



Danish Ministry of the Environment
Environmental Protection Agency

Partnership for Eco-efficient Technology to the Wastewater sector in India

Lessons learned and recommendations

Environmental Project No. 1556, 2014

Title:

Partnership for Eco-efficient Technology to the
Wastewater sector in India

Editing:

Jesper Goodley Dannisøe
Danish Water Forum

Published by:

The Danish Environmental Protection Agency
Strandgade 29
1401 Copenhagen K
Denmark
www.mst.dk/english

Year:

2014

ISBN no.

978-87-93178-26-7

Disclaimer:

When the occasion arises, the Danish Environmental Protection Agency will publish reports and papers concerning research and development projects within the environmental sector, financed by study grants provided by the Danish Environmental Protection Agency. It should be noted that such publications do not necessarily reflect the position or opinion of the Danish Environmental Protection Agency.

However, publication does indicate that, in the opinion of the Danish Environmental Protection Agency, the content represents an important contribution to the debate surrounding Danish environmental policy.

Sources must be acknowledged.

Contents

Executive Summary and Recommendations	4
Danish summary	7
1. Background and aim of the partnership.....	10
1.1 Organisation of the partnership.....	10
2. General activities in the partnership.....	12
3. The timeline of the partnership	14
3.1 Interventions with Delhi Jal Board.....	14
3.2 Interventions with TATA Group, JUSCO	15
3.3 Interventions with Gujarat water authorities.....	15
3.4 DWF registers in India	16
4. Further results and spin-offs from the partnership project	17
5. Lessons learned.....	20
6. Recommendation	22
Appendix 1: Signed agreement between DWF and DJB.....	23
Appendix 2: Signed agreement between DWF and Tata/Jusco	38
Appendix 3: Signed agreement between DWF and Gujarat Water Authorities.....	45

Executive Summary and Recommendations

Since 2009, a partnership between Danish companies and authorities has worked on exposing Danish water technologies and competencies to the Indian market. The initial goal was to establish a demonstration project for Danish water technology and knowhow with focus on refurbishing an existing Indian waste water treatment plant to increase capacity, improve treatment of the wastewater, and save energy.

From the initial focus on establishing a demonstration project, the partnership has grown into a platform on which to facilitate the entry of the whole water sector into India, using synergies, opening doors and exposing green solutions, as access may be challenged like government control, bureaucracy, and at present a difficult diplomatic situation between Denmark and India.

The partnership was established and financed by the Danish Ministry of Environment and with an initial funding for joint export promotion to India in February 2009 from the Danish Ministry of Foreign Affairs. The members of the partnership included six Danish companies: COWI, Danfoss, DHI, Grundfos, Siemens Turbo Machinery and Water Centre South (Odense Water); two authorities: the Danish EPA, the Danish Embassy in India through the Trade Council, and in addition active involvement from the Danish Water Services. The partnership has been facilitated by a secretariat run by Danish Water Forum (DWF).

At the outset, the partnership started off with initiating collaboration with a public partner, Delhi Jal (water) Board (DJB), who is responsible for water supply and water treatment in the Delhi area. DJB was facing major challenges due to increasing population and increasing demand for sufficient waste water treatment capacity in the city area. Emphasis in the collaboration was on refurbishment of a specific DJB selected plant with a business model based on potential energy savings and optimisation of the treatment processes.

The progress in the work was insufficient for a variety of administrative reasons, and the partnership decided to look for other Indian partners preferably in the private sector. Focus was changed to the fast growing state of Gujarat as well as the city of Jamshedpur in the eastern part of India, where the water infrastructure is run by a private enterprise, JUSCO, under Tata group. Again the emphasis was on establishing a demonstration project to pave the way for Danish water technology and knowhow at the Indian market.

After 4 years of intense work the partnership has succeeded in exposing the Danish Water Sector to the Indian and hereby paving the way for a number of Danish technologies being supplied to Indian customers; Although the initial idea of establishing a specific demonstration project (reference project) in India has not materialised yet, single companies have received contracts, good contacts and have been exposed to public as well as private companies in a way which had not been possible had the company worked on its own. Furthermore, a model for partnerships between companies and authorities aiming at exposing Danish water solutions at specific markets has been developed and tested. The experience gained has been used to approach other markets and environmental areas like Vietnam, Brazil and Taiwan, promoting the Danish water technologies and solutions.

MAIN LESSONS:

- Importance of presence has been emphasized. It is not possible over a few years to access, and to build the trust needed to gain access to a market sector like the water sector in India. It takes time and requires a focussed and continuous effort. Presence in India and willingness to invest time and resources without immediate return of investments are crucial parameters for success as is delivering on expectations and cultivating gained ground once agreements have been made.
- 'Seeing is believing'. It is important to keep emphasis on concrete projects, implementation and demonstration of solutions and technologies
- Slicing a huge market like India, for example by focusing on selected geographical areas, is an advantageous approach. The Indian market is not just one big market, but rather 28 individual states with different political goals, framework conditions and willingness to collaborate and invest in the environment.
- The sector approach is a successful way to approach a market, because the effort becomes more focused and competent. This is also an advantage for the local Trade Council, as they can build stronger and more specific knowledge and thereby increasing impact towards the target group of potential customers.
- The partnership model is a strong base for such a sector based effort with the possibility of wide exposure of holistic Danish solutions to the water sector and other environmental areas in India which includes more technologies and reaches a target group which doesn't just think in single products. Close collaboration in the partnership between Danish companies and authorities (the Danish Embassy and the Ministry of Environment (sector ministry)) and a water networking organisation like DWF, representing a broad range of stakeholders related to the Danish water sector, has been crucial for providing quick relevant response to Indian needs and requests. Other benefits, such as networking and capacity building within the partnership, e.g. of the Danish Embassy and the Trade Council within the water area, has strengthened the possibilities of a more focussed approach towards potential Indian partners.
- Local anchoring of the partnership is crucial. The participation and the competencies of the Danish Embassy and the Trade Council have been critical. They have provided local presence, local contacts, understanding the Indian market and mentality as well as of the bureaucracy. Though local Indian partners and participation may be strengthened.
- Economic incentives are very important – this means that there is a need to work strongly with describing business cases, and supporting the development of economic and financing models which include total cost methods. Areas such as energy efficiency in wastewater treatment, NRW and water recycling in industrial processes have emerged as promising focus areas as they ease the presentation of a favourable business case and consequently reinforce the opportunity of working with businesses and not just government.

There has been a number of benefits and spin-offs from the project like: the establishment of access to and the build of trust with local government officials, which are then accessible to companies; the strengthening of lifecycle thinking and the total cost approach in local counterparts, which is an advantage for Danish technology; the influence on definition of targets for the technology needed in tenders; and contracts awarded to individual companies which have presented their solution in relation to the project. The latest spin-off from the partnership is the possibility to carry out a water audit in the city of Rajkot in Gujarat, which is paid by the Gujarat water authorities. The work will include supply of Danish technology to localise water losses in the piping system provided by a Danish SME water company, which was not previously on the Indian market.

RECOMMENDATIONS:

Based on the lessons learned and to further strengthen the presence of the Danish water sector and solutions in India the following is suggested:

- Continued presence in India. Based on the experiences and what has been achieved in terms of spin-off, it is extremely important for the Danish water sectors present expansion on to the Indian market to build on top of the investments made. These include both contacts and networks build, human resources and skills, and capacity created in the sector and certainly also in the Trade Council. Considering the business opportunities for Danish solutions and the strong competitors present in the Indian market (e.g. the Netherland, France, Japan, Israel, USA) continuous presence and exposure of Danish solutions within the water sector and other environmental areas are important. There might be a danger of missing the window of opportunity in the Indian market, for Danish solutions to contribute to solving Indian environmental challenges. A continued effort would also add to being ready to take advantage of possible sudden change in the diplomatic situation between Denmark and India.
- Continued sector approach and a more broad based partnership to support this
- Continued joint effort, coordination and mutual capacity building between MoE (Ministry of Environment), MFA (Ministry of Foreign Affairs)/ TC (Trade Council) and Danish Companies and IO (Interest Organisations). Strengthening cooperation across authorities, for example with Danish Ministry of Food on the dairy sector.
- Continue the strong involvement of the private companies and targeting of the private sector in India as well
- Strengthen cooperation with Indian partners as door openers
- Further strengthen financing and economic models and cases
- Further strengthen visibility of Danish solution to Indian customers
- Use India's position in the region to open access for Danish water sector in nearby countries like Singapore, Thailand, Malaysia, Bangladesh and others.

Danish summary

Danske virksomheder og myndigheder har i et partnerskab siden 2009 arbejdet på at eksponere dansk vandteknologi på det indiske marked. Oprindeligt var målet at etablere et demonstrationsprojekt for dansk vand teknologi og knowhow. Fokus var på at renovere et eksisterende indisk rensningsanlæg for at forøge kapaciteten, bedre renseprocesserne og spare energi.

Fra det indledende mål om at etablere et demonstrationsprojekt har partnerskabet udviklet sig til at være en platform, der faciliterer adgang til det indiske marked for hele den danske vandsektor, ved at åbne døre, udnytte synergi og vise de grønne løsninger, på et marked som kan være kompliceret, på grund af bl.a. regeringskontrol, bureaukrati, og så den nuværende diplomatiske situation mellem Danmark og Indien.

Partnerskabet blev etableret og finansieret af den danske Miljøstyrelse med indledende støtte fra Udenrigsministeriets Eksportråd til et eksportfremstød i Indien i februar 2009. Medlemmerne af partnerskabet har været COWI, Danfoss, DHI, Grundfos, Siemens Turbo Machinery og Vandcenter Syd og på myndighedssiden Miljøstyrelsen, Eksportrådet på den danske ambassade i Indien og desuden med aktiv medvirken fra Danish Water Services. Partnerskabet har været faciliteret af Danish Water Forum (DWF).

I den første del af partnerskabet var der et særligt samarbejde om demonstrationsprojektet med en offentlig partner, Delhi Jal Board (DJB), som er ansvarlig for vandforsyning og spildevandsrensning i Delhi området. DJB stod overfor store udfordringer på grund af stigende befolkningstal og en stigende efterspørgsel efter kapacitet til spildevandsrensning i byområdet. Fokus var på reovering af et specifikt anlæg til spildevandsrensning med en fornuftig økonomi gennem en forretningsmodel baseret på energibesparelser i driften og optimering af renseprocessen.

Da der ikke var fremdrift i projektet begyndte partnerskabet at se sig om efter andre indiske samarbejdspartnere særligt i den private sektor. Fokus flyttede til den hurtigt voksende delstat Gujarat i vest og byen Jamshedpur i det østlige Indien, hvor vandinfrastrukturen drives af et privat firma, JUSCO, der er en del af industrigiganten TATA. Hvor der var interesse for at etablere et demonstrationsprojekt for at bane vejen for dansk vandteknologi og knowhow på det indiske marked.

Efter 4 år med aktiviteter har partnerskabet nu fået eksponeret den danske vandsektor i Indien og banet vejen for anvendelse af dansk miljøteknologi i Indien. Selvom det oprindelige demonstrationsprojekt ikke blev etableret, har danske virksomheder gennem projektet fået gode kontakter til myndigheder, offentlige og private selskaber og muligheden for at gennemføre demonstrationsprojekter for at vise, hvordan man kan skabe en bedre viden om tab af drikkevand fra ledningsnettet (Non-revenue water, NRW).

Herudover er erfaringerne med partnerskabsmodellen efterfølgende brugt i Vietnam, Brasilien og Taiwan, hvor dansk vandteknologi er blevet promoveret.

ERFARINGER med at arbejde i partnerskaber som det i Indien omfatter:

- Lokal tilstedeværelse er et "must". Det er ikke muligt på bare få år at få adgang til og opbygge den tillid, der er nødvendig for at tilgå et nyt marked som vandsektoren i Indien. Det tager tid og kræver en fokuseret og kontinuerlig indsats. Tilstedeværelse i Indien og villighed til at investere tid og ressourcer uden umiddelbar gevinst af investeringen er afgørende for indsatsen, ligesom det er afgørende at kunne levere på forventninger og dyrke samarbejdet, når aftalerne er indgået.
- Det er nødvendigt at opbygge demonstrations-steder for at vise, at dansk teknologi også virker under indiske forhold.
- Et stort marked som det indiske, bør opdeles, for eksempel ved at fokusere på udvalgte geografiske områder. De har forskellige behov og der er 28 individuelle stater med forskellige politiske mål, rammebetingelser og villighed til at samarbejde og investere i miljøet.
- Sektortilgangen er en god måde at tilgå et marked, da indsatsen bliver mere fokuseret og kompetent. Dette er også en fordel for det lokale Eksportråd, idet de kan opbygge større specifik viden inden for et antal begrænsede sektorer og derved øge deres gennemslagskraft over for potentielle kundesegmenter.
- Partnerskabsmodellen er en stærk base for en sektor tilgang med mulighed for bred eksponering af hele danske løsninger til vandsektoren og andre sektorer i Indien, der kan inkludere mange teknologier og samtidigt rammer en målgruppe, der ikke kun tænker i enkelt produkter. Tæt samarbejde i partnerskabet mellem danske virksomheder og myndigheder (den danske ambassade og miljøministeriet (sektor ministerie)) og en vandnetværks organisation, der repræsenterer en bred vifte af aktører på vandområdet, har været afgørende for at kunne give hurtig og relevant respons på indiske forespørgsler. Desuden har partnerskabsmodellen andre fordele såsom at styrke personlige netværk og kapacitetsopbygning indenfor gruppen, bl.a. har den danske ambassade og Eksportrådet styrket sine muligheder for en mere fokuseret indsats overfor potentielle kunder i Indien til glæde for danske virksomheder.
- Lokal forankring af partnerskabet er afgørende. Den danske ambassade og Eksportrådets deltagelse samt deres kompetencer har i denne sammenhæng været væsentlige. De har leveret lokal tilstedeværelse, lokale kontakter, forståelse for det indiske marked og den indiske mentalitet såvel som det indiske bureaukrati. Den lokale indiske deltagelse kan dog styrkes
- Økonomiske instrumenter er nødvendige og der er derfor brug for fortsat at arbejde med udvikling af forskellige forretningsmodeller, som kan hjælpe danske virksomheder ind på nye markeder. Projekter inden for energi-optimering og reduktion af ledningstab i drikkevandsforsyningen er lettere at skabe økonomi i, da sådanne projekter skaber et økonomisk overskud, hvilket gør dem mere attraktive for kunderne. Det giver specielt gode muligheder for at samarbejde med virksomheder i den private sektor.

Partnerskabet har **oplevet** en række spin-off's, herunder forbedrede kontakter til lokale embedsmænd og beslutningstagere, forbedret adgang til store private aktører, samt øget forståelse for livs-cyklus tankegangen og opgørelse af total omkostninger ved nye investeringer, hvilket er en fordel for danske løsninger. Det seneste spin-off har været, at to danske virksomheder i 2013 har arbejdet med at demonstrere muligheder for at begrænse ledningstab i en større by i Gujarat. Arbejdet er afsluttet december 2013 og yderligere en by har anmodet de danske virksomheder om at gennemføre tilsvarende undersøgelser. Projekterne i Gujarat har i øvrigt medført, at partnerskabet kunne inddrage en dansk SMV, som ellers ikke ville have haft adgang til det indiske marked.

ANBEFALINGER:

- Sektor-specifik markedsføring, baseret på brede partnerskaber
- Fælles indsatser mellem det danske Miljøministerium, Udenrigsministeriet, Eksportrådet og de danske virksomheder og organisationer inden for sektoren.
- Udbygge de danske muligheder ved at arbejde med tværgående løsninger for energi og vand, samt fødevarer og vand.
- Fortsætte den vigtige tilstedeværelse, som danske virksomheder allerede har i Indien, og fortsætte arbejdet med at få fat i den private sektor, idet denne forventes at komme til at spille en større rolle i fremtiden.
- Fremme samarbejde mellem danske og indiske virksomheder der i fællesskab kan åbne døre til nye muligheder.
- Fremme nye forretnings- og finansielle modeller, der kan styrke økonomiske helhedsvurderinger hvor kvalitet og drift vejer tungere og kan gavne danske virksomheder.
- Bruge erfaringer og demonstrationer i Indien som reference for andre projekter i regionen til fx Singapore, Thailand, Malaysia, Indonesien og andre områder.

1. Background and aim of the partnership

The Indian water sector is best described as needing new technology and services to cope with growing problems with water pollution, leakage and illegal tapping from water supply pipes (so-called nonrevenue water- NRW), flooding during the monsoon period and prolonged draught periods.

In February 2009 a delegation of Danish companies lead by the Danish Minister for the Environment participated in “Danish-Indian Water Days” in Delhi and Mumbai. The commercial delegation was organised by WTC, the Danish Trade Council (both local and from Copenhagen) and Danish Water Forum (DWF). Focus was to present state-of-the-art solutions from the Danish water sector and to develop new sales, projects and cooperation with the Indian water sector. The Danish delegation included the companies: COWI, Danfoss, DHI, Grundfos, Water Centre South (formerly Odense Water) and Siemens Turbo Machinery. In addition the Danish Water Forum, the Danish EPA and the Royal Danish Embassy in Delhi were represented.

Many Indian companies and authorities visited the events and the Danish participants made valuable contacts. There seemed to be possibilities for collaboration within the area of waste water treatment with apparent needs of renovation and upgrading of Indian waste water treatment plants and possibilities for setting up a business model based on energy savings.

During the India visit the idea of establishing a demonstration site for Danish solutions to waste water treatment was born. The access to the Indian market has not been easy for Danish companies, although some Danish companies have established themselves. The underlying objective of the subsequent partnership was thus to open the difficult but very lucrative Indian water market to the Danish companies.

To ease access to the demonstration site for Indian water authorities and other decision makers (and possible investors), it was decided to find a plant in the Delhi area.

In addition to the goal of selling Danish technology to India, the partnership should also work on financial models to support implementation of Danish technology, mainly based on systems generating an income through energy savings.

1.1 Organisation of the partnership

The partnership was initially organised through bringing together the 6 companies who participated in the export event in India in February 2009, the Danish Embassy in Delhi, Danish Water Forum and the Danish EPA. Other companies were given the opportunity to join in at a later stage.

A steering committee was established to execute the work in the partnership. In addition a broader interest-group was established to encompass all stakeholders and interested parties to get information about the progress in the partnership.

The Steering group was established with representative members from the different groups represented in the project: The consulting group, the manufacturing group and the authorities (DEPA and the DTC/Embassy). The Steering group met at least twice per year, depending on progress in the project.

The facilitation of the partnership has been taken care of by staff from DWF in close cooperation with representatives from DEPA, who had the chair in the committee.

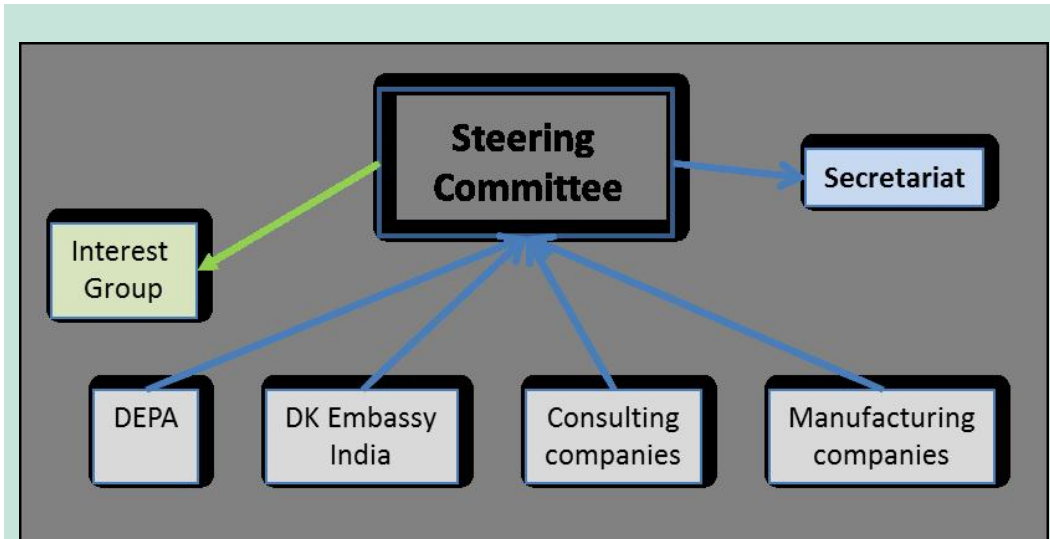


FIGURE 1
OVERVIEW OF THE ORGANISATION OF THE PARTNERSHIP

2. General activities in the partnership

Originally, the partnership had defined several tasks to be performed during the project period. The key tasks are described below, including to which extent the tasks were fulfilled. Due to the development of the project along the way the tasks have changed accordingly.

Task	Comments	Completed YES/NO
Establish plan for executing the project, including economy and time schedules	A project plan was drafted and accepted by the Steering committee	YES
Establish Steering committee and drafting statutes	The Steering committee was established with representatives from the company-segments (Consulting and manufacturing)	YES
Assess Indian law in relation to public-owned treatment plants	The Indian laws were studied and individual assessments were done for all the treatment plants in the region of Delhi	YES
Assess Indian law in relation to privately-owned treatment plants	No direct assessment was made. Instead the Trade Council had consultations with private-run treatment companies and the results showed that the private treatment plants should adhere to the national effluent standards.	(YES)
Identify potential treatment plants for demo-project	One treatment plant under Delhi Jal Board was identified and in addition two treatment plants were identified in Jamshedpur, run by Tata- company JUSCO	YES
Perform a market analysis for wastewater treatment in India, including how Danish companies could enter this market	Not carried out. However, knowledge built up during the project has shown that European companies like Veolia and Degremont are active in India and accordingly Danish technology would also be qualified in India. Equipment from two Danish strongholds, Grundfos and Danfoss, are already being utilised in India and the energy efficiency tied to their products have brought the technology in the front line	YES, indirectly
Assessment of financial models for financing a demo-project	The financial model task was completed through collaboration with Danish Water Services, who provided a model for both fully DK financing and a model for partial financing, both based on a pay-back model related to energy and water cost savings	YES
Identify 1-2 potential clients and prepare for a joint visit for all 6 partners	Delhi Jal Board and JUSCO were identified during the first 2 years of the project. Gujarat Water Authorities were identified late 2012.	YES
Provide overall description of a demo-project, including budgets	After assessing the plant Coronation phase III, an overall suggestion for a refurbishment was developed, although it was indicated that it was rough and was based on a semi-utilised plant. For the plants in Jamshedpur (Jusco), the rough assessment of the two plants were also provided with indications on upgrading possibilities	YES
Host meetings for all partners and also for non-members of the partnership	The partnership has held a few meetings for all members, and has also presented the partnership and its aim during other relevant meetings and workshops, both in Denmark and abroad	YES

TABLE 1
OVERVIEW OF TASKS AND COMPLETION IN THE PARTNERSHIP PROJECT

The task descriptions from the start of the project were developed based on the existing knowledge and from the expectations, but were reformulated and approached according to actual possibilities and as the project advanced. Overall it has been possible to fulfil almost all tasks and to a large extent additional activities have been included to generate relevant and useful knowledge. This has

mainly been possible due to acceptance from DEPA in working dynamically according to progress and possibilities.



FIGURE 2

3. The timeline of the partnership

After inauguration of the partnership the Danish Trade Council (DTC) in the Danish Embassy in Delhi started to develop contacts to relevant Indian partners and to open doors to relevant authorities, both at national and at state level, which was considered essential for the partnership activities. The sector approach with involvement of a number of Danish companies as well as authorities and representing “system solution” to a specific challenge seemed to give easier access to the management and decision making levels in relevant authorities and companies. This can be a challenge for individual companies even with the support of DTC.

3.1 Interventions with Delhi Jal Board

Initially the partnership decided to focus on the Delhi area. Collaboration was initiated with a public partner, Delhi Jal (water) Board, who was facing major challenges due to increasing population and increasing demand for sufficient waste water treatment capacity in the city area. Beside, building new waste water treatment plants, there seemed to be a huge potential in upgrading existing plants with new and more energy efficient Danish technology. The business model was based on the assumption of potential energy savings and optimisation of the treatment processes leading to better discharge water quality and enabling reuse of the water for other purposes, e.g. industrial or agricultural use. In November 2010 the partnership signed a MoU with DJB with focus on refurbishment of a specific waste water treatment plant.

The work to identify a suitable treatment plant was initiated in the early 2010. By consultations with Delhi Jal Board (DJB), more than 10 treatment plants were visited and DJB finally decided to provide the Coronation Treatment Plant Phase III, to the disposal of the Danish partnership. The plant was a relatively small plant, situated in the outskirts of Delhi. Unfortunately, the plant was not fully loaded at the time of the assessment, but was promised to be so during tests and further assessments. During the process of creating the contacts with DJB until having a firm confirmation of their interest in the project and to having assigned a treatment plant, the partnership experienced slow decision making and bureaucracy at the Indian side. The partnership concluded that a thorough analysis and assessment of the STP (loads, running conditions etc) would be a prerequisite for the further development of the project. Based on this assessment, it was decided to conduct an investigation/assessment of the plant with the aim to provide a solid technical basis for the project design and the financial model.

The bureaucracy again delayed the project due to very slow procedures to obtaining a permission to carry out a simple load study of the plant, needed for the continued work. After more than 6 months the project was granted access to do the assessment of the plant. The first study was carried out by Danish experts from COWI and Water Centre South on 7-11 May 2011 and the experts established the facts that the treatment plant was still not running on full load, although DJB had promised to ensure full load by the time of the assessment. In addition it was obvious that the plant was not performing well and was mainly delivering acceptably treated wastewater due to working far under capacity (60% under capacity). It was decided to carry out an additional study to get better information about the factual load (amount of waste received) of the plant a terms of reference was developed.

In October 2011 (9-11) the Indian company AECOM performed a load assessment on the plant, which was still not running on more than 40% capacity. The assessment showed that the discharge permit levels of BOD (Biochemical Oxygen Demand) and Total suspended solids were in compliance with state permits, the reason being the very low load and the retention time, which was 2-3 times the nominal retention time under full load. The results showed low energy uptakes due to low load and overall the business case based on pay back of investment based on energy savings would not be relevant.

In January 2013 DJB sanctioned that DWF and its project proposals could continue. However, as the plant is still not fully loaded and financial investment can't be expected from DJB, the initial conditions for the project is not fulfilled, and the specific project is put on hold. The refurbishment will not provide enough revenue in energy savings to provide a reasonable pay-back time. Therefore, a new financial model is needed in case of resumption of the project.

DJB has lately (April 2013) shown a growing interest in the ability of Danish companies to help them in combatting non-revenue water (water-loss from the water supply system), mainly due to the commitment that DWF has got in Gujarat. DJB has agreed to discuss further on providing a pilot area in Delhi to demonstrate Danish technologies in the field of non-revenue water.

3.2 Interventions with TATA Group, JUSCO

Due to the very slow progress working with DJB the partnership started to look for alternatives and through interventions with the DTC focus was changed to find a private Indian partner. Good contact was established to the globally present industrial conglomerate Tata Group and in particular the city of Jamshedpur, where the water infrastructure is run by a private enterprise, JUSCO, under Tata group. In May 2012 DWF on behalf of the partnership signed a MoU with JUSCO to promote commercial cooperation between JUSCO and Danish Water companies. The interest from JUSCO in Danish technology was shown during several visits to the city and in June 2012 a Danish delegation visited Jamshedpur to exchange views. In addition the Danish delegation met with the environmental managers from several Tata-companies in Mumbai in June, presenting Danish technologies and solutions.

In October 2012, the partnership performed an initial technical assessment of the two waste water treatment plants in Jamshedpur to pave the way for a demonstration site. The assessment was performed by COWI and supported by the Danish EPA. It showed some potential for upgrading of the system, however, the demonstration project for the full Danish package has not yet been initiated, since other investments in Tata Group have put this activity on hold. However, Grundfos as a single company has got contracts with JUSCO on energy audit and installation of energy efficient pumps. In a follow-up visit in January 2013 the Danish delegation discussed solid waste and sludge management as potential new areas of cooperation.

3.3 Interventions with Gujarat water authorities

New possibilities for the partnership came when DWF and the Danish Embassy were invited to participate in the "Vibrant Gujarat" exhibition and meeting in Ahmedabad in January 2013. Gujarat state is very progressive and also has a reputation for low level of corruption. During the "Vibrant Gujarat", a seminar with the Danish Ministry of Environment and the Danish Ministry of Foreign Affairs through the Embassy present, Grundfos Danish Water Forum and DHI presented potentials for water management and energy efficiency. At the same seminar DWF signed a MoU with the water authorities in Gujarat. Although the enthusiasm was there, there was not direct expectation of any real possibilities for Danish projects, but less than 24 hours after signing the MoU, DWF was called back to Gujarat as soon as possible and in February 2013 a delegation visited Gujarat again. The outcome was a request from Gujarat to provide a project offer for carrying out a water audit in a selected part of the city of Rajkot. They have a major loss per year in non-revenue water (app. \$25 mio/year). At present Rajkot Municipal Corporation has just approved the NRW project in the city of Rajkot, Gujarat. The project will start as soon as DWF have signed the contract (September 2013). The owner of the project will be DWF, but the actual work will be taken care of by DWF

members like DHI-India and the Danish company Leif Koch. Leif Koch is a Danish SME which has been exposed to the opportunities in the Indian market due to this partnership. Another municipality of Gujarat, Vadodara, has shown keen interest in implementing the Danish technologies in its administrative region.

3.4 DWF registers in India

The work associated with the above project in Gujarat demanded that DWF had to establish itself as a registered organisation in India. On 4 April 2013 DWF was officially registered in India which gives the opportunity to negotiate projects on behalf of the members of the original waste water treatment partnership project and all other DWF members. It is the intention to utilise the investment in the registration to facilitate similar works in Gujarat.



FIGURE 3
TWIN WATER TOWERS IN RAJKOT CITY, GUJARAT STATE, INDIA

4. Further results and spin-offs from the partnership project

The partnership project has been active for nearly 4 years and during that time the partnership has developed from the initial focus on establishing a demonstration project and grown into a platform from which to facilitate the entry of a whole sector into India where access at the moment is complicated due to the difficult diplomatic situation.

The partnership has succeeded in exposing the Danish Water Sector to the Indian market including Danish technological solutions, services and incentives. The initial idea of establishing a specific demonstration project (reference project) in India for a full package of Danish solutions (system solution) has not materialised yet. However, single companies have won contracts, established good contacts and have been exposed to public as well as private companies in a way, which had not been possible had the company worked on its own. Furthermore, a model for partnerships between companies and authorities aiming at exposing Danish water solutions at specific markets has been developed and tested. The experience gained can be used to approach other markets and environmental areas.

The list below is a non-exhaustive overview of the important spin-offs from the project:

1. Overall, the Danish water technology; hitherto mostly unknown in the Indian market, has got comprehensive exposure in the Indian market. Now, the Danish water solutions are as well-known as the Japanese, French, Israeli or American water technologies. This is by far the most important gain from the partnership project.
2. Consolidated contacts with the relevant central ministries and organizations like Central Groundwater Board, Central Pollution Control Board, various municipalities and at state level across India, especially the Delhi region, the State of Gujarat and the State of Rajasthan– this has a direct impact on the work done by the Danish companies present in India. The partnership has opened the doors for these companies to do business in a transparent manner; which is generally close to impossible for companies without indulging in corruption.
3. Feasibility Study generated for the Delhi Jal Board for a specific sewage treatment plant in Delhi. Beside information on the functioning of a specific plant, this study can be used by DJB to study the energy efficiency of other plants as well. The objectives of capacity building and knowledge sharing with the municipality have been achieved. In addition the work has provided important information to the Danish companies on the challenges and possibilities within the waste water treatment sector in India.
4. The partnership has been invited to several seminars and exhibitions, where it has provided access the partnership companies (free of charge) to present their technical papers and make contacts with the highest possible decision makers across the country.
5. The partnership activities have paved the way for contacts with the TATA Group (one of the most respected business group in India); the discussions are underway to establish a

- long term partnership between TATA Group and Danish water companies, based on a MoU signed in April 2012. Discussions with Jusco on solid waste management have also materialised and will continue after closure of the wastewater partnership.
6. The partnership activities enabled the introduction of new technologies into the Indian market (like centrifugal blowers by Siemens), which have not been used anywhere in India until now. The Indian municipalities are now becoming aware of the benefits in using these energy efficient Danish technologies, and further opportunities for establishing projects in India with participation of Siemens and one or more Danish partners are being explored at present
 7. Grundfos has entered into a dialogue with TATA Group for energy/pump auditing of the entire Jamshedpur municipality. The entry point for discussion being the partnership project.
 8. Due to the partnership, COWI has been able to enter a discussion with the TATA Group for doing water auditing for the whole TATA Group, starting with a small factory/plant.
 9. Danfoss has been able to consolidate its contacts amongst various municipalities across India, thanks to the exposure of this partnership project.
 10. Siemens Turbomachinery is anticipated to benefit the most in future, thanks to the partnership. They have introduced a new technology in the Indian market and were given good exposure to most of the important stakeholders in the market. They are now ready to enter phase 2 of their entry strategy in the Indian market, where all the municipalities have been taught about their products who are now willing to invest in the products.
 11. The Danish Embassy and Danish Water Forum as secretariat for the partnership have been invited to meetings with large-scale Indian entrepreneurs, who are interested in getting access to Danish technology in the water sector through direct cooperation agreements (Larsen and Toubro is one of the biggest EPC contractors in India, Gannon & Dunkerley is engaged in supplying wastewater technologies; also Simplex Projects is a big EPC contractor active in water projects across India).
 12. DJB, although we never had a direct contract from them, are now speaking about the lifecycle costs of their technical investments, due to continued presence and presentations from members of the partnership
 13. Due to the partnership DWF and participating companies, the Danish Ministry of Environment and the Danish Embassy were invited to “Vibrant Gujarat” and the Danish Ambassador was given a special speaking slot in the opening session of the event together with other high end diplomats and topmost industrialists. Moreover, the Danish delegation was able to host a separate seminar on water solutions.
 14. The establishment of a DWF registration in India for handling demonstration projects. This was accomplished in 2013 after close discussions with the water authorities in Gujarat State. A MoU was signed in January 2013 between DWF on behalf of the partnership and the Gujarat Water Authorities.
 15. Development of a demonstration project for non-revenue water in Rajkot, Gujarat, with three Danish companies participating. This would not have been possible without the partnership.
 16. Delhi Jal Board has been inspired by the work of the partnership and has initiated discussions on how to reduce Non-revenue water. DJB has asked for clarifications and specs from the partnership members.
 17. The Embassy, DTC, has been approached by Infosys, an IT giant in India, which is suffering from NRW in their campuses and they have asked for Danish solutions to solve the issue. Infosys has been given the mandate to work for the 100 acre township in Bangalore, where several Indian companies are established. They are interested in using the Danish water technologies and solutions to create the first water neutral commercial township globally.
 18. The DWF group has been approached by the city of Vadodara in Gujarat for consultations for a water audit, like to one being carried out in Rajkot.

19. In June 2013 DWF has been approached by the company Innocriti, who has asked for contacts to potential Danish collaborating partners for various water-related projects.



FIGURE 4
LISTENING TO WATER LEAKING IN THE WATER SUPPLY SYSTEM IN RAJKOT CITY, GUJARAT STATE, INDIA

5. Lessons learned

The intensive work during the past four years within the partnership, and related activities during the period, have provided a lot of specific knowledge on waste water treatment and management and in addition a lot of general knowledge on how to work and act in India. In this respect, the integration of the activities of the MoE with the Danish Embassy and the Trade Council (TC) activities into the partnership to back up common goals, has been crucial and the success of the partnership has also been achieved by having very dedicated staff available.

The further overall lessons learned can be summarized as:

- Importance of presence has been emphasized. It is not possible over a few years to access, and to build the trust needed to gain access to, a market sector like the water sector in India. It takes time and requires a focused and continuous effort. Presence in India and willingness to invest time and resources without immediate return on investments are crucial parameters for success. As is delivering on expectations and cultivating gained ground once agreements have been made.
- Slicing a huge market like India, for example by focusing on selected geographical areas, is an advantageous approach. The Indian market is not just one big market, but rather 28 individual states with different political goals, framework conditions and willingness to collaborate and invest in the environment.
- The sector approach is a successful way to approach a market, because the effort becomes more focused and competent.
- The partnership model is a strong base for such a sector based effort with the possibility of wide exposure of Danish solutions to the water sector and other environmental areas in India. Close collaboration in the partnership between Danish companies and authorities (the Ministry of Foreign Affairs through the Danish Embassy and the Ministry of Environment (sectorial Ministry) and a water networking organization like DWF, representing a broad range of stakeholders related to the Danish water sector, has been crucial for providing quick relevant response to Indian needs and requests. Other benefits, such as networking and capacity building within the partnership, e.g. of the Danish Embassy and the Trade Council within the water area, has strengthened the possibilities of a more focused approach towards potential Indian partners.
- Local anchoring of the partnership is crucial. The participation and the competencies of the Danish Embassy, TC, have been critical. In that respect they have provided local presence, local contacts, understanding the Indian market and mentality as well as of the bureaucracy. It has also been a big advantage that 3 of the 6 companies, originally joining the partnership, were already established in the market and could assist in helping the partnership with market intelligence.
- Economic incentives are very important – this means there is a need to work strongly with describing business cases, and support the development of economic and financing models which include total cost methods. Areas such as energy efficiency in wastewater treatment, NRW and water recycling in industrial processes have emerged as promising focus areas as they ease the presentation of a favourable business case and consequently reinforce the opportunity of working with businesses and not just government.
- The availability of funds (at the right time) to establish and facilitate strategic collaboration between authorities and companies to expose Danish solutions and to initial

preparatory work is crucial. The partnership was established as a follow up activity on the Danish export promotion (funded by the Ministry of Foreign Affairs/Trade Council) to India in 2009 based on initiative and money from the Danish Ministry of Environment under the Eco innovation Action Plan. The funding covered establishing and facilitating the partnership and later on initial technical reviews and assessments. It seems unlikely that the partnership had been established without this support.

- A flexible approach is needed to accommodate opportunities arising on the way. The partnership is still quite explorative. In the future it might work better as a water sector framework, under which specific solutions may be the focal point of missions and projects.
- Recognition of the different incentives of partners and customers is central to moving solutions forward, including the financial structure of government and political pressure for solutions to environmental challenges.
- “Seeing is believing”. There is a strong need for visibility and practical adaptation of technologies through technology development and demonstration projects. This may also establish Indian partners, for example builders, which are often needed in relation to the actual execution of projects.
- The partnership in India can be used to expand the Danish water sector’s footprints in other regional markets like Singapore, Malaysia, Thailand, Vietnam and Bangladesh.

6. Recommendation

Based on the latest developments, the spin offs and the lessons learned from the partnership work we find it very important that the Danish water sector continue the effort to enter the Indian market. The way has been paved by the work in the partnership and the Danish water sector has now attention from and access to relevant decision-makers in the Indian water sector. The goodwill, the capacity and the knowledge gained through the project by itself and the spin-offs would be utterly wasted if we do not continue the effort together with existing and new partners in India.

The sector and area specific approach has been successful and this approach is also recommended for the future activities. In that respect it could be relevant to focus on e.g. Gujarat State, where there is now a MoU between the Danish water sector (DWF) and the Gujarat water authorities. The advantage is that the state wants to attract more foreign investments in terms of factories and at the same time the limiting factor for growth in many segments of the industry will be access to water. At present Gujarat is facing a severe water shortage, which might hamper the state growth goals.

Interest areas for future activities seem to include energy efficiency in wastewater treatment, NRW and water recycling in industrial processes (e.g. dairy production and textile industry). These have emerged as promising focus areas as they ease the presentation of a favourable business case, and consequently reinforce the opportunity of working with businesses and not just government.

Joint forces, either in a direct signed partnership or via a joint agreement of some kind, are recommended. Especially the partnership model is a strong base for a sector based effort with possibility for wide exposure of Danish solutions to the water sector in India.

Visibility and seeing technology actually working in India is the key to winning over a number of customers. Although a partnership might not need to have one specific project as the key activity, – demonstration and technology development as actual projects should still be a central part of its work.

Main recommendations are:

- Continued presence
- Continued sector approach and a more broad based partnership to support this
- Continued joint effort, coordination and mutual capacity building between MoE, Embassy/TC and Danish Companies and IO. Strengthening cooperation across authorities, for Example with Danish Ministry of Food on the dairy sector.
- Continued strong involvement of the private companies and targeting of the private sector in India as well
- Strengthen cooperation with Indian partners as door openers
- Further strengthening of financing and economic models and cases
- Further strengthening of visibility of Danish solution to Indian customers.

Appendix 1: Signed agreement between DWF and DJB

**Memorandum of Understanding for the collaboration between
Delhi Jal Board and Danish Water Forum
on a specific demonstration project**

Partners:

Delhi Jal Board

Danish Water Forum

Introduction

Recognizing the MoU between Denmark and India in the area of environment:

- Emphasizing the potential of strengthened cooperation in the area related to water technologies with a special focus on energy savings, capacity expansion and optimization of treatment processes in existing waste water treatment plants in India.
- And building on preliminary investigations done by the Danish consortium in cooperation with the Delhi Jal Board;

..the Delhi Jal Board and the Danish Water Forum(hereafter referred to as the parties) agrees to sign this MoU

Article 1

The objective of this MoU is to facilitate cooperation between the parties in the field of wastewater treatment with the aim of establishing one demonstration project focusing on energy savings, improved treatment and capacity optimization by refurbishing an existing waste water treatment plant (under Delhi Jal Board) with new and more efficient technology.

Within the framework of the demonstration project, emphasis will be given to general applicability to other similar plants within the jurisdiction of Delhi Jal Board after the completion of the demonstration project.

The approach for the assessment is described in Annex 1 (SOW) and Annex 2 (ToR) and will provide the basis for the demonstration project.

Article 2

Based on preliminary investigations and mutual agreement the parties agree that the Coronation Pillar plant, Phase III is chosen for the demonstration project

To bring the initiative into action and to facilitate smooth project cooperation, the parties further agree that within a short time frame:

The Danish Water Forum will provide:

1. A technical assessment, covering the existing conditions (energy consumption, wastewater amounts, technical equipment and other essential types of information), will be carried out by the Danish Water Forum in close cooperation with DJB. The Danish Water Forum will provide financial means for carrying out the technical assessment.
2. After finalizing the technical assessment, a proposal for a rehabilitation of the specified plant will be given to Delhi Jal Board. The proposal will include:
 - a) A suggestion for a number of technical changes that will focus on bringing down the energy consumption and at the same time ensuring that the plant will comply with Indian national discharge standards (e.g. BOD 20 mg/l, Total suspended solids 30 mg/l).
 - b) Budget for the project including cost of establishment and an estimate for the energy savings.
 - c) A proposal for a financial model based on a small investment from the Indian side and on the idea that return on investment will come from energy savings via operation of the plant with high energy efficient technology. The financial model will include a tentative timetable for the return-payment.
 - d) A time table for the implementation of the demonstration project

The Delhi Jal Board will:

1. Facilitate access to the treatment plant and local authorities including timely access to relevant information.
2. Support smooth project cooperation.
3. Provide the consultant with all necessary information and data

Article 3

Depending on the findings from the steps outlined in article 2 and mutual agreement the parties will take further steps to establish a demonstration project in which:

1. Investments will be shared by the parties according to mutual agreement signed by the parties.
2. Based on mutual agreement between Delhi Jal Board, plant management and the Danish Water Forum on a process plan and time schedule for the demonstration project, the Danish Water Forum will initiate the retrofitting of the specified plant.

Article 4

This agreement shall enter into force on the date of signature

Annexe 1: Scope of Work

Annexe 2: Terms of Reference



22/11/2010

Mr. Lars Christensen

Head, Trade Department and
Commercial Counsellor
Embassy of Denmark to India
On Behalf of Danish Water Forum



22/11/2010

Mr. Ramesh Negi

Chief Executive Officer
On Behalf of Delhi Jal Board

SCOPE OF WORK
FOR
THE STUDY ON
ENERGY, PROCESS AND CAPACITY AUDIT OF
CORONATION PILLAR SEWAGE TREATMENT PLANT (PHASE III - 10 MGD)
AND SUGGESTIONS FOR REFURBISHMENT OF THE PLANT

AGREED UPON BETWEEN DELHI JAL BOARD
AND
DANISH WATER FORUM

I. INTRODUCTION

In response to and under the ambit of the Memorandum of Understanding signed between the Government of Republic of India and the Government of the Kingdom of Denmark on cooperation in areas of environment, it is decided to conduct the Study on Energy, Process and Capacity Audit of Coronation Pillar Sewage Treatment Plant, Phase III, 10 MGD (hereinafter referred to as CP STP) and Suggestions for Refurbishment of the Plant (hereinafter referred to as “the Study”) in accordance with relevant technologies in force in Denmark and other countries.

Accordingly, the Danish Water Forum (hereinafter referred to as “DWF”), will on behalf of the Danish companies involved undertake the Study through a competent Danish Consultant along with a local Indian company in close cooperation with the concerned authorities of the Government of India.

II. OBJECTIVE OF THE STUDY

The objectives of the study are:

1. To conduct Energy, Process and Capacity Audit at Coronation Pillar STP (Phase III - 10 MGD) including assessment of structures, plant configuration and equipment. This can be scaled up to cover the entire capacity of the Coronation Pillar Sewage Treatment Plant.
2. To suggest options for refurbishment of the plant, aiming at increasing energy, process & capacity efficiency and **lowering Operational & Maintenance costs**.

Results to be achieved by the Consultant:

A solid project base for identification and assessing of possible interventions with the aim of improving the CP STP in terms of treatment efficiency and energy effectiveness.

III. STUDY AREA

The Study area is as shown in the attached sheet of Annex 1. Information about the study area must be further assessed prior to commencing the study

IV. SCOPE OF THE STUDY

To achieve the above objectives, the Study will cover the following tentative items, which will be carried out by a Danish consultant, along with a local Indian company in close cooperation with DWF and the Danish companies:

1. Baseline Study
 - a. Description of current plant configuration inclusive of quantification of process volumes, list of all mechanical equipment (including nominal effect - kV and kW ratings). Survey on running mode for all units (continuous operation, on-off, timer controlled etc.).
 - b. Hydraulic profile of plant.
 - c. Process efficiency assessment. Treatment results for wastewater and sludge
 - d. Description of operational practices (operating mode, various process variables, level of maintenance, level of (manual) process control)
 - e. Assessment of state of plant structures and equipment (based on visual survey)
 - f. Overall energy consumption at plant.

2. Equipment testing
 - a. Conduct a measuring programme on actual power consumption for individual mechanical units covering the most power consuming equipment accountable for 95% of the total nominal effect installed at the plant (based on the equipment lists described under 1.a)
 - b. Description of actual operation conditions for most important equipment (up to 70% of total nominal effect).
 - c. Rapid assessment of energy efficiency of equipment compared to modern Indian and International experience.

3. Load testing
 - a. Conduct a measuring programme on wastewater composition at inlet and outlet of plant including taking of flow-proportional or time proportional samples. The sampling programme shall cover variations in composition over one week (7 days). One-hourly samples shall be taken and mixed to one-day samples for analyzing. Analysis shall be made according to internationally recognized standards and cover the following parameters: BOD (5-days), COD (dichromate), pH, temperature, total Nitrogen, total Phosphorus.
 - b. Conduct a flow measuring programme. The consultant shall decide the measuring principles used based on identified possibilities at the existing plant (existing flow meters, pumps testing combined with registration of running hours, others) and present his proposal for the acceptance of DWF. The study does not comprise any installation of new flow meters or similar flow devices.
 - c. Comparison of actual load to 1) nominal capacity of plant, 2) theoretical

capacity of plant (current process) and 3) theoretical capacity for introduction of nutrients removal process.

4. Improvement proposal study
 - a. Identification and calculation of key-performance indicators for current and future operations, including quantification of improvement potentials in terms of treatment efficiency and effective use of energy.
 - b. Identification of possible concrete improvements to the plant, i.e. replacement of worn out or in-efficient equipment, change of process parameters, change of operational practices, etc.
 - c. feasibility analysis (cost benefit assessment) of short, medium and long term improvement proposals, including quantification of investment needs and operational savings.

V. SCHEDULE OF THE STUDY

The Study will be carried out in accordance with the tentative schedule shown in Annex II. The schedule is tentative and subject to modification when both parties agree upon and any necessity that arises during the course of the Study. The Indian side promised to provide the needed input for securing the target time schedule.

VI. REPORTS

The Consultant shall prepare and submit to DJB and DWF the following reports (in English language):

2 weeks after commencement of study: Inception report including list of additional data requirements (beyond already existing and available documentation collected by the Consultant). The inception report shall contain the Consultant's proposal for concrete activities to be performed to comply with the above described study.

4 weeks after commencement of study: Draft Baseline study report (phase 1)

9 weeks after commencement of study: Draft Reporting of equipment and load testing activities (phases 2 & 3).

12 weeks after commencement of study: Draft Improvement proposals report

(phase 4)

16 weeks after commencement of study: Final study report

DJB and DWF will have 2 weeks for commenting the above report. After one additional week the Consultant shall submit final versions of the said reports to DJB and DWF.

All reports shall be submitted in electronic versions only.

DWF shall prepare and submit the Final Options Report with Detailed Project Report, designs etc., and a digital data in English to the Government of India. The rights to the report are jointly owned by the DJB and the DWF. Use of the report for other purposes than related to the collaboration between DJB and DWF should be agreed in writing between both the parties.

VII. FOLLOW UP ACTIVITIES

1. The DJB and DWF will set up a meeting to discuss the findings and the further process to promote the implementation phase.
2. There will be an opportunity for the DJB team to visit Denmark, to conduct study tour, once the project enters the execution mode.

VIII. UNDERTAKING OF THE Delhi Jal Board

1. To facilitate the smooth conduct of the Study, The Delhi Jal Board shall take the following measures:
 - a. To secure permission for the Study Team to enter into private properties or restricted areas for the implementation of the Study,
 - b. To secure permission for the Study Team to take all data and documents including photographs and maps related to the Study out of India to Denmark if needed, and
 - c. To provide medical services as needed. Its expenses will be chargeable to members of the Study Team [Please clarify with DJB].
2. The Delhi Jal Board shall bear claims, if any arises, against the members of the Study Team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the member of the Team.

3. DJB shall act as a counterpart agency to the Study Team and also as a coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.
4. DJB shall, at its own expense, provide the Team with the following, in cooperation with other organizations concerned:
 - a. Available data and information related to the Study,
 - b. Counterpart personnel
 - c. Suitable office space with necessary equipment in DJB
 - d. Credentials or identification cards, and
 - e. Information on, as well as support in, obtaining medical services

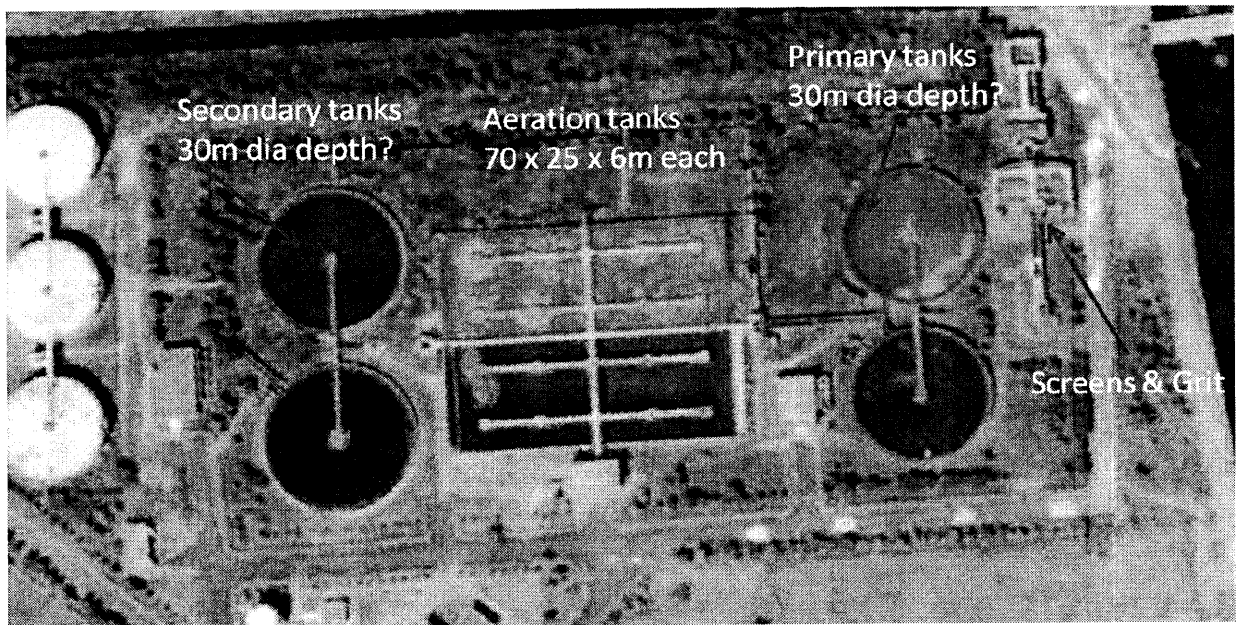
IX. CONSULTATION

DWF and DJB shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Addendum I: Study Area

Addendum II: Tentative Schedule

Addendum I



Addendum II

TENTATIVE SCHEDULE

1. Initial list of data requirements to be sent to DJB (week 2)
2. Summary of the work to be carried out on Coronation Pillar wastewater plant activities, to be presented to DJB for their approval (week 4)
3. Audit report of the selected wastewater treatment plant with its pumping stations and operations within the premises of Coronation Pillar (week 9)
4. Draft options report (week 11)
5. Workshop presenting findings of initial analysis of wastewater activities and options (week 12)
6. Draft scope of consultant services for execution & monitoring of projects (week 13)
7. Final options report with detailed project report, designs, contract agreement, etc. (week 16)

Terms of Reference
For Consultancy to Prepare Projects
For Energy Savings in Wastewater Management Operations of Delhi Jal Board
(DJB)

1. Background

Delhi Jal Board (DJB) was statutorily constituted in 1998 as a wholly publicly owned Board for provision of water supply and sewerage services in Delhi. With respect to sewerage services, around 55 % of population is connected to the sewer network of over 6500 km. There are 17 wastewater treatment plants with installed capacity of 512 MGD and 42 major wastewater pumping stations. However, there is urgent need to take up energy audit of WWTPs and Pumping Stations for improving energy efficiency, reducing costs and effectiveness of Sewage Treatment process. This study will allow DJB, the water and sanitation service provider to Delhi, to take up projects for improving energy efficiency and quality of wastewater management in the City. The proposed project would provide technical assistance to DJB to reduce energy and water consumption in waste water supply systems by improving the energy efficiency of these systems. As per DJB records, energy costs in 2009-2010 were Rs. 340 cr – accounting for 30% of DJB's total operating budget. Through implementation of energy efficiency measures, the DJB can achieve electricity savings and reduce CO₂ emissions substantially. Energy and water efficiency improvements in water & wastewater utilities typically save around 25% in energy costs and reduce CO₂ emissions. Payback periods for these improvements range from three months to three years. Thus it is possible to develop bankable projects on energy savings.

2. Consultant Services Required

The DANISH EMBASSY will procure consulting services for a Danish consultant specialized in energy audit and wastewater management.

The consultant will a) undertake a review of ONE selected wastewater treatment plant and pumping stations and prepare a summary of wastewater activities on that plant (Coronation Pillar) (scale, energy requirements and scope) both present and future; b) conduct energy audit, evaluate actual energy requirements and make recommendations for options for improving energy efficiency, reducing costs and effectiveness of Sewage Treatment process; c) on the selected options, develop a demonstration project for execution of energy efficiency works.

3. Project Preparation Arrangements

Within DJB a Project Management Unit (PMU) will be established with responsibility for providing advice and guidance to the consultants.

4. Project Objective

The objective of the demonstration project is to suggest options for refurbishment of the plant, aiming at increasing energy, process and capacity efficiency and **lowering Operational & Maintenance costs** for DJB which outlines the various PPP (Public Private Partnership) options available to the City to improve its wastewater management for both current and planned activities.

5. Detailed Terms of Reference

The consultant activities will include, but not be limited to, the following:

1. Prepare briefing note and list of data/drawings to be provided by DJB.
2. Review and assess the quality of the information available with DJB for the chosen plant (Coronation Pillar)
3. Review of selected wastewater treatment plant and pumping stations and prepare a summary of possibilities for the said plant to DJB (scale, energy requirements and scope)
4. Conduct energy audit of the selected wastewater treatment plant and pumping stations and operations thereof
5. **Energy Audit study** - The total study will be divided into two categories i.e.
 - A) **System Efficiency Study** :- Energy Input to the System for given Supply & Head
 - a) Hydraulic Losses - Excess Head.
 - b) Mechanical Losses - Pump efficiency.
 - c) Electrical Losses - T & D losses.
 - d) Losses due to Operation & Maintenance practices.
 - B) **Equipment Efficiency Test** :- (Motor, Pump, Transformer Controls, Valves etc.) as an essential part of Energy Audit study. The equipment efficiency will be tested on field at actual operating parameters. The efficiency assessment will be based on i] Existing efficiency of equipment against design efficiency, ii] Actual operating / duty point compare to design duty points, iii] Modified duty points with future identified action plan, iv] Commercial availability of equipments for given duty parameters for better energy efficiency, v] Assessment of controls & monitoring systems for operations of equipment at Best Efficiency Point (BEP) and vi] Cost benefit analysis for the replacement or modification suggested.
6. Evaluate actual energy requirements and make recommendations for options for improving energy efficiency, reducing operational & maintenance costs and effectiveness of Sewage Treatment process
7. [OPTIONAL] Organize a workshop with the technical officers of the DJB to present the technical and institutional findings and options report, and finalize most suitable options.
8. On the selected options, develop project for execution of energy efficiency works based on typical models for mobilizing PPP support or ESCO arrangement in the wastewater management based on a desk study of international experiences and from experiences within India
9. Based on the selected options, develop project for execution of energy efficiency works, including detailed project implementation report, designs, contract agreement, qualifications, etc
10. Develop options for financing mechanisms for the project.
11. Based on the selected, develop scope of services for project monitoring consultant of the demonstration project. Include life cycle cost analysis for procuring advanced equipment.

12. Upon completion of the project, provide DJB with a rough assessment, based on desk studies, on potentials for energy savings, process optimization and potentials for increased capacity in other plants under DJB.

6. Reporting Requirements and Time Table

For administrative and contractual obligations, the consultant will deal directly with the Danish Embassy. On a day to day, operational basis, the consultant will work with the PMU in DJB.

The contract will commence at the end of October 2010 and be completed around end of February 2011. The key outputs from the consultant, with completion dates in weeks after signing of the contract, comprise:

1. Initial list of data requirements to be sent to DJB (Week 2)
2. Summary of wastewater activities in Coronation Pillars (week 4)
3. Energy audit report of the selected wastewater treatment plant and its pumping stations and operations (week 9)
4. Draft Options Report (week 11)
5. [OPTIONAL] Workshop presenting findings of initial analysis of wastewater activities and options (Week 12)
6. Draft Scope of consultant services for execution & monitoring of projects (Week 13)
7. Final options report with detailed project report, designs, , contract agreement, qualifications, etc (Week 16)
8. Arrange a study tour of DJB officials to Denmark to visit and observe firsthand the technologies already in use (once the project enters the execution mode).

All reports must be sent by e-mail, with files in Microsoft Word and Excel in draft version and should be finalized, no later than 30 days, in hard copy in English, after receiving comments from PMU and Embassy Team.

8. Milestones and Payment Schedule

The proposed activity will be carried out for a period of four months.

9. Facilities to be provided by Delhi Jal Board

In the performance of the services in Delhi, the DJB will provide all necessary reports, assistance for visits of the consultant to plants / facilities and total reimbursement of \$ ____ for expenses on office space (if required) and local transportation of the consultant.

Appendix 2: Signed agreement between DWF and Tata/Jusco

MEMORANDUM OF UNDERSTANDING

BETWEEN

DANISH WATER FORUM

AND

JAMSHEDPUR UTILITIES AND SERVICES COMPANY LIMITED

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING (“MoU”) is entered into as on this 8th day of May, 2012 (“Effective Date”) at New Delhi by and:

BETWEEN

1. Danish Water Forum, a Danish organization, representing a wide range of Danish organizations, ministries, manufacturers and consulting companies, and an organization facilitating partnerships, joint export promotions and water research groups, and having a registered office at Agern Alle 5, 2970 Horsholm, Denmark,

AND

2. Jamshedpur Utilities and Services Company Limited, (Company No.125634) a company duly incorporated in India under the Companies Act, 1956 and having its registered office at Sakchi Boulevard Road, Northern Town, Bishtupur, Jamshedpur – 831 001, Jharkhand, India.

(Danish Water Forum and JUSCO shall hereinafter be referred to individually as “Party” and jointly as the “Parties”).

WHEREAS

- A. Danish Water Forum is working for its members to facilitate and promote cooperation within the water sector with institutions and companies in foreign countries, sharing knowledge and exchanging sustainable solutions for the benefit of the society.
- B. JUSCO is promoted with the main objects of business *inter alia* operating and maintaining the entire utilities and services *viz* water supply, wastewater, power supply, construction of roads & buildings, maintenance of houses, roads and other allied services.
- C. The Parties recognize the global nature of environmental degradation and many other such environmental issues and the urgency of finding cost effective and lasting solutions within the water sector which are coherent with the need for economic growth.
- D. Considering the strategic role of clean technology to address current global challenges and development needs in the water sector, the Parties wish to promote mutually beneficial cooperation for sustainable development in this sector;

Now, therefore in consideration of the mutual covenants, the Parties agree that this MOU is intended to provide a general framework for expressing their cooperative intent.

ARTICLE 1 – OBJECTIVE

The objective of this MOU is to promote a mutually beneficial partnership between the Parties in the field of environmental sustainability in the water sector.

ARTICLE 2 – PRIORITY AREAS FOR COOPERATION

2.1. The Parties have identified following high priority areas for cooperation under the framework of this MOU:

- a. River-to-River Water Management
- b. Water pollution control including wastewater treatment, sewage management, stormwater management etc;
- c. Water supply including ground water abstraction and treatment, water distribution management, non-revenue water and water safety planning;
- d. Clean technologies including:
 - i. Clean water technologies;
 - ii. Wastewater processes and sludge handling technologies ;
 - iii. Water quality and quantity monitoring technologies ; and
 - iv. Technologies to support substitution of harmful chemicals in processes and products.

2.2. With mutual consent, the Parties may add additional areas subsequently.

ARTICLE 3 – COOPERATION POSSIBILITIES

Cooperation between the Parties under this MOU may be conducted in the form of:

- a. Linking Danish Water Forum members to JUSCO for specific projects and general exchange of knowledge;
- b. Exchange of information and documentation;
- c. Exchange visits by experts, scholars and delegations;
- d. Collaborative projects and
- e. Other forms of cooperation as mutually agreed upon.

The Parties agree to enter into separate agreements on a case to case basis, should such need arise.

ARTICLE 4 – INTELLECTUAL PROPERTY

If any Intellectual Property Rights (IPR) are developed while implementation of this MOU, both Parties shall jointly own the same and shall adopt appropriate measures to protect such IPR. The conditions for the acquisition, maintenance and commercial exploitation of such IPR over possible products and/or processes will be defined in the specific programs, contracts or working plans, which shall also set out the conditions regarding the confidentiality of information whose publication and/or disclosure might jeopardize the acquisition, maintenance and commercial exploitation of IPR obtained under this MOU.

ARTICLE 5 – CONFIDENTIALITY OBLIGATIONS

The Parties shall hold this MOU and all information relating to this MOU in confidence, except for: (a) such disclosures as may be necessary in effecting the transactions contemplated in this MOU, (b) such disclosures of information as may be required by law or court order and (c) such disclosures of information which are publicly available or otherwise available from third parties. The foregoing shall not prohibit any Party from disclosing this MOU or such information to its attorneys, accountants or advisors.

ARTICLE 6 – JOINT WORKING GROUP

Each Party shall designate one contact person to ensure transfer of information, knowledge and contacts relating to this MOU. Each year the Parties shall draft a report on events of the year. A Joint Working Group (“Group”) will be constituted to coordinate the work being undertaken under this MOU.

This Group shall meet alternatively in India and Denmark to review and analyze the progress of activities and shall keep both Parties duly informed of such progress and achievements and also submit an annual report on the developments.

ARTICLE 7- COSTS & EXPENSES

Unless expressly agreed otherwise between the Parties in writing, each Party shall bear its own costs and expenses in connection with the transactions contemplated by this MOU.

ARTICLE 8 - OBLIGATIONS

The Parties reserve the right to re-visit or modify issues, objectives or principals in good faith in the event a prejudice would result if there are other laws, regulatory or economic issues which may be applicable to this MOU.

ARTICLE 9 – AMENDMENTS TO THE MOU

This MOU may be amended at any time by the mutual written consent of the Parties,

ARTICLE 10 – GOVERNING LAW & DISPUTE RESOLUTION

This MOU shall be governed, construed and interpreted in accordance with the laws of India. Any dispute relating to the interpretation or implementation of this MOU shall be resolved through consultations between the Parties.

ARTICLE 11 – RESPONSIBILITIES

Danish Water Forum, acting on behalf of its members, shall not be held responsible financially or otherwise for any subsequent independent transactions between its members and JUSCO. In case such disputes arise, they shall be resolved between the involved members and JUSCO, without involving Danish Water Forum. It is clearly understood by both Parties that this MOU is purely an understanding and has no legal binding or any financial commitment/obligation on either Party.

ARTICLE 12 – TERM & TERMINATION

This MOU shall come into force from the Effective Date and shall be valid for two (2) years and may be renewed for a further period of two (2) years on mutual consent.

Either Party may terminate this MOU by giving one (1) month written notice to the other Party.

Termination will not affect activities already under implementation under this MOU.

Executed in New Delhi in two originals, on 8th day of May, 2012.

IN WITNESS WHEREOF, the undersigned have executed this Agreement as of the date first above written

For Danish Water Forum

By



H.E. Mr. Freddy Svane

Ambassador of Denmark to India

On behalf of Danish Water Forum

8th Day of May, 2012

New Delhi

For JUSCO

By



Mr. Manish Sharma

Managing Director

JUSCO

8th Day of May, 2012

New Delhi

Witness

Name



Title

Committee Member

Date

8/5/2012

Witness

Name



Title

BHARAT WAKHU

Date

RESIDENT DIRECTOR

MAY 08, 2012

Appendix 3: Signed agreement between DWF and Gujarat Water Authorities



MEMORANDUM OF UNDERSTANDING (Strategic Partnership)

This Memorandum of Understanding is entered on 11th January 2013 at Gandhinagar, in Gujarat during Vibrant Gujarat Summit 2013

between

The Danish Water Forum, Denmark having its office at Agern Alle 5, Horsholm, Denmark (hereinafter referred to as "The Danish Water Forum") on the one Part

and

The Government of Gujarat represented by the Gujarat Water Infrastructure Limited (GWIL) / Gujarat Water Supply and Sewerage Board (GWSSB) having its head Office at Gandhinagar Gujarat -382010 (hereinafter referred to as "GWIL / GWSSB" which expression shall unless the context otherwise include its successor in Office and assignees) on the other part.

The Danish Water Forum wishes to forge Strategic Partnership in the area of Knowledge Sharing for the State of Gujarat.



Government of Gujarat

Government of Gujarat would facilitate the Danish Water Forum to obtain necessary permissions / registrations / approvals /clearances etc. from the concerned departments of the State, as per the existing policies / rules and regulations of the State Government.

For and on behalf of
Government of Gujarat

(AUTHORISED SIGNATORY)

For and on behalf of
Danish Water Forum

(AUTHORISED SIGNATORY)

Name: N M Patel
Designation: Project Director (Urban Cell) &
Chief Engineer
Contact no.: +91-99784 06504
E mail: ucgwssb@gmail.com
Contact address: Gujarat Water Supply &
Sewerage Board, Jalbhavan
Sector-10A, Opp. Air Force
Gandhinagar-382 010
Gujarat-INDIA

Name: Jesper Goodley Dannise
Designation: Director
Contact no: :+45 4021-7646
Email: jda@dhigroup.com
Contact address: Agern Alle 5,
Horsholm,
Denmark

Department: Water Supply Department

Partnership for Eco-efficient Technology to the Wastewater sector in India

The report describes the activities carried out within the framework of "Partnership for environmental technologies for the wastewater sector in India". It picks up on the experiences gained from the export partnership and cooperation with Indian stakeholders and comes with a number of recommendations for further cooperation in India and the partnership approach, with a focus on environmental improvements and exports within the water sector.



Danish Ministry of the Environment
Environmental Protection Agency

Strandgade 29
1401 Copenhagen K, Denmark
Tel.: (+45) 72 54 40 00

www.mst.dk