BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, DELHI

ORIGINAL APPLICATION NO. 553 of 2024

In the matter of: -

News item titled "From Ropar to Hoshiarpur via HP 30-km detour as illegal mining damages bridge" appearing in The Indian Express dated 10.04.2024.

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Filed by Adv. Saurabh Balwani
On behalf of Central Pollution Control Board

Place: Delhi
Dated:28.10.2025

Action Taken Report of CPCB in compliance to the orders of Hon'ble National Green Tribunal dated 20/05/2024 and 28/07/2024 in Original Application No. 553/2024; News item titled "From Ropar to Hoshiarpur via HP: 30-km detour as illegal mining damages bridge" appearing in The Indian Express dated 10.04.2024.

1.0 Background:

The matter in Original Application No.553 / 2024, pertains to a News item titled "From Ropar to Hoshiarpur via HP: 30km detour as illegal mining damages bridge" published in the Indian Express dated April 10, 2024, which was registered suo-moto by the Hon'ble National Green Tribunal (PB).

In compliance to the orders of Hon'ble NGT dated 20/05/2024, a report was filed by CPCB on 24/08/2024. After considering the report on 28/08/2024, Hon'ble National Green Tribunal in its order dated 28/08/2024 directed CPCB to obtain the satellite images of the stretches concerned for last 5 years, excluding the monsoon period, analyse them and ascertain the extent of illegal sand mining, specially 1000 meter both side of the bridge which was damaged in July 2023. In compliance to the above directions, a status report was filed by CPCB on 02/12/2024, which was followed by another report on 25/03/2025, wherein it was mentioned that the satellite data was received from the New Space India Limited, which was provided to Punjab Remote Sensing Center (PRSC). PRSC responded that the capabilities of 3D mapping of satellite images are not available with PRSC and it is only capable of 2D mapping which does not give the depth of the craters to assess the mining activities.

During hearing of the matter on 27/03/2025, Learned counsel appearing for the CPCB submitted that the CPCB will approach the other expert agencies for 3D mapping of the satellite images received.

Accordingly, the work order for the same was issued by CPCB to Punjab Engineering College, to ascertain the extent of illegal sand mining through the use of satellite imagery. Learned Counsel for CPCB during hearing on 28/07/2025 submitted that work is almost complete and the within a week, the report will be received by CPCB from Punjab Engineering College. Hon'ble NGT in its order dated 28/07/2025 (**Annexure-1**) accepted the prayer for adjournment and directed that fresh action taken report be filed by CPCB within four weeks and further listed the matter on 29/10/2025.

2.0. Compliance and Action Taken Report of CPCB:

The following actions taken by CPCB in compliance to various orders of Hon'ble NGT in the present matter:

1. CPCB team carried out spot inspection to ascertain the extent of illegal mining in the area concerned and submitted the report on 28/08/2024 in compliance to the order of Hon'ble NGT dated 20/05/2024.

2. CPCB was directed by Hon'ble NGT vide Order dated 28/08/2024 to obtain the satellite images of the stretches concerned of last 5 years, excluding the monsoon period, analyse them and ascertain the extent of illegal sand mining specially 1000 meter both side of the bridge which was damaged in July 2023. In compliance to the above directions of Hon'ble NGT, CPCB obtained the available satellite data for the last five years from NRSC/ISRO.

3. CPCB approached Punjab Remote Sensing Centre (PRSC) for analysis interpretation of the satellite data received from NRSC/ISRO, to ascertain the extent of illegal mining done, on 21/11/2024. However, it was informed by PRSC that the interpretation of the data provided by ISRO/NRSC, to ascertain the extent of illegal mining required 3 D mapping, whereas PRSC does not have capabilities of 3D mapping of satellite images.

4. CPCB approached 03 expert institutions namely Punjab Engineering College (PEC), Chandigarh, IISER Mohali, and IIT Ropar, for 3D analysis of satellite imagery procured by CPCB from ISRO through New Space India Limited for assessing the extent of illegal mining. Proposals/Offers received from Punjab Engineering College (PEC), Chandigarh, IISER Mohali, and IIT Ropar were evaluated and proposal of Punjab Engineering College (Deemed to be University), Chandigarh was accepted for award of the assignment for interpretation of satellite imagery.

5. CPCB issued work order to Punjab Engineering College vide letter dated 16/06/2025 (**Annexure-2**), to ascertain the extent of illegal sand mining through the use of satellite imagery received from NRSC/ISRO.

6. CPCB received the final report from Punjab Engineering College (PEC), Chandigarh on 29/08/2025. The overall findings of the Punjab Engineering College (PEC) with regard to extent of illegal mining done based on the interpretation of the satellite imagery procured from NRSC/ISRO by CPCB and the additional data collected by the PEC Team, are given in subsequent paragraphs.

3.0. Overall Findings of Punjab Engineering College (PEC), Chandigarh:

This study was conducted around the Algran Bridge, located on the River Swan at the Punjab-Himachal Pradesh border. The primary objective was to evaluate the extent and impact of illegal sand mining activities within a 1 km radius upstream and downstream of the bridge, utilising high-resolution satellite imagery (2018–2023) provided by the National Remote Sensing Centre (NRSC). The key findings of the study are as follows:

i. **Evidence of Increased Unauthorized Sand Extraction:** Temporal analysis of satellite imagery and Digital Elevation Models (DEMs) ***reveals significant expansion of mining pits, reduction in vegetation cover, and landscape alterations, particularly downstream of the Algran Bridge. These changes indicate sustained and spatially concentrated anthropogenic activities over the study period.***

ii. **Field Verification**: Ground surveys corroborate the patterns observed in satellite imagery, confirming the presence of mining and crusher activities consistent with the remote sensing data (Photographs given in Fig. 3.14, 3.15 and 3.16 of the PEC Report attached as **Annexure-3**)

iii. **Quantification of Material Extraction:** Volumetric analysis, employing DEM differencing, ***indicates substantial material removal within 1 km on both sides of the bridge—about 3.41 ± 0.18 million m^3 cumulatively (2000→2024).*** Expressed year-wise (annualised) from the available epochs: 2000–2013 ≈ **57 ± 23 thousand m^3/yr** (Upstream ≈ 21 ± 15, Downstream ≈ 36 ± 17), and 2013–2024 ≈ **242 ± 22 thousand m^3/yr** (Upstream ≈ 102 ± 15, Downstream ≈ 141 ± 16). These figures are "extraction-equivalent" volumes derived from mean bed-level change (Δh) × area with 1-σ errors propagated from DEM vertical accuracies (SRTM ±5 m, ASTER ±7 m, Carto DEM ±1 m).

iv. **Limitations/caveats:** DEMs capture morphological lowering, not cause; early-period changes (2000–2013) are near the uncertainty floor; resolution/datum differences and possible wet-surface biases remain. Therefore, classification as illegal requires corroboration with the visual time-series mapping and permit/inspection records.

v. **Asymmetric Material Removal**: The ***right bank of the river exhibits slightly higher material extraction, likely attributable to mining or crusher activities, potentially exacerbated by lateral river migration influenced by human intervention.***

vi. **Riverbed Lowering and Structural Concerns:** Comparison of ***the current riverbed*** *level with the bridge's original design level reveals a significant lowering of approximately 40 meters in certain areas.* This morphological change raises critical concerns regarding the stability of the bridge, particularly during high-flow events, necessitating urgent geotechnical assessment of the foundation conditions.

The detailed report submitted by Punjab Engineering College (PEC) including its findings and recommendations is attached as **Annexure-3.**

4.0. Action Taken by CPCB:

CPCB has issued a letter No. CM-13011/133/2024/NGT/26-10/SPL-1 dated October 26, 2025 (**Annexure-4**), asking Punjab Pollution Control Board to refer to the findings and recommendations made by Punjab Engineering College (PEC) and co-ordinate with concerned departments including Department of Mining and Department of Water Resources for:

i) Identifying and taking action against the persons responsible for illegal extraction of sand from river bed in the area.

ii) Taking remedial action considering the approved DSR of the District Ropar and as per Sustainable Sand Mining Management Guidelines, 2016 and Enforcement & Monitoring Guidelines for Sand Mining, 2020 of Ministry of Environment, Forests and Climate Change (MoEF&CC), to prevent recurrence of such incidents of illegal extraction of sand in the area.

iii) The Action Taken Report (ATR) on the above points on the above points shall be provided by PPCB to CPCB, from time to time.

5.0. Prayer:

It is humbly submitted that the compliance of the Orders of Hon'ble NGT has been made by CPCB with the assistance of Punjab Engineering College (PEC), Chandigarh, and the technical report prepared in this regard may kindly be taken on record, for passing the suitable orders in the matter.

27/10/25

डॉ. नरेंन्द्र शर्मा / Dr. Narender Sharma
वैज्ञानिक 'एफ'/Scientist 'F'
क्षेत्रीय निदेशालय/Regional Directorate
केंद्रीय प्रदूषण नियंत्रण बोर्ड
Central Pollution Control Board
(पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, भारत सरकार)
(Ministry of Environment, Forest and Climate Change, Govt. of India)
बीएसएनएल एक्सचेंज, दूसरी मंजिल, सेक्टर 49 सी, चण्डीगढ़ 160 047
BSNL Exchange, 2nd Floor, Sector 49-C, Chandigarh-160 047

Item No. 11 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 553/2024

News item titled "From Ropar to Hoshiarpur via HP 30-km detour as illegal mining damages bridge" appearing in The Indian Express dated 10.04.2024.

Date of hearing: 28.07.2025

CORAM: **HON'BLE MR. JUSTICE PRAKASH SHRIVASTAVA, CHAIRPERSON**
HON'BLE DR. A. SENTHIL VEL, EXPERT MEMBER
HON'BLE DR. AFROZ AHMAD, EXPERT MEMBER

Respondent: Mr. Saurabh Balwani, Advocate for CPCB

Mr. Naginder Benipal and Mr. Udit Vaghela, Advocate for PPCB

ORDER

1. In this original application (OA), Tribunal, inter-alia is examining the issue indiscriminate illegal sand mining in district Ropar.

2. Learned Counsel appearing for Central Pollution Control Board (CPCB) submits that to ascertain the extent of illegal sand mining through the use of satellite imagery, work order was issued to Punjab Engineering College on 16.06.2025 and work is almost complete and within a week report will be received by CPCB.

3. In this background, prayer for adjournment has been made.

4. Let fresh action taken report be filed by CPCB within four weeks.

5. List on 29.10.2025.

Prakash Shrivastava, CP

Dr. A. Senthil Vel, EM

Dr. Afroz Ahmad, EM

July 28, 2025
Original Application No. 553/2024
JG.

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
क्षेत्रीय निदेशालय, चण्डीगढ़
Central Pollution Control Board
Regional Directorate, Chandigarh
(पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार)
(MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA)

CPCB/RD-CHD /Court Case /229/2022/269 Date: 16/06/2025

To

Director,
Punjab Engineering College (Deemed to be University),
Sector 12, Chandigarh.
Pin Code: 160012

Kind Attn: **Dr. Har Amrit Singh Sandhu**, Assistant Professor, CED, PEC, Chandigarh

Subject: Award of assignment for Analysis of Satellite Imagery for ascertaining the extent of illegal mining in NGT Matter of OA No. 553/2024-reg

Sir,

This has reference to our email dated May 1, 2025 alongwith Letter No CPCB/ RD-CHD/ Court Case/ 229/ 2022/245 dated April 30, 2025 on the above subject, seeking your willingness to take up the assignment of analysis and interpretation of the Satellite Images procured by CPCB from ISRO/NRC in compliance of the Hon'ble National Green Tribunal (NGT) order dated 28.08.2024, passed in Original Application No. 553/2024, titled *"From Ropar to Hoshiarpur via HP: 30-km detour as illegal mining damages bridge"*, as reported in *The Indian Express*, to ascertain the extent of illegal sand mining, particularly within 1,000 meters on both sides of the bridge damaged in July 2023.

This also refers to your subsequent email communication dated 15/05/2025 in response to aforementioned letter of CPCB RD Chandigarh, confirming your willingness to take up the assignment alongwith offer involving consultancy fee of Rs. 300000/= (Rs. Three Lacs only) plus 18% GST (including consultancy charges, institutional charges, report printing charges etc.).

We are pleased to accept your proposal received through email dated 15/05/2025 on the following terms and conditions:

1. You shall analyze and interpret satellite images procured from NRSC and already provided to you by CPCB, to determine the extent (qualitative and quantitative) of illegal sand mining.

16/06/25

2. You may also generate additional satellite images of the area in question for the period under reference. after visiting the site and interpret these images, as per proposal submitted by you vide email dated 15/05/2025.

3. **You shall submit the signed report on or before 15th July, 2025 both in hard and soft copy. Being a Court/NGT matter, time is the essence of this assignment.**

4. Any clarification, additional information, or explanation, if sought by the Hon'ble National Green Tribunal (NGT) or Central Pollution Control Board (CPCB) in connection with the submitted report shall be provided by you without any additional cost.

5. The payment towards consultancy will be made through Cheque in f/o Punjab Engineering College (Deemed to be university); A/c No. 30073124224; SBI, PEC Campus Branch , Sector 12; IFSC: SBIN0002452; GST: 04AABTP1179LIZE. as under:

    - 70% of the basic consultancy fees shall be paid in advance alongwith award letter through cheque.
    - 15 % of the basic consultancy fee shall be paid on submission of draft report.
    - Remaining 15% of the basic consultancy fee alongwith total GST shall be paid on submission of the final signed report both in hard and soft copy.

6. The TDS deduction will be made while making payment of above consultancy fees, as per applicable rules.

7. The arrangement of logistics for visiting the site and permissions from the local authorities will be made by CPCB Regional Directorate, Chandigarh.

8. The data generated for the assignment shall be confidential and the property of CPCB and you shall not use the data anywhere without written permission of CPCB.

9. In case of any dispute, the decision of Competent Authority of CPCB will be final and binding on you.

You are requested to acknowledge the receipt of this letter and confirm acceptance to take up this assignment offer by signing and returning a copy of this letter by June 14 2025.

This issues with the approval of Competent Authority.

Yours faithfully,

16/06/25

(Dr. Narender Sharma)
Regional Director

Copy to:

i.	Shri Jagdish Prasad Meena, Sc. 'D'		For information and co-ordination please
ii.	Shri Muddasir Ahmed Lone, Accounts Assistant	:	For information and releasing Payment, as per payment schedule

Regional Director

Annexure-3

A

REPORT

ON

INTERPRETATION AND ANALYSIS OF SATELLITE IMAGERY FOR MINING ACTIVITIES ALONG ALGRAN BRIDGE RUPNAGAR, PUNJAB

IN

NGT matter of OA No. 553 of 2023; News item titled "From Ropar to Hoshiarpur via HP: 30-km detour as illegal mining damages bridge" appearing in The Indian Express dated 10.04.2024

BY

PUNJAB ENGINEERING COLLEGE (PEC), CHANDIGARH

SUBMITTED

TO

CENTRAL POLLUTION CONTROL BOARD (CPCB)

REGIONAL DIRECTORATE, CHANDIGARH

August, 2025

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1 Introduction

1.1 Background

The matter in Original Application No. 553 of 2023; News item titled "From Ropar to Hoshiarpur via HP: 30-km detour as illegal mining damages bridge" appearing in The Indian Express dated 10.04.2024, relates to the closure of a bridge on the Swan river, connecting Nangal with Garhshankar due to indiscriminate sand mining causing residents of atleast 200 villages in Ropar, district Rupnagar (Punjab) to take a detour of 30 km. CPCB was directed by Hon'ble NGT vide order dated 28/08/2024 to obtain the satellite images of the stretch concerned of last 5 years, excluding the monsoon period, analyses them and ascertain the extent of illegal sand mining specially 1000 meter both side of the bridge which was damaged in July 2023.

Accordingly, CPCB Regional Directorate, Chandigarh approached Punjab Engineering College (PEC), Chandigarh vide Letter No. CPCB/ RD-CHD/ Court Case/ 229/ 2022/245, dated April 30, 2025, to get the offers for interpretation of the satellite data/images received from NRSC/ISRO. After considering the offer submitted by PEC to CPCB, Punjab Engineering College (Deemed to be University), Chandigarh was awarded the consultancy assignment for conducting analysis of satellite imagery to assess the extent of illegal mining, particularly within 1000 meters on both sides of the identified bridge, as per the directions of the Hon'ble NGT in Original Application No. 553 of 2024. The formal work order was issued by CPCB vide letter No. CPCB /RD-CHD /Court Case /229/2022/269 dated 16.06.2025. Thus, Dr. Har Amrit Singh Sandhu (Faculty, Civil Engineering Department, PEC) along with his team submitted this project report on this matter.

1.2 Objectives of the Study

The present study was carried out at the Algran Bridge site, located along the course of the River Swan, near the inter-state border of Ropar (Punjab) and Una (Himachal Pradesh). The main aim of the study was to interpret of the satellite data/images obtained by CPCB from ISRO/NRSC to ascertain the extent/quantum of mining, by demonstrate the effective application of Remote Sensing and GIS techniques in identifying and monitoring illegal sand mining activities in the vicinity of the bridge. This research utilized Landsat imagery along with Google Earth Pro to assess spatio-temporal changes in the mining footprint. The satellite-derived observations were further compared with official records obtained from local administrative and mining departments. Significant deviations and unregulated mining activities were observed within a 1 km buffer zone on either side of the bridge. Apart from the satellite data provided by CPCB, open-source and paid datasets (images, DEMs, etc.) were also used by Punjab Engineering College, for arriving at the conclusion.

2 Methodology

2.1 Overview

Building on the objectives defined for the study in previous chapter the methodology was divided into three parts as:

- Visual approach using satellite images for mining extent
- Conventional volumetric approach for quantum estimates
- Quantum estimation using satellite Digital Elevation Models (DEMs)

2.2 Study Area

The Algran Bridge is located near the village of Algran, connecting Ropar district in Punjab to Una district in Himachal Pradesh. The bridge spans the River Swan, with approximate geographical coordinates ranging from 31°0’15.8’’N to 31°0’35.4’’N latitude and 76°30’12.2’’E to 76°30’45.6’’E longitude as per Survey of India toposheet numbers 53A/3. The bridge sits at an average elevation of 275 meters above mean sea level. The River Swan beneath it maintains variable water depths, typically ranging between 1.2 m in the pre-monsoon season and up to 2.8 m during the monsoon season. The surrounding terrain has a gentle slope towards the southeast. The highest point near the bridge is at 278.5 m reduced level on the northern abutment, while the lowest point is at 272.1 m reduced level along the riverbed beneath the central span.

2.3 Visual Approach

To identify and document suspected unauthorized sand-mining within 1 km upstream and downstream of Algran Bridge, we adopted a multi-temporal, multi-source remote-sensing workflow anchored to the coordinates provided for the site and the bridge closure context (Dec 2023). A 1-km buffer was delineated on both banks around the bridge as shown in figure 2.1. The client-provided coordinates were plotted in Google Earth Pro to create working polygons, which served as masks for subsequent image analysis across multiple dates.

The study used a stack of medium- to very-high-resolution images spanning 2018–2023 from ISRO (Cartosat-2E, LISS-4), Maxar, and Airbus (visible in Google Earth), complemented by Landsat scenes for additional temporal context. These images were georeferenced and visually compared to assess mining activities u/s and d/s of the bridge.

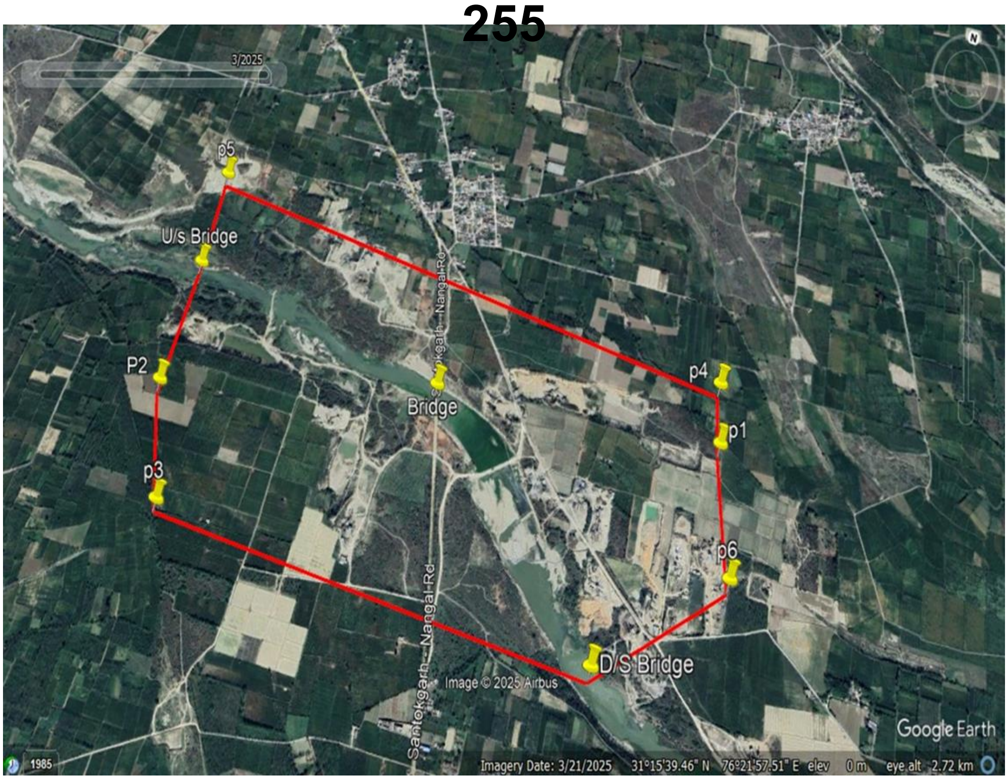

Figure 2.1 Study area 1km u/s and d/s of the bridge

2.4 Conventional Volumetric Approach

The study used a conventional volumetric approach to generate quick, auditable quantity estimates independent of DEM vertical error. Disturbed polygons mapped from imagery are adjusted by a regulatory buffer (e.g., 20% curtailment) and their planform areas are multiplied by assumed uniform excavation depths of 0.5 m, 1.0 m, and 1.5 m to derive volumes; volumes are then converted to tonnage using a bulk density of 2.0 t/m³. These scenario-based estimates bracket likely excavation thicknesses and provide a baseline for comparison with the DEM-differencing.

Following standard practice, we first apply a river-bank curtailment of 20 % to the mapped area to account for protected buffers and operational constraints; the minable area used in calculations is therefore

A_m= 0.8 × 20.7 = 16.56 ha. Bulk density (BD) of sand is taken as 2,000 kg m^{-3}, and three scenario depths are evaluated: 0.5 m, 1.0 m, 1.5 m. The volume for each scenario is calculated using:

$$V = A_m \times d \times 10{,}000 \text{ (m}^3\text{)}$$

and the tonnage is calculated using:

$$T = V \times \text{BD} = V \times 2 \text{ (t)}$$

2.5 Satellite Image (DEM) Based Quantum Estimation

The study delineated multiple polygons - on the upstream and downstream of the bridge, where sand-mining activity is suspected. As images provided by the client for volume quantification were insufficient, open-sourced Digital Elevation Model (DEM) and DEM purchased from National Remote Sensing Centre (NRSC) were procured and used. In this study, DEMs of years 2000, 2013 and 2024 were used to quantify the volume change considering year 2000 for base elevations. The details of DEMs which are used in the study is shown in the table 2.1.

Table 2-1 List of satellite derived elevation datasets

S.No.	Name of DEM	Source	Resolution	Year of Dataset	Availability
1	SRTM DEM	NASA	30m	2000	Open Sourced
2	ASTER DEM	NASA & METI	30m	2013	Open Sourced
3	Carto DEM	ISRO/NRSC	2.5m	2024	Purchased from NRSC/NSIL

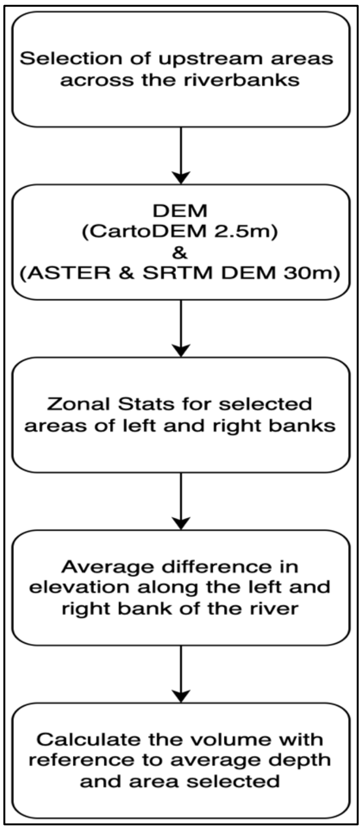

Figure 2.2 Image based quantum estimation methodology

Each DEM was first re-projected to a common datum (WGS 84 / UTM Zone 43N) and clipped to the study area where polygons were created in u/s side. Zonal statistics (mean, minimum, maximum, and standard deviation) were then computed for every DEM within each polygon upstream and downstream. By differencing the mean elevations of successive epochs (2000 → 2013 → 2024), we derived the average vertical change (Δh) on each bank. Multiplying Δh by the corresponding planform area produced volumetric estimates of aggradation or excavation ($\Delta V = \Delta h \times A$). Comparison of the left- and right-bank volumes provided a proxy for net material removal and its asymmetry across the channel, a key driver of potential scour at the bridge piers. To assess the quantum of mining the method adopted is shown in figure 2.2.

As main objective of the study was to ascertain the extent of illegal mining from the satellite images procured by CPCB from NRSC/ISRO, Quantum estimation using satellite Digital Elevation Models (DEMs) was used to ascertain the extent of illegal mining. Moreover, one DEM was purchased from NRSC to refine the results.

3 Results & Analysis

3.1 Overview

This chapter presents an integrated assessment of planform disturbance and bed-level change in the 1-km reach flanking the Algran Bridge using all three approaches.

3.2 Analysis using visual approach

To visually inspect the satellite images the demarcation of visible possible mining activities have been shown in figure 3.1. Further for visual identification the client provided four Cartosat 2E images out of which two images were covering the study area. Other than that, to accomplish the objectives we procured LISS-IV images from NRSC and temporal images of Maxar technology and Airbus were explored using Google Earth Pro. Maxar technology provides high resolution images collected using WorldView satellite constellation while Airbus works on Pléiades Neo satellite constellation.

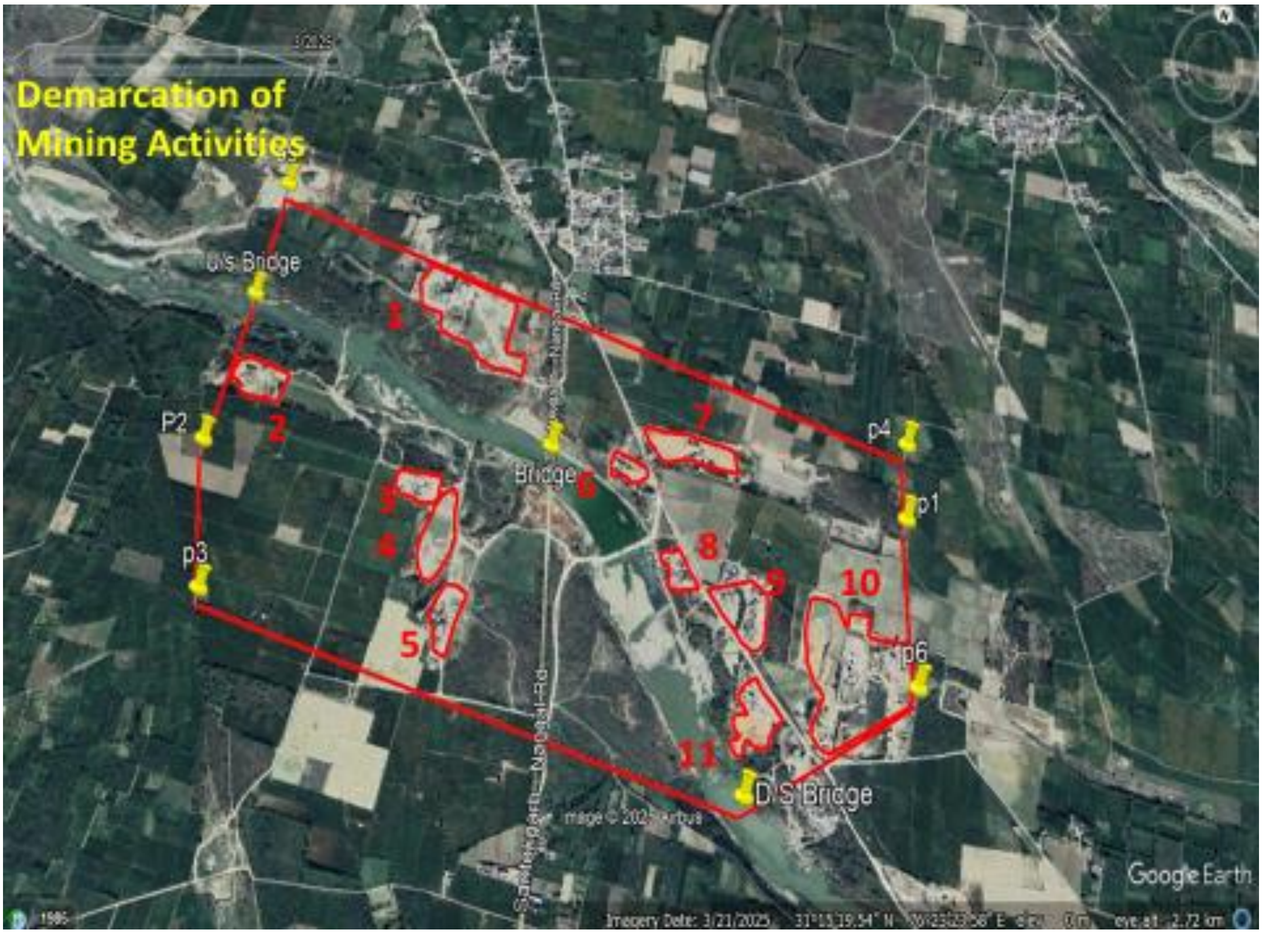

Figure 3.1 Demarcation of mining area using Google Earth image

A multi-temporal remote sensing approach was adopted using satellite imagery from ISRO (Cartosat-2E, LISS4), WorldView, and Pléiades Neo spanning from 2018 to 2023. High-resolution satellite images were analyzed to assess changes in the river morphology, mining activity along the river course, and surrounding landscape modifications. The images were georeferenced and visually compared to detect variations in river channel patterns, sediment deposition, bank erosion, and excavation sites. The focus was on identifying the extent and progression of mining activities along the upstream and downstream sections of the river within a 1 km buffer zone from Algran Bridge. The analysis involved qualitative interpretation of satellite images to track visible changes over time, highlighting the impact of mining on river dynamics and environmental conditions. The details of satellite images have been shown in table 3.1.

Table 3-1 List of Satellite Images with Date of Scene and Sources

S. No	Year	Date of Image	Source	Remarks
1.	2018	February 18	ISRO/Cartosat-2E	Provided by CBCB
2.		August 16	WorldView	Self-Procured
3.		October 14		
4.	2019	October 21	ISRO/LISS4	
5.	2020	-	-	No Image Found
6.	2021	February 05	WorldView	Self-Procured
7.		July 14		
8.	2022	April 13		
9.		May 05	ISRO/Cartosat-2E	Provided by CPCB
10.		November 01	Pléiades Neo	Self-Procured
11.	2023	June 20		

3.2.1 Year 2018

The figure 3.2 shows the river flowing through multiple channels, likely due to the lean flow conditions. The presence of extensive water bodies and vegetation along the riverbanks suggests a relatively undisturbed environment. Further, mining activity along the course of the river is not prominently visible in this image, indicating that large-scale extraction cannot be interpreted. The river appears to maintain a more natural morphology, with minimal signs of human-induced alterations such as bank erosion or excavation pits. The figure 3.3 has been captured during monsoon period of the study area. It is evident from the image that the flow in the river is maximum. The river seems to be shifting towards the right bank. Evidence of mining activity is not evident due to presence of high flow conditions due to monsoon seasons.

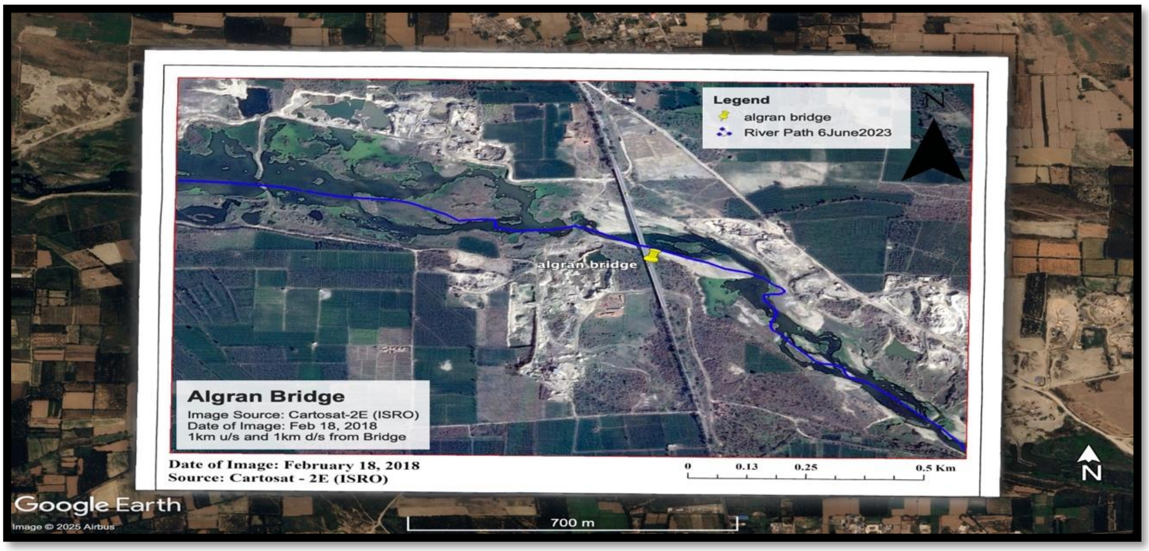

Figure 3.2 February 18, 2018 Satellite Image (Cartosat – 2E)

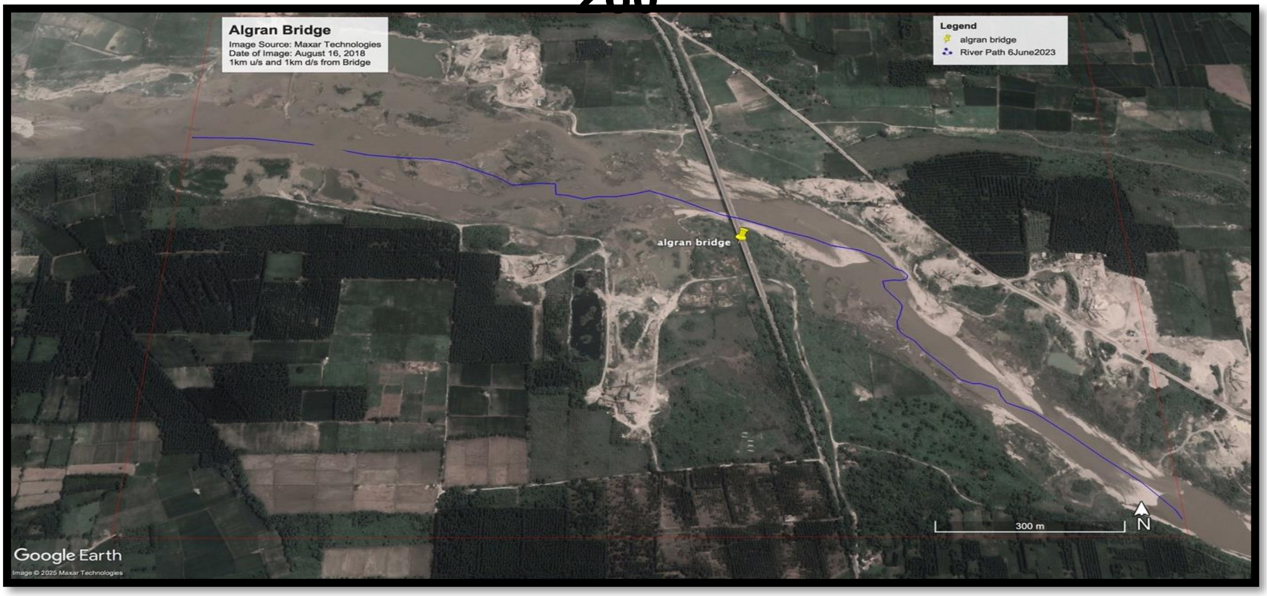

Figure 3.3: August 16, 2018 Satellite Image (WorldView)

The image shown in figure 3.4 has been captured just after the monsoon season in 2018. As evident from the figure 3.4 that water seems to be receding in the river and surrounding areas where excess flow was seen in figure 3.3. Also, it can be inferred from the image that sediments deposits can be seen near the u/s and d/s of the bridge. The river continues to show signs of sedimentation and changes in flow paths.

Figure 3.4 October 14, 2018 Satellite Image (WorldView)

3.2.2 Year 2019

For year 2019 the image has been procured from ISRO which is captured by LISS4 sensor of Resourcesat 2 satellite. The sensor provides an image with a pixel size of 5m x 5m. As the sensor doesn’t have Blue Band so the true color image can’t be created. However, the image shown in figure 3.5 is a False Color Composite in which water can be seen in Blue Color, vegetation in Red Color. Bright colored areas represent stones/sediments/gravel. It is evident from the image that there are dumps of sediments/stones/gravel is visible in a small area in u/s as well as d/s of the bridge. The possible mining activity could not be assessed as the image is medium resolution as well as no pits of water can are visible.

Figure 3.5 Medium Resolution Image Procured from ISRO October 21, 2019

3.2.3 Year 2021

For year 2021, WorldView images for the month February and July were procured for visual examination. The river exhibited a relatively stable flow path with some changes in the width of its channels as shown in Fig 3.6. Mining activity has significantly increased compared to previous years, particularly in downstream of the bridge. Patches of land appear to have been excavated, exposing bare surfaces. Also, it can be seen from the images that there has been ponding alongside river possibly due to creation of pits.

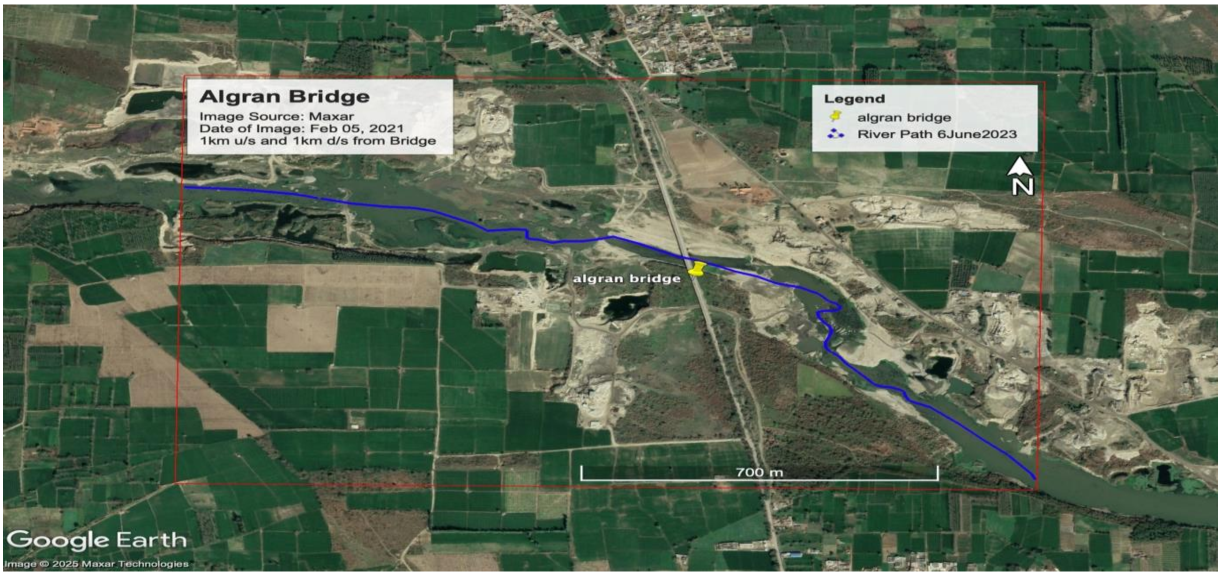

Figure 3.6 February 05, 2021 Satellite Image (WorldView)

The image shown in Figure 3.7 has been captured in July 2021 which is a monsoon season in the region. It is also evident from the muddy water flowing in the river. The natural pits in u/s can be seen filled with muddy water, although in d/s the pits along with the river have been created due to mining activities in the past which were not there in earlier images. Also, the patch of stone/gravel/sediment remains like previous images in u/s of the river close to bridge.

Figure 3.7 July 14, 2021 Satellite Image (WorldView)

3.2.4 Year 2022

For the year 2022 April, May and November month images were used for visual examination. April and November, 2022 images were procured from WorldView and Pléiades Neo while May 2022 image was provided by the client which was captured by Cartosat – 2E satellite.

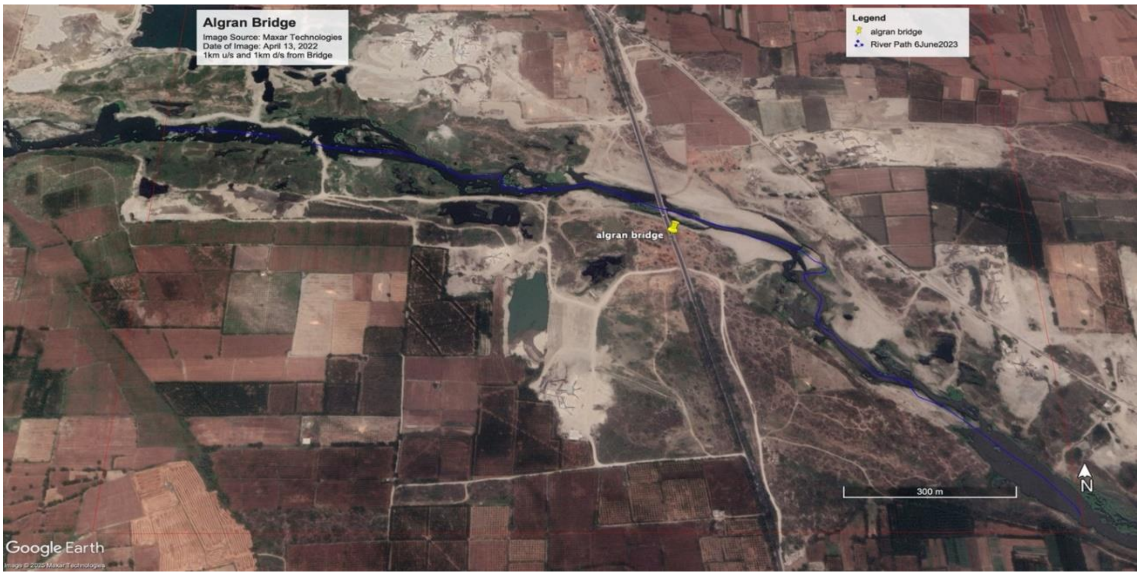

Figure 3.8 April 13, 2022 Satellite Image (WorldView)

Significant land excavation was observed along the upstream and downstream sections of the river as shown in figure 3.8. However, site inspections confirm that the pits on the right side of the upstream area are natural depressions that typically fill with water during the monsoon season. In contrast, large open pits, likely formed due to sand and gravel extraction, are evident along the river course. Mining/Crushers activities have also expanded into adjacent agricultural zones, leading to a noticeable reduction in vegetation cover. The river appears more channelized, with a shift in its course, potentially influenced by both natural processes and human interventions. Increased sediment deposition is visible in certain areas, suggesting that mining activities may be contributing to altered sediment transport dynamics. Additionally, some water-filled pits from earlier years now appear dried up or replaced by land excavation, indicating progressive landscape modifications over time.

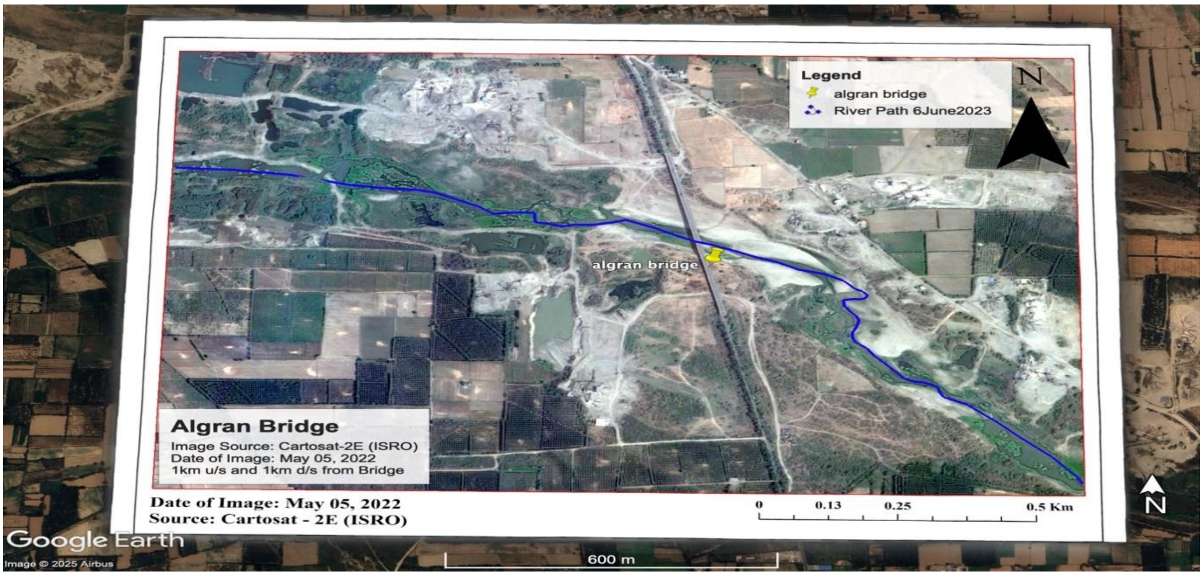

Figure 3.9 May 05, 2022 Satellite Image (Cartosat-2E)

The image shown in figure 3.9 has been captured during summer season which can be seen through the dried areas. The flow in the river is very low which is evident by the width of the river. In the u/s the vegetation cover has been increased, however near to the bridge the sediment/gravel deposits are also evident as seen in previous images. The mining activity is also visible in the d/s as compared to u/s of the bridge. The pits along the banks are also filled with water, but these pits can be seen with vegetation which nullify the mining activity. The mining activity area has expanded significantly, particularly downstream of Algran Bridge, where several land patches have been converted into mining sites. Additional sand and gravel extraction pits are evident near the river in the downstream section, whereas the presence of vegetation along the river course upstream suggests minimal or no mining activity in that area. The river path appears to have straightened in certain sections, likely influenced by ongoing sediment deposition and excavation. Some previously water-filled mining pits now appear shallower, possibly due to sediment infill transported by the river. Additionally, a greater exposure of dry riverbed sections compared to earlier years suggests changes in flow patterns and sediment dynamics over time.

In the image shown in figure 3.10 the river has narrowed in certain sections, likely due to sediment deposition and artificial changes. The mining areas have expanded significantly compared to previous years. Excavation pits are more widespread, especially downstream of Algran Bridge. The exposed sand and gravel deposits indicate ongoing and active extraction. Increased meandering is visible downstream, indicating continuous hydrodynamic adjustments. The riverbanks appear more eroded, suggesting instability caused by reduced vegetation in d/s while in the u/s close to the bridge sediment/gravel deposits can be seen like previous years while vegetated areas are also there in u/s showing the least chances of mining with in the 1km u/s and d/s of the bridge. Some areas that were cultivated in earlier years appear abandoned or disturbed.

Figure 3.10 November 01, 2022 Satellite Image (Pléiades Neo)

3.2.5 Year 2023

For the year 2023 the satellite image was captured by Pléiades Neo for the month of June as shown in figure 3.11. In this the river has narrowed in certain sections, likely due to sediment deposition and artificial changes. The mining areas have expanded significantly compared to previous years. Excavation pits are more widespread, especially downstream of Algran Bridge.

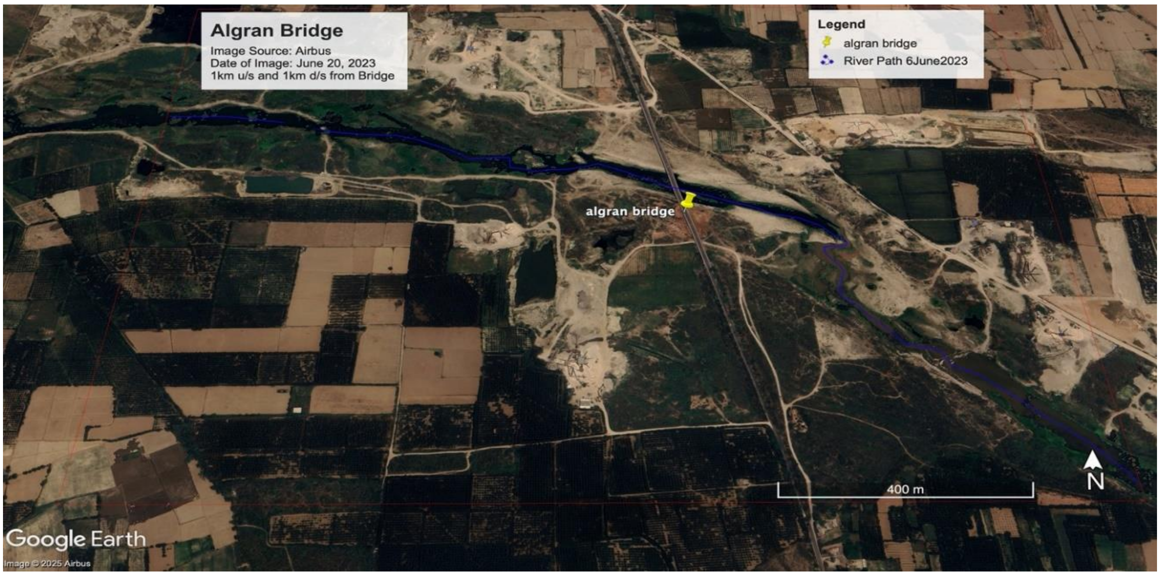

Figure 3.11 June 20, 2023 Satellite Image (Pléiades Neo)

The exposed sand and gravel deposits indicate ongoing and active extraction. Increased meandering is visible downstream, indicating continuous hydrodynamic adjustments. The riverbanks appear more eroded, suggesting instability caused by reduced vegetation in d/s while in the u/s close to the bridge sediment/gravel deposits can be seen like previous years while vegetated areas are also there in u/s showing the least chances of mining with in the 1km u/s and d/s of the bridge. Some areas that were cultivated in earlier years appear abandoned or disturbed.

3.3 Summary from visual approach

Mining activities have intensified over time, particularly downstream of Algran Bridge, leading to notable changes in the river's morphology, including channel migration, narrowing, sediment accumulation, and bank erosion. In contrast, upstream areas exhibit minimal mining activity, with vegetation cover serving as a natural protective barrier. Downstream sections have experienced an increase in mining pits and excavation areas, resulting in the conversion of agricultural land. Seasonal variations further influence the river's characteristics, with monsoon periods filling natural pits upstream and drier months exposing excavation sites shown in figure 3.14 – 3.16. These observations highlight the significant transformation of the river system driven by human activities, particularly mining/crushers, alongside natural sedimentation processes.

Figure 3.12 Obstruction of flow seen on the river during site visit

Also, flow obstruction was evident from satellite images as well as field visits. Images shown in figure 3.12 and 3.13 shows the flow obstruction in the u/s and d/s of the bridge.

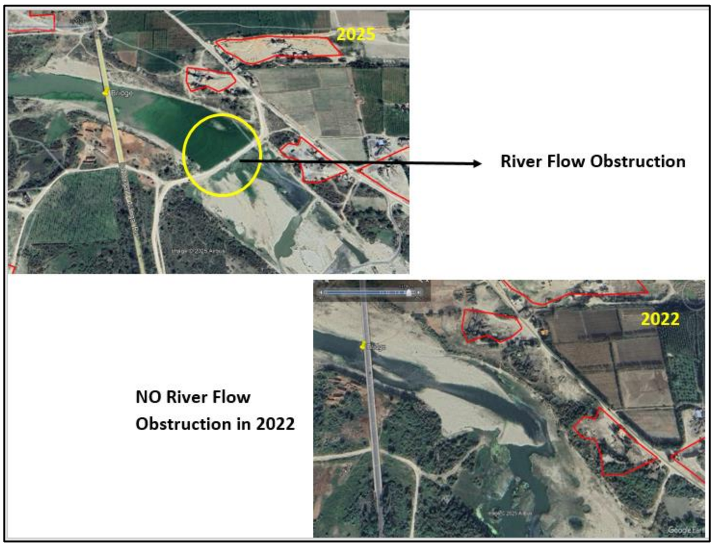

Figure 3.13 Obstruction in River flow in 2025

Figure 3.14 Time Series of images Showing formation of pits with time

Figure 3.15 Time Series of images showing expansion mining activities

Figure 3.16: Time series of images showing expansion of mining activities

3.4 Analysis using conventional volumetric approach

The study also estimated quantities using a conventional plan-area × depth method that is independent of DEM vertical uncertainties. Disturbed polygons mapped from imagery are adjusted by the agreed bank curtailment (e.g., 20%), and volumes are computed for uniform depths of 0.5 m, 1.0 m, and 1.5 m; tonnage follows by applying a bulk density of 2.0 t/m³. These scenario totals provide a quick, auditable baseline that we later cross-check against the uncertainty-aware DEM-based estimates.

Signatures of active or disturbed land surfaces, indicative of illegal mining, were observed within approximately 1 km on both sides of the Algran bridge. Furthermore, the area of these identified polygons was calculated in Google Earth Pro using its measurement tools, allowing precise quantification of the extent of illegal mining activities as shown in figure 3.17. Also, the area of the polygons has been shown in table – 3.2.

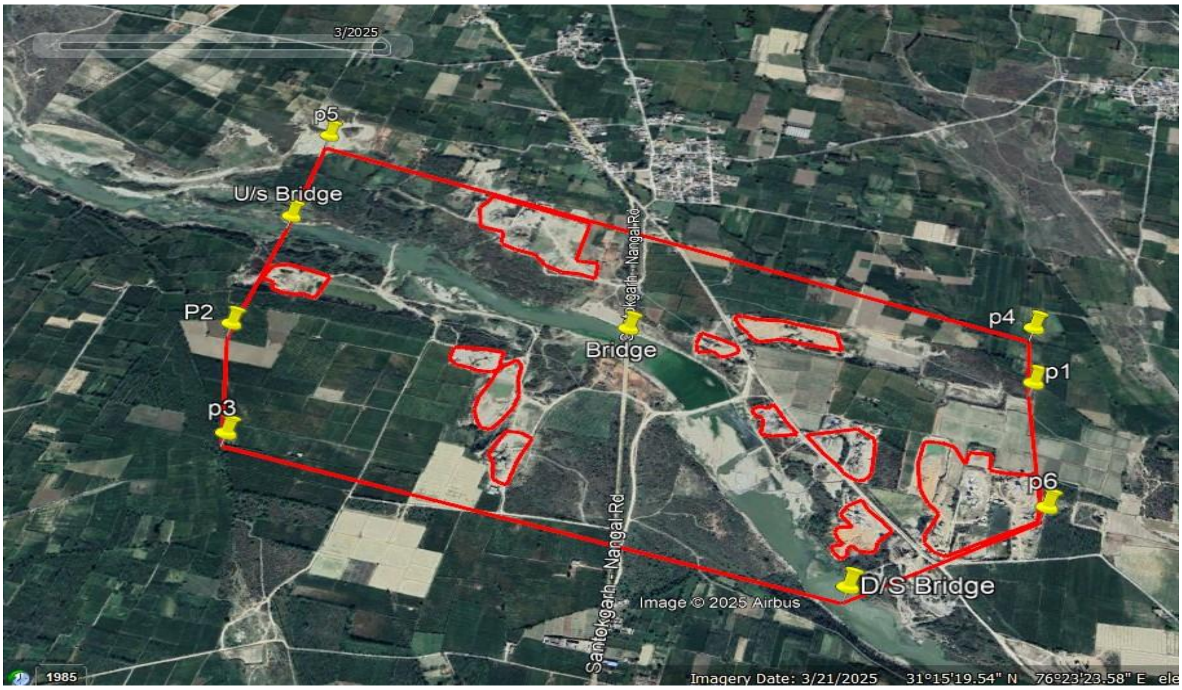

Figure 3.17 Mining pits used for conventional approach

Table 3-2 Polygons and their respective area

Polygon	Area (Hectares)	Polygon	Area (Hectares)	Polygon	Area (Hectares)
1	4.89	5	0.9	9	1.52
2	1.28	6	0.5	10	6.1
3	0.78	7	1.53	11	1.18
4	1.46	8	0.56		
Total	**20.7 Hectares**				

After delineating the affected areas using satellite imagery and Google Earth Pro, the surface area of each mining site was calculated. To derive the volume of sand removed, average excavation depths of 0.5 m, 1.0 m, and 1.5 m were assumed based on typical mining practices and field observations in similar regions. The estimated volume for each site was then computed by multiplying the measured area by each of these assumed depths. Based on a bulk density conversion to weight, the corresponding quantities of extracted sand were calculated as approximately 16,560 metric tons for a 0.5 m depth, 33,120 metric tons for a 1.0 m depth, and 49,680 metric tons for a 1.5 m depth, respectively. The calculations are shown in table 3.3 to 3.5.

3.4.1 Assuming Depth of Mining – 0.5m

Table 3-3 Determination of Quantities of minerals taking an average depth of 0.5m

S. no	Nature of Land	Study Area in Ha	Total proved geological reserves MT= Area x Depth x BD (A)	20% blocked in river bank Area in Ha	Blocked geological Reserve (B)	Total Minable Reserves (A) – (B) = (C)	Minable Reserve per year (Estimate in Metric Tonne)
1	River Bed	20.7	20700	4.14	4140	16560	16560

Assumptions: Depth – 0.5 m, Bulk density of sand – 2000kg/m3, Curtailment – 20 %

3.4.2 Assuming Depth of Mining – 1.0m

Table 3-4: Determination of Quantities of minerals taking an average depth of 1m

S. no	Nature of Land	Study Area in Ha	Total proved geological reserves MT= Area x Depth x BD (A)	20% blocked in river bank Area in Ha	Blocked geological Reserve (B)	Total Minable Reserves (A) – (B) = (C)	Minable Reserve per year (Rough Estimate in Metric Tonne)
1	River Bed	20.7	41400	4.14	8280	33120	33120

Assumptions: Depth – 1m, Bulk density of sand – 2000kg/m3, Curtailment – 20 %

3.4.3 Assuming Depth of Mining – 1.5 m

Table 3-5: Determination of Quantities of minerals taking an average depth of 1.5m

S. no	Nature of Land	Study Area in Ha	Total proved geological reserves MT= Area x Depth x BD (A)	20% blocked in river bank Area in Ha	Blocked geological Reserve (B)	Total Minable Reserves (A) – (B) = (C)	Minable Reserve per year (Rough Estimate in Metric Tonne)
1	River Bed	20.7	62100	4.14	12420	49680	49680

Assumptions: Depth – 1.5 m, Bulk density of sand – 2000kg/m3, Curtailment – 20 %

3.5 Analysis using satellite-based elevation (DEM) datasets

To assess the effect of mining, the area was selected on the left and right bank in the upstream (u/s) and possible locations in downstream area of the bridge. Figure 3.18 shows the elevation datasets from SRTM satellite for year 2000 with area selected along upstream and downstream, while figure 3.19 shows the elevation datasets from ASTER satellite for year 2013. Furthermore, image shown in figure 3.20 shows the elevation data of CartoDEM purchased from NRSC for the year 2024. As there was unavailability of elevation data for year 2018, hence elevation data for the year of 2000 was considered as base year and quantum was estimated based on the change in elevation from year 2000, 2013 and 2024.

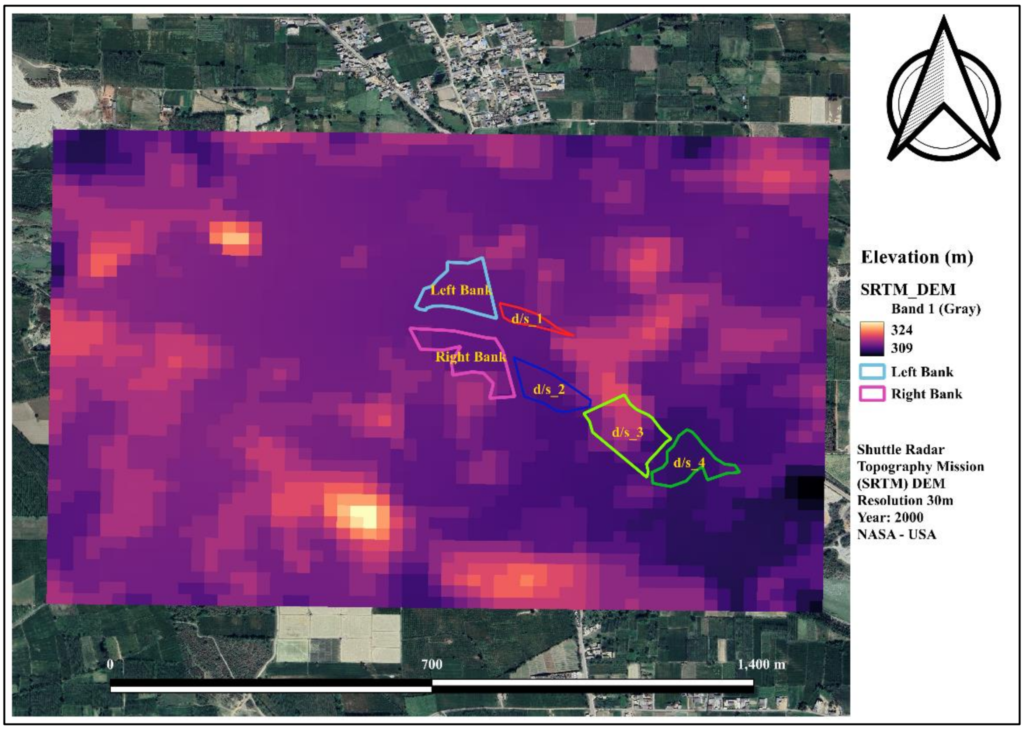

Figure 3.18 SRTM DEM along with left and right bank areas

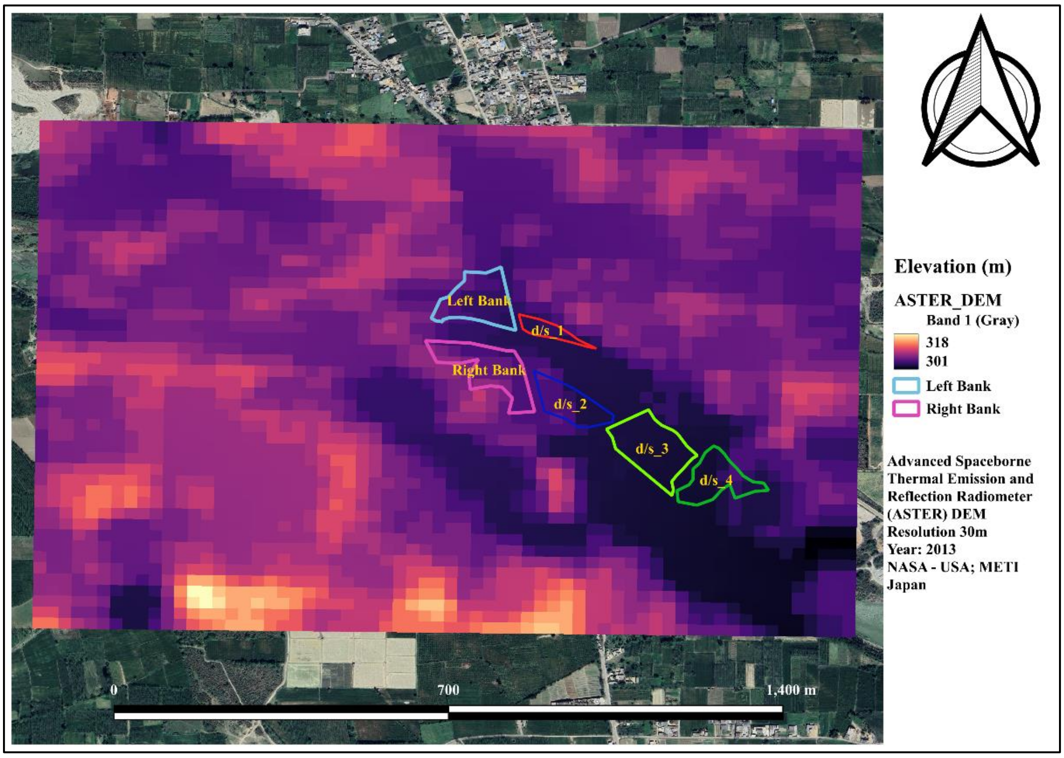

Figure 3.19 ASTER DEM along with left and right bank areas

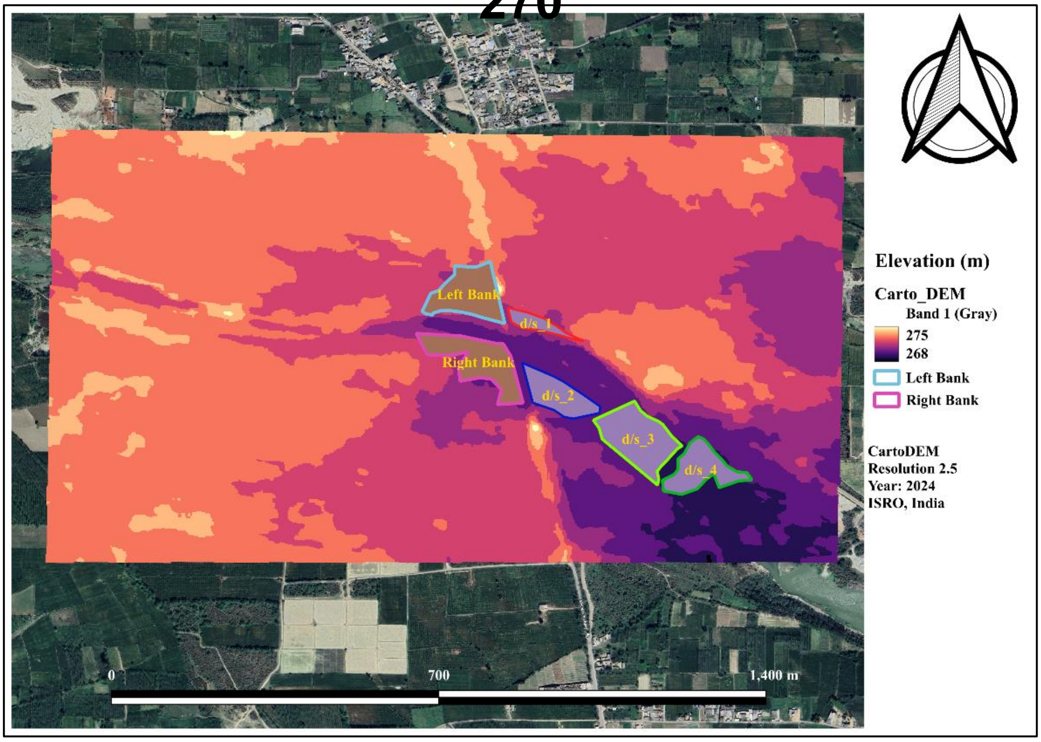

Figure 3.20 CartoDEM along with left and right banks areas

3.5.1 Results, Uncertainty-Aware Quantum Estimation

We report uncertainty-aware quantum estimates derived from inter-epoch DEM differencing. For upstream, downstream and period, the mean elevation change (Δh) is converted to volume (ΔV = Δh × A) and 1-σ bounds are propagated from DEM vertical errors (SRTM ±5 m, ASTER ±7 m, CartoDEM ±1 m); Table 3.6 lists the point estimates and their confidence ranges.

Table 3-6 Comparative analysis of elevation images for quantum assessment on upstream of the bridge

Bank	Epoch	Mean Elevation (m)	Δh (m)†	σΔh (m)‡	ΔV (×10³ m³)§	σΔV (×10³ m³)‖
Left(15 436 m²)	2000 (SRTM)	313.60	–	–	–	–
	2013 (ASTER)	304.65	**– 8.95**	8.60	–138	±133
	2024 (CartoDEM)	271.58	**– 33.07**	7.07	–510	±109
	2000 → 2024	–	**– 42.02**	5.10	**–649**	± 79
Right(17 230 m²)	2000 (SRTM)	313.54	–	–	–	–
	2013 (ASTER)	305.99	**– 7.55**	8.60	–130	±148
	2024 (CartoDEM)	270.48	**– 35.50**	7.07	–612	±122
	2000 → 2024	–	**– 43.06**	5.10	**–742**	± 88

† Δh = elevation change relative to the preceding epoch (negative = lowering).
‡ $\sigma\Delta h = \sqrt{\sigma_1^2 + \sigma_2^2}$; adopted 1-σ vertical errors: SRTM ±5 m, ASTER ±7 m, CartoDEM ±1 m.
§ ΔV = Δh × planform area; negative = material removed. Volumes are rounded to the nearest

1000m^3.

‖ $\sigma\Delta V = \sigma\Delta h \times$ area (propagated 1-σ uncertainty).

Table 3-7 Comparative analysis of elevation images for quantum assessment on downstream of the bridge

Patch	Epoch	Mean Elevation *(m)*	Δh *(m)†*	σΔh *(m)‡*	ΔV *(×10^3 m^3)§*	σΔV *(×10^3 m^3)‖*
d/s_1 (3,993 m^2)	2000 (SRTM)	313.49	–	–	–	–
	2013 (ASTER)	303.69	**− 9.81**	8.6	**− 39**	± 34
	2024 (CartoDEM)	271.16	**− 32.53**	7.07	**− 130**	± 28
	2000 → 2024	–	**− 42.33**	5.1	**− 169**	± 20
d/s_2 (10,997 m^2)	2000 (SRTM)	313.13	–	–	–	–
	2013 (ASTER)	304.12	**− 9.01**	8.6	**− 99**	± 95
	2024 (CartoDEM)	270.05	**− 34.07**	7.07	**− 375**	± 78
	2000 → 2024	–	**− 43.08**	5.1	**− 474**	± 56
d/s_3 (18,801.9 m^2)	2000 (SRTM)	314.62	–	–	–	–
	2013 (ASTER)	302.82	**− 11.80**	8.6	**− 222**	± 162
	2024 (CartoDEM)	269.67	**− 33.16**	7.07	**− 623**	± 133
	2000 → 2024	–	**− 44.95**	5.1	**− 845**	± 96
d/s_4 (12,427 m^2)	2000 (SRTM)	311.86	–	–	–	–
	2013 (ASTER)	303.1	**− 8.76**	8.6	**− 109**	± 107
	2024 (CartoDEM)	269.1	**− 34.00**	7.07	**− 423**	± 88
	2000 → 2024	–	**− 42.76**	5.1	**− 531**	± 63

3.5.1.1 Magnitude and timing of incision (2000 → 2013)

Apparent lowering is small-to-moderate and near the noise floor.

a) Upstream: ~0.27 ± 0.20 million m^3 (Left 0.138 ± 0.133; Right 0.130 ± 0.148).

b) Downstream: ~0.47 ± 0.22 million m^3.

c) Total (both sides): ≈ 0.74 ± 0.30 million m^3, i.e., ~56.7 ± 22.7 thousand m^3 yr^{-1}.

Because the uncertainties overlap zero, this early-period extraction-equivalent signal cannot be confirmed with high confidence from SRTM–ASTER alone.

3.5.1.2 Magnitude and timing of incision (2013 → 2024)

Incision accelerates and clearly exceeds uncertainty.

a) Upstream: ~1.12 ± 0.16 million m^3 (Left 0.510 ± 0.109; Right 0.612 ± 0.122).

b) Downstream: ~1.55 ± 0.18 million m^3.

c) Total (both sides): ≈ 2.67 ± 0.24 million m^3, i.e., ~242 ± 22 thousand m^3 yr^{-1}.

The right bank/u/s shows ~0.10 million m³ more loss than the left, indicating asymmetry that is consistent with either uneven extraction or lateral channel migration.

3.5.1.3 Cumulative (2000 → 2024)

a) Upstream: ≈ 1.39 ± 0.12 million m³ (bed levels ↓ ~42–43 m).

b) Downstream: ≈ 2.02 ± 0.13 million m³.

c) Total (both sides): ≈ 3.41 ± 0.18 million m³ removed within the mapped areas; the area-weighted mean bed-level drop is ~43 m. This evidence suggests an order of magnitude larger than the propagated DEM error and is therefore high-confidence.

3.5.1.4 Implications for bridge stability

The pronounced post-2013 incision, especially on the right bank, is likely to have:

a) Raised local flow depths and velocities during floods, intensifying scour potential at the downstream bridge piers.

b) Shifted the thalweg toward the right bank, concentrating hydraulic attack and inducing differential pier settlement or exposure.

c) Reduced overbank storage, increasing the stage-discharge curve and shortening flood rise times—both detrimental to bridge resilience.

3.6 Key Findings

i. Substantial bed-level departure from 2001 design datum

The bridge drawings (Jan 2001) cite a design bed level of 310.50 m and a low-water level of 311.00 m. DEM differencing indicates that the contemporary mean elevations within the analysed polygons are now near 271 m (CartoDEM 2024). Even allowing for vertical-datum inconsistencies and DEM error (±5–7 m for SRTM/ASTER, ±1 m for CartoDEM), the data point to a multi-decadal lowering on the order of several tens of metres relative to the plan reference.

ii. Magnitude of change exceeds combined DEM uncertainty, but causation remains indeterminate

Upstream, the cumulative elevation drops are ≈ 42 m on the left bank and ≈ 43 m on the right—about 6–8 times larger than the propagated 1-σ DEM error for 2000→2024 (≈ 5.1 m), confirming a real morphological adjustment. A comparable signal is observed downstream: across selected patches (d/s_1–d/s_4) the cumulative lowering ranges from ≈42.3–45.0 m (area-weighted mean ≈ 43.7 m), again roughly 8 times the 1-σ error, and equivalent to a substantial volumetric deficit within the mapped polygons.

Despite the magnitude, the DEM analysis does not isolate the driver. Plausible contributors include (i) episodic flood scour with incomplete post-flood recovery, (ii) progressive channel migration or avulsion, (iii) long-term sediment-supply imbalance, and (iv) localized anthropogenic extraction. Without time-stamped field surveys, discharge records, and verified mining/permit logs, none of these mechanisms—upstream or downstream - can be ruled in or out.

iii. Bank-to-bank asymmetry points to spatially selective processes.

The right bank shows slightly greater recent lowering (~1 m more than the left between 2013 and 2024). Such asymmetry may arise from hydraulic skew caused by meander dynamics, differential sediment calibre, or spatially uneven human intervention. The present evidence does not permit a definitive assignment to any single factor.

iv. Potential implications for bridge safety warrant further investigation regardless of cause.

If the present elevations are confirmed, the riverbed now lies well below the original well-cap top level (311 m) and even the recorded M.S.L. for pier (303.49 m). Whether this lowering stems from natural scour or extraction, it could reduce the effective embedment of foundations and increase vulnerability during high flows. Independent bathymetric, geodetic and geotechnical checks are therefore recommended.

4 Conclusions

4.1 Overall Findings:

This study is conducted around the Algran Bridge, located on the River Swan at the Punjab-Himachal Pradesh border. The primary objective was to evaluate the extent and impact of illegal sand mining activities within a 1 km radius upstream and downstream of the bridge, utilising high-resolution satellite imagery (2018–2023) provided by the National Remote Sensing Centre (NRSC). The key findings of the study are as follows:

- **Evidence of Increased Unauthorized Sand Extraction**: Temporal analysis of satellite imagery and Digital Elevation Models (DEMs) reveals significant expansion of mining pits, reduction in vegetation cover, and landscape alterations, particularly downstream of the Algran Bridge. These changes indicate sustained and spatially concentrated anthropogenic activities over the study period.
- **Field Verification**: Ground surveys corroborate the patterns observed in satellite imagery, confirming the presence of mining and crusher activities consistent with the remote sensing data.
- **Quantification of Material Extraction:** Volumetric analysis, employing DEM differencing, indicates substantial material removal within 1 km on both sides of the bridge—about 3.41 ± 0.18 million m^3 cumulatively (2000→2024). Expressed year-wise (annualised) from the available epochs: 2000–2013 ≈ 57 ± 23 thousand m^3/yr (Upstream ≈ 21 ± 15, Downstream ≈ 36 ± 17), and 2013–2024 ≈ 242 ± 22 thousand m^3/yr (Upstream ≈ 102 ± 15, Downstream ≈ 141 ± 16). These figures are "extraction-equivalent" volumes derived from mean bed-level change (Δh) × area with 1-σ errors propagated from DEM vertical accuracies (SRTM ±5 m, ASTER ±7 m, CartoDEM ±1 m).
- ***Limitations/caveats**: DEMs capture morphological lowering, not cause; early-period changes (2000–2013) are near the uncertainty floor; resolution/datum differences and possible wet-surface biases remain. Therefore, classification as illegal requires corroboration with the visual time-series mapping and permit/inspection records.
- **Asymmetric Material Removal**: The right bank of the river exhibits slightly higher material extraction, likely attributable to mining or crusher activities, potentially exacerbated by lateral river migration influenced by human intervention.
- **Riverbed Lowering and Structural Concerns:** Comparison of the current riverbed level with the bridge's original design level reveals a significant lowering of approximately 40 meters in certain areas. This morphological change raises critical concerns regarding the stability of the bridge, particularly during high-flow events, necessitating urgent geotechnical assessment of the foundation conditions.

4.2 Recommendations

In alignment with the objectives outlined by the CPCB, this study has meticulously analyzed the specified coordinates and timelines, interpreted satellite imagery to identify illegal mining activities, and quantified extraction volumes using spatial and volumetric methodologies. Based on these findings, the following recommendations are proposed:

- Conduct a detailed investigation into the impacts of existing crusher operations.
- Implement periodic remote sensing-based monitoring to track ongoing activities.
- Perform a comprehensive safety audit of the Algran Bridge structure to assess its stability.
- Establish GIS-based regulatory frameworks to promote sustainable riverine management and mitigate further environmental degradation.

Appendix-I (DEM Procurement from NRSC/NSIL)

Digital Elevation Model procured from ISRO dated March 2024 provides the elevation dataset corresponding to study area for volume calculation. As there was unavailability of the elevation data for year 2018-2023 hence it was difficult to compare the volumetric difference for the upstream of the bridge. In this regard we considered open sourced DEMs available for the area ranging from year 2000 to 2013. Year 2000 DEM was considered as base elevation source for comparing the volumetric difference.

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ORDER DETAILS

OrderNO:64419
OrderDate:30-Jun-2025
OrderValue:7422

TO
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ItemNo	Sat-Sen	DateofImaging	Scene-Spec	Product Code	ItemCost	IGST	CGST	SGST	DispatchMode
1-1	P5-PAN	20-MAR-2024		G4GC006TD	7422.2	1132.2	0	0	FTP

Appendix-II (Site Visit Photos)


vivo V20 Pro


vivo V20 Pro

Report prepared by:

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केन्द्रीय प्रदूषण नियंत्रण बोर्ड
क्षेत्रीय निदेशालय, चण्डीगढ़
Central Pollution Control Board
Regional Directorate, Chandigarh
(पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, भारत सरकार)
(MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, GOVT. OF INDIA)

LiFE Lifestyle for Environment

No. CM-13011/133/2024/NGT/26-10/SPL-1

October 26, 2025

To,

Member Secretary.
Punjab Pollution Control Board,
Vatavaran Bhawan, Nabha Road.
Patiala, Punjab

Subject: Ensure compliance in the NGT matter of Original Application No. 553/2024; News item titled "From Ropar to Hoshiarpur via HP: 30-km detour as illegal mining damages bridge" appearing in The Indian Express dated 10.04.2024.

Sir,

This has reference to Hon'ble NGT Order dated 28/08/2024, whereby CPCB was directed by Hon'ble NGT to obtain the satellite images of the stretch concerned of last 5 years, excluding the monsoon period, analyses them and ascertain the extent of illegal sand mining specially 1000 meter both side of the bridge which was damaged in July 2023. In compliance to the above directions of Hon'ble NGT, CPCB obtained the available satellite data for the last five years from NRSC/ISRO.

Further, in compliance to the orders of Hon'ble NGT dated 27/03/2025, CPCB got the satellite imagery obtained from NRSC/ISRO interpreted from the Punjab Engineering College, to ascertain the extent of illegal sand mining. The overall findings of the Punjab Engineering College (PEC) with regard to extent of illegal mining done based on the interpretation of the satellite imagery procured from NRSC/ISRO by CPCB and the additional data collected by the PEC Team, are as follows:

i. **Evidence of Increased Unauthorized Sand Extraction:** Temporal analysis of satellite imagery and Digital Elevation Models (DEMs) *reveals significant expansion of mining pits, reduction in vegetation cover, and landscape alterations, particularly downstream of the Algran Bridge. These changes indicate sustained and spatially concentrated anthropogenic activities over the study period.*

ii. **Field Verification**: Ground surveys corroborate the patterns observed in satellite imagery, confirming the presence of mining and crusher activities consistent with the remote sensing data.

iii. **Quantification of Material Extraction:** Volumetric analysis, employing DEM differencing, *indicates substantial material removal within 1 km on both sides of the bridge—about 3.41 ± 0.18 million m^3 cumulatively (2000→2024).* Expressed year-wise (annualised) from the available epochs: 2000–2013 $\approx 57 \pm 23$ thousand m^3/yr (Upstream $\approx 21 \pm 15$, Downstream $\approx 36 \pm 17$), and 2013–2024 $\approx 242 \pm 22$ thousand m^3/yr (Upstream $\approx 102 \pm 15$, Downstream $\approx 141 \pm 16$). These figures are "extraction-equivalent" volumes derived from mean bed-level change (Δh) × area with 1-σ errors propagated from DEM vertical accuracies (SRTM ±5 m, ASTER ±7 m, Carto DEM ±1 m).

iv. **Limitations/caveats:** DEMs capture morphological lowering, not cause; early-period changes (2000–2013) are near the uncertainty floor; resolution/datum differences and possible wet-surface biases remain. Therefore, classification as illegal requires corroboration with the visual time-series mapping and permit/inspection records.

v. **Asymmetric Material Removal**: The *right bank of the river exhibits slightly higher material extraction, likely attributable to mining or crusher activities, potentially exacerbated by lateral river migration influenced by human intervention.*

vi. **Riverbed Lowering and Structural Concerns:** Comparison of *the current riverbed level with the bridge's original design level reveals a significant lowering of approximately 40 meters in certain areas*. This morphological change raises critical concerns regarding the stability of the bridge, particularly during high-flow events, necessitating urgent geotechnical assessment of the foundation conditions.

The detailed report submitted by Punjab Engineering College (PEC) including its findings and recommendations is attached as **Annexure-1.**

Looking into the seriousness of the matter, Punjab Pollution Control Board is hereby requested to refer to the findings and recommendations made by Punjab Engineering College (PEC) and co-ordinate with concerned departments including Department of Mining and Department of Water Resources for:

i) Identifying and taking action against the persons responsible for illegal extraction of sand from river bed in the area.

ii) Taking remedial action considering the approved DSR of the District Ropar and as per Sustainable Sand Mining Management Guidelines, 2016 and Enforcement & Monitoring Guidelines for Sand Mining, 2020 of Ministry of Environment, Forests and Climate Change (MoEF&CC), to prevent recurrence of such incidents of illegal extraction of sand in the area.

iii) The Action Taken Report (ATR) on the above points on the above points shall be provided by PPCB to CPCB, from time to time.

Yours faithfully.

26/10/25

(Dr. Narender Sharma)
Regional Director

Encl: as above.

Copy to:

1. PS to MS, CPCB Head Office, Delhi : for kind information of Member Secretary please.
2. Divisional Head, IPC-II, CPCB HO, Delhi : for information please.
3. Divisional Head, Law, CPCB HO, Delhi : for information please.

26/10/25

(Regional Director)