



REPORT

ON



Assessment of extractable river bed material from
river Dabka for the year 2021-22

FOR

**Uttarakhand Forest Development Corporation (UKFDC),
Ramnagar, Nainital (Uttarakhand)**



BY

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ICAR-Indian Institute of Soil and Water Conservation,
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
218, KAULAGARH ROAD, DEHRADUN-248 195 (UTTARAKHAND)
(December, 2021)



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Executive Summary

A study on consultancy basis was undertaken by ICAR-IISWC (formerly CSWCRTI), Dehradun during 2020 entitled "Assessment of extractable river bed material from river Dabka for the year 2021-22" for the UKFDC, Ramnagar, Nainital (Uttarakhand). The study area was river Dabka downstream to the bridge on Ramnagar – Haldwani highway about 06 km from Ramnagar under jurisdiction of RM, UKFDC covering a length of 06 km. The area was critically examined for the entire length and the cross-sections were taken at the locations mentioned in the Fig. 2. However the survey was carried out for the length of 5.56 km as rest of the area does not have sufficient material for extraction. *Remaining area of the river is partly exposed with the Clay strata and hence suggested to exclude this length of the defined river reach.*

Based on the survey conducted and volume calculation for permissible extraction of deposited RBM is worked out as **167769.99cum**. It is also suggested that for estimation of RBM in the following year, a reassessment study will be required to be conducted during the post monsoon period.

It is recommended to confine the extraction of RBM from middle half of the river width in order to channelize the flow and for protecting the adjoining land from flood damages. The various depths of cut at different distance from the bank of the river have been mentioned in Table 2, which is strictly required to be followed for safe passage of river flow.

Hence, it is strongly recommended that extraction of RBM should be undertaken in a scientific and regulated manner by marking the extraction boundaries in order to improve the safe passage of flow and protect the adjoining river ecosystem.

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Assessment of extractable river bed material from river Dabka for the year 2021-2022

Introduction

The mountain Rivers of Himalayas bring down huge quantity of sediment (sand, bajri, gravel and stones) from hilly catchments while flowing with high velocity on steep slopes. The riverbed material (RBM) rolls over the surface and is deposited while coming to the foothills with mild slopes due to reduction in flow velocity.

The RBM deposited on the river bed in the form of mounds/islands causes braiding of flow (i.e flowing through several streams instead of confined one) and meandering of the river course. This process continues and the river erodes adjoining lands thus increasing the total width of the river, though the required width for actual flow is much less. Further, the encroachment of river along the banks damages valuable property, agricultural lands and forests during the monsoon period.

The extraction/removal of this erratic deposited material, therefore, needs to be done periodically from the river bed in order to channelize the flow and consequently prevent bank erosion and flood damages along the banks.

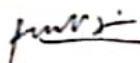
On request from UKFDC, Ramnagar, Nainital (Uttarakhand) consultancy project was undertaken by IISWC (formerly CSWCRTI), Dehradun to conduct a study on river Dabka with following objectives

Objectives

1. Study the morphological profile (Cross section) of river Dabka for defined river reach.
2. Estimation of permissible limit of extraction of river bed material to improve the river flow.

River Dabka

The river Dabka originates (29°28'46"N & 79°20'14"E) from the hills of Nainital district of Uttarakhand and flows down to the foothills near Ramnagar, district Nainital (Fig. 1) The river carries with it sediment/river bed material (RBM) consisting of sand, bajri, gravel and stones during every monsoon season.



Extraction of RBM in river Dabka:

The Study Area

The study area is located at river Dabka, under jurisdiction of UKFDC, Ramnagar, district Nainital, Uttarakhand (Fig.1). River Dabka is about 6 km away from Ramnagar crossing the Ramnagar – Haldwani highway. The river reach under study is in the downstream of the road bridge.

Methodology

A team from ICAR-IISWC, Dehradun consisting of Dr. P.R. Ojasvi, Pr. Scientist & Head (H&E), Er. S.K. Sharma, Chief Technical Officer, Shri H.S. Bhatia, Technical Officer, and Er. Amit Chauhan, Senior Technical Officer analyzed the data and studied the project site. The site was visited for pre & Post Monsoon survey on 12-13 July & 10-11 Nov, 2021 with of DLM, Dabka and other staff of UKFDC.

The starting point of the survey was river bed downstream of the bridge on highway and thereafter river reach downstream up to 06 km. One km length from the bridge was left out of survey as no extraction is permitted from this zone in view of the safety of bridge. The elevations at different points along cross-sections at different locations were recorded and analyzed. The average slope of the river under extraction zone is 0.76 percent and undulated in nature Fig.3.

To protect the land adjoining the river banks 25 per cent of the river bed width along each bank of river would be left undisturbed for extraction. Therefore, volume of extractable sediment within the middle 50 per cent of river width was worked out based on the average width of the segment and required shape for safe passage of flow.

Analysis, Results and Recommendations

1. The cross-sections of river Dabka at different locations are shown in Fig. 4. It is seen from the cross-sections that a small amount of sediment deposits are occurring in the middle portion of the river (shown by hatched portion between $M_R - M_L$). Thus, it is suggested that these deposits may be removed in order to channelize the river flow.

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2. The permissible quantity of RBM that can be extracted in different segments of the river is shown in Table 1. The estimated total scientifically extractable material is m^3 as shown in Table 1.
3. The recommended depths in respect of different locations as mentioned in Table 2 should be strictly monitored during extraction of RBM.
4. The remaining area under lower reach of the river defined for the extraction feeding area of Baithkadi gate has been excluded from the survey keeping in view the negligible quantity of RBM deposition and may be suspended for extraction.
5. It is observed that rainfall in this region and therefore discharge of river in the past few years has reduced. Therefore, the quantity of RBM deposition in this reach of the river is reducing over the years and is not able to fill the river reach under study/ proposed extraction of RBM.. It is, therefore, suggested that extraction of RBM in this river reach may be temporarily suspended for the period, till the sufficient quantum of RBM is deposited and restoring the natural river bed profile. Follow-up study has to be conducted at appropriated time for the remaining area to ensure the rejuvenation of river morphological profile river
6. Suitable river training measures need to be taken for prevention of bank erosion and protection of adjoining lands from flood damages.

Acknowledgements

The project team is grateful to, Director, IISWC, Dehradun for approving this project and providing necessary support and facilities.

The team is thankful to Regional Manager, Kumanu Region for sponsoring this project and providing all help and facilities for timely completion of this study. The logistics and field assistance provided by the officers and staff of Uttarakhand Forest Corporation is thankfully acknowledged.

The help rendered by the Division of Hydrology & Engineering officers and staff on preparation of the project report is duly acknowledged.



(P.R. Ojasvi)
Project Leader
ICAR-IISWC,
Dehradun (Uttarakhand)

(Dr P. R. Ojasvi)
Head (Hydrology & Engineering)
ICAR-Indian Institute of Soil
& Water Conservation
Dehradun-248195 (Uttarakhand)

Table 1: Estimation of the extractable RBM for the marked river reach of Dabka River.

Location	Length Segment (m)	Width of the river (m)	Extractionable width (m)	Average Depth of Extraction	Cross Section (m ²)	Average Cross section, (m ²)	Volume (m ³)	Cumulative Volume (m ³)
CS1	0	256.73	128.36	0.22	28.24	0	0	0
CS2	846	199.74	99.87	0.56	55.93	42.08	35602.73	35602.73
CS3	1814	117.95	58.98	0.33	19.46	37.70	68379.27	103982.01
CS4	1127	84.52	42.26	0.51	21.55	20.51	23112.52	127094.52
CS5	596	209.63	104.81	0.49	51.36	36.45	21727.03	148821.55
CS6	453	154.53	77.47	0.39	30.21	40.79	18475.65	167297.21
CS7	724	107.54	53.77	0.62	33.34	26.40	19113.89	186411.09
						Total Volume		186411.09
	Recommended volume of extraction (90% of total volume)							167769.99

Table 2: Distance and extraction depth across width

CS1	Distance	64.18	87.93	106.94	128.36	128.96	149.82	179.66	192.55		128.36
	Depth	0.00	0.21	0.24	0.54	0.38	0.20	0.20	0.00		0.22
CS2	Distance	49.93	65.01	92.27	99.87	130.64	149.80				99.87
	Depth	0.00	0.99	1.02	0.77	0.60	0.00				0.56
CS3	Distance	29.49	44.99	58.98	62.70	74.35	88.46				58.98
	Depth	0.00	0.92	0.48	0.30	0.30	0.00				0.33
CS4	Distance	21.13	42.26	47.62	61.43	63.39					42.26
	Depth	0.00	1.15	1.38	0.03	0.00					0.51
CS5	Distance	52.41	57.74	68.33	86.78	104.81	109.73	135.56	155.55	157.22	104.81
	Depth	0.00	0.40	0.70	0.40	0.37	1.20	0.49	0.80	0.00	0.49
CS6	Distance	38.73	40.80	72.87	77.47	90.84	109.56	116.20			77.47
	Depth	0.00	0.81	0.65	0.69	0.20	0.40	0.00			0.39
CS7	Distance	26.89	45.13	53.77	55.00	67.28	78.17	80.66			53.77
	Depth	0.00	0.81	0.99	1.25	1.20	0.10	0.00			0.62

Note: All dimensions are in meter.

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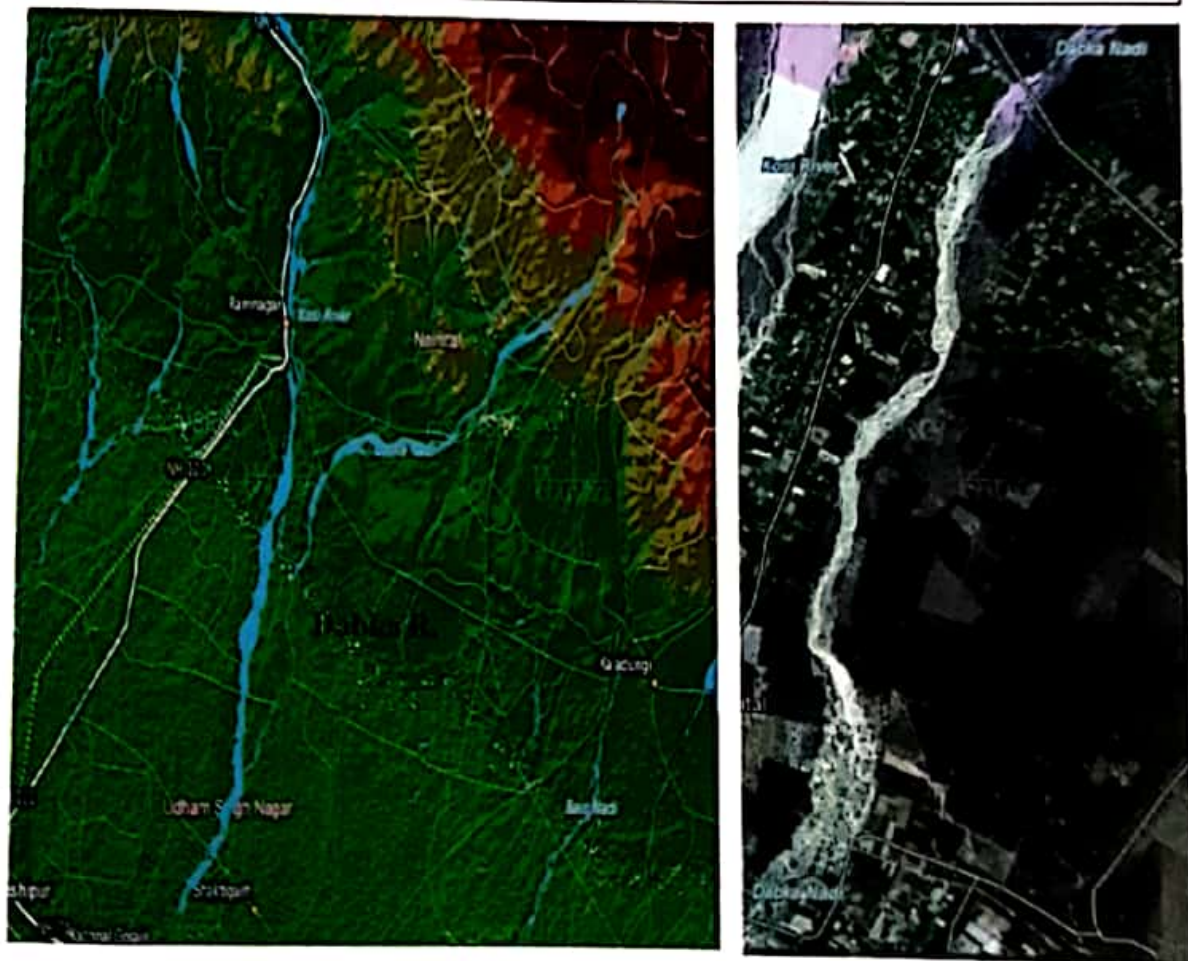
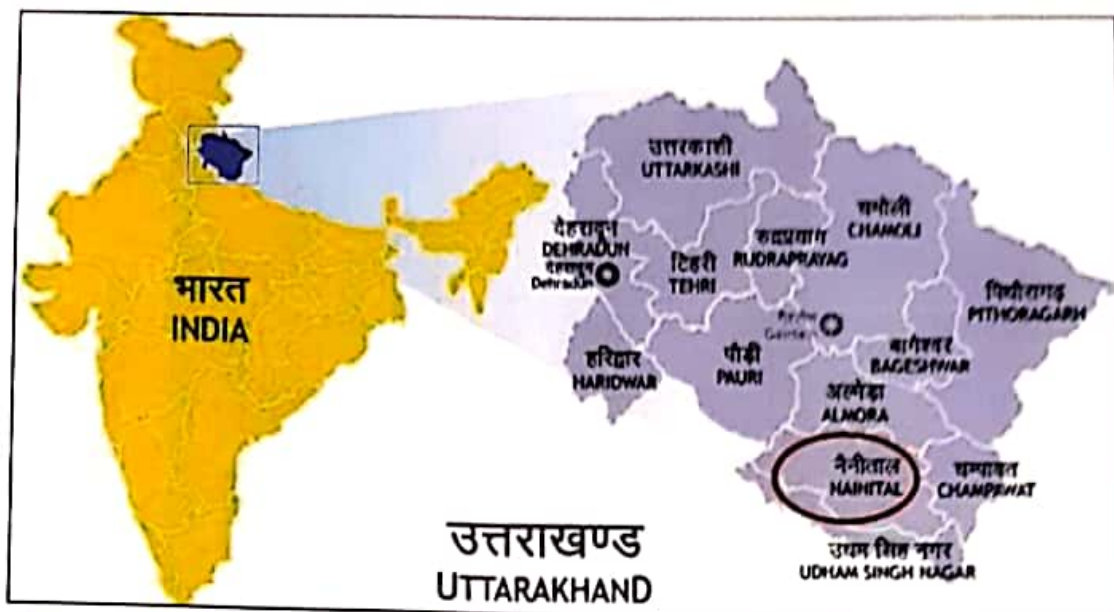


Fig.1: Location of the study area

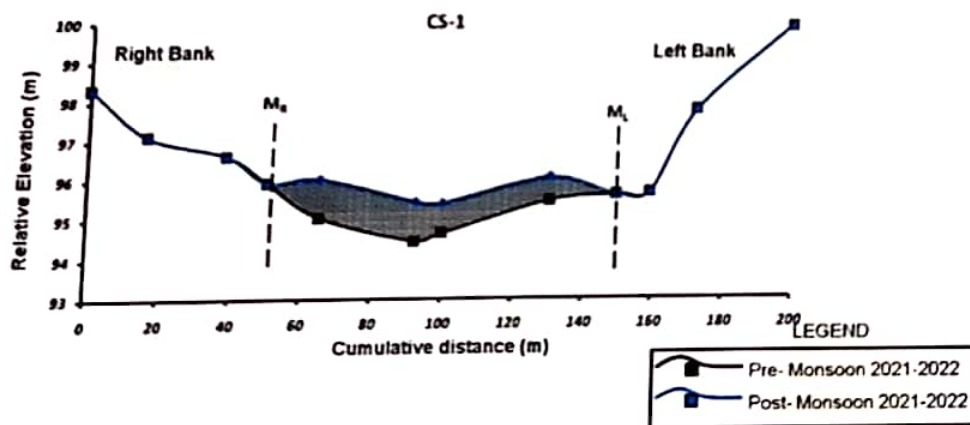
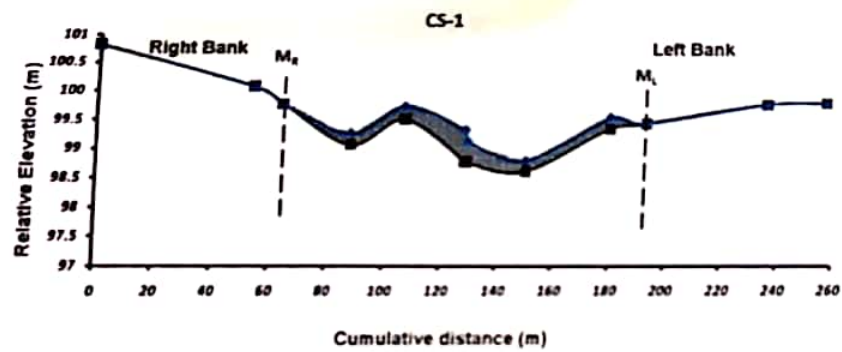
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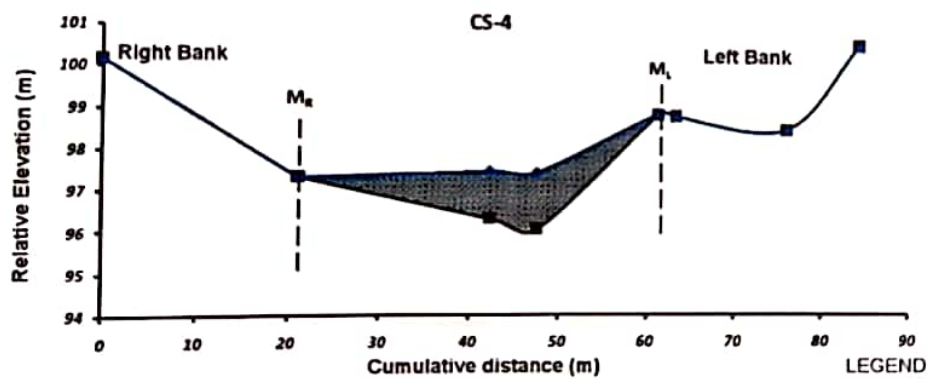
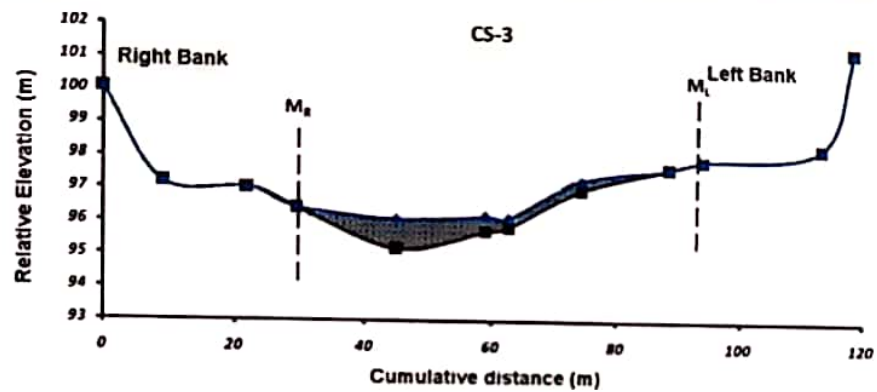
Cross-section at River Dabka at Ramnagar

Fig. 2: Cross-section of river Dabka, Ramnagar at different kilometers showing the extractable RBM

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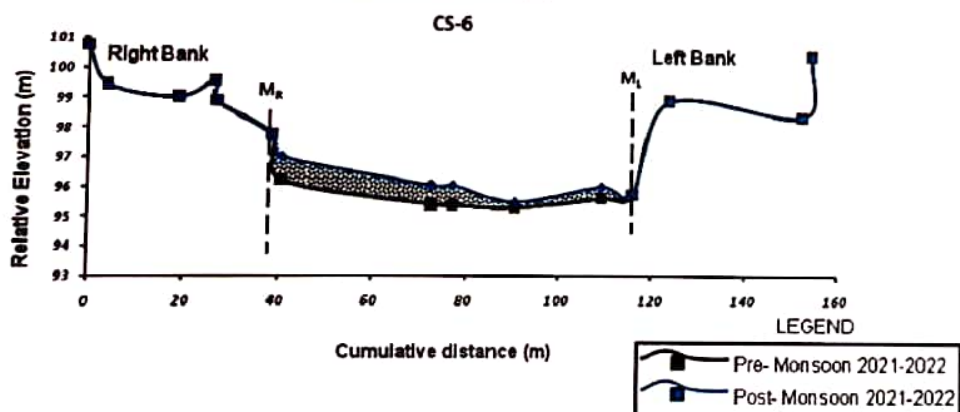
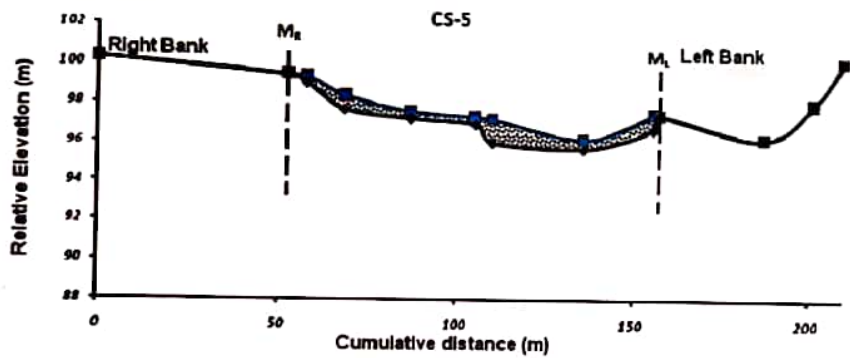
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Pre-Monsoon 2021-2022

Post-Monsoon 2021-2022

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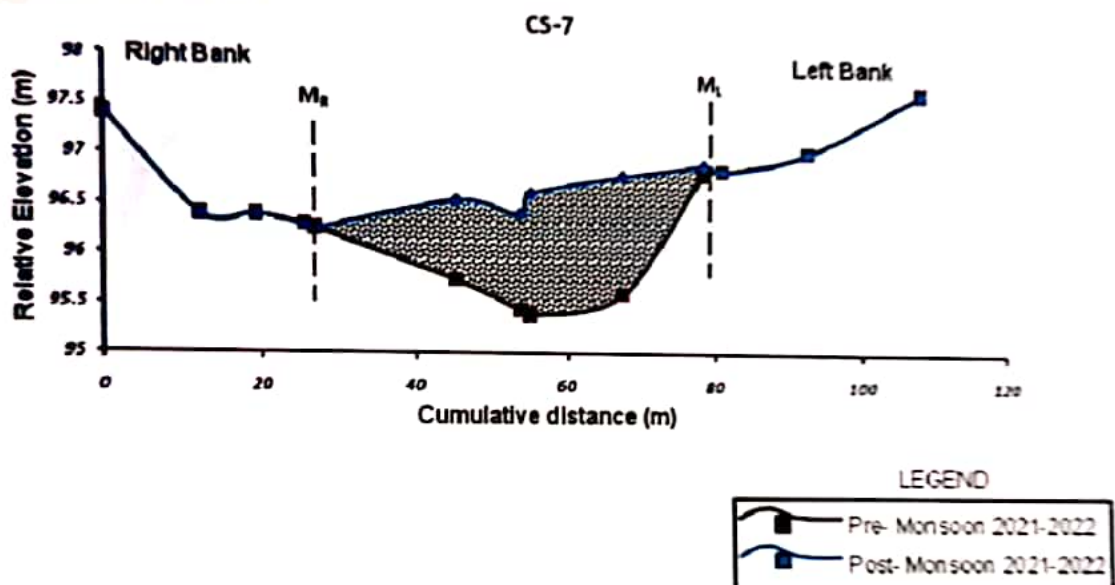


Fig. 4: Cross-section of river Dabka, Ramnagar at different locations showing the extractable RBM

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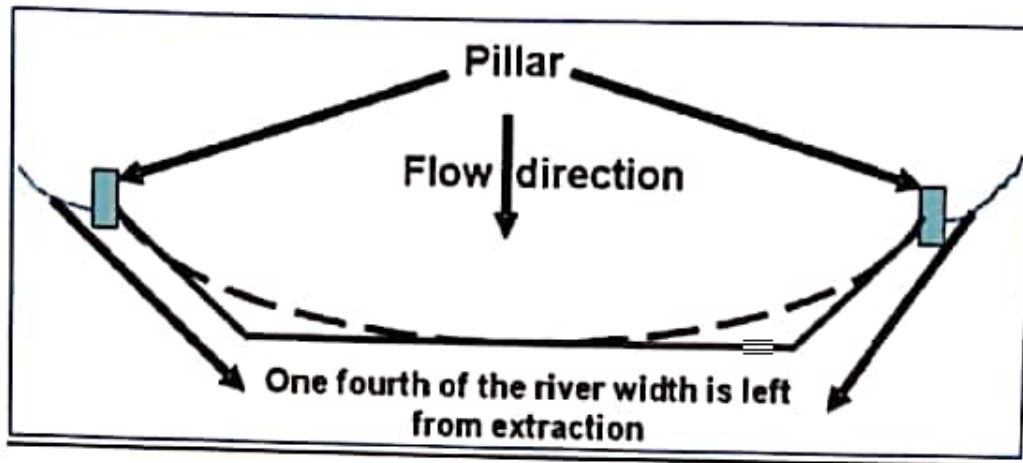


Diagram: 1. Procedure of extraction of river bed material

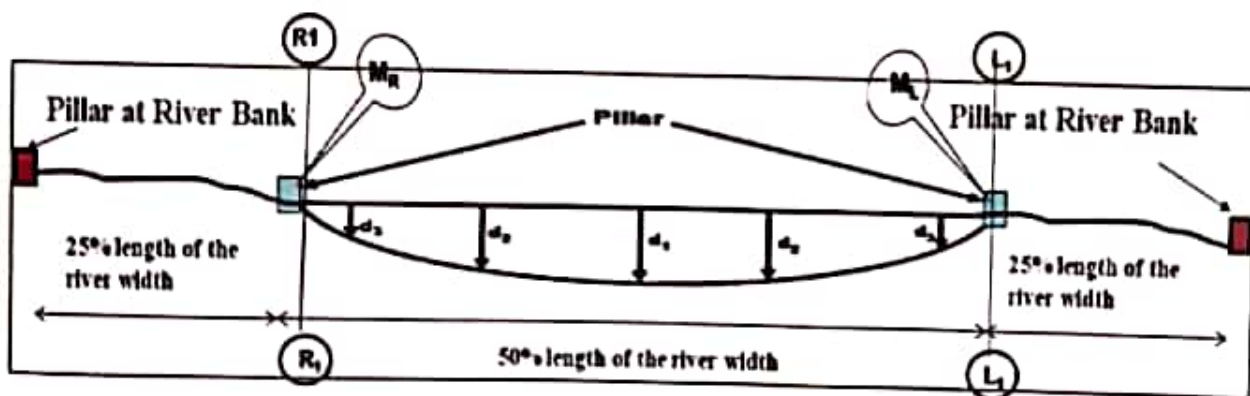


Diagram 2: Anticipated shape of the river after proper extraction of river bed material

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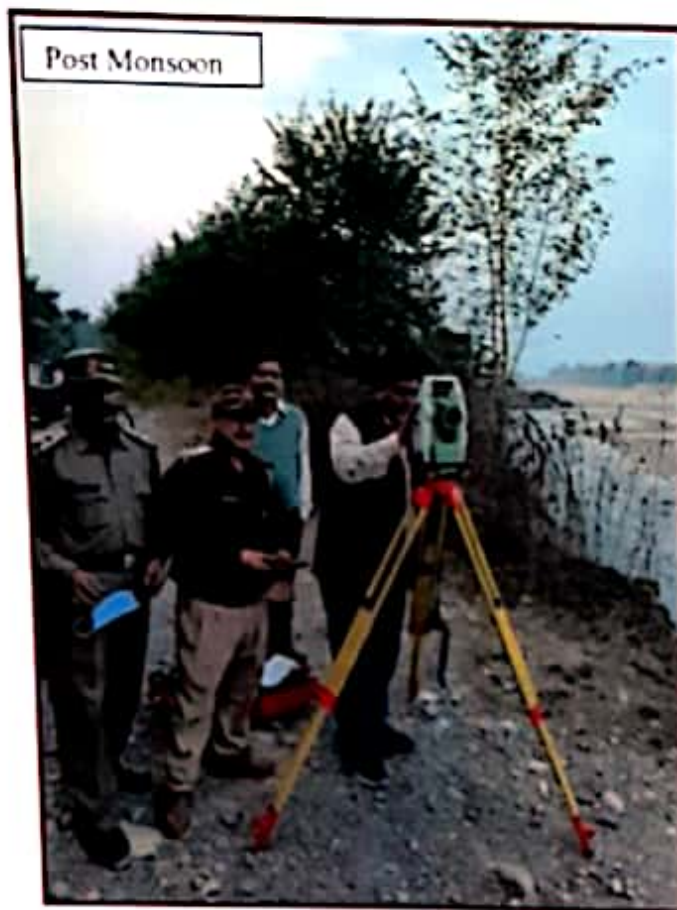


Photo: Survey of river Dabka for RBM estimation

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Photo: Survey of river Dabka for RBM estimation

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