Deliverable 4.1.2

Detailed Implementation Plan for Efficiency Improvement Measures in Selected STPs Along Ganga Towns in Uttarakhand

December 2019

GOPA Infra

in consortium with

FICHTNER
WATER & TRANSPORTATION

Consulting Services on Rehabilitation Measures on behalf of the National Mission on Clean Ganga

"Support to Ganga Rejuvenation"
Phase II
Uttarakhand and Uttar Pradesh

India

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1 Background

As an output of one of the activities in SGR first phase, recommendations were proposed by GIZ – SGR team following the assessment by National and International Experts for improvement of technical, organisation and economic performance of 10 Sewage Treatment Plants (STPs) along Ganga towns in Uttarakhand.

The recommendations were also presented to relevant stakeholders in a meeting held at State Programme Management Group, Dehradun on 01 Aug 2018 under the Chairmanship of then Programme Director, Mr. Raghav Langer. Meeting was attended by officials from Uttarakhand Jal Sansthan (UJS), Uttarakhand Peyjal Nigam (UKPJN), State Program Management Group (SPMG) UK and GIZ – SGR team.

Recommendations were presented and discussed with relevant stakeholders and they agreed to implement them for improving the efficiency of concerned STPs. MoM of that meeting are attached as Annex 1.

In continuation of the recommendations proposed during SGR first phase, a detailed plan for implementation of the efficiency improvement measures in the 10 STPs was developed in current phase of SGR project (Del. 4.1.2). The implementation plan, developed by the SGR team in close collaboration with UKPJN, is presented in chapter 2. In order to check the status of implementation of the recommended measures and advise Jal Nigam, Jal Sansthan and the operators, a number of field visits have been carried out by the SGR team to different STPs during the course of the year 2019. Visits report is attached as Annex 2.

The improvement plan will be the basis for identification of success stories on the improved performance of STPs after implementation of measures. The SGR team will carry out visits to the STPs to monitor and record the success stories in course of the year 2020.

Also, in order to support and strengthen the responsible institutions viz. UJS and UKPJN in the implementation of recommendations, a detailed capacity gap analysis and training plan is being developed together with UKPJN. In this respect, a meeting with General Manager (Training), UKPJN, Ms. Charu Agarwal was also held on 01 August 2019 at UKPJN Training Centre, Roorkee. The objective of the meeting was assessing the skill and capacity gap of UKPJN in particular to implement the improvement measures for STPs along the Ganga Towns. Training needs assessed in coordination with GM, Training, UKPJN are attached as annex 3.

This report presents the **Detailed Implementation Plan** for efficiency improvement measures in selected STPs identified in SGR first phase and the supporting documents:

1. MoM, presentation of improvement measures for STPs to UKPJN and other stakeholders (Annex 1).
2. Reports of visits to selected STPs in UK (Annex 2).
3. Training needs assessment of UKPJN for implementation of improvement measures (Annex 3).

2 Detailed Implementation Plan

STP & Sewerage Management Systems in Ganga Towns of Uttarakhand, Review & Recommendations					
S. No.	Initiative	Benefits	STPs	Implementation Status	Implementation Plan
Process Improvement					
1	Provide Stamford baffle in the primary and secondary clarifier Approx. cost Rs 4-5 lakhs/ clarifier	Reduction in TSS by 25% Can considerably improve the treatment efficiency and effluent quality	18 MLD Jagjeetpur 27 MLD Jagjeetpur	Being considered for rehabilitation and capacity upgradation using IFAS as recommended during exposure visit	DPR under preparation (Jan end 2020) for submission to NMCG for Approval (March 2020). Plan to execute by March-April 2021
2	Optimize blower line sizing to reduce/ eliminate resonance and the damages caused to the civil structures and noise pollution Joints and foundations to be strengthened Approx. cost Rs 15-25 lakhs	Increased Stability & life of structures Noise pollution reduced Energy savings	18 MLD Sarai 27 MLD Jagjeetpur	Replacement not being considered now	
3	Improve Centrifuge operations with optimized polyelectrolyte dosing and Sludge thickeners – leading to improved sludge consistency Approx. Rs. Nil	Reduction in sludge volume Lower transportation cost	27 MLD Jagjeetpur 18 MLD Sarai 3 MLD Swargashram 3.5 MLD Tapovan [2 MLD Gyansu]	Implemented	
4	Isolate 11 of the 12 beds in the Soil Bio reactor and utilize one bed (only) for improved efficiency of treatment. Currently < 3% (40-50 kL) of the capacity of the STP's design capacity Approx. cost < Rs 10,000/-	Increased treatment efficiency Energy savings	1.4 MLD Devprayag	Not Done. Not willing to risk design configuration	
5	Homogenization and controlled intake of sewage to ensure uniform / steady flow to the STP from the receiving tank using pumps of	Ensure steady rate of feeding of sewage. Better process control Cycles of starvation & Shock	1.4 MLD Devprayag 3.5 MLD Srinagar	Implemented at Srinagar STP. Equalization tank constructed as part of upgradation works. Not Implemented at Devprayag	

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	lower feed rate Approx. cost < Rs 10,000 @ Devprayag Rs 2 lakhs @ Srinagar	loads eliminated		for now as the inflow is very low (2 -3 %)	
6	Better control of the aeration process with sludge recycling (sludge recycling line to the MBBR reactor # 1 inlet) so that the sufficient biomass is retained till process gets stabilized Approx. Rs. 10,000/-	Improved Treatment efficiency	3.5 MLD Srinagar	MBBR media has been changed with PVA gel during upgradation and the contractor has submitted proposal for sludge recycle line to UKPJN for approval	To be implemented by March 2020
7	Flowmeter re-installed as per technical specifications provided by the manufacturer / supplier; so that the turbulence do not impact the accuracy of the readingApprox. Rs. Nil	Reliable inflow data	2 MLD Gyansu	New flowmeter installed at both inlet and outlet of the STP as part of the RTEQMS installation	
8	Repairing/ Replacement of Air flowmeters (2 nos) for effective monitoring and process control Approx. Rs. 10-15000/-	Better process control Energy savings	2 MLD Gyansu 3.5 MLD Srinagar	Not in current plans	
Energy Savings/ Resource Recovery					
9	Repairing/ Replacement of DO sensors in SBR basins & Operation of SBR basins in DO mode (operation based on DO measurement) Approx. Rs 1.5 – 2.0 lakhs/ optical DO sensor	Expected savings: 10-12% in power cost because of optimized blower operations	27 MLD Jagjeetpur 18 MLD Sarai 3 MLD Swargashram 3.5 MLD Tapovan	Implemented at 27 MLD Jagjeetpur and at 18 MLD Sarai	
10	Controlled sewage inflow into the wet well with provision to divert excess over peak design flow either at SPS or by installing diversion line with automated valves Approx. cost Rs 7 lakhs/ clarifier	Considerable Energy savings Increased pump life savings [to be quantified post energy audit] Very low payback period	27 MLD Jagjeetpur	Improvements taken up at Pumping Station to divert excess sewage flow to the newly built 68 MLD whereby averting the undesirable conditions	

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S. No.	Initiative	Benefits	STPs	Implementation Status	Implementation Plan
11	Change over to energy efficient hybrid blowers ROI < 2 years Fit case for consideration for EESL funding	>30% efficient compared to Roots Blower Enhanced life of equipment Less Space required, Low Noise pollution	27 MLD Jagjeetpur 3 MLD Swargashram [18 MLD Sarai]	Likely to be considered for the upgradation of Swargashram STP, as part of the capacity augmentation DPR under preparation	Will henceforth be considered to be incorporated in the proposal stage itself. Adoption of energy efficient equipment has been a factor which was so far left to the contractor's choice
12	Replacement with fine bubble plate type diffusers in Aeration tanks Approx. Rs 8,000-12,000/ per pc of 1 m Fit case for consideration for EESL funding	Expected savings: 25-30% in power cost because of optimized blower operations	27 MLD Jagjeetpur 18 MLD Sarai 3 MLD Swargashram 3.5 MLD Tapovan 3.5 MLD Srinagar 2 MLD Gyansu	Likely to be considered for the upgradation of Swargashram STP and 18 MLD ASP based STP at Jagjeetpur, as part of the capacity augmentation and upgrade. DPR currently under preparation	DPR under preparation (Jan end 2020) for submission to NMCG for Approval (March 2020). Plan to execute by March-April 2021
13	Installation of mixers in SBR basins Approx. cost Rs 17 – 20 lakhs/ unit	Expected savings: 10-15% in power cost Better for large STPs	27 MLD Jagjeetpur 18 MLD Sarai	Mixers have been implemented instead of aeration systems in the 3.5 MLD Srinagar STP's newly built equalization tank	
14	Installation of highly energy efficient Screw press based sludge dewatering unit, which is also easier to useApprox. Rs 18 lakhs (6 cu.m/hr)	Sludge consistency: 20-22%Energy savings: > 90%Low vibration, less space requirementsEasier to maintain	3 MLD Swargashram2 MLD Gyansu	Already Implemented. Has become a standard practice and is implemented in the new plants at Srinagar, Badrinath and Joshimath. Proposal also mooted for 3.5 MLD STP at Srinagar	
Sludge Management/ Cost Recovery					
15	Sludge utilization for biogas production (PPP model – as in Jaipur case) Revenue of approx. Rs 1.51 crores receivable over 7 years	Additional Revenue source for UJS. Plant (Sludge thickeners, bio digesters and gas holders to be maintained by the concessionaire. UJS to provide	18 MLD Jagjeetpur	PPP agreement signed and the concessionaire has been engaged. Both bio-digesters, biogas holders have been revamped. Concessionaire has	Compressors and rest of machinery to be installed by Jan-Feb 2020. Need SPMG/ NMCG intervention to get the land for filling station on concessional

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		sludge, power, land for establishing biogas purification plant by bidder)		brought in most of the machinery. Identified land for putting up the Bio-CNG filling station. ULD to transfer land to UJS on lease	lease. Target date of commissioning: March 2020
16	Replacement of Sludge digesters' cracked dome & Repair of Sludge drying beds as per CPHEEO Norms	Prevents gas leakage and increased life of civil structure	27 MLD Jagjeetpur]	Double membrane dome installed in the digester by UKPJN. Single membrane has been installed over the dome of the other digester over its cracked dome to seal gas leaks by the concessionaire as part of the revamping taken up by them	
17	Centralized Solar Sludge drying system for conversion of sewage sludge to fuel; from the 18 MLD + 14 MLD STPs @ Sarai, Haridwar. Land required: 2000 sq.m [100m x 10 m] x 2 lines Cost: Rs 3.5 crore [initially one line of 10 TPD of sludge @ 20-22% DS - ~ Rs 2 crore]	Reduced sludge quantity: ~70 kg/MLD Calorific value: ~2800 kcals/kg Solar Sludge drying unit for effective drying of sludge to > 90% consistency	18 MLD Sarai + [14 MLD Sarai]	DPR under preparation by UKPJN	DPR under preparation (Jan end 2020) for submission to NMCG for Approval (March 2020). Plan to execute by March-April 2021
18	Centralized Solar Sludge drying system for conversion of sewage sludge to fuel; from the other STPs in Rishikesh Land required: 1000 sq.m [100m x 10 m] x 1 line Cost: Rs 2 crore [10 TPD of sludge @ 20-22% DS]	Reduced sludge quantity: ~70 kg/MLD Calorific value: ~2800 kcals/kg Solar Sludge drying unit for effective drying of sludge to > 90% consistency	26 MLD Lakkarghat + 3 MLD Swargashram 3.5 MLD Tapovan	DPR under preparation by UKPJN	DPR under preparation (Jan end 2020) for submission to NMCG for Approval (March 2020). Plan to execute by March-April 2021
19	Repairing of filter press and proper mixing of sludge with polyelectrolyte before feeding into the Filter press	Better sludge consistency	3.5 MLD Srinagar	Contractor has submitted proposal to UKPJN for replacing of Filter Press with Screw Press based Sludge dewatering unit	Likely to be implemented by March 2020

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20	Neutralize the septic sludge and stabilize it with 4-7% lime to avoid odour problems as well as soil contamination issues as an emergency measure	Reduction in obnoxious smell Reduced public complaints	2 MLD Gyansu	Sludge dewatering machine installed and the dewatered sludge is being used as manure within STP premises as well as being supplied to Forest Department and Horticulture departments in Uttarkashi	
21	Planning for proper sludge management treatment and disposal practices need to be put in place	Prevention of contamination of soil and ambience around STP Avoid Public complaints	1 MLD Gangotri 3.5 MLD Srinagar	Has found takers of sludge - Forest and Horticulture department in Uttarkashi and Ashrams in Gangotri	
Disinfection Systems					
22	Disinfection system has to be replaced to ensure proper contact time between the chemicals (hypochlorite) dosed and the treated sewage Chlorine dioxide may also be used as an alternate disinfectant Approx. cost < Rs 1.5 lakhs	Better disinfection Better treatment quality (COD reduction) ClO2 is a safer chemical compared to Chlorine gas / Sodium hypochlorite	3.5 MLD Srinagar 2 MLD Gyansu	Not yet implemented. To be taken up at Srinagar. Contractor asked to prepare estimates and get approval	Likely to be implemented by March 2020
23	Proper disinfection systems need to be put in place. Chlorinator provisioned in contract, but not installed	Disinfected Sewage Better treatment quality	1 MLD Gangotri	Poor chemical spray units installed – plan to replace with efficient disinfection system	Likely to be implemented by March 2020
24	Establishment of Standard Operating Practices for Chlorine Contact Tank Operations		All STPs	To be taken up immediately, especially in the light of the disaster averted at 27 MLD Jagjeetpur STP. Safety Audits to be planned and necessary EHS measures to be adopted	To be incorporated by UJS as per its SOP and Action Plan. No clarity on dates for this
Septage Management					
25	Co-processing of septage in the STP for better utilization of existing infrastructure	Better utilization of the currently underutilized STPs	3.5 MLD Tapovan 3.5 MLD Srinagar	At Rishikesh: Household survey completed. Planned to build a	Proposal for 20 kLD separate FSSTP is being con-

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	An anaerobic reactor (approx. 200-300 kL) to be installed for pre-treatment of 10 kL Septage and subsequent treatment in the STP Receiving tank for Septage of 20 kl is also considered Approx. Cost : Rs 30 lakhs	Compliance with Septage Protocols		holding tank and have controlled release to the sewer lines leading to Tapovan STP. @ Srinagar 3.5 MLD STP: Septage is being dumped into the sewer lines causing very heavy organic loading at the inlet of STP (BOD 550 mg/L) in spite of having an equalization tank causing the STP to fail. Technique for Co-processing of Septage at Srinagar needs to be relooked	sidered, in view of the issues caused to STP functioning caused by unscientific dumping of septage into the sewer lines. To be implemented by Aug 2020 in Srinagar.
Centralised Monitoring Systems					
26	Installation of RTEQMS and upgradation of the SCADA system for remote monitoring of plant performance Data connectivity to be established for linking with SPMG's Central Server Software - Ganga Tarang	Centralized Monitoring of sewage treatment operations and their effectiveness. Better governance Better process control Create public connect (once matured enough for display in public domain)	27 MLD Jagjeetpur 18 MLD Sarai 3 MLD Swargashram 3.5 MLD Tapovan	Implemented at the seven plants upgraded and the new plants above 1 MLD. Currently six STPs are connected to Ganga Tarang	Proposal for connecting 29 STPs along Ganga via RTEQMS submitted to SPMG fot funding support. On Approval, implementation expected by Aug-Sept 2020
27	Repair and activation of the SCADA infrastructure and software at the STP. Data transfer for online monitoring to be initiated Approx cost: Rs 10,000/-		1.4 MLD Devprayag	Implemented. (Repaired). Online connectivity needs hardware upgradation and with very low flow of about 40-50 kLD, the plant gets low priority	
28	Automation & Instrumentation of the electro mechanical components for remote monitoring and better process control of plant operations Approx. cost: Rs 40-50 lakhs		18 MLD Jagjeetpur	Likely to be considered for the upgradation of Swargashram STP and 18 MLD ASP based STP at Jagjeetpur, as part of the capacity augmentation and upgrade. DPR currently under preparation	DPR under preparation (Jan end 2020) for submission to NMCG for Approval (March 2020). Plan to execute by March-April 2021

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S. No.	Initiative	Benefits	STPs	Implementation Status	Implementation Plan
29	The MIMIC Board needs to be upgraded with the new components being introduced at the site. Upgradation of the SCADA/ Instrumentation system for remote monitoring of plant performance Data connectivity to be established for linking with SPMG's Central Server Software - Ganga Tarang Approx. cost: Rs. 3-4 lakhs per plant		3.5 MLD Srinagar 2 MLD Gyansu 1 MLD Gangotri	SCADA not considered for now, to be taken up subsequently because of budget constraints	
30	Installation of RTEQMS Approx. cost: Rs 30 lakhs		1 MLD Gangotri	Proposal for connecting 29 STPs along Ganga via RTEQMS submitted to SPMG for funding support	On Approval, implementation expected by Aug-Sept 2020
Skill Development					
31	Exposure visit for select officials of UKPJN, UJS and SPMG to highlight better practices, technologies, interactions with peer group in other states	Better awareness Increased confidence levels		Implemented. Has led to increased confidence and interest in attempting new and advanced technologies in the state	
32	Training of Trainers training to key officials of UJS & UKPJN under Skill Council of Green Jobs, M/o Skill Development & Entrepreneurship, Govt. of India PM Kaushal Vikas Yojana (UK Skill Development Mission)	In-house capacity building to train juniors and the personnel hired for plant operationsRecorded in GoI Register of Trainers		One UKPJN officer has been trained as ToT and is registered in the National Roster. Planned to initiate regular training program for UKPJN and UJS officials as well as contractor personnel (STP operators). UKPJN's training centre to be revitalized and to be used as the resource center. Looks up to GIZ support and co-operation to strengthen the initiative	Initial set of training with GOPA support as Trainer as well as with senior officers of UKPJN was taken up at UKPJN's Training Centre, Roorkee on Jan 6-7, 2020.

STP & Sewerage Management Systems in Ganga Towns of Uttarakhand, Review & Recommendations					
S. No.	Initiative	Benefits	STPs	Implementation Status	Implementation Plan
33	Training of officials of UKPJN, UJS, SPMG on Technical & Managerial aspects	Capacity Building Skill Upgradation		Need Assessment and Proposed Training Programme under consideration by GIZ for funding and is currently in procurement stage	
34	Skilling of operators and design verification capabilities of UKPJN officials for STPs in cold climates	Particularly for STPs in very remote and high altitude locations		Yet to be taken up. Need specialized support from international experts	
Others					
35	Innovative & Proven German Solution for Modernization and Augmentation of Waste Lagoons; Innovative CWSBR® process and Bioworks Process Approx. cost: CWSBR: Rs. 40 crores for 26 MLD BIOWORKS: Rs. 35 crores for 26 MLD	CWSBR 70 % and more capacity extension 60 % and more costs saving in comparison to new construction Utility rate of existing structures over 90 % The BIOWORKS® process is both highly economic and efficient: Because we have the lead on the full design of the entire process solution, we can guarantee that effluent values are fully complying with any legal requirements	6 MLD Lakkarghat	Not Implemented. Tender is required to be technology agnostic. The German Technology providers don't want to directly participate as well did not have local partners currently who are convinced to take it up	
36	Procurement of PPEs and safety equipment and training of STP / Sewerage network operators, helpers	Prevention of loss of lives Better work conditions	All	One set procured by UJS - Haridwar Circle. Need to procure, mandatorily use PPEs, as well have regular mock drills. Same to be implemented for all plants and for units engaged in sewer line cleaning/ maintenance	Planned to be procured in the new STPs by UKPJN by March 2020.

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S. No.	Initiative	Benefits	STPs	Implementation Status	Implementation Plan
37	Operationalization of laboratory exclusively for the STP	Better process control	3.5 MLD Srinagar	Was Implemented. In disarray now following upgradation works. Procurement in progress	Plan to integrate lab activities of both 3.5 MLD & 1 MLD STPs at Srinagar from the newly built 1 MLD STP at Srinagar. (Jan 2020)
38	Advised to use the services of the Plant Research Centre at Chinyalisaur, Uttarkashi to study the effect of sewage sludge for horticulture, non-food crops; to prospect potential application of the sewage sludge (To support research)	Better utilization of sludge for horticulture Better acceptability among public	2 MLD Gyansu	Sludge dewatering machine installed and the dewatered sludge is being used as manure within STP premises as well as being supplied to Forest Department and Horticulture departments in Uttarkashi	
39	The treated water discharge (existing 150 mm diameter) pipeline needs to be replaced with 300 mm diameter pipeline Approx. Rs. 8-10 lakhs	Prevent backflow	2 MLD Gyansu	Implemented. New pipeline installed to ensure smooth outfall post tertiary treatment	
40	Retractable type Aeration system are advisable. The MOC and the operating practices for the aeration system need to be implemented considering the local conditions Approx. cost: Rs 10-12 lakhs	Better plant operations Increased life of the aeration unit given the intermittent operations at extreme climatic conditions	1 MLD Gangotri	Not Implemented. These components need to be incorporated at DPR stage, else it becomes contractors discretion	
41	Replacement with high efficient Spiral aerators Approx. Cost: Rs 15 lakhs/ unit	Better process control Energy savings potential Improved sewage treatment	18 MLD Jagjeetpur	Highly efficient Diffused aeration system being planned for 18 MLD ASP based STP at Jagjeetpur, as part of the capacity augmentation and upgrade. DPR currently under preparation	DPR under preparation (Jan end 2020) for submission to NMCG for Approval (March 2020). Plan to execute by March-April 2021

Annexes

All annexes are attached separately.

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