

**TERMS OF REFERENCE
FOR CONSULTANT TO BE HIRED UNDER EPD SCHEME
“Study to Recommend the Most Feasible Option for
Treatment of Hudiara Drain Wastewaters”
(2014-2016)**

BRIEF BACKGROUND OF THE PROJECT

Hudiara drain originates from Batala (District Gurdaspur - East Punjab, India) and after being joined by many tributaries in Amritsar and covering 40 Kms enters Pakistan near Laloo village. The drain which used to be a natural storm water nullah, now carries sewage water mingled with untreated industrial waste as it enters Pakistan taking the highly contaminated water to the river Ravi after travelling 55 Km.

This drain was originally a storm water drain. However, dumping of industrial and domestic wastewater has turned it into a perennial drain. Its annual average discharge at its confluence with the River Ravi is about 500 cusecs. There are approximately 600 industrial units of different natures situated along Hudiara Drain on both sides of the border which dump effluent into it. Hudiara Drain is the only Waste Water channel covering Southern Lahore. In addition wastewater of some parts of Lahore City and cantonment areas, wastewater of other small villages also enters the drain. The drain water is polluted and as such not suitable for agricultural irrigation, having high levels of heavy metal, biologically contaminated, and also does not support any aquatic life. Moreover, it is also likely to cause contamination of subsoil water.

OBJECTIVE OF THE CONSULTANCY

The purpose of this study is to arrive at a feasible proposal for treatment of Hudiara Drain waters with a full knowledge of the technical and institutional options available and estimation of the costs and benefits (both private and social) of the treatment. Innovative approach to wastewater treatment with energy recovery, minimum reliance on power, least possible O&M costs would be preferred.

Environment Protection Department, Government of the Punjab is seeking proposals from consulting firms/independent consultants and experts with technology products/offerings having collaboration with international firms to provide professional services as described in these Terms of Reference.

SCOPE OF WORK

The study will determine the data to be used for design, the

disposal of the treated effluents, the required quality, the treatment technology, layout and size of the treatment units, preliminary engineering design and cost of the project. This study will also prepare the Terms of Reference (TOR) to contract the detailed engineering design for the selected treatment plant(s).

The scope of work of this consultancy shall include, but not limited to the following tasks:

PROJECT STUDY PHASE (06 MONTHS STUDY PERIOD + 01 MONTH PEER REVIEW + 01 MONTH FOR IMPROVEMENT OF DOCUMENTS)

1. Build-up the database of the project with all relevant data:

- 1.1. Topography (maps 1:25,000 up to 1:5,000 if necessary).
- 1.2. GIS based data development and mapping.
- 1.3. Climate (temperatures, wind, rain, evaporation).
- 1.4. Water-shed characteristics.
- 1.5. Socio-economic level of the population.
- 1.6. Population and future projections.
- 1.7. Water sources and water consumption.
- 1.8. Determination of effluent quantities and qualities, i.e., discharge and characteristics of all point sources of pollution contributing directly or indirectly (i.e., through contributory drains to Hudiara drain) and future projections (diurnal variation, seasonal variations, etc.). Pollution loads will also be calculated separately for domestic and industrial liquid effluents.

(In addition to Hudiara, its contributory drains, receiving water body (River Ravi), the quality and quantity of liquid effluents (domestic and industrial) of all industrial units contributing directly or indirectly to Hudiara Drain will be carried out following standard sampling & analysis protocols/SOPs)

- 1.9. Existing sewage network and presence/functional/non-functional/effectiveness of treatment plants/facilities
- 1.10. List of all industrial units along with fresh assessment of their effluents quantity and quality besides survey of presence/ functioning/ effectiveness of treatment plants of individual industrial units contributing directly or indirectly to Hudiara drain and its tributaries.

- 1.11. Quality of subsoil/groundwater will also be monitored at different points along Hudiarra and contributory drains to assess water contamination.
- 1.12. Sampling points, sampling frequency and mode of sample analysis

(Analysis will be focused on applicable NEQS parameters for municipal & industrial liquid effluents and drinking water. In case of surface water and use of untreated/treated wastewater for agricultural irrigation/ horticulture purpose, the analysis will include, but not limited to parameters indicated in US EPA Standards & WHO Guidelines besides parameters followed by Punjab Irrigation and Agriculture Departments. Contaminant levels in the crops and vegetables irrigated with the drain's waters will be compared with criteria used by Agriculture Department and FAO)
- 1.13. Determination of pollution load entering Pakistan from Indian stretch of the drain.
- 1.14. Alternative sites to construct the treatment plant and land cost.
- 1.15. Availability of energy and energy cost.
- 1.16. Recompilation of lacking information which may be pointed out by client or identified by consulting firm, after peer review.

2. Alternative technologies for treatment:

- 2.1. Different modern wastewater treatment technologies, considered most suitable for treatment. They may include activated sludge, UASB anaerobic reactors, high-rate trickling filters, membrane reactors, activated sludge combined with fixed biomass, waste stabilization ponds, wastewater reservoirs, soil aquifer treatment, constructed wetlands, macrophyte ponds, low energy aerated lagoons, low-rate trickling filters, high rate stabilization ponds, RBC or any other suitable wastewater treatment technology.
- 2.2. Construction steps (immediate, medium-term, long-term).

3. Wastewater management alternatives:

- 3.1. Individual treatment options for industrial units and population clusters
 - 3.1.1. Capital Cost Estimate

- 3.1.2. Operation and Maintenance Requirements
- 3.1.3. EIA requirements
- 3.2. Clustered treatment options
 - 3.2.1. Capital Cost Estimate
 - 3.2.2. Operation and Maintenance Requirements
 - 3.2.3. IEE/EIA requirements
- 3.3. Centralized treatment and disposal
 - 3.3.1. Collection System
 - 3.3.2. Treatment Alternatives
 - 3.3.3. Disposal Alternatives
 - 3.3.4. Operation and Maintenance Costs
- 3.4. Storm water management alternatives
- 3.5. Recommended Centralized System Alternative s
- 3.6. Recommended Clustered System Alternatives

4. Comparison between alternatives:

- 4.1. Engineering advantages and disadvantages.
- 4.2. Environmental and public health impacts.
- 4.3. Construction and O&M costs.

5. Disposal of the treated effluents and sludge:

- 5.1. Alternatives for the disposal of the treated effluents (reuse in irrigation, lake, river, infiltration in the aquifer, etc.).
- 5.2. Quality of effluents required for each disposal alternative.
- 5.3. Enrichment of treated effluent for a purpose.
- 5.4. Alternatives for the disposal of the sludge.
- 5.5. Environmental and public health impacts of each alternative.

6. Recommend site for treatment plant, process design of the treatment plant, size of the units, layout and preliminary hydraulic profile.

- 6.1. Identification and finalization of site for the recommended treatment plant.
- 6.2. Construction costs of the selected alternative.
- 6.3. Operational and maintenance costs of the selected alternative.

- 6.4. Preliminary Engineering Designs
- 6.5. TOR to contract the detailed engineering design of the treatment plant(s).

7. If irrigation with treated wastewater is a feasible alternative, the study will also address:

- 7.1. Characteristics of agriculture in the region (soils, crops, land ownership, irrigation practices, farmers' organizations).
- 7.2. Quality required for the treated effluents to be used for irrigation.
- 7.3. Water demand for irrigation (existing demand or potential one).
- 7.4. Potential crops to be irrigated and the market.
- 7.5. Expected attitude of local population to wastewater irrigation practice.
- 7.6. Development of mechanism to be followed for utilization of treated drain's water for irrigation purpose.

8. Valuation of adverse impacts of drain's pollution:

- 8.1. Identification of areas using the drain's waters for irrigation purposes.
- 8.2. Estimation of contaminant levels in the crops and vegetables irrigated with the drain's waters.
- 8.3. Impact, if any, of the drain's contamination on the aquifer and its extent.
- 8.4. Estimation of disease burden due to the drain's pollution.
- 8.5. Economic analysis of the cost of losses/ damages caused by contamination of the drain.
- 8.6. Estimation of impact of untreated drain's water on River Ravi

9. Socio Economic Survey:

- 9.1. Socio-economic survey of the population discharging their wastewater (directly or indirectly) into the drain and being affected by drain's water.
- 9.2. Willingness-to-Pay survey of the drain users for estimating a possible source for meeting O&M costs of the proposed and adopted treatment system.

9.3. Proposals from industrial sectors and their acceptability.

10. Legal Aspects:

- 10.1. Discuss and suggest measures to address all legal aspects concerning treatment and management of the drain effluents.
- 10.2. Indicate need for (and implication involved in) IEE/EIA of all components of the proposed/selected option.
- 10.3. Discuss the issue of polluted waters entering Pakistan from other side of the international border.
- 10.4. Provide draft reference including empirical evidence for Government of Pakistan to take up with Indian Government the issue of treatment costs of pollution load in the drain entering Pakistan with a recommendation for treatment of its wastewaters by India in observance of Basel Convention on Transboundary Movement of Hazardous Wastes.

11. Awareness Activities:

- 11.1. Workshops/seminars with stockholders for sharing project objectives and feasibility reports and for incorporating their comments/ feedback in the documents/ reports, at suitable phases of the project.

12. Any other Assignment:

- 12.1. The consulting firm will also be responsible for any other assignment given by the client during currency of contract agreement.

TIME DURATION OF PROPOSED CONSULTANCY

The consulting firm will be required to complete the whole activity/ assignment and furnish the final documents/ reports within a period of 08 months from the award of contract in accordance with the timeline.

Core Team of Experts Required for Consultancy

No .	Position	Qualification	Experience (minimum)	Man-months
1	Project Manager/ Team Leader	PhD/MSc, (Env/Civil) Engineering	10 years for PhD 15 years for MSc in WW Treatment	08
2	International Consultant	PhD/MSc, (Env/Civil) Engineering	10 years for PhD 15 years for MSc in WW Treatment	03
3	Mechanical Engineer	BSc Mech. Engineering	06 years	02
4	Electrical Engineer	BSc Elec. Engineering	06 years	02
5	Environmentalist	MSc Env. Engineering/ MPhil Env Science)	06 years	06
6	Sociologist	MSc (Sociology)	06 years	03
7	Ecologist	MSc (Biology)	06 years	02
8	Economist/ Financial Analyst	Master in (Economics/ Finance)	08 years	02
9	Epidemiologist	MBBS with MS/Dip in Public Health	06 years	02
10	Legal Expert	LLB, LLM	10 years	02
11	Other Experts	As per requirement	As per requirement	04 (2*2)
12	AutoCad Operators	Post Metric one year certificate in AutoCAD applications	08 years	8 (2*4)
13	GIS Specialist	MSc GIS/Space Science	05 years	02

DELIVERABLES

Consulting firm will provide ten hard copies along with soft copy of following reports.

1. Inception Report. The consulting firm shall prepare and submit an inception report within 10 days of assigning the agreement which shall include and explain the methodology of work plan and time schedule, prepared in consultation with and duly vetted by international consultant.
2. Background Information Report including literature review of the research studies on the Hudiara Drain conducted by national, international firms and individuals.
3. Report on Alternative Technology for Treatment of Hudiara Drain Wastewater
4. Report on Wastewater Management Alternatives and Available Treatment Options
5. Report on Disposal of Treated Effluents and Sludge
6. Report on Process Design of Treatment Plant, Size of the Units, Layout and Preliminary Hydraulic Profile of Selected Treatment and Management Option
7. Report on Use of Treated Hudiara Drain Water for Irrigation/ Horticulture
8. Report on Valuation and Evaluation of Adverse Impacts of Drain's pollution
9. Report on Socio-Economic Survey
10. Report on Legal Aspects
11. Report on assessment and implications of trans-boundary pollution in Hudiara Drain in the light of international treaties/ conventions.
12. Preliminary Engineering Design
13. Terms of Reference (TOR) to contract the detailed engineering design for the selected treatment plant(s).
14. Draft Feasibility Study Report
15. Final Feasibility Study Report

ROLE OF CLIENT

No lodging, boarding, office accommodation, and logistics will be provided by the client to consulting firm/consultant. The client shall only assist the consultant in obtaining information/ data form other departments/ organizations.

PROFESSIONAL LIABILITY OF CONSULTANT

Professional liability as stated in the prevalent conduct and practice of consulting engineers prescribed by Pakistan Engineering Congress (PEC) and as given under Rule 54 of Punjab Procurement Rules 2014, shall be applicable to the consultant.

PAYMENT

All payments made to the consulting firm are subject to sales tax and income tax deductive as per prevalent rules.