercury, photo-chemicals, pharmaceuticals and radioactive waste

One of the important intervention in this project will be extensive capacity building of health care personnel across different categories to implement safe health care waste management systems, apart from management of waste that is generated in any health care settings like infectious, plastic, sharps etc the collateral benefits of this intervention will be to build capacity in managing special categories of waste like mercury, photo-chemicals, pharmaceuticals and radioactive waste.

The following will be the methods of management of these special categories of wastes in any health care setting

#### **Management of Mercury**

Mercury is not governed by the Stockholm Convention. However, as a persistent toxic substance it would be also suitably covered under the project as described below:

Mercury is a highly toxic and dangerous substance. Spills can be cleaned up safely and collected and reused in new equipment. It should be ensured that the whole staff are trained to understand the dangers of mercury, the need to isolate the spill to keep it from spreading and the need to handle it with care.

Alternatives to mercury based instruments - Digital instruments are available as substitutes to the mercury containing instruments and these would be vigorously promoted in this project to establish "mercury free hospitals".

#### **Management of Photographic chemicals & pharmaceutical waste:**

Under the project the photographic chemicals and Pharmaceutical waste will be managed according to the Biomedical waste (Management & Handling) Rules of 1998.

#### **Management of Radioactive waste:**

Radioactive waste is generated at tertiary health care centres and other dedicated cancer care centres which are of limited number in the 5 states. Management systems, process and protocols for radiological waste are defined and currently executed very stringently according to Atomic Energy Regulatory Board guidelines. The project would follow the established guidelines.

Ref: AERB Safety Guide No. AERB / NRF – TS / SG – 10; Security of Radioactive material during Transport; AERB, Mumbai, India, January 2008.

**Remark 2 : “ Promotion of public private partnerships to deal with different phases of medical waste management chain in this project is encouraging, but there are many risks and uncertainties involved that has to be analyzed and presented.**

**In practice, introduction of PPPs does not necessarily guarantee effectiveness and lower costs of delivery of public service. A number of factors have to be met in designing and implementing such instruments such as open and competitive bidding, competition among service providers, short term contracting, strict monitoring, contractual enforcement, public sector training and effective stake holder consultation process. ....Enforcement of these principles in the context of resource –poor countries is challenging and the outcome is not always obvious, particularly for such a complex issue as waste management that involves heterogeneous substances, processes and stake-holders.**

**STAP recommends presenting at the CEO endorsement phase a cost benefit analysis for the whole management chain justifying selection of PPPs in the first place and support for particular form of PPP as most effective and cost- saving mechanism.”**

**Reply:** We wish to submit the following in response to this observation :-

Isolated programs & efforts do not empower a nation. New vision should target inter-sectoral coordination to achieve the best results. Appropriate motivation of key players like the line ministries: MoEF & MOH at both the central and state levels is essential to ensure judicious use of limited resources – funds & man power. The main purpose of considering & proposing PPP for some of the identified activities involved in this project is to achieve good synergisation of multiple agencies to ensure harmony of effort.

- PPPs and PPCs in health sector are necessary and important in the light of challenges the public sector is facing in finance, management and provisions. Further, many public health systems confronted with fiscal constraints also face newer demands to provide for ever increasing cost of services, to procure technological advances and to provide for Non communicable diseases and the expanding geriatric requirements.

- **We draw your kind attention to the following reports:**

1. **HNP discussions paper of October 2006** entitled ‘PPP’s and collaboration in the Health sector: an overview with case studies from recent European experience’ – Irina A Nikolic and Harold Maskisa” -

- “ PPPs when appropriately structured and executed help address specific cost and investment challenges, deliver improvements in efficiency ( e.g: Improved service provisions and management at reduced costs) and enhance service quality ( e.g: increased expertise), more rapid & substantial investments in infrastructure and new medical technologies, a potential to attract & retain better performing staff ”.
- “Partnering with private sector carries the potential for meaningful benefits to be gained for the public partner and health sector. Potential benefits can include reduced government spending (e.g: eliminating large up-front investments of scarce public funds ), greater efficiency (e.g: due to private partner’s operational efficiency ) or better health care management (e.g: hospital services and infrastructure ). In the health sector, partnering can also be particularly valuable as a method of leveraging technical & management expertise (e.g: performance based monitoring & incentives) and spurring technology transfer, all of which can lead to quality improvements.

- “Partnering can also reduce or better allocate risks (e.g.: the private partner may be better able to manage cost and schedule overruns). Appropriate convergence of interest and expertise in PPP or PPC in practice may also lead to a better managed project execution”.

**2. Indian Journal of Medical Ethics – 2007, Oct-Dec: 4(4) – ‘Public – Private partnership for providing health care services’ – Abijit Das -**

\* “ The private sector is the most important source of health care services in India, providing close to 80% of all services according to the Government’s own reckoning ( NSSO – Government of India 2006 : NSS 60<sup>th</sup> round ) ”.

\* “The primary reason to encourage private participation does not appear to be a lack of funds but a lack of managerial & technical ability”.

\* In the same report it is observed that some of the failed PPPs were due to the fact that no program guidelines had been drawn up, no agreements signed and no arrangements done for operational costs. The government was still to formulize procedures.

**3. <http://www.Expresshealthcare.in/200701/strategy05.shtml> – \*Dr Alok Roy** in his article ‘Private Partners can help Government widen Foreign Assistance’ states – “Private partners can wide the coverage of foreign assistance programs, help in achieving the Government’s development goals and in the formulation of sound projects. They can also assist to improve identification of adequate investments , these being sometimes over estimated by the local authorities , which tend to over dimension physical infrastructure, both qualitatively and quantitatively and therefore create constraints to the timely deployment of appropriate investments. Thus PPPs as a tool to improve quality and / or increase quantity of services to consumers is positive. The increase in public benefits may either be an increase in capacity to deliver (more users connected) or an increase in the quality of the delivery”.

\* **Dr. Prof. P.K. Dave** has expressed in the same discussion paper “Health care cannot be the sole responsibility of one sector alone. In a country as diverse as ours, resources from all the agencies responsible for health care have to chip in. There has to be an alliance for the new vision of health sector. The alliance is between the local & central government, the business class and NGOs and also the consumers and the corporate hospitals”..... “We must empower the community to participate in health care as informed and involved partners”.

\* **Anil Kamath**, President Hospital Business Development, Wockhardt Hospital group has opined – “ The governments primary role should be in good governance, security and law & order, infrastructure, education and Health care, but the model of delivery needs to be radically changed to being carried out by professionally-managed expert organizations who would be account-able for every rupee spent ”. ....” It is time that 100% of Health care reaches the common man. Resources are available, but need to be spent right. Empirical data does not favour the government’s ability to deliver. Time is right to initiate PPP in India as the answer to get to the bottom of the problem and the pyramid”

PPPs have the potential to improve quality and increase the quantity of services. This goal can be achieved if the PPP is not conceptualized as a mere contract of service and every effort is made to develop real partnership. Many PPPs which have been cited to have failed reflect that they were more based on commercial considerations and not with a social context. In fact some the private players in such failed PPPs have perished at the end of the contract period as they had no base or positive organization structure. In few of the other failed PPPs despite the committed involvement of the private player, poor planning, poor execution and the failure to release funds at the appropriate time due to the slow moving government machinery has ensured the death of such partnerships. **Hence, to mention of**

**failed PPPs which were mere contract of services is not a fair way to assess all future PPPs.**

Health care delivery and related activities such as sound management of Health care waste cannot be the sole responsibility of one sector. This is not due to the problem of resource crunch alone, but due to poor management of manpower and equipment and also the failure to watch performance by the public sector in an objective manner. This has necessitated the involvement of private players with commitment, expertise and a vision to develop new alliances.

If PPPs are conceptualized to empower the community to participate as involved partners the results would positively be different in the future. This calls for concrete approaches to sensitive issues with focused efforts to identify private partners with correct potential, commitment, expertise and based on prevailing performance. Further, professionally managed expert organizations would be able to turn in accountable performance. Resources that have been mobilized and made available need to be spent effectively.

In our opinion and based on our analysis of existing data the probable reasons for failed PPPs are:

1. Sound technical & ethical parameters ignored.
2. Failure to bring in decision making mechanisms & need based allocation of responsibilities.
3. Lack of appropriate design and failure to have pro-active management.
4. Low institutional capacity in the selected private partner and failure to identify private partners with social commitment.
5. Overdoing in the project resulting in excess capacity or development of unwanted capacity.
6. Lack of adequate regulatory & monitoring mechanisms.
7. Diligent up-front evaluation which is critical for the success of the PPP has been missed out.
8. Hasty and inappropriate design of the PPP.
9. Lack of transparency.

With regards to the enforcement of the following critical principles which have been referred to in the remark column (2) namely –

1. Open competitive bidding
2. Competition amongst service providers
3. Short term contracting
4. System monitoring
5. Contractual enforcement
6. Public sector training
7. Effective stakeholders consultation process

All the above seven principles will be implemented in letter and spirit for the development of a model district in each of the five states, during the development of the health care waste management plan and also during the development of the new medical curriculum to sub serve the objectives of the project. It needs to be emphasized that in India the district is the unit of planning. Implementation of the PPP model at the level of a district has the cascading effect and potential for inclusion in the Five Year Plan of the country in perspective planning.

In the project document submitted the PPP model has been conceptualized in few selected areas needing such a model namely –

3.4 Promotion of a scheme to provide uninterrupted service and supplies supporting the demands of sound medical waste management

4.1 To enhance new domestic technologies and manufacturing capabilities for medical waste transport and disposal

3.1 Development of new medical curriculum for capacity development in the community

In the situation analysis report of the study of 140 hospitals in these five selected states and while studying the 57 common bio-medical treatment facilities surveyed, distinct gaps were noticed such as

(1) Failure to explore alternate non-burn technologies

(2) Ineffective and sub optimal operation of common bio-medical treatment facilities mainly due to poor load of waste reach out to them (30to40% of their capacity).

In order to promote and ensure optimal continuous operation, it is necessary to explore and develop indigenous transport mechanism and mechanism for compaction of the waste from the hospitals. The need, therefore, exists to explore technology and manufacturing capabilities available locally and if not to bring in appropriate technologies from outside.

The government has not explored or moved in this direction. Hence it is necessary to approach this issue through a PPP model. The situation analysis also reveal that a certain portion of bio-medical waste management is commonly managed by private players authorized by the government in the sectors of transport and in setting up of common bio-medical treatment facilities. As of now due to manpower constraints monitoring is very poor. It is now necessary to network all of them to bring in standard operating protocols (SOPs), strict monitoring and accountability. The present involvement of private players has not brought in a transparent competition amongst service providers and entrepreneurs by a well conceived PPP. As part of this project it is proposed to bring in a healthy competition amongst service providers through effective monitoring through a community based PPP committee. Guidelines for operation of segregation, collection, compaction, transportation and finally treatment will be developed. Also non-burn alternate technologies like micro oven, steam sterilization, plasma pyrolysis, will be explored under cost effectiveness and efficacy study, keeping in view heterogeneity of the substances involved process in question and the stakeholders' participation.

India has adequate experience in open competitive bidding and this is demonstrated by the many World Bank projects that have India as the implementing agency. In the present project every attempt will be made when involving the PPP model to ensure open and competitive bidding. Every attempt would be made to harness the capacity of the government and the technical expertise and implementing efficiency of the private sector.

Public Sector Training – As a part of this project it will be ensured through technical briefing to all involved stakeholders, by continued VSAT mode of training updates during the project and by empowerment during planning and evaluation. It is also proposed to have exposure visits of the implementing agencies to other states and to “Centre of Excellence”.

In the present project, out of the 140 hospitals chosen as demonstration sites equal number from the government and the private sectors have been selected and included to ensure judicious public sector training as part of this project.

Contractual enforcement, which is a challenging entity, has been considered in this project in the form of development of competent procedures, SOPs development, for continued consultation with all stakeholders and by developing performance indicators to monitor implementation of the programme.

**Some examples of successful PPP models:**

While we need to learn lessons from failed models of PPPs we also need to celebrate small success of successful PPPs and draw inspirations from the same. We have had several well conceived PPPs succeeding in India such as:

1. Bangalore Agenda Task Force Best Available Technique (Best Available Technique (BAT))
2. Arvind Eye Hospital
3. Jaipur Foot Project
4. Nirmala and Sulabh Project Schemes

**Risks and uncertainties involved has been analyzed and presented below:**

<b>Risk</b>	<b>Explanation</b>	<b>Mitigation measures</b>
Completion risk	The possibility that a project's construction or installation will be delayed, with additional cost or other implications.	Since it is a time bound project and the release of funds will be on submission of the completion reports the risk of not completing the tasks are minimal.
Cost overrun risk	The possibility that during the design and construction phase, the actual project costs will exceed projected costs.	Since the project is co funded by other partners like state governments and nongovernmental organisations the funding will be for the specific activities envisaged and moreover nearly half of the co funding will be in kind. Hence the risk of cost overrun can be minimised
Design risk	The possibility that the private party's design may not achieve the required specifications.	The decision regarding specifications for the design of the equipments for the treatment and disposal of medical waste will be decided at various levels of hierarchy like project steering committee and state project management units which will have equal representation from the government and private agencies
Exchange rate/forex risk	The possibility that exchange rate fluctuations will impact on the costs of imported inputs or the project's debt or equity.	The funding from the Global environment facility will come in forex and it is only 25% of the funding the rest of the funding will be raised from the state and central governments and from non governmental agencies in local currency.
Force majeure	The occurrence of certain unexpected events that are beyond the control of the parties, whether natural or man-made, that affects the project.	The unexpected events that can be foreseen in this project will be transfer of key governmental officials, attrition of key personnel from the private agencies. This risk can be minimised by developing a efficient second line of personnel
Market/demand risk	The demand for the services generated may be less than projected.	Medical waste management is in various stages of evolution in the country and with stringent implementation of the existing legislation by the government authorities and most importantly the awareness regarding health impacts to the personnel working in the health care facilities is slowly increasing. Hence the demand for establishment of safe and sound medical waste management systems will increase in the coming years
Operating risk	Factors other than Force Majeure such as projected	Meticulous care will be taken to choose private partners

	operating expenditure, skills requirements, labour disputes, and employee fraud.	
Political risk	Unforeseeable conduct by a government institution that materially and adversely affects the expected return on equity, debt service or costs of the project. This includes expropriation and nationalisation.	The co funding commitment from both central government and the participating 5 state governments is to the tune of 45% moreover, India being a signatory to the Stockholm convention the commitment of the governments is very high to comply with the Stockholm obligations, which is a global convention treaty
Regulatory risk	Consents required from government authorities or an independent regulatory agency are not obtained or result in additional costs	The regulatory authority for implementing the existing legislation i.e. Bio Medical Waste (Management & Handling) Rules 1998 is state pollution control boards and in the project organogram, in all the 5 participating states the state nodal officers for this project are from these pollution control boards. Commitment of states obtained before the proposal.
Utilities risk	The utilities (water, electricity, gas) for the project are not available.	The 5 participating state governments have committed for co funding this project in either cash or kind and since the utilities are controlled by the governmental agencies these utilities can be supplied at a subsidised rate to the participating service providers like CBMWTFs

### Justifying selection of PPPs in the first place: as stated in the remark

#### Public Private Partnership

Public Private Partnerships are intended to bring public and private sectors together in long term partnership for mutual benefit. It describes a government service or private venture which is funded and operated through a partnership of government and one or more private sector companies. It is a contract between a public sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project. Various models of PPP can be envisaged depending upon various factors like type and scope of the project, Funding abilities, technological and operational factors within the government etc.

PPP's are not a new concept in India and there is ample evidence base for the number of PPP's which have proved successful in the country

PPP model has been envisaged in the project taking into consideration the following:

- The broad frame work of the various activities of the project to be totally executed by the government /Project implementation unit, calls for a mammoth task and will lead to compromise in the quality of the current ongoing activities of the both.
- Red tape procedures and other factors may lead to delay of the various activities of the project, if handled by public party alone. Governmental agencies are overburdened and short staffed to designate dedicated staff to carry out all the activities listed in the project. This will lead to compromise in quality and not to mention discrepancies in meeting deadlines, report preparation; despite best intentions to do so.

- It is well known fact that Private sector is predominant and robust health care sector in India which contributes to large number of health care beds and generates majority of health care waste
- 93% of all hospitals, 64% of beds, 85% of doctors, 80% of outpatients and 57% of inpatients are in the private sector (World Bank 2001), thus major contribution of medical waste comes from the private sector. It is assumed that collaboration with the private sector in the form of Public/Private Partnership would improve equity, efficiency, accountability, quality and accessibility of the entire health system. Accessibility and utilisation of private sector for health care is more than Government sector
- Majority, if not all of the CBWTF's currently operating in India are from the private sector.
- Pre project situation analysis revealed that the Private players in the form of Common Biomedical waste treatment Facilities are already in operation in the country, though with limitations in coverage and quality of services.
- In the absence of a PPP the implementation of the project will rest with MoEF which in turn may cascade the responsibility to respective Pollution control Boards which are already handling the Air , water act etc
- In the best interests of the project and the community, it is desirable and in wiser sense to join hands with a private partner/sector, who are currently operating the waste management systems, strengthen their hands, provide favourable environments for their dedicated participation, ensure transparent and strict regulation of the PPP model to ensure a facilitatory mode of implementation
- 'There are currently existing evidence based successful models of PPP in India namely Primary care (Karuna Trust in Karnataka) to slum communities, Community health insurance initiatives (Arogya Raksha scheme in Andhra Pradesh; Yeshasvini scheme in Karnataka). telemedicine and tele-health project in Karnataka,

For the various activities states in the Full sized project document for which PPP would be formed, the following broad guidelines proposed to be followed would illustrate the mode of functioning of the PPP formed

	<i>Type of contract for PPP</i>	<i>Asset ownership</i>	<i>Operations &amp; maintenance</i>	<i>Capital investment</i>	<i>Commercial risk</i>
<b>Outcome 3</b> :Facilitating and promoting PPP to improve support and supply capacities in medical waste management within the healthcare facility perimeter	Service contract	Public	Public and private	Public and private	Public



<b>Outcome 4:</b> Facilitating and promoting PPP to improve local technological and manufacturing capacities in medical waste transport and disposal sectors with specific reference to avoid generation of PCDD/PCDF and other unintentionally produced POPs releases by applying BAT/BEP measures	Management contract	Public	Private	Public	Public
A Public-Private Partnership model (PPP) would be established for the purpose of implementing a pilot integrated comprehensive medical waste management system in one district in each of the selected states thus creating 5 model districts in the country	Build Operate Own	Private	Private	Private And Public	Private

<b>Type of contract for PPP</b>		<b>Features</b>	<b>Public contribution</b>	<b>Private contribution</b>	<b>For which project activity?</b>
Service contract	The private part will take responsibility of providing the service component only	Will overcome the additional burden of waste management by hospital staff especially nurses who can dedicate their time for patient care	Funds for service Training for service provision Monitoring and evaluation Equipment Energy Office space	Provision of services on a day to day basis Manpower Technical inputs	Will be suitable for provision of uninterrupted provision of supplies for medical waste management in health care settings
Management contract	A private agency will be sub contracted for managing the medical waste systems including documentation, review and corrective measures. the public funding will come in form of all supplies, technical	Switches role of the public sector from a provider of services to a guardian of services. Will overcome the additional burden of administrators and other staff	Funds for service Training for service provision	Monitoring and evaluation Reinforce training of workers Equipment Energy Equipment Office space Technical inputs	Establishing medical waste management systems in health care facilities

	support and training				
Build Operate Transfer	Already private established and operated CBWTF's are existing Public can enter into a partnership into one of the CBWTF's in the model district Strengthen the CBWTF to create model demonstration CWBTF, that can be replicated elsewhere	Asset ownership will remain with private Greater efficiency in provision of the stated contract Coverage of services will be increased	Identification and leasing of land if required  Provision of subsidies for energy and tax exemptions for equipment  Participatory funding  Monitoring of emissions support Training and capacity building of the personnel  Evaluation support	Participatory funding  Day to day operations and maintenance  Marketing  Labour  Monitoring of emissions  Training and capacity building	For demonstration of model district  Technological equipment  CBWTF upgrading

However these are broad guidelines and not watertight due to the following reasons

- There are limitations in adopting a single pre-specified PPP model for all the states as the ground realities vary grossly in all the 5 states.
- Each of the 5 participating states is in different stages of evolution as far as medical waste management is concerned.
- It is clearly mentioned in the document that the state specific strategies will be adopted for the purpose of fulfilling the project objectives. E.g: Almost all district have a CBWTF in Maharashtra hence the strategy would be to enter into a PPP with already existing service provider and create model systems , whereas in entire State of Orissa there are only 3 CBWTF's and hence there is a flexible option to start a new CBWTF.

### Cost Benefit analysis of the management chain

PPP in “Environmentally sound management of medical wastes” Project:

The project proposes utilisation of PPP model for the following

- **Outcome 3:** Facilitating and promoting PPP to improve support and supply capacities in medical waste management within the healthcare facility perimeter.
- **Outcome 4:** Facilitating and promoting PPP to improve local technological and manufacturing capacities in medical waste transport and disposal sectors with specific reference to avoid generation of PCDD/PCDF and other unintentionally produced POPs releases by applying BAT/BEP measures.

- A Public-Private Partnership model (PPP) would be established for the purpose of implementing a pilot integrated comprehensive medical waste management system in one district in each of the selected states thus creating 5 model districts in the country.

Most of the CBWTF's currently operational are privately run business oriented models. Prior to emergence of CBWTF's onsite facilities were in operation in the country. Various evidence based studies proved that it is more cost effective to adopt a CBWTF model of medical waste management rather than an onsite model as referred below.

\* Hem Chandra, K. Jamalluddin, KASTURI AGNIHOTRI, Leela Masih "Cost-Benefit Analysis/Containment in Biomedical Waste Management: Model for Implementation" Journal of Financial Management and Analysis, Vol. 19, No. 2, July-December 2006

*"The treatment cost of biomedical waste (BMW) is a limiting factor for all the hospitals due to resource crunch. Therefore to minimize the BMW and to contain the costs are the only solutions. As recycling is not permitted under the Biomedical Waste Management (BMW) Rules, cost-benefit analysis is not possible also. BMW management on outsourced system, but under the supervision of hospital staff, is still the best option. The present model has been prepared by taking the reference of U.P. Health System Development Project, Lucknow, India, to achieve the cost-benefit/ containment while treating the BMW. The cost of in-house treatment facility was calculated and was compared with cost of treatment if it were to be outsourced. The cost of in-house treatment comes to Rs. 19.50 per bed/day whereas in case of outsourcing it is Rs. 17.50 per bed/day for a hospital ranging from 250-600 beds (with 80% bed-occupancy rate). Thus Rs. 157500 can be saved per year (Rs. 1575000 in 10 years) on the basis of Rs. 2.00 per bed/day saving. This model is under consideration for implementation at the Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow, India."*

Data collected from a totally private run CBWTF operator in Bangalore for estimating the cost of establishment and operations is presented below.

It is totally private firm owned and operated CBWTF covering currently around 9620 beds with charges varying from 3.75-5.20 INR/bed/day depending upon the distance from CBWTF and type of establishment.

Input and process cost in INR		Income from all sources in INR	
Initial costs for authorisation, consent fees to fulfil the government regulation criteria	200,000/annum	Total income from service charges	1,68,00,000 14,00,000/month
Cost of Land()	25,00,000	Revenue from sale of recyclable material	3,00,000 per annum
Structure of CBWTF & other civil works	60,00,000		
Cost of equipment			
Capital			
Incinerator	75,00,000		
Autoclave	12,00,000		
Shredder	1,50,000		
Effluent treatment plant	4,50,000		
Vehicles – 8 vehicles	35,00,000		
Operations and maintenance of equipment	60,00,000 per annum (5 lakh per month)		
Operations and maintenance of vehicles	36,00,000 per annum (3 lakh per month)		
Salaries	42,00,000 per annum (3.5 lakhs per month)		

Office establishment	25,000		
Incineration ash payment to landfill	4,00,000 per annum (40,000 per month)		
Water	1,44,000 per annum (12000 per month)		
Electricity	4,20,000 per annum (35000 per month)		
Business promotion	5,00,000 per annum		
Total costs	3,67,89,000 (USD 799,761)		1,71,00,000 per annum (USD 371,739)
Total capital costs	2,13,00,000 (USD 463,043)		
Total recurrent costs per annum	1,54,89,000 (USD 336,717)		

Though it is a single case study, to state an example it is observed that the entirely private run model of CBWTF is earning a net income of 1,71,00,000 INR (USD 371,739) per year. Of the total calculated cost, 58% is capital cost and 42% is recurrent cost for operation and maintenance. The net benefit in terms of rupees is 16, 11,000 INR (USD 35,021 per year) and the ratio of income to recurrent cost 1.1. The recovery of the capital costs would be achieved in not less than 10 years

The factors that influence economic viability of the system can be as follows

- Achieving coverage of beds required to ensure cost benefit to the system. BMW rules prescribe coverage of 10,000 beds. In many instances there may be lack of adequate number of health care facilities or inadequate coverage of the existing facilities to enrol with the CBWTF. This greatly influences the cost benefit ratio.
- **Awareness regarding the BMW rules and in-house systems of management in health care facilities which will lead to better segregation. Good segregation will lead to decrease in operation and maintenance cost in CBWTF, increase longevity of equipment, decrease fuel consumption etc**
- Land value: Guidelines prescribe one acre of land for CBWTF and price of such a land size increases capital costs
- Purchase of equipment, Tax , energy – power, water etc:
- Vehicles and labour

### **Advantages of a PPP model:**

It can increase the cost benefits by addressing the following

- **Reduction of capital costs** : Land would be leased by the State Governments to the operator for certain time frame, soft loans for civic works, support in technology purchase, subsidies on duties
- **Reduction in recurrent costs:** extending subsidies in water and electricity
- **Increase the generated income** : assure enrolment of all Healthcare facilities with the CBWTF, ensure that no other CBWTF operator is allowed within a jurisdiction that covers 10,000 beds
- Government offers: Land lease, assurance that no other operator will be allowed.
- It expects 10% decrease in fees charged from government health care facilities; The other option is to reduce the capital costs to the operator by formation of a economically viable PPP model
- The same money saved in PPP model can be invested in up gradation/alternate technology that will result in avoidance of release of PCDD/PCDF

- Another important aspect to be considered that in an environment and health related endeavour benefits expected are not only in monetary as in a business model but there are intangible benefits like expected decrease in releases of toxic gases and POP's, decrease in infections, health promotion in health care facilities and CBWTF.
- The benefits arising out of decrease in incidence of respiratory problems, cancers, decrease in low birth weight and other expected benefits due to reduction of PCDD/PCDF emissions also need to weigh considering a cost benefit analysis alone.

Applying the reduction in capital costs expected in the PPP model such as land lease, 5 % subsidies in electricity and ensuring coverage of 10,000 beds, an approximation of the expected benefits derived is presented below. The projected benefits would be achieved during the course of this project. The purpose of the table is to illustrate benefits expected to be derived from the concept of PPP.

Variable	Private model (in INR)	Proposed PPP model (in INR)	% decrease (in INR) (% decrease)
Capital costs	2,13,00,000 (USD 463,043)	1,51,94,000 USD 330,304 (25,00,000 INR land cost and 36,00,000 equipment support from proposed project deducted)	132,739 (28%)
Recurrent costs /year	1,54,89,000 (USD 336,717)	98,89,000 USD 214,978 (deducted project fund of 56,00,000 for transportation)	121,739 (36%)
Total costs	3,67,89,000 (USD 799,761)	2,50,83,000 USD 545,282	11706000 (31%)
Income per year	1,71,00,000 (USD 371,739)	1,80,00,000 USD 391,304 (considering coverage of 10,000 beds @ rs 5/bed/day)	900,000 USD19565
Net Profit	16, 11,000 INR (USD 35,021 per year)	81,11,000 (USD 176,326)	
For the proposed CBWTF model in each state there is project funds to be released			

The proposed PPP model is based on a successful CBWTF one in Mumbai, Aurangabad and Nasik in the state of Maharashtra.