WHITE PAPER

THE ₹650-CRORE BUDDHA DARYA REJUVENATION PROJECT

Infrastructure Audit, Scientific Assessment, Source Apportionment and Roadmap for Sustainable Restoration & Rehabilitation of Buddha Darya and River Satluj

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Prepared in Public Interest

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EXECUTIVE SUMMARY

The ₹650-crore Buddha Darya Rejuvenation Project needs to be assessed first as a major wastewater infrastructure project and thereafter against the much higher test of whether it has actually resulted in the ecological rejuvenation, restoration and rehabilitation of Buddha Darya.

That distinction is crucial.

Construction of Sewage Treatment Plants (STPs), Effluent Treatment Plants (ETPs), Intermediate Pumping Stations (IPSs), interceptor pipelines and related infrastructure may establish physical completion of a project. It does not by itself establish ecological rejuvenation of a water body.

The fundamental question is therefore not merely:

«Was the ₹650-crore project completed?»

The more important question is:

«Did the ₹650-crore Buddha Darya Rejuvenation Project deliver the environmental outcome for which such large public expenditure was justified — namely prevention of pollution and sustainable restoration of Buddha Darya and protection of downstream River Satluj?»

The available evidence indicates that a substantial part of the infrastructure envisaged under the project has indeed been constructed or rehabilitated. However, pollution-control challenges involving industrial effluent, dairy waste, solid cattle dung, illegal outlets, sewer interceptions, pumping reliability, CETP compliance and treatment-plant performance have continued even after the project was described as substantially or fully completed.

The Punjab Government subsequently constituted a High-Level Committee on 14 July 2025 to develop comprehensive short- and long-term solutions, monitor STPs/CETPs/CBG plants/IPS infrastructure, devise SOPs, introduce real-time independent monitoring and commission additional scientific assessments. The very establishment of such a mechanism demonstrates that the problem had moved beyond merely completing the 2020 infrastructure package.

The scientific investigations associated with IIT Roorkee/NIH Roorkee and IIT Ropar therefore assume exceptional importance.

The publicly available record supports three distinct technical interventions:

1. IIT Roorkee technical recommendations, including concerns relating to performance of rehabilitated UASB-based STPs;
2. a later NIH Roorkee assessment, publicly reported by the Punjab Government as concluding that the existing STPs were not under-capacity; and
3. the IIT Ropar "Source Apportionment and Comprehensive Investigation of Pollution in Buddha Dariya" study, formally commissioned by PPCB for ₹1,44,38,600 plus GST and intended to provide the scientific foundation for rejuvenation of Buddha Darya and downstream River Satluj.

The complete underlying reports, raw measurements, calculations and recommendations should therefore be placed in the public domain.

This White Paper proposes a Project Audit + Operational Audit + Pollution Load Audit + Ecological Outcome Audit, followed by an Integrated Restoration and Rehabilitation Plan.

PART I

ORIGIN AND PURPOSE OF THE PROJECT

1. Buddha Darya: From Natural Watercourse to Pollution Carrier

Buddha Darya is historically associated with the natural hydrological system of Ludhiana and ultimately joins River Satluj.

Over decades, increasing urbanisation, industrialisation, untreated or inadequately treated municipal sewage, dairy wastes, solid waste, industrial effluents and unauthorised discharges transformed significant stretches of the Darya into a heavily polluted channel.

This pollution does not remain confined to Ludhiana.

The environmental consequences potentially extend downstream into:

- River Satluj;
- agricultural areas;
- surface-water irrigation systems;
- groundwater systems;
- aquatic biodiversity;
- livestock;
- communities dependent on downstream water resources.

Restoration of Buddha Darya must therefore be considered not merely an urban beautification project but an important component of the ecological security of the Satluj river system.

PART II

FINANCIAL ARCHITECTURE

2. The ₹650-Crore Headline Figure Requires Reconciliation

Public descriptions repeatedly refer to the ₹650-crore Buddha Darya Rejuvenation Project.

However, this headline number should not automatically be described as ₹650 crore spent exclusively on construction.

The tendered infrastructure component was reported at approximately:

₹519 crore.

The wider programme also contained a substantial long-term Operation & Maintenance commitment, reportedly covering ten years. Contemporary descriptions expressly included ten-year O&M within the programme.

Indicative provisions publicly associated with the project included:

Component	**Approximate Provision**
New STPs — 285 MLD	₹375 crore
Dairy ETPs — approximately 6 MLD	₹29.5 crore
Rehabilitation of existing STPs — 418 MLD	₹49 crore
Intermediate Pumping Stations	₹65.5 crore
Capital infrastructure/tender value	approximately ₹519 crore
Long-term O&M	substantial separate provision

An accounting reconciliation is essential.

There is an additional complication.

A Government of India parliamentary/PIB record of July 2021 described the Buddha Nallah Rejuvenation Project at an estimated cost of ₹840 crore, referring to the 225 MLD and 60 MLD new STPs, rehabilitation of 418 MLD capacity, the three dyeing-industry CETPs of 40, 50 and 15 MLD and dairy ETPs.

Accordingly, at least four financial expressions appear in the documentary/public record:

₹650 crore → headline Punjab rejuvenation project

₹519 crore → tendered infrastructure/capital package

10-year O&M → additional/embedded long-term expenditure

₹840 crore → wider programme figure appearing in Government of India records

These figures cannot simply be interchanged.

Requirement

Government should publish a **Project Cost Boundary & Reconciliation Statement** showing:

- original administrative approval;

- DPR cost;
- funding agencies;
- ₹650-crore scope;
- ₹519-crore tender scope;
- ₹840-crore programme scope;
- expenditure actually incurred;
- expenditure booked to AMRUT;
- Smart City contribution;
- PIDB/Punjab Government contribution;
- Central Government contribution;
- CETP expenditure;
- ETP expenditure;
- subsequent escalation;
- variation orders;
- O&M liabilities;
- expenditure made outside the original project.

Only after this reconciliation can a credible financial audit be undertaken.

PART III

ORIGINAL ENGINEERING PACKAGE

3. New STPs

The project provided for two major new Sewage Treatment Plants:

Jamalpur — 225 MLD

Balloke — 60 MLD

Total new treatment capacity:

285 MLD

The 225 MLD installation became the flagship component and was commissioned after trial operations.

The 60 MLD Balloke installation formed the second new STP.

Contemporary project documentation confirms both capacities.

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4. Rehabilitation of Existing STPs

Existing effective sewage-treatment capacity was commonly reported at approximately:

418 MLD

The project envisaged rehabilitation/repair/upgradation of this existing infrastructure.

Government/NGT documentation from 2022 broke down Buddha Darya sewage management into new and rehabilitated plants and reported:

- 225 MLD Jamalpur;
- 60 MLD Balloke;
- rehabilitation of 111 MLD at Bhattian;
- rehabilitation of 152 MLD at Balloke;
- repair/overhaul of 50 MLD and 105 MLD plants.

The simple nominal calculation was therefore:

418 MLD existing/upgraded

+

285 MLD new

=

703 MLD nominal treatment capacity.

PART IV

THE HYDRAULIC CAPACITY QUESTION

5. Was 703 MLD Actually Sufficient?

This remains one of the most important technical questions.

Early project presentations described sewage flows broadly within the range that could theoretically be accommodated by the proposed treatment system.

However, other assessments questioned whether the assumed flow had been underestimated.

Industrial representatives relying upon a Guru Nanak Dev Engineering College-related assessment publicly challenged an approximately 700 MLD design assumption and claimed substantially higher flows, including figures approaching approximately 2,000 MLD in some representations.

Separately, an official Punjab presentation before the NGT in 2022 recorded total discharge into Buddha Nallah as approximately:

755 MLD

comprising:

- domestic — 612 MLD;

- dairy — 6 MLD;
- industrial — 137 MLD.

These figures illustrate precisely why a scientifically defensible hydraulic balance is required.

The relevant questions are:

What is the actual Dry Weather Flow?

What is the Peak Dry Weather Flow?

What is the Wet Weather Flow?

What quantities are municipal sewage?

What quantities are industrial effluent?

What quantities are dairy liquid waste?

How much fresh canal water is being introduced?

How much groundwater/infiltration enters the sewer?

How much flow bypasses treatment infrastructure?

How much ultimately reaches River Satluj?

Without answering these questions, nominal installed MLD capacity alone is insufficient for concluding that the system is adequately sized.

PART V

IIT ROORKEE / NIH ROORKEE TECHNICAL ASSESSMENTS

6. Important Clarification

References in public discussion sometimes collectively describe the technical intervention as the "IIT Roorkee Report."

The documentary record, however, indicates at least two distinguishable Roorkee-related interventions.

A. IIT Roorkee Technical Recommendations

In 2023, national river-management proceedings recorded concern that rehabilitation of four existing STPs totalling approximately 418 MLD, based on UASB technology, might not automatically ensure compliance with desired treated-water standards.

The record specifically observed that:

- the State should re-examine performance of the technology;
- recommendations made by IIT Roorkee should be implemented.

This indicates that capacity alone was not the only concern.

Treatment quality and treatment technology were also material.

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7. Sludge and Dairy-Waste Problems

The 225 MLD Jamalpur facility subsequently encountered issues involving large quantities of sludge and dairy wastes reaching sewage-treatment infrastructure.

Authorities sought IIT Roorkee technical assistance to examine the design/operation problems, including the impact of dairy waste on STP functioning.

This is an important engineering lesson.

STPs designed primarily for municipal sewage cannot be assumed to operate properly if substantial:

- cattle dung;
- high-strength dairy waste;
- industrial chemicals;
- toxic discharges;
- heavy metals

enter the municipal sewer network.

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8. Later NIH Roorkee Capacity Finding

By November 2025, the Punjab Government's High-Level Committee publicly stated that an NIH Roorkee study had confirmed that the existing STPs were not under-capacity.

That is a very consequential conclusion.

If correct, it would mean:

«The principal continuing problem is not merely shortage of installed sewage-treatment capacity.»

Attention must then shift toward:

- incomplete interception;
- sewer connectivity;
- pumping reliability;
- bypass flows;
- illegal connections;
- untreated industrial discharge;
- dairy waste;
- plant utilisation;
- operational downtime;
- treatment performance.

However, the complete NIH Roorkee capacity report, methodology, hydraulic measurements and calculations should be disclosed before this conclusion is treated as scientifically settled.

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9. Specific Requirements From the Roorkee Assessment

The complete assessment should disclose:

1. locations at which flows were measured;
2. measurement period;
3. sampling season;
4. dry-weather flow;
5. wet-weather flow;
6. peak hydraulic flow;
7. hourly flow variations;
8. municipal sewage generation assumptions;
9. infiltration/inflow assumptions;
10. industrial effluent flows;
11. dairy waste flows;
12. designed versus actual STP utilisation;
13. hydraulic retention times;
14. inlet pollution load;
15. outlet pollution load;
16. sludge generation;
17. process efficiency;
18. technology limitations of UASB installations;
19. bypass arrangements;
20. power failures/downtime;
21. pumping-station capacity;
22. redundancy arrangements;
23. recommendations for augmentation;
24. recommendations for technology improvement;
25. implications of canal-water addition.

Key Requirement

The full IIT Roorkee/NIH Roorkee technical report and annexures should be made publicly accessible, not merely its summarized conclusion that “STPs are not under-capacity.”

PART VI

INTERMEDIATE PUMPING STATIONS

10. Six IPSs: The Interception Backbone

The project included six Intermediate Pumping Stations.

Their role is fundamental.

They are intended to intercept sewage otherwise entering Buddha Darya and convey it through the sewer/interceptor network towards the appropriate STPs.

Approximately 10–11 km of interceptor/pipeline was also constructed under the programme.

Even if treatment capacity is sufficient, failure of interception or pumping means untreated sewage can still enter the Darya.

Thus:

«Treatment capacity without interception capacity is environmentally meaningless.»

PART VII

GAUGHAT IPS — THE CRITICAL MISSING LINK

11. Delayed Completion

Gaughat became one of the most important delayed components because of land/legal problems.

Its delay meant that raw sewage could continue reaching the Buddha Darya system despite substantial downstream treatment infrastructure having already been installed.

Later, the High-Level Committee reported Gaughat IPS as operational.

However, completion and commissioning must not be confused with continuous reliable operation.

The relevant audit question is:

«Was Gaughat operating continuously, at design capacity, during every material period when sewage was generated?»

Operational records should therefore be disclosed for:

- pumps;
- power availability;
- standby pumps;
- power backup;
- downtime;

- flow meters;
- inlet/outlet flows;
- maintenance;
- breakdowns;
- overflow events;
- emergency bypasses.

PART VIII

DAIRY EFFLUENT AND CATTLE DUNG

12. Two Dairy ETPs

The project included approximately 6 MLD dairy wastewater-treatment capacity.

Later technical descriptions identify:

Tajpur — approximately 2.25 MLD

Haibowal — approximately 3.75 MLD

Total: approximately 6 MLD

But liquid-effluent treatment addresses only one part of the dairy-waste problem.

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13. Solid Cattle Dung Is a Separate Pollution Stream

A much larger problem arises when solid cattle dung enters:

street drains → sewers → pumping stations → STPs → Buddha Darya.

Dung can:

- drastically increase organic load;
- increase suspended solids;
- choke sewers;
- disrupt pumps;
- increase sludge generation;
- interfere with biological treatment;
- reduce STP performance.

Therefore:

«Dairy ETP capacity cannot be treated as a substitute for complete cattle-dung management.»

A comprehensive system requires:

- source segregation;
- door-to-door dung collection;
- covered transportation;
- weighment;
- GPS tracking;
- CBG/biogas treatment;
- manure/resource recovery;
- prohibition of sewer disposal;
- penalties;
- CCTV/digital monitoring;
- independent verification.

Continued dung-management challenges were still being publicly reported during 2026.

PART IX

INDUSTRIAL POLLUTION AND CETPs

14. Three Major Textile CETPs

The principal dyeing CETPs are:

CETP	**Capacity**
Bahadurke	15 MLD
Focal Point	40 MLD
Tajpur Road	50 MLD
Total	**105 MLD**

These are separate from municipal sewage-treatment capacity.

This distinction is essential.

STPs ≠ CETPs.

Industrial effluent may contain:

- dyes;
- salts;
- high TDS;
- recalcitrant organics;

- heavy metals;
- toxic chemicals;
- varying pH;
- substances capable of inhibiting biological treatment.

Such streams must be managed industrially and cannot simply be allowed to enter municipal STPs.

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15. Serious NGT Findings Regarding CETP Compliance

The NGT's July 2025 proceedings recorded environmental compensation and enforcement action involving all three CETPs.

The Tribunal recorded PPCB action including:

- approximately ₹2.49 crore against the 50 MLD CETP;
- approximately ₹2.96 crore against the 40 MLD CETP;
- approximately ₹4.5 crore against the 15 MLD CETP;
- prosecution proceedings;
- directions to stop treated-wastewater discharge into Buddha Nallah;
- curtailment of CETP operational capacity;
- restrictions on new/expanded connections.

The same proceedings recorded MoEF&CC concerns regarding environmental-clearance compliance.

Among the issues noted were requirements concerning:

- zero discharge;
- reuse of permeate;
- treatment of RO concentrate;
- MEE;
- online monitoring;
- GPS/manifests;
- meters;
- hazardous-waste management;
- daily logs;
- groundwater monitoring;
- environmental-management cells;
- public disclosure of data.

This is highly relevant to restoration of Buddha Darya.

PART X

IIT ROPAR SOURCE-APPORTIONMENT STUDY

16. Formal Study

The Punjab Pollution Control Board awarded IIT Ropar the project titled:

“Source Apportionment and Comprehensive Investigation of Pollution in Buddha Dariya”

The NGT recorded the cost as:

₹1,44,38,600 + GST

The stated purpose is to provide a scientific foundation for river-rejuvenation efforts, enable targeted interventions, strengthen compliance monitoring and restore the ecological and socio-economic value of Buddha Darya and downstream River Satluj.

The NGT record stated a completion date of:

31 March 2026.

However, a complete publicly accessible final report has not been identified in the presently available public record.

This report therefore becomes one of the most important outstanding documents for a scientific audit.

PART XI

WHY SOURCE APPORTIONMENT IS ESSENTIAL

17. The Study Must Answer “Who Pollutes How Much?”

Concentration at a single location is not enough.

Scientific restoration requires calculation of:

POLLUTION LOAD = CONCENTRATION × FLOW

Source apportionment must therefore quantify pollution contributed by:

- domestic sewage;
- textile/dyeing industries;
- electroplating units;
- other industries;
- dairy liquid waste;
- cattle dung;

- commercial establishments;
- municipal solid waste;
- stormwater contaminated by urban activity;
- illegal connections;
- unauthorised outlets;
- unidentified drains.

Only then can responsibility be scientifically attributed.

PART XII

SPECIFIC REQUIREMENTS OF THE IIT ROPAR STUDY

18. Pollution-Source Inventory

The study should produce a complete GIS-based inventory of:

- authorised outlets;
- unauthorised outlets;
- industrial units;
- dairy complexes;
- sewer outfalls;
- storm drains;
- CETPs;
- STPs;
- ETPs;
- pumping stations;
- CBG plants;
- reprocessing facilities;
- solid-waste dumping points.

Each source should have:

- coordinates;
- ownership;
- regulatory status;
- design flow;
- actual flow;

- discharge quality;
- compliance status.

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19. Strategic Sampling

A scientifically credible programme should cover:

- upper Buddha Darya;
- urban entry points;
- industrial stretches;
- dairy stretches;
- midstream;
- downstream;
- Walipur/confluence;
- River Satluj upstream and downstream of the confluence;
- feeder drains;
- relevant downstream points toward Harike.

Sampling should distinguish:

- day;
- night;
- weekday;
- weekend;
- industrial operating hours;
- dry season;
- monsoon;
- canal-water release period;
- no-canal-water period.

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20. Parameters Required

Conventional Water Quality

- pH
- DO
- BOD

- COD
- TSS
- TDS
- electrical conductivity
- ammonia
- nitrate
- phosphate
- chlorides
- sulphates
- oil and grease

Microbiological

- total coliform;
- faecal coliform;
- E. coli.

Industrial/Toxic

- chromium;
- lead;
- cadmium;
- nickel;
- copper;
- zinc;
- arsenic;
- mercury where relevant;
- phenolic compounds;
- colour;
- priority industrial contaminants.

Sediment

Water sampling alone is insufficient.

Historic industrial pollution can accumulate in sediments.

Therefore:

- sediment chemistry;

- heavy metals;
- persistent contaminants;
- toxicity

must also be evaluated.

PART XIII

CETP PERFORMANCE ASSESSMENT

21. Each CETP Must Be Audited by Mass Balance

For each 15, 40 and 50 MLD CETP:

Influent flow

→ **influent pollutant concentration**

→ **pollutant mass entering**

→ **treatment-stage efficiency**

→ **treated-water quantity**

→ **reuse**

→ **discharge**

→ **sludge/reject**

must be reconciled.

Compliance should not be based only on a conveniently timed outlet sample.

The NGT specifically expressed concern about obtaining a permanent solution, rather than temporary compliance during periods when regulatory sampling is expected.

PART XIV

STP PERFORMANCE ASSESSMENT

22. Capacity Alone Is Not Performance

Every STP should disclose continuously:

- rated capacity;
- actual inlet MLD;
- minimum flow;
- peak flow;
- bypass quantity;

- BOD inlet/outlet;
- COD inlet/outlet;
- TSS inlet/outlet;
- faecal coliform;
- energy consumed;
- aeration status;
- sludge generated;
- sludge disposed;
- downtime;
- non-compliance events.

The question should never be merely:

«“Is the STP constructed?”»

It should be:

«“Was it operating correctly, continuously and at the required environmental standard?”»

PART XV

THE 200-CUSEC FRESH-WATER COMPONENT

23. Fresh Water Through Neelon Drain

The project also involved release of approximately:

200 cusecs

of fresh canal water through the Neelon Drain/Sirhind Canal system.

Ecological flow can be beneficial.

But dilution must not become a substitute for pollution prevention.

The distinction is scientifically crucial.

If:

100 units pollution + limited water

becomes

100 units pollution + much more fresh water,

pollutant concentration may fall while pollutant mass remains substantially unchanged.

Indeed, dramatic reductions in measured BOD/COD after fresh-water release were publicly reported early in the project.

Thus water-quality reports must always disclose:

- concentration;
- flow;
- pollutant mass;
- fresh-water contribution.

Principle

«Dilution can support ecological restoration only after pollution sources are controlled. Dilution cannot be accepted as pollution treatment.»

PART XVI

PROJECT DELAYS

24. Original Timeline

The project commenced in December 2020 and was originally expected to be completed by:

December 2022.

Subsequently, deadlines were extended repeatedly.

By early 2022 only about 30% completion was publicly reported.

Later timelines moved through 2023 and beyond, with Gaughat remaining a critical delayed component.

By 2025 officials were describing approximately 99% completion, while acknowledging unresolved problems beyond the immediate infrastructure scope.

In November 2025 the High-Level Committee announced that the ₹650-crore infrastructure-upgradation project had been completed and Gaughat IPS was operational.

PART XVII

COMPLETION VERSUS REJUVENATION

25. The Central Contradiction

Government statements eventually presented:

- completion of ₹650-crore infrastructure;
- adequate STP capacity;
- Gaughat operation;
- dairy zero-discharge initiatives;
- closure of illegal outlets;

- CETP BOD/COD improvements;
- improved water-quality indicators.

But subsequent field and public records continued to identify:

- dairy-waste problems;
- cattle dung;
- treatment-plant difficulties;
- industrial pollution concerns;
- operational deficiencies;
- continued need for enforcement and additional interventions.

Therefore:

“Project completed” cannot automatically mean “Buddha Darya rejuvenated.”

At most, it may establish that:

«The identified physical infrastructure package was substantially completed according to its contractual scope.»

Ecological rejuvenation requires a separate outcome audit.

PART XVIII

HIGH-LEVEL COMMITTEE — 14 JULY 2025

26. A New Governance Phase

The Punjab Government constituted a High-Level Committee on 14 July 2025.

Its officially recorded functions include:

1. developing comprehensive short- and long-term action plans;
2. monitoring and fast-tracking CBG plants, IPSs and STP/CETP infrastructure;
3. launching additional projects where required;
4. developing SOPs for STPs, CETPs, cow-dung collection and electroplating-effluent collection;
5. introducing real-time and independent monitoring;
6. coordinating with regulatory institutions;
7. conducting further scientific studies and assessments.

This represents an important shift:

Phase I

Infrastructure construction.

Phase II

Source control, enforcement, scientific monitoring and ecological restoration.

The second phase is essential.

PART XIX

PRELIMINARY PROJECT AUDIT

IssuePreliminary Assessment	
Capital infrastructure	Largely completed
225 MLD Jamalpur STP	Constructed/commissioned
60 MLD Balloke STP	Implemented
Existing 418 MLD rehabilitation	Implemented, but performance requires independent verification
IPS network	Built substantially; reliability requires operational audit
Gaughat IPS	Historically delayed; later declared operational
Interceptor network	Substantially constructed
Dairy ETP infrastructure	Constructed, but long-term performance requires verification
Cattle-dung management	Major continuing vulnerability
Industrial pollution	Not solvable through municipal STPs alone
CETPs	Require continuous independent compliance verification
Hydraulic adequacy	NIH Roorkee reportedly says adequate; complete report required
UASB treatment performance	Earlier IIT Roorkee recommendations need disclosure and implementation audit
Source apportionment	IIT Ropar study crucial
Ecological restoration	Not established merely by infrastructure completion
Downstream Satluj protection	Requires outcome-based monitoring
Public financial accountability	Cost boundaries require reconciliation

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PART XX

SIX-PART ACCOUNTABILITY AUDIT

27. Test I — Financial Audit

Reconcile:

₹650 crore sanctioned

→ **₹519 crore tender**

→ **₹840 crore wider programme reference**

→ **actual capital expenditure**

→ **variation/escalation**

→ **10-year O&M**

→ **payments made**

→ **payments outstanding**

→ **additional subsequent expenditure**

The audit should be preferably conducted independently and placed in the public domain.

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28. Test II — Physical Audit

For every asset:

DPR provision

→ **Tender provision**

→ **Constructed**

→ **Commissioned**

→ **Present condition**

→ **Defects**

→ **Repair**

→ **Responsible agency**

This must cover:

- STPs;
- MPSs;
- IPSs;
- interceptor lines;
- dairy ETPs;

- pumping equipment;
- power systems;
- telemetry;
- laboratories;
- sludge systems.

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29. Test III — Hydraulic Audit

Establish a complete water balance:

Water consumption

→ **sewage generated**

→ **industrial wastewater**

→ **dairy wastewater**

→ **stormwater/infiltration**

→ **intercepted flow**

→ **STP flow**

→ **CETP flow**

→ **bypassed flow**

→ **fresh canal water**

→ **Buddha Darya flow**

→ **Satluj discharge**

This will finally resolve the 700 MLD versus higher-flow controversy.

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30. Test IV — Pollution-Load Audit

Every discharge point should be mapped and quantified:

Source

→ **Flow**

→ **Concentration**

→ **Pollution load**

→ **Treatment**

→ **Compliance**

→ **Responsible entity**

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31. Test V — Operational Audit

Each asset must answer:

«Was it actually functioning 24×7 when required?»

Monthly operating records should disclose:

- hours operational;
- hours stopped;
- electricity failures;
- pump failures;
- standby capacity;
- bypasses;
- maintenance shutdowns;
- non-compliant output.

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32. Test VI — Ecological Outcome Audit

After all public expenditure, the final test is:

«Is Buddha Darya becoming an ecologically functional and sustainable water body?»

Indicators must include:

- DO;
- BOD;
- COD;
- TSS;
- TDS;
- pH;
- nutrients;
- heavy metals;
- industrial toxicants;
- faecal contamination;
- sediments;
- biodiversity;
- aquatic life;

- riparian vegetation;
- groundwater interaction;
- impact on River Satluj.

PART XXI

DOCUMENTS THAT MUST NOW BE DISCLOSED

33. Priority Documentation

Financial/Contractual

1. Original DPR.
2. Revised DPRs.
3. Administrative approval.
4. Technical sanction.
5. ₹519-crore tender.
6. BOQ.
7. work order.
8. contractor agreement.
9. variation orders.
10. escalation.
11. payment certificates.
12. completion certificates.
13. ten-year O&M contract.
14. O&M payment schedule.

Technical

15. hydraulic design report;
16. sewer-flow survey;
17. GNDEC flow assessment relied upon by stakeholders;
18. IIT Roorkee reports/recommendations;
19. NIH Roorkee capacity report;
20. STP performance records;
21. IPS operating data;
22. IIT Ropar source-apportionment report;

23. IIT Ropar interim reports;
24. raw IIT Ropar sampling data;
25. geo-tagged pollution-source inventory.

Regulatory

26. CETP consent conditions;
27. environmental clearances;
28. inspection reports;
29. environmental compensation calculations;
30. prosecution status;
31. OCEMS records;
32. environmental compliance reports.

PART XXII

SPECIFIC DISCLOSURE REQUIRED FROM IIT ROPAR

34. Complete Source-Apportionment Package

The following should be released:

1. Letter of Award;
2. Terms of Reference;
3. inception report;
4. methodology;
5. sampling design;
6. coordinates;
7. sampling calendar;
8. field observations;
9. laboratory results;
10. QA/QC protocol;
11. flow data;
12. pollution-load calculation;
13. source-wise percentage contribution;
14. STP analysis;
15. CETP analysis;

16. ETP analysis;
17. CBG/dairy assessment;
18. industrial mapping;
19. unauthorised outlets;
20. sediment data;
21. downstream Satluj impact;
22. preliminary report;
23. draft final report;
24. final report;
25. short-term recommendations;
26. medium-term recommendations;
27. long-term restoration roadmap.

PART XXIII

FROM POLLUTION CONTROL TO RESTORATION

35. The Next Stage Cannot Be Another Conventional STP Project

Buddha Darya restoration must move from:

"Collect → Pump → Treat → Discharge"

to:

"Prevent → Segregate → Treat at Source → Recover Resources → Reuse → Restore Ecology"

This requires:

Domestic Sewage

Complete sewer interception and tertiary treatment.

Industrial Wastewater

Industry-specific pretreatment + CETP + advanced treatment + maximum reuse/ZLD wherever legally and technically applicable.

Dairy Waste

Dung segregation + CBG/biogas + ETP + resource recovery.

Stormwater

A clean stormwater network separated from sewage.

Treated Wastewater

Reuse for agriculture, industry, landscaping and other non-potable applications subject to appropriate standards.

Sludge

Safe treatment, testing and disposal/resource recovery.

Ecological Flow

Freshwater augmentation only as a complementary ecological measure.

Riparian Restoration

Green buffers and native vegetation.

Wetland Polishing

Where feasible, constructed/natural wetland systems for tertiary ecological polishing.

Biodiversity

Habitat recovery rather than mere concrete-channel beautification.

PART XXIV

REHABILITATION OF THE ENTIRE BUDDHA DARYA–SATLUJ SYSTEM

36. Upper Catchment

Protect:

- natural drains;
- seasonal flows;
- floodplain connectivity;
- recharge areas;
- wetlands;
- Mattewara landscape;
- natural hydrology.

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37. Urban Buddha Darya

Achieve:

Zero untreated discharge.

Not “mostly treated.”

Not “diluted.”

Not “compliant during inspection.”

Zero untreated discharge.

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38. Lower Buddha Darya

Investigate:

- ecological restoration;
- treated-water reuse;
- irrigation potential;
- wetlands;
- floodplain restoration;
- biodiversity corridors.

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39. River Satluj

Buddha Darya rehabilitation must be judged partly by its impact on Satluj.

Therefore monitoring must include:

Satluj upstream of Buddha Darya

versus

Satluj downstream of Buddha Darya

so that Buddha Darya's incremental pollution burden can be scientifically quantified.

PART XXV

INDEPENDENT REAL-TIME MONITORING

40. Public Environmental Dashboard

A transparent dashboard should display in near real time:

STPs

Flow + BOD + COD + TSS + operating status.

CETPs

Flow + BOD + COD + TDS + pH + reuse/discharge status.

IPSs

Flow + pump status.

Buddha Darya

Multiple monitoring stations.

Satluj

Upstream/downstream comparison.

Dairy

Dung collected daily.

CBG

Dung processed daily.

Illegal outlets

Status: identified/sealed/prosecuted.

Historical data should remain downloadable.

Public transparency will reduce dependence on occasional official inspections.

PART XXVI

GOVERNANCE

41. Single Accountable Mission Structure

The present system involves:

- Municipal Corporation Ludhiana;
- PWSSB;
- PPCB;
- Water Resources;
- PEDA;
- Industries Department;
- Local Government;
- district administration;
- CETP SPVs;
- dairy operators;
- academic institutions;
- regulatory bodies.

Fragmented responsibility creates opportunities for each institution to blame another.

A single integrated mission structure should assign:

Asset → Agency → Officer → Performance Indicator → Deadline.

PART XXVII

PUBLIC PARTICIPATION

42. Community Monitoring

Local communities, environmental organisations, farmers, universities, technical institutions and PAC should participate in:

- quarterly monitoring;
- joint site inspections;
- sampling observation;
- disclosure review;
- ecological surveys;
- public hearings.

Restoration of a public water body cannot remain confined to closed administrative meetings.

PART XXVIII

PRINCIPAL FINDINGS

43. Finding One

The ₹650-crore programme was principally an infrastructure-based pollution interception and treatment project.

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44. Finding Two

Substantial infrastructure appears to have been completed.

That fact should be acknowledged.

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45. Finding Three

Physical completion does not establish ecological rejuvenation.

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46. Finding Four

The distinction between sewage, industrial effluent, dairy liquid waste and solid cattle dung was not sufficiently resolved merely by constructing additional STPs.

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47. Finding Five

IIT Roorkee recommendations indicate that treatment technology and performance, not simply nominal capacity, require scrutiny.

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48. Finding Six

The later NIH Roorkee assessment reportedly concluded that existing sewage-treatment capacity is not inadequate.

If validated through disclosure of the complete report, this shifts accountability toward interception, utilisation, operation and pollution-source control.

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49. Finding Seven

The IIT Ropar study is potentially the most important scientific investigation undertaken so far because it seeks to identify and apportion pollution sources rather than merely measure final water quality.

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50. Finding Eight

The IIT Ropar final report and underlying datasets should now be placed in the public domain.

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51. Finding Nine

CETP environmental-compliance issues documented before the NGT demonstrate that industrial pollution cannot simply be assumed to have been solved because CETPs exist.

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52. Finding Ten

Fresh canal water can support ecological flow but cannot substitute for eliminating pollution at source.

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53. Finding Eleven

A separate financial reconciliation is required because ₹650 crore, ₹519 crore and the ₹840-crore wider programme figure represent different project boundaries and cannot be used interchangeably.

PART XXIX

THE CENTRAL ACCOUNTABILITY QUESTION

The investigation should therefore not be restricted to:

«“Was ₹650 crore properly spent?”»

It should ask:

«“Did the expenditure made under the Buddha Darya Rejuvenation Project achieve the measurable environmental outcomes for which it was sanctioned, and if not, why not?”»

And further:

«“If treatment capacity is adequate, why is untreated or inadequately treated pollution still capable of entering Buddha Darya?”»

These questions should be answered scientifically through the combined evidence of:

Hydraulic Audit

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NIH/IIT Roorkee Assessment

-

IIT Ropar Source Apportionment

-

STP/CETP Operating Records

-

Independent Environmental Monitoring.

PART XXX

RECOMMENDATIONS

54. Immediate — 0 to 6 Months

1. Release the complete IIT/NIH Roorkee reports.
2. Release the IIT Ropar final report.
3. Release raw source-apportionment data.
4. Reconcile ₹519 crore/₹650 crore/₹840 crore figures.
5. Audit O&M expenditure.
6. Publish asset-wise operating status.
7. Identify every discharge point.
8. Install/validate calibrated flow meters.
9. Independent 24-hour sampling.
10. Complete cattle-dung source control.
11. Eliminate all untreated bypasses.
12. Make CETP data public.

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55. Medium Term — 6 to 24 Months

1. Implement IIT Ropar recommendations.
2. Upgrade deficient STP technology.
3. Upgrade industrial treatment.
4. Strengthen ZLD/reuse where mandated and technically appropriate.
5. Complete CBG infrastructure.
6. Establish treated-water reuse networks.
7. Restore stormwater segregation.
8. Remediate contaminated sediments where scientifically required.
9. Restore riparian ecological buffers.
10. Develop wetland-polishing systems where feasible.

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56. Long Term — 2 to 10 Years

Restore Buddha Darya as a functioning ecological corridor integrated with:

- Upper Buddha Darya;
- regional drains;
- Mattewara Jungles;
- wetlands;
- floodplains;
- groundwater recharge;
- Middle (Urban Stretch within Municipal Limits) Buddha Darya;
- Lower Buddha Darya;
- River Satluj.

The ultimate objective must be:

Pollution Prevention + Water Reuse + Ecological Flow + Biodiversity + Floodplain Protection + Community Stewardship.

CONCLUSION

The ₹650-crore Buddha Darya Rejuvenation Project represents one of the largest public interventions undertaken for pollution control in Ludhiana.

Its infrastructure must be recognised where successfully created.

But infrastructure is a means, not the final environmental objective.

The final measure of success is neither expenditure booked nor concrete constructed.

It is:

whether untreated pollution has stopped;

whether treatment systems operate continuously;

whether industrial and dairy wastes are controlled at source;

whether water quality remains healthy without artificial or temporary compliance;

whether River Satluj is protected;

whether aquatic ecology returns;

and whether Buddha Darya can once again sustain its natural ecological functions.

The combined Roorkee and IIT Ropar scientific work therefore provides a critical opportunity.

The Roorkee assessment should establish whether the system possesses adequate hydraulic and treatment capability.

The IIT Ropar study should identify who or what contributes the pollution, where it originates, how much pollution each source contributes and what must be done to eliminate it.

The two scientific investigations must now be brought together with financial, physical and operational audits.

Only thereafter can Punjab answer the fundamental question:

«Has Buddha Darya merely received a ₹650-crore infrastructure project — or has Buddha Darya genuinely been rejuvenated?»

Until measurable ecological outcomes demonstrate the latter, the work of restoration and rehabilitation must be regarded as unfinished.

A CALL FOR TRANSPARENCY, SCIENCE AND PERMANENT RESTORATION

The issue should not become a contest between Government, industry, citizens or environmental organisations.

Buddha Darya and River Satluj belong to present and future generations.

The objective must therefore be a scientifically credible, transparent and permanent solution based on:

Polluter Pays Principle

Precautionary Principle

Public Trust Doctrine

Zero Untreated Discharge

Continuous Monitoring

Resource Recovery and Reuse

Ecological Restoration

and

Public Accountability.

The enormous public investment already made must now be converted into measurable environmental recovery.

The next phase should therefore not be another temporary “cleaning project.”

It should be the permanent ecological restoration and rehabilitation of Buddha Darya and protection of River Satluj.

Col CM Lakhanpal
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