



Sludge to Energy in Udaipur



Introduction

Aarhus and Udaipur have been working together under the Danish Ministry of Foreign Affairs' Strategic Sector Cooperation since 2018 on the broader themes of urban water management. Aarhus and Udaipur entered into a MoU in December 2016. Udaipur and Aarhus joined European Union's International urban cooperation program on June 4th, 2019 and December 18th, 2019 respectively. Since then, IUC is working with both the cities to further strengthen this already formed partnership and work on sludge to energy technologies.

Executive Summary

Udaipur is known as the City of Lakes and is a popular tourism site due to its historical palaces, and scenic nature. It is also known for its handicrafts and rich mineral sector. The city lies 415 km from state capital Jaipur and 250 km from regional hub Ahmedabad. Udaipur Municipal Corporation has an area of 64 sq. km. after the city's expansion, and is divided into 70 wards. In 2019, the city had a population of 642,518.

Aarhus is the second-largest city in Denmark, with 350,000 inhabitants and 1.2 million people living within 1 hour's drive. Aarhus is the central city in the Central Denmark Region and the largest center for trade, services and industry in western part of Denmark. The city is spread across 468 km².



As part of the IUC programme, Udaipur will further strengthen its ties with City of Aarhus and develop a Baseline Study for Sludge to Energy from the Sewage Treatment Plants of Udaipur. The Baseline Study will set the basis for a more detailed feasibility report that is essential as part of a potential tender. Key contributors to this process have been the representatives from Aarhus Vand A/S which provides water and waste-water services to private, commercial, and governmental customers in the area of Aarhus, Denmark. Significant progress has already been made in this regard, as a result of number of visits since 2018 by Aarhus experts to Udaipur as well as based on exchange of key information, major challenges and available solutions.

The present mayor of Udaipur, Mr. Govind Singh Tak said, *“We are delighted to work with Aarhus on this international cooperation program. We believe that this cooperation will bring successful results beneficial to both the cities. Water is a crucial sector for Udaipur city and with support from Aarhus, we are committed to delivering the best services to the citizens of Udaipur city”*.

On the occasion of signing the partnership agreement with IUC-India, Mr. Jacob Bundsgaard, Mayor of Aarhus said: *“Aarhus places a high priority on promoting the UN’s sustainable development goals – both locally and globally, wherever possible. One example of this is the fruitful collaboration that has developed between Aarhus and Udaipur in the area of water management, drinking water supply and wastewater. With this signature, this collaboration will be expanded to include EU IUC, which means that there will be even more expertise and resources to draw on. This new collaboration will strengthen our joint efforts to achieve the sustainable development goals. We look forward to that.”*.

Key Challenges and Potential Solutions

Udaipur city, on an average generates about 57 MLD of sewage. The city currently has two commissioned STPs for treatment of wastewater. The first STP, with a capacity of 20 MLD, was commissioned in 2014 while the second STP, with a capacity of 25 MLD, was commissioned in 2019. Both the STPs use moving bed bio reactor (MBBR) technology, followed with claritube flocculator and filters, to produce high-quality treated water suitable for reuse. These STPs meet their input sewage requirement partially from the city sewage network, while the remaining sewage is intercepted from the city’s 139 open drains. 50% of the wastewater treated by the operational STPs is being utilized by the HZL industrial complex and the other 50% is discharged into the rivers of Udaipur. Two more STPs with a combined capacity of 15 MLD are slated to be commissioned in the coming few months. At present, the waste water generation and its treatment faces the following challenges:

- Unavailability of appropriate technology
- Unavailability of efficient local resources
- Lack of local know how and technical competencies
- Lack of general awareness about use of technology
- Other associated risk factors

Considering all these challenges, Udaipur has been paired with Aarhus to as part of the International Urban Cooperation programme and certain activities have been conceptualised including exchange visits between the two cities and preparation of a local action plan. Technical inputs have been prepared as result of visits from Danish experts from City of Aarhus and Aarhus Vand have already taken place to Udaipur since 2018 on technical matters of cooperation on water and other issues as



part of the Strategic Sector Cooperation. The nodal person from Udaipur has also participated in key conferences and seminars on sustainable urban development supported by IUC in India (e.g., Smart Republic Conference – 2019 organized by AIIILSG, Urban Forum and Urban Thinkers Campus).

In March 2020, IUC-India launched a Baseline Study on Sludge to Energy. This study covers background information, baseline analysis (e.g., policies, organisational set up, technologies, financial aspects), trends, international and national best practices, and makes recommendations for the way forward. The key learnings from this baseline report will feed into a more extensive feasibility report focusing on sludge to energy for Udaipur city.

All these activities are brought together in a Local Action Plan (LAP) where both the cities have provided their respective inputs with regards to the current challenges, opportunities, lessons learned, available solutions and way forward.

Results and Impact

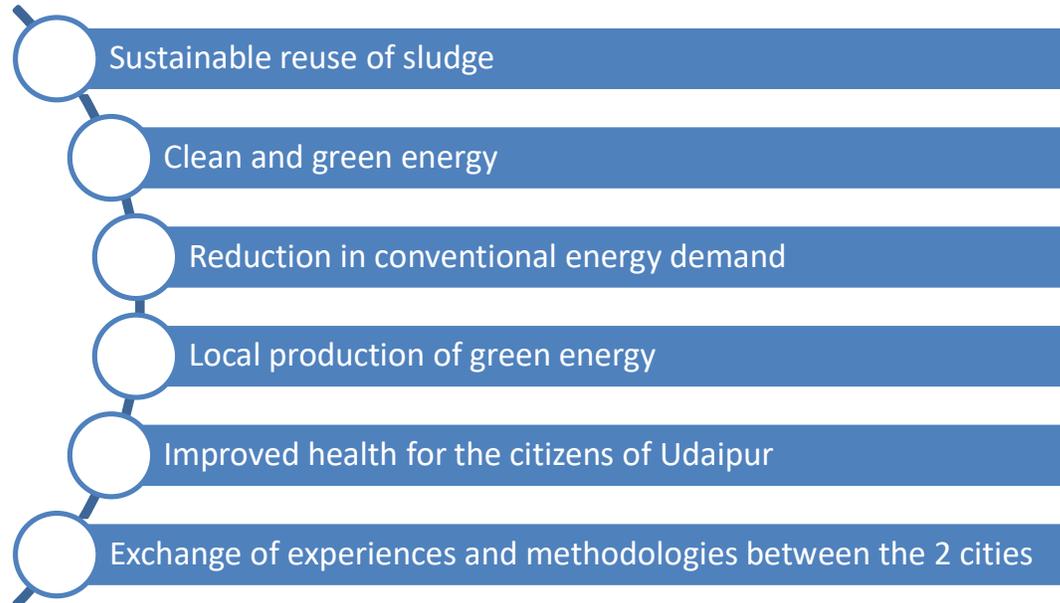
The city of Aarhus has been generating energy from its STPs for more than three decades and a lot can be learnt from their experience of converting sludge to energy. First and foremost, the best way to make the entire process of sludge to energy conversion efficient is by integrating the STP with the energy plant or upgrading the existing plant by installing sludge to energy technologies. This will enable the energy plant to have a constant supply of fresh and high-quality sludge for production of energy. Second, if it is not possible to integrate the STP with the energy plant, the energy plant should be set up as close to the source of sludge as possible. This not only helps solve the problems related to transportation of sludge, it makes sure that the plant always receives a fresh supply of sludge. Third, a large amount of land is required to set up of machinery for a sludge to energy plant and for possible future expansion. Fourth, the process of sludge to energy conversion is technically advanced and requires manpower with adequate technical know-how to operate the plants. Lastly, anaerobic digestion of sewage sludge forms methane-rich biogas, which can be utilized as fuel to offset heat and electricity consumption of the wastewater treatment plant or can be further used for distribution. Methane production in digesters is directly related to the organic matter content of the waste. Hence, wastewater rich in organic matter (carbon content), has ultimately more potential of generating energy.

The potential sludge to energy conversion will bring a revolutionary change in the waste water handling practices of Udaipur Municipal Corporation. Besides addressing the efficient treatment and disposal of waste water in the city, this action will also pave the ways for exploring innovative means of generating energy efficiently and reducing greenhouse gas emissions. This initiative also contributes

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to a better quality of life. The following results are expected from the cooperation between Udaipur and Aarhus:



The action supports the Nationally Determined Contributions (NDC) of India and is directly related to the following United Nations Sustainable Development Goals (SDGs):



Aarhus city will benefit from learning about the Indian conditions and processes, expanding its expertise, and becoming a model city for EU projects. In addition, the action will contribute to the following EU urban agenda themes:

- Climate adaptation
- Circular economy
- Energy transition
- Sustainable use of land and nature-based solutions



- Improved health for the citizens
- Better water quality in rivers and lakes

In conclusion, the IUC programme has provided a beneficial platform to both the cities to initiate scoping activities with regards to selecting a topic of cooperation, identifying suitable experts and preparing a beneficial Local Action Plan, which will form the basis of a continuing partnership. Going forward, both cities are expected to work on the implementation of the pilot project on “Sludge to Energy” in Udaipur. Overall, the cities of Udaipur and Aarhus have demonstrated a high level of commitment and have expressed their willingness to continue their collaboration beyond the termination of the IUC project.

Lessons Learnt:

- **Proactive planning to compensate for procedural delays** – Generally, it takes significant amount of time and efforts to obtain approvals on key deliverables and relevant activities. In the absence of a proactive approach in planning these activities, substantial amount of time is lost in procedural delays therefore, one should plan in advance to curtail the effect of those delays.
- **Collection of accurate information is key to planning and appropriate solutions** – Collection of technical data regarding the baseline scenario is crucial to assess the ground situation, make projections and propose an appropriate solution therefore one should be very careful about information collection from the authentic sources, its verification and then analyzing it.
- **Maintaining rapport with the relevant stakeholders for the provision of crucial information and planning important activities** – This is important to identify a nodal person within the local authority for the provision of relevant data and key information for the preparation of baseline reports, forecasting and proposing recommendations. Therefore, maintaining relations with key resources within the local authority should be an ongoing activity.
- **Identification of specific challenges is the key to building strong partnerships and recommending appropriate solutions** – In the beginning of the cooperation itself, the key challenges should be identified in cooperation with the relevant stakeholders. This can avoid a lot of miscommunication and helps in planning efficiently for the relevant policies and solutions.

Contact person

Mr. Mukesh Pujari
Superintending Engineer
Udaipur Municipal Corporation
Udaipur (Rajasthan)

About IUC

The International Urban Cooperation (IUC) programme enables cities in different global regions to link up and share solutions to common problems. It is part of a long-term strategy by the European Union to foster sustainable urban development in cooperation with the public and private sectors, as well as representatives of research and innovation, community groups and citizens. Through engaging in the IUC, cities will have the chance to share and exchange knowledge with their international counterparts,



building a greener, more prosperous future. The IUC programme is an opportunity for local governments to learn from each other, set ambitious targets, forge lasting partnerships, test new solutions, and boost their city's international profile. Its activities will support the achievement of policy objectives as well as major international agreements on urban development and climate change, such as the EU Urban Agenda, the UN Sustainable Development Goals, and the Paris Agreement.



Picture Source:

<https://twitter.com/MVenkaiahNaidu/status/8045992>



Picture Source: Aarhus City



Picture Source: IUC-India



Picture Source: IUC-India



Picture Source: IUC-India



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