



कादम्प/ई-गैल दात

कार्यालय- प्रमाणीय प्रबन्धक खनन रामनगर
उत्तराखण्ड वन विकास निगम, खनन प्रभाग-रामनगर(नैनीताल)।
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पत्रांक- 1435

/ कोरी दाबका गांव-02 /

दिनांक- 12.10.2021

सेवा में,

अपर प्रमुख वन संरक्षण/नोडल अधिकारी,
वन संरक्षण उत्तराखण्ड
इन्डा फॉरेस्ट गैलौली-देहरादून (उत्तराखण्ड)।

विषय-

जनपद ऊष्म सिट नगर के अन्तर्गत आरक्षित वन क्षेत्र में कोरी दाबका गांव-02 से 150
है० वन भूमि में उपखनिज चुगान (रिता, मजरी, मोल्डर) हेतु उत्तराखण्ड वन विकास निगम
को 10 वर्षों की अवधि के लिये अनुमति दिये जाने के सम्बन्ध में।

सन्दर्भ-

आपका पत्रांक-2332/FPUK/MIN/60921/2020 दिनांक 08.03.2021 एवं इस कार्यालय की
पत्र सं०-162/कोरी दाबका गांव-02/दिनांक 20.04.2021।

महोदय,

उपर्युक्त विषयक सन्दर्भित पत्र के अनुपालन में जनपद ऊष्म सिट नगर के अन्तर्गत
आरक्षित वन क्षेत्र में कोरी दाबका गांव-02 के 150 है० वन भूमि में उपखनिज चुगान के प्रस्ताव में विभिन्न
वांछित सूचनाएं संलग्न कर प्रेषित की गई थी। बिन्दु संख्या-08 के क्रम में भारतीय मृदा एवं जल संरक्षण
संस्थान, देहरादून से कोरी दाबका गांव-02 नदी की सर्वे रिपोर्ट प्राप्त हो चुकी है, जिसे आवश्यक
कार्यवाही हेतु संलग्न कर प्रेषित किया जा रहा है।
संलग्नक-उपरोक्तानुसार।

भवदीय,

(पीरेश चन्द बिष्ट)
प्रमाणीय प्रबन्धक खनन
उत्तराखण्ड वन विकास निगम,
रामनगर (नैनीताल)।

पत्रांक 1435 / / उक्त दिनांकित

प्रतिलिपि:- निम्नलिखित की सेवा में सन्दर्भित पत्र के क्रम में सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित-

1. महाप्रबन्धक (कु०मण्डल), उ० वन विकास निगम, ढल्हानी।
2. क्षेत्रीय प्रबन्धक (प०क्ष०), उ० वन विकास निगम, रामनगर।
3. प्रमाणीय वनाधिकारी, त०प० वन प्रभाग, रामनगर को मय संलग्नक के इस अनुरोध के साथ
प्रेषित कि अपने स्तर से भी उच्च स्तर को सूचित करने का कष्ट करें।

(पीरेश चन्द बिष्ट)
प्रमाणीय प्रबन्धक खनन
उत्तराखण्ड वन विकास निगम,
रामनगर (नैनीताल)।



REPORT



ON

“Assessment of extractable River Bed Material (RBM) from River KOSI –Dabka II during year 2021-22”

FOR

**Uttarakhand Forest Developmet Corporation
Ramnagar, Nainital (Uttarakhand)**



BY

**Er. S S Shrimali
Dr. P R Ojasvi
Er. S.K. Sharma
Sh H S Bhatia
Er. Amit Chauhan**

**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 2021 entitled “Assessment of extractable river bed material from river Kosi -DabkaII for the year 2021-22” for the UKFDC, Ramnagar, Nainital (Uttarakhand). The study area was river Kosi Dabka II downstream to the bridge on Ramnagar – Haldwani highway about 06 km from Ramnagar under jurisdiction of RM, UKFDC covering a length of 6.85 km. The area was critically examined for the entire length and the cross-sections were taken at the locations mentioned in the Fig. 2. Survey was carried out for the length of 6.85km of the defined river reach.

Based on the survey conducted and volume calculation for permissible extraction of deposited RBM is worked out as **574291.57 cum**. 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.

Assessment of extractable river bed material from river KOSI Dabka-II 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 Kosi -Dabka II with following objectives

Objectives

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

River Kosi - Dabka II

The river reach under study Kosi- DabkaII originates at 29°16'22.41"N & 79°6'17.60"E and terminate at 29°12'51.13"N & 79°5'25.46"E The Catchment delineated start 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 Kosi Dabka II:

The Study Area

The study area is located at river Kosi -Dabka II, under jurisdiction of UKFDC, Ramnagar, district Nainital, Uttarakhand (Fig.1). River reach 6.85 km downstream of Kosi I away from Ramnagar crossing the Ramnagar – Haldwani highway.

Methodology

A team from ICAR-IISWC, Dehradun consisting of Dr. P.R. Ojasvi, Pr. Scientist & Head (H&E), Er. S.S. Shrimali, Sr. Scientist, 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 and surveyed on 12 and 13 July 2021 with the help of DLM, Ramnagar and other staff of UKFDC. Cross section survey at the marked locations (Fig. 2) was carried out for the estimation of the RBM.

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 (Fig 3 & 4) for safe passage of flow.

Analysis, Results and Recommendations

1. The cross-sections of river Kosi -DabkaII at different locations are shown in Fig. 5. It is seen from the cross-sections 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.
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 **574291.57 cum** 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. 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 in the river reach under study/ proposed for extraction of RBM..
5. 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, Kumaon 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.

PI and Consultants
ICAR-IISWC, Dehradun (Uttarakhand)

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

Volume of safely extractable RBM from River Kosi-Dabka-2 for the year 2021-22								
Location	Length Segment (m)	Width of the river (m)	Extractable width (m)	Average Depth of Extraction	Cross Section (m ²)	Average Cross section (m ²)	Volume (m3)	Cumulative Volume (m ³)
CS1	0.00	557.86	206.13	0.60	123.68	0.00	0.00	0.00
CS2	438.00	480.53	240.27	0.50	120.14	121.91	53395.05	53395.05
CS3	495.00	569.24	205.29	0.64	131.39	125.76	62251.35	115646.40
CS4	490.00	541.22	171.60	0.64	109.82	120.60	59096.35	174742.75
CS5	598.00	652.12	208.09	0.51	106.13	107.97	64569.02	239311.77
CS6	498.00	699.42	332.18	0.40	132.87	119.50	59510.48	298822.24
CS7	666.00	489.58	235.32	0.39	91.77	112.32	74807.38	373629.63
CS8	460.00	292.16	110.50	0.57	62.99	77.38	35594.75	409224.38
CS9	434.00	377.77	91.78	0.90	82.60	72.79	31592.38	440816.76
CS10	741.00	653.70	326.85	0.53	173.23	127.92	94785.94	535602.70
CS11	412.00	450.76	137.58	0.40	55.03	114.13	47022.08	582624.78
CS12	480.00	463.73	147.94	0.55	81.37	68.20	32735.76	615360.54
CS13	437.00	463.76	139.69	0.80	111.75	96.56	42196.50	657557.04
CS14	703.00	356.64	175.94	0.34	59.82	85.79	60307.42	717864.46
	6852.00				Total Volume			717864.46
	Recommended volume of extraction (80% of total volume)							574291.57

Total Volume : 574291.57 Cum

Table2 : Distance and extraction depth across width

CS1	Distance	212.26	228.40	238.92	255.34	278.93	282.73	301.77	317.89	330.71	365.28	418.39							206.13
	Av. Depth	0.00	1.11	0.94	0.80	1.04	1.06	0.20	0.18	0.80	0.48	0.00							0.60
CS2	Distance	120.13	134.62	146.55	160.04	170.97	183.82	205.50	228.34	240.27	244.58	257.92	268.70	309.62	360.40				240.27
	Av. Depth	0.00	0.50	0.92	0.11	0.13	1.01	0.84	0.71	0.53	0.50	0.24	1.09	0.35	0.00				0.50
CS3	Distance	221.64	238.45	255.68	278.41	284.62	297.27	328.63	383.47	421.62	426.93								205.29
	Av. Depth	0.00	0.57	0.96	0.94	0.92	0.86	0.82	1.05	0.29	0.00								0.64
CS4	Distance	234.32	249.30	268.82	270.61	297.42	322.07	353.62	394.35	405.92									171.60
	Av. Depth	0.00	0.79	1.26	1.29	0.93	0.78	0.47	0.24	0.00									0.64
CS5	Distance	249.49	263.44	286.18	321.00	326.06	352.05	386.55	415.24	457.58									208.09
	Av. Depth	0.00	0.82	0.86	0.71	0.71	0.71	0.52	0.24	0.00									0.51
CS6	Distance	192.39	202.57	217.86	239.75	256.32	278.58	295.00	317.15	320.95	349.71	351.59	359.61	365.48	415.01	443.83	486.72	524.57	332.18
	Av. Depth	0.00	0.22	0.89	0.32	0.20	0.15	0.25	0.17	0.40	0.60	0.64	0.63	0.64	0.86	0.28	0.51	0.00	0.40
CS7	Distance	123.86	169.89	192.64	216.50	244.79	247.26	263.30	275.25	285.62	302.97	327.04	345.20	359.19					235.32
	Av. Depth	0.00	0.49	0.20	0.78	0.81	0.79	0.71	0.32	0.33	0.10	0.32	0.23	0.00					0.39
CS8	Distance	73.04	99.71	136.44	146.08	165.18	183.54												110.50
	Av. Depth	0.00	0.59	1.04	1.00	0.82	0.00												0.57
CS9	Distance	156.96	180.81	188.88	196.61	211.96	230.62	248.74											91.78
	Av. Depth	0.00	1.40	1.23	1.06	1.39	1.20	0.00											0.90
CS10	Distance	163.43	177.53	204.10	220.68	244.60	264.72	296.07	323.07	326.85	364.54	381.53	393.79	461.64	484.69	490.28			326.85
	Av. Depth	0.00	0.71	0.93	0.66	0.78	0.56	0.84	0.77	0.73	0.14	0.73	0.56	0.35	0.15	0.00			0.53
CS11	Distance	194.11	225.38	233.13	252.14	276.75	302.99	331.69											137.58
	Av. Depth	0.00	0.45	0.45	0.89	0.82	0.22	0.00											0.40
CS12	Distance	133.12	143.85	170.36	193.41	212.84	231.87	247.08	263.42	281.06									147.94
	Av. Depth	0.00	0.42	0.77	1.33	1.13	0.78	0.38	0.14	0.00									0.55
CS13	Distance	115.94	132.34	148.13	154.32	180.52	202.49	223.28	231.88	255.63									139.69
	Av. Depth	0.00	1.40	0.25	0.86	1.04	1.20	1.38	1.03	0.00									0.80
CS14	Distance	89.16	106.44	150.37	163.29	165.30	178.32	191.20	212.11	234.32	265.10								175.94
	Av. Depth	0.00	0.14	0.62	0.59	0.21	0.31	0.22	0.27	1.04	0.00								0.34

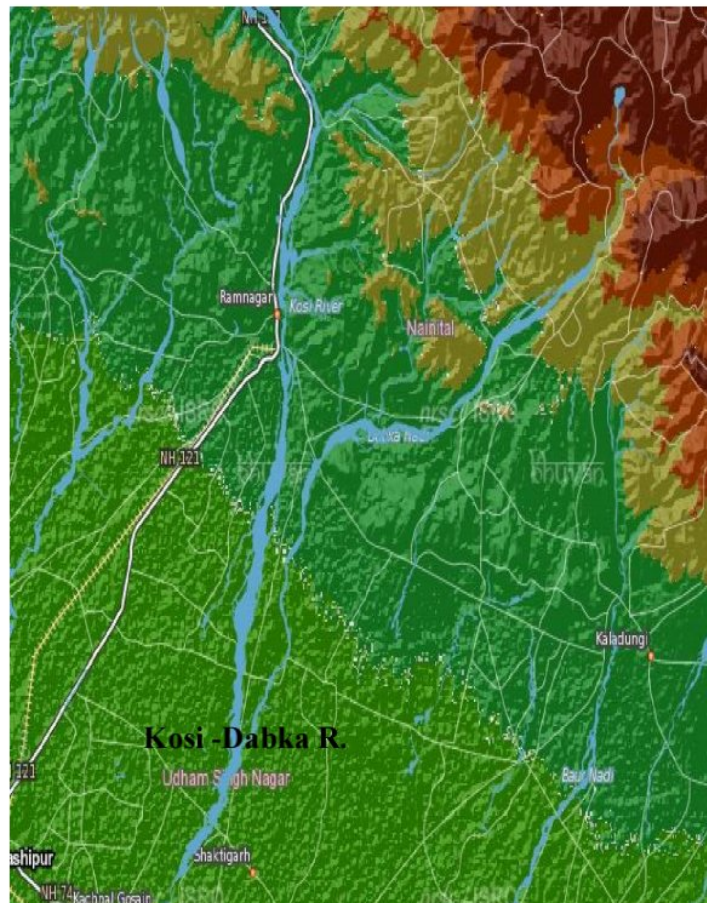
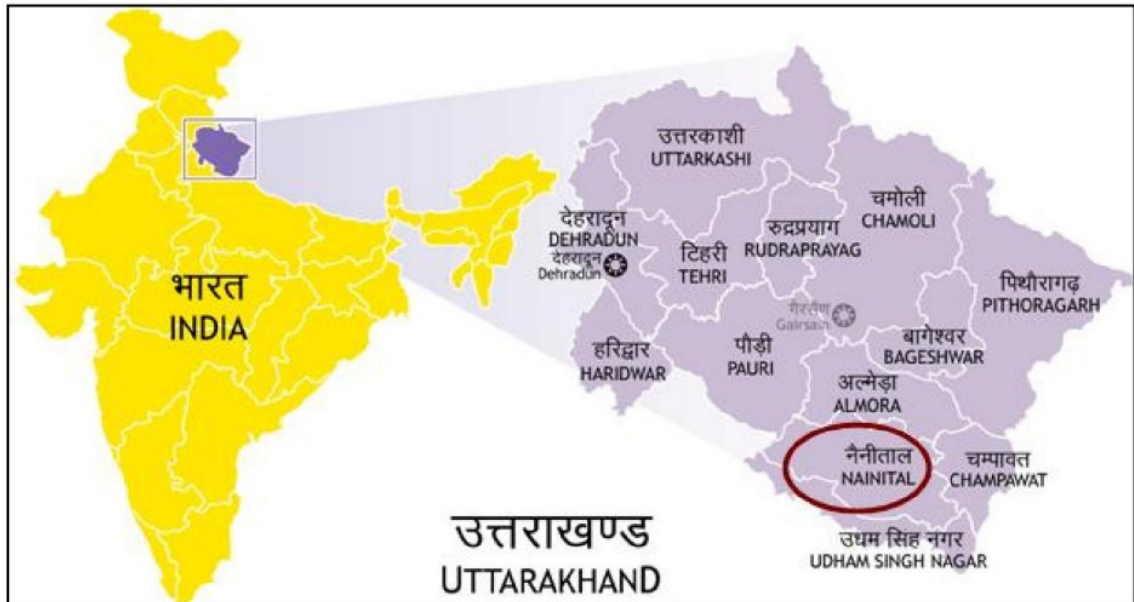


Fig.1: Location of the study area

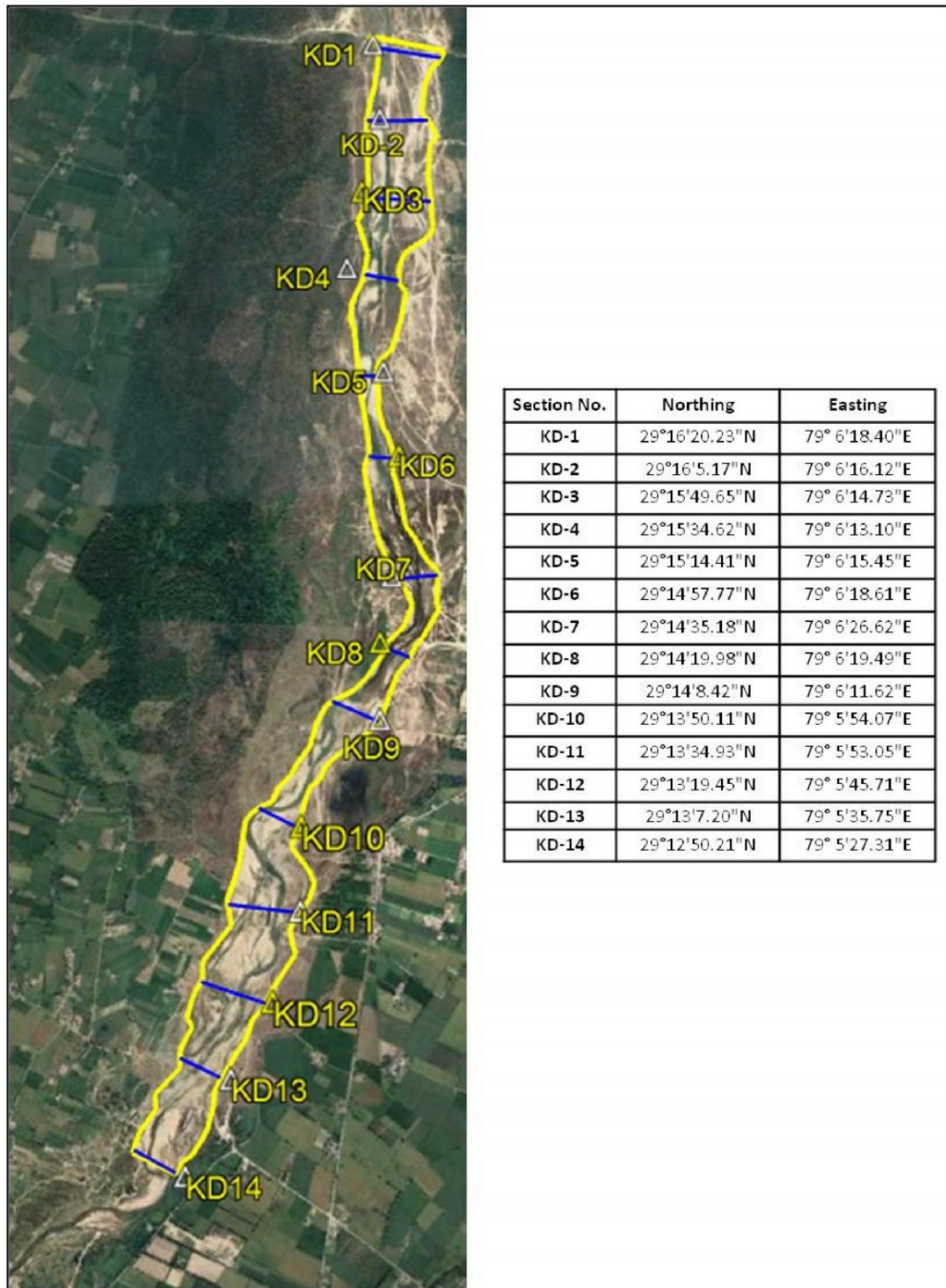


Fig. 2: Cross-section of river Kosi -Dabkall, Ramnagar at different kilometers showing the extractable RBM

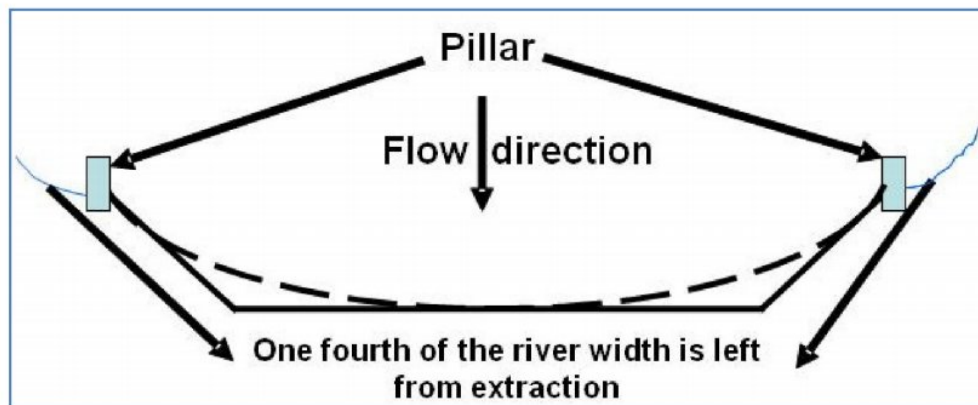


Fig: 3. Procedure of extraction of river bed material

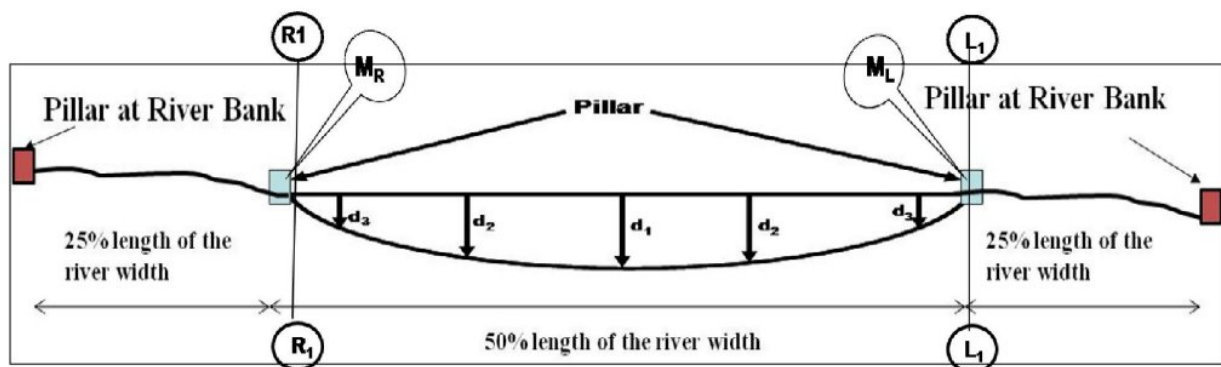


Fig . 4 Anticipated shape of the river after proper extraction of river bed material

Table3: Details of cross-sections

Cross-section 1			Cross-section 2		
Northing	Easting	Elevation	Northing	Easting	Elevation
874.13	1009.96	256.57	1205.01	1101.27	255.64
876.99	1007.42	254.71	1189.46	1097.67	251.85
918.44	1008.20	254.85	1168.50	1086.68	251.98
1007.13	1008.95	254.33	1124.77	1048.73	252.00
1016.13	1014.18	253.31	1109.71	1041.24	252.14
1026.11	1019.26	252.60	1087.82	1035.01	251.50
1043.97	1017.06	252.86	1080.89	1023.34	251.52
1052.72	1019.22	252.91	1068.29	1018.08	250.41
1063.52	1022.24	253.02	1058.67	1012.86	250.33
1074.63	1025.93	252.97	1045.82	1009.36	251.61
1085.56	1028.71	252.49	1025.10	1001.95	252.14
1101.66	1029.95	254.01	1008.37	985.20	251.71
1111.99	1032.41	254.54	1000.28	967.47	251.00
1128.58	1031.32	254.80	996.06	950.06	250.94
1155.35	1039.17	255.06	992.77	936.49	252.09
1173.87	1044.84	254.50	980.29	888.28	251.85
1189.62	1048.93	255.78	914.59	834.59	253.26
1202.12	1052.23	256.38	890.02	802.84	253.76
1234.97	1066.74	256.28	872.22	754.62	253.38
1321.01	1084.07	256.91			
1362.46	1095.20	256.36			
1407.09	1104.98	257.47			
1431.97	1013.49	259.91			

Note: All X & Y Coordinates are arbitrary (**with Inst at 1000,1000**) while Z coordinate is as per GPS at Inst station

Cross-section 3			Cross-section 4		
Northing	Easting	Elevation	Northing	Easting	Elevation
1245.37	1052.85	251.88	1265.55	1028.64	251.00
1223.32	1051.26	248.78	1240.26	1028.05	247.25
1195.85	1043.85	248.74	1209.53	1022.43	247.12
1151.67	1022.30	248.85	1165.12	1009.08	247.28
1134.27	1018.35	248.88	1146.55	1006.91	247.25
1113.96	1014.79	248.83	1127.03	1004.68	247.29
1099.41	1009.45	248.65	1108.68	1002.50	247.24
1082.65	1005.72	248.67	1089.83	999.54	247.10
1066.75	1002.67	247.97	1070.80	997.58	246.35
1053.39	999.70	247.53	1057.17	994.87	245.83
1030.82	997.27	247.67	1033.67	994.94	246.53
1015.43	989.73	248.27	1018.96	991.99	247.24
1000.00	980.97	248.66	999.87	987.73	247.96
980.78	966.26	248.64	973.13	974.36	247.38
963.68	957.90	248.56	949.13	968.60	247.33
940.39	930.42	248.52	920.45	951.49	247.22
893.40	900.64	249.05	882.81	933.66	247.34
860.17	881.45	248.89	845.24	920.76	247.13
844.91	859.83	249.17	831.26	912.44	248.29
844.91	860.23	249.31	795.74	907.83	248.45
825.53	870.32	249.50	763.31	904.07	252.62
805.09	870.33	249.67	739.42	901.72	254.86
785.17	870.63	249.84			
765.26	880.13	250.01			
745.34	860.35	250.36			
725.26	875.37	250.25			
705.45	872.52	254.50			

Note: All X & Y Coordinates are arbitrary (**with Inst at 1000,1000**) while Z coordinate is as per GPS at Inst station

Cross-section 5			Cross-section 6		
Northing	Easting	Elevation	Northing	Easting	Elevation
1285.74	1004.43	248.13		1204.89	246.02
1257.19	1004.84	245.72	1115.89	1180.44	244.71
1223.20	1001.02	245.49	1100.06	1151.63	244.42
1178.57	995.86	245.71	1078.41	1138.82	244.43
1158.83	995.46	245.62	1071.43	1115.47	244.40
1140.09	994.57	245.74	1062.20	1103.65	244.22
1117.94	995.56	245.82	1050.79	1092.22	244.40
1097.01	993.36	245.54	1042.49	1075.73	244.17
1074.84	992.49	244.73	1031.53	1067.27	243.72
1060.96	990.04	244.14	1026.69	1060.10	243.23
1036.53	992.60	245.39	1014.15	1056.18	243.86
1022.49	994.25	246.22	1007.65	1048.35	244.12
999.73	994.48	247.26	998.03	1036.47	244.89
965.49	982.46	246.11	981.90	1021.40	244.42
934.58	979.31	246.11	966.48	1012.83	244.40
900.50	972.57	245.92	949.31	998.31	244.55
872.22	966.69	245.64	937.57	986.79	244.75
830.31	960.06	245.36	919.71	973.14	245.02
817.61	965.05	247.41	918.60	968.99	245.35
746.57	955.42	247.59	884.85	959.07	246.04
701.10	937.82	247.94	882.67	949.88	247.43
637.76	931.11	250.87	876.02	948.24	247.04
			825.02	930.32	247.26
			800.12	915.02	247.68
			756.32	900.62	248.01
			645.32	850.23	248.32
			615.33	830.53	248.63
			580.63	820.15	248.96
			560.32	807.98	249.00

Note: All X & Y Coordinates are arbitrary (**with Inst at 1000,1000**) while Z coordinate is as per GPS at Inst station

Cross-section 7			Cross-section 8		
Northing	Easting	Elevation	Northing	Easting	Elevation
986.70	1405.35	248.78	942.66	1371.82	246.19
974.60	1356.04	243.71	942.45	1344.31	241.97
976.91	1302.24	243.35	946.31	1306.08	241.71
978.25	1281.77	243.16	952.18	1272.57	241.79
984.02	1235.48	243.19	959.87	1236.47	241.74
984.30	1212.72	242.70	965.28	1208.20	241.62
983.64	1188.87	242.98	968.84	1190.17	240.88
987.97	1158.09	242.79	974.58	1163.38	241.70
988.22	1142.05	242.71	974.82	1147.02	241.48
992.41	1130.16	242.32	977.64	1133.24	241.60
991.78	1119.77	242.33	979.06	1118.81	241.36
992.80	1102.44	242.03	981.28	1101.20	243.24
996.32	1078.45	242.52	984.65	1082.70	244.00
998.32	1060.34	242.73			
998.38	1046.35	242.69			
998.12	1024.06	243.18			
1002.93	1006.90	243.85			
1009.10	986.22	244.67			
1019.60	972.93	243.29			
1023.12	962.72	244.49			
1064.23	921.95	246.93			

Note: All X & Y Coordinates are arbitrary (with Inst at 1000,1000) while Z coordinate is as per GPS at Inst station

Cross-section 9			Cross-section 10		
Northing	Easting	Elevation	Northing	Easting	Elevation
898.62	1338.30	243.61	1139.07	819.30	242.89
910.30	1332.57	240.24	1123.21	842.07	241.59
915.70	1309.93	240.07	1112.96	854.08	239.50
926.11	1263.36	240.41	1104.62	875.75	238.20
935.71	1237.47	240.29	1097.72	872.26	237.58
946.26	1203.69	240.53	1087.47	903.78	238.21
954.05	1191.46	238.78	1078.93	922.00	237.62
961.18	1168.66	240.60	1069.37	939.42	238.23
961.42	1152.00	240.26	1059.88	958.36	237.26
962.87	1136.32	240.89	1054.34	975.30	238.01
966.33	1117.84	240.40	1042.13	998.91	238.13
969.77	1099.95	239.14	1035.21	1014.02	237.81
972.97	1086.95	239.75	1024.36	1035.33	237.83
977.86	1067.86	240.31	1012.17	1051.62	237.56
985.34	1046.75	239.65	997.28	1079.22	237.84
982.87	1024.97	240.30	983.02	1102.18	237.77
993.99	1014.75	240.13	967.02	1140.68	237.34
1002.91	1006.54	243.07	960.39	1156.40	238.53
1014.91	978.88	242.79	950.88	1165.21	238.51
			910.23	1220.23	238.65
			890.23	1235.23	238.85
			875.33	1255.33	239.26
			830.65	1302.55	240.12
			801.55	1335.22	241.32
			780.66	1365.99	241.98

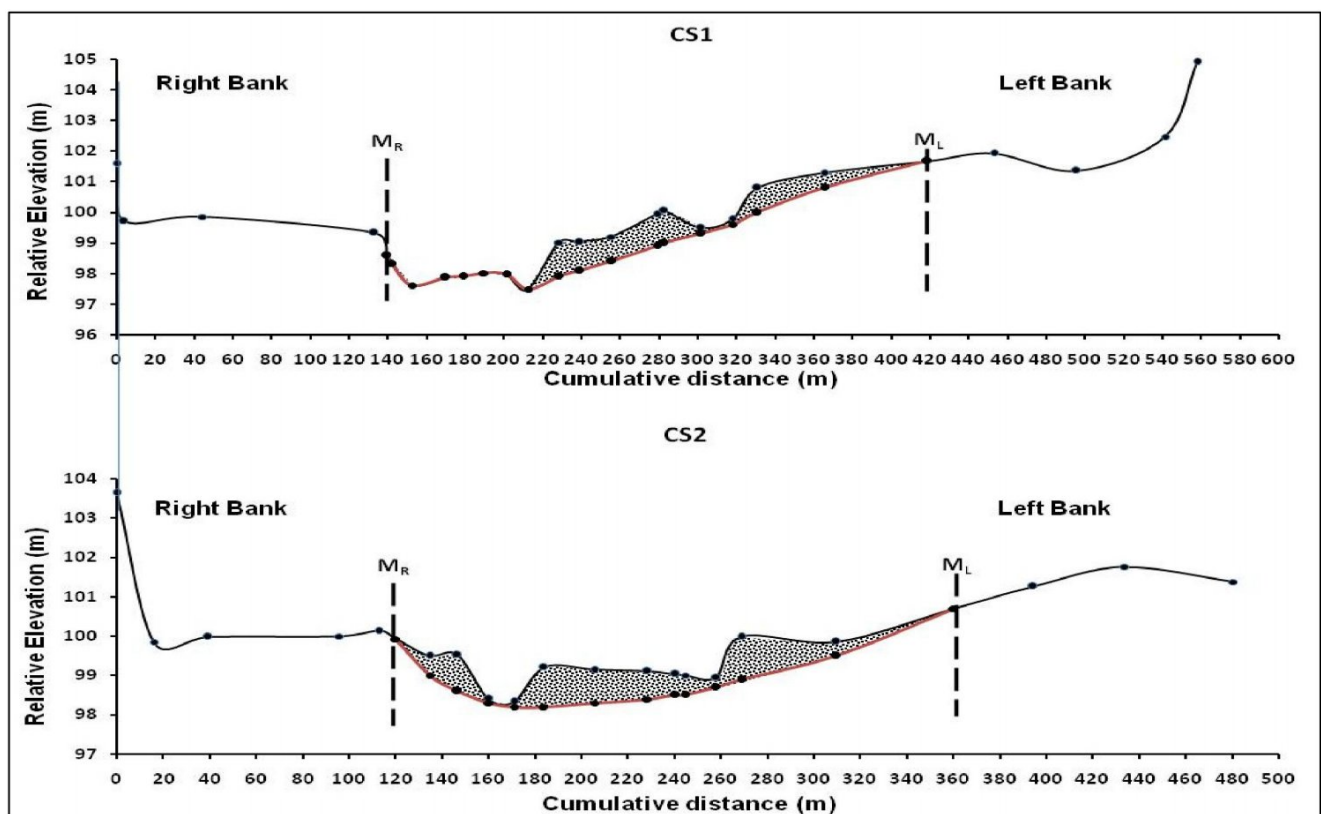
Note: All X & Y Coordinates are arbitrary (**with Inst at 1000,1000**) while Z coordinate is as per GPS at Inst station

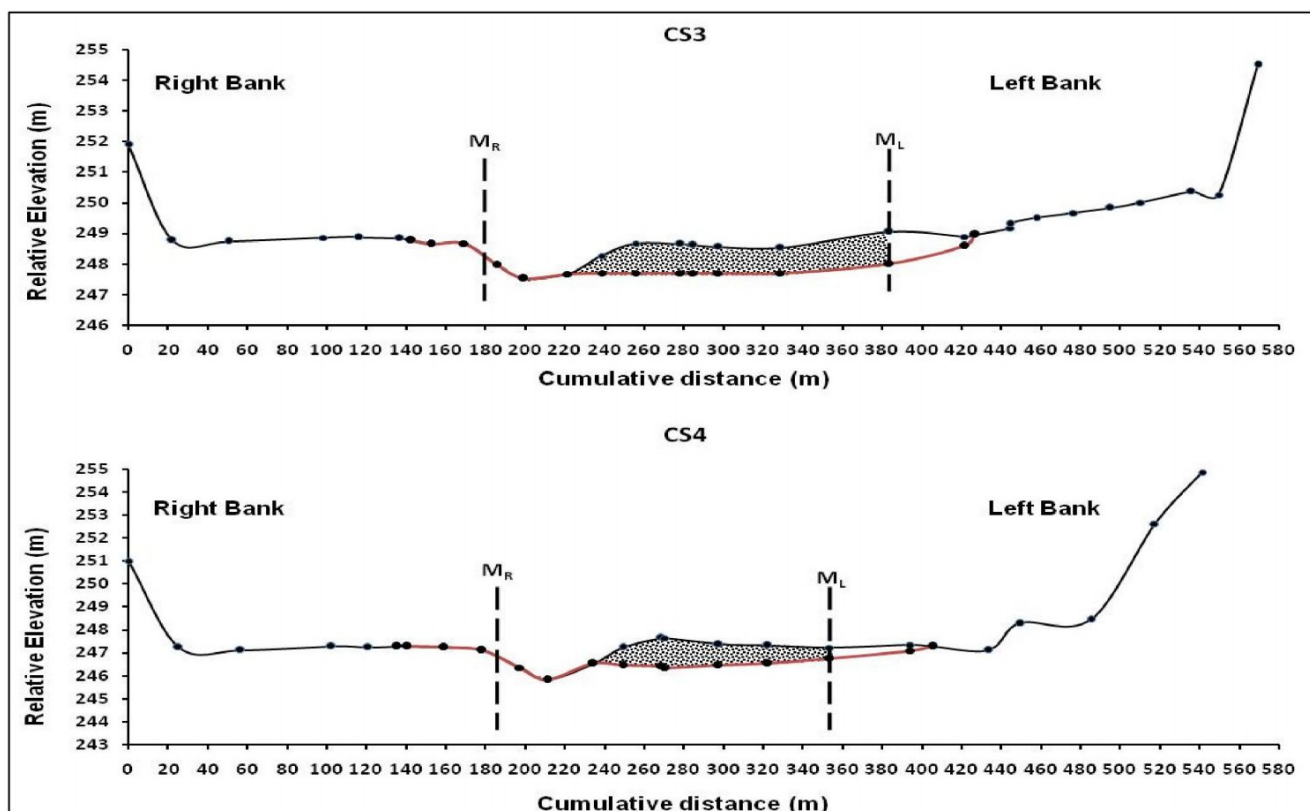
Cross-section 11			Cross-section 12		
Northing	Easting	Elevation	Northing	Easting	Elevation
1263.24	659.72	239.57	1150.79	630.72	238.65
1243.50	677.60	236.76	1131.16	648.76	233.18
1231.92	693.41	235.08	1109.14	679.32	232.77
1223.90	704.76	236.00	1094.74	692.08	232.92
1212.57	719.55	234.95	1073.16	714.65	232.98
1197.09	739.69	235.93	1056.26	724.45	232.01
1184.88	757.04	235.74	1044.65	727.82	232.22
1168.97	778.88	235.41	1028.24	749.06	231.97
1153.42	798.88	236.00	1012.93	766.38	232.13
1145.81	814.29	234.73	1002.00	782.92	231.83
1122.83	845.82	235.25	976.54	805.89	231.38
1109.25	859.37	235.99	965.29	817.76	231.34
1094.67	879.21	235.92	945.94	823.15	231.53
1078.08	899.55	235.22	931.67	841.39	231.19
1058.86	920.96	235.03	916.87	859.28	231.10
1039.93	941.00	236.76	903.23	886.80	235.48
1018.34	971.43	236.89	850.37	950.25	237.63
1010.47	980.22	237.17	840.75	975.57	238.13
1003.14	992.11	239.86			
973.68	1005.18	239.91			

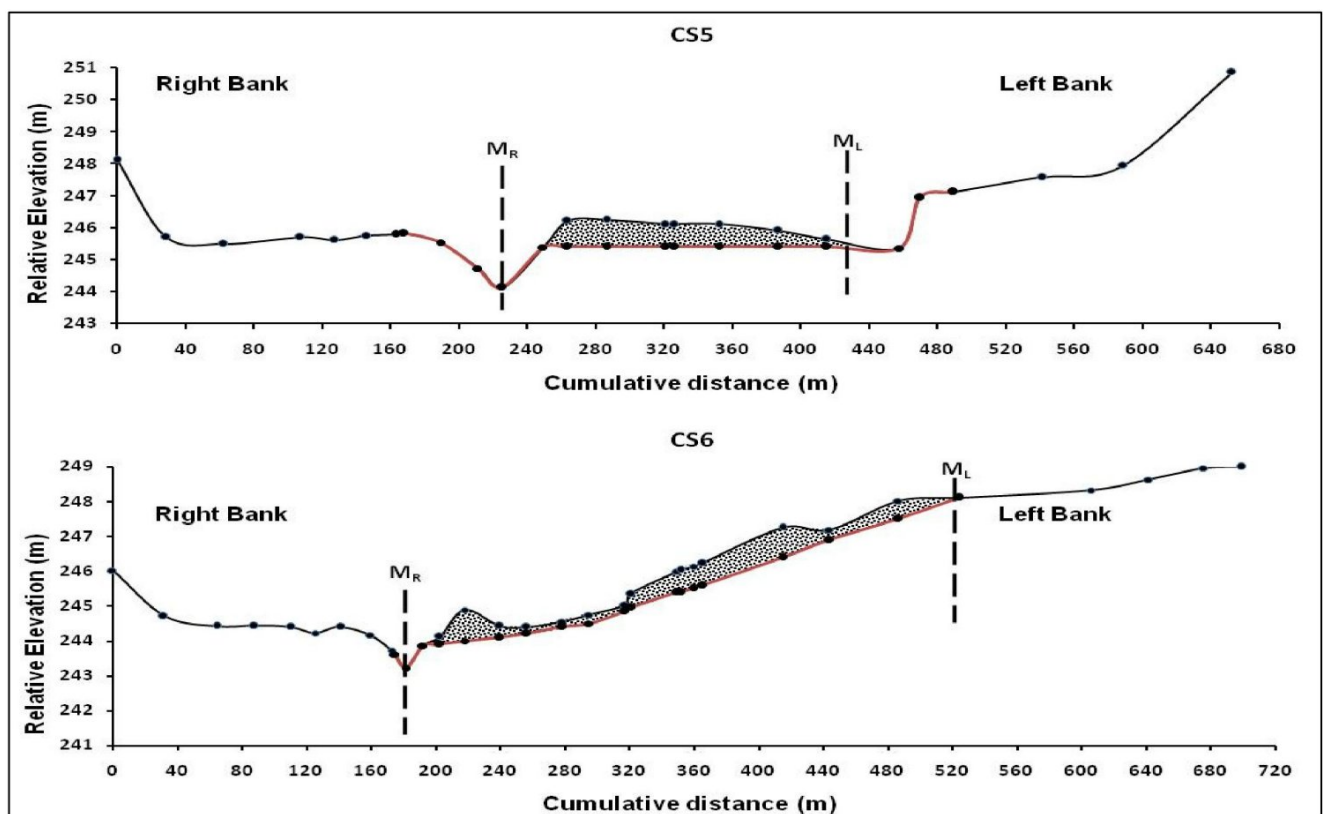
Note: All X & Y Coordinates are arbitrary (with Inst at 1000,1000) while Z coordinate is as per GPS at Inst station

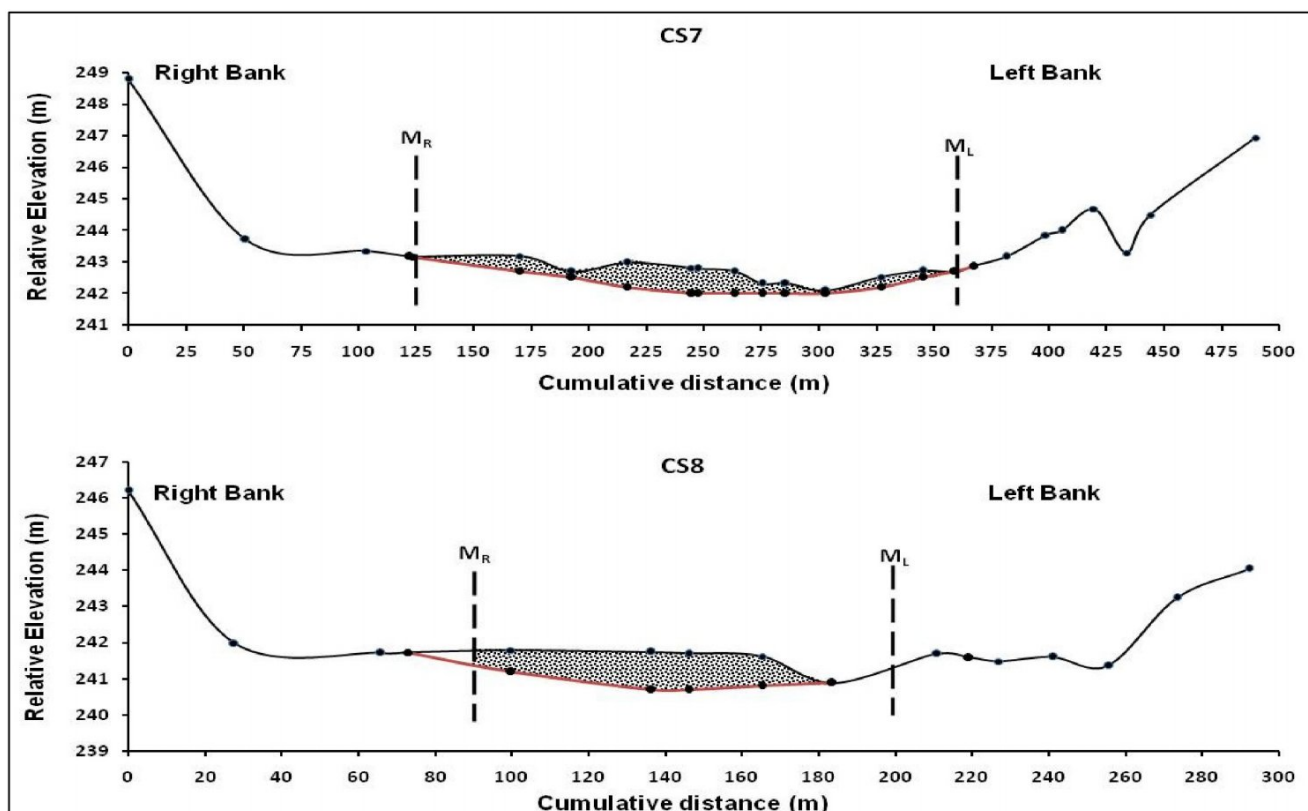
Cross-section 13			Cross-section 14		
Northing	Easting	Elevation	Northing	Easting	Elevation
1094.57	616.22	237.60	1038.35	601.72	232.12
1074.99	634.34	235.39	1018.82	619.92	229.60
1047.74	672.28	231.62	986.35	665.23	230.46
1030.15	685.74	231.38	965.57	679.40	229.84
1003.46	712.21	232.00	933.76	709.76	231.02
985.84	716.83	230.05	915.43	709.21	228.09
974.53	713.20	230.46	904.41	698.59	228.71
957.88	734.14	230.24	887.52	719.23	228.52
942.69	750.14	230.20	872.45	733.89	228.27
930.10	767.23	230.38	858.19	751.55	228.94
903.39	785.92	229.44	830.24	765.95	227.51
893.32	796.95	229.02	821.34	776.14	226.70
871.57	795.12	229.34	797.20	767.09	227.14
858.47	812.31	229.18	785.26	783.23	227.17
845.88	828.45	229.14	774.89	797.61	227.18
834.87	859.70	234.83	766.52	832.60	234.19
800.65	910.26	235.63			
780.57	920.66	237.57			
758.36	935.66	238.63			

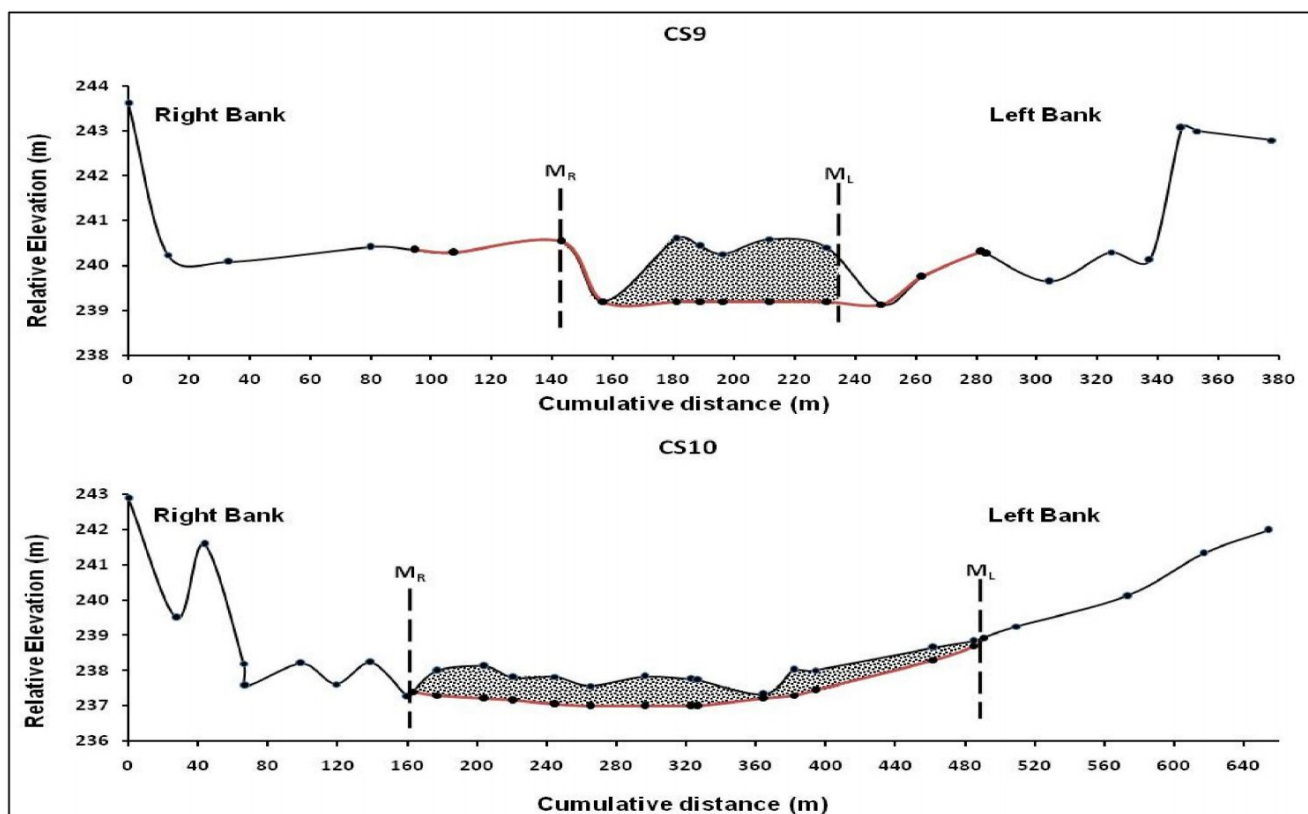
Note: All X & Y Coordinates are arbitrary (with Inst at 1000,1000) while Z coordinate is as per GPS at Inst station

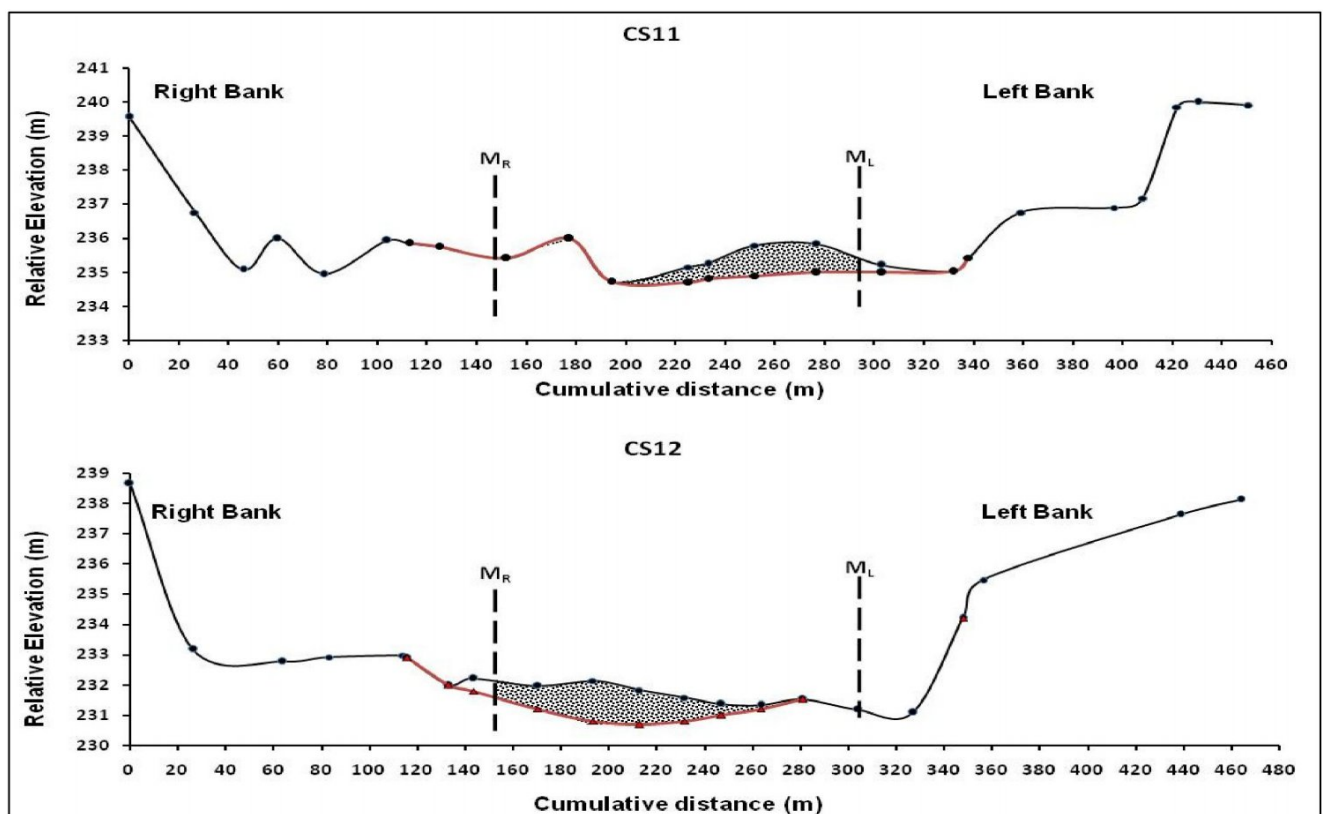












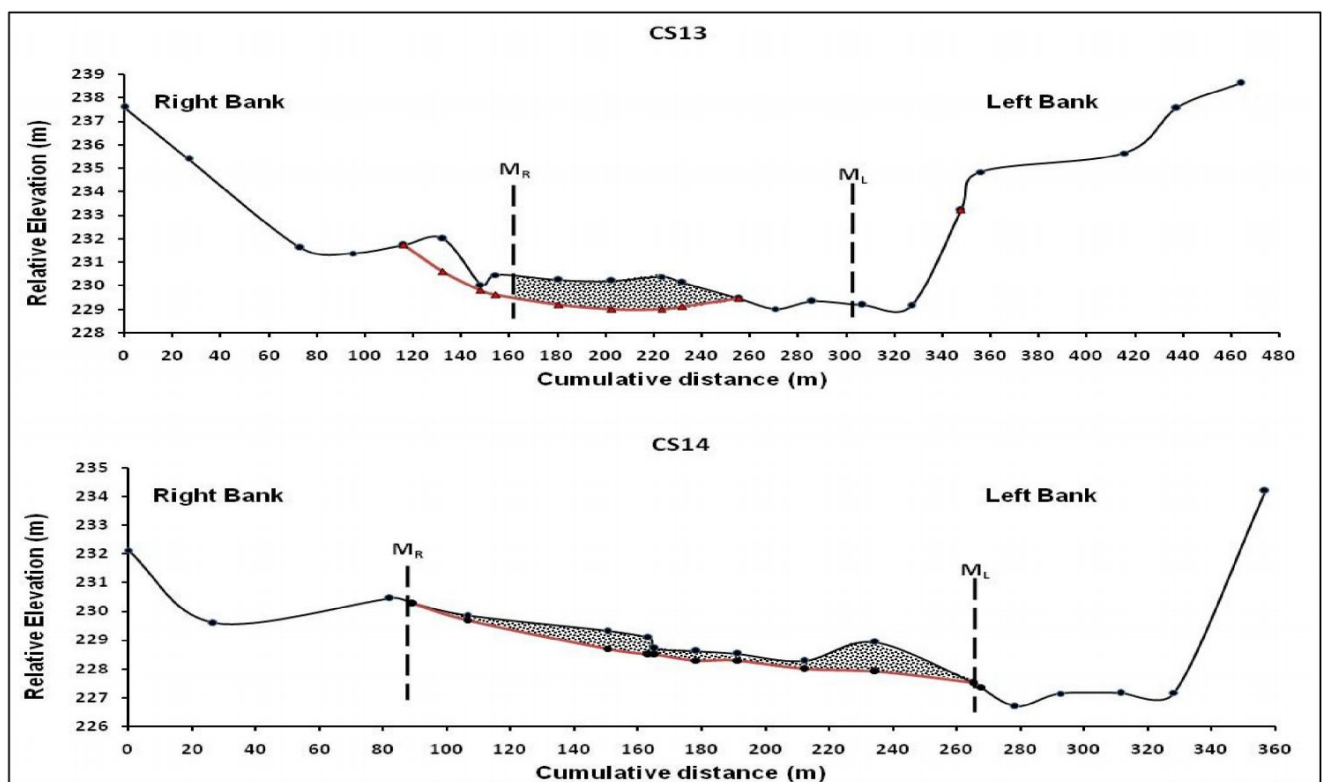


Fig. 5: Cross-section of river Kosi -DabkaII, Ramnagar at different locations showing the extractable RBM

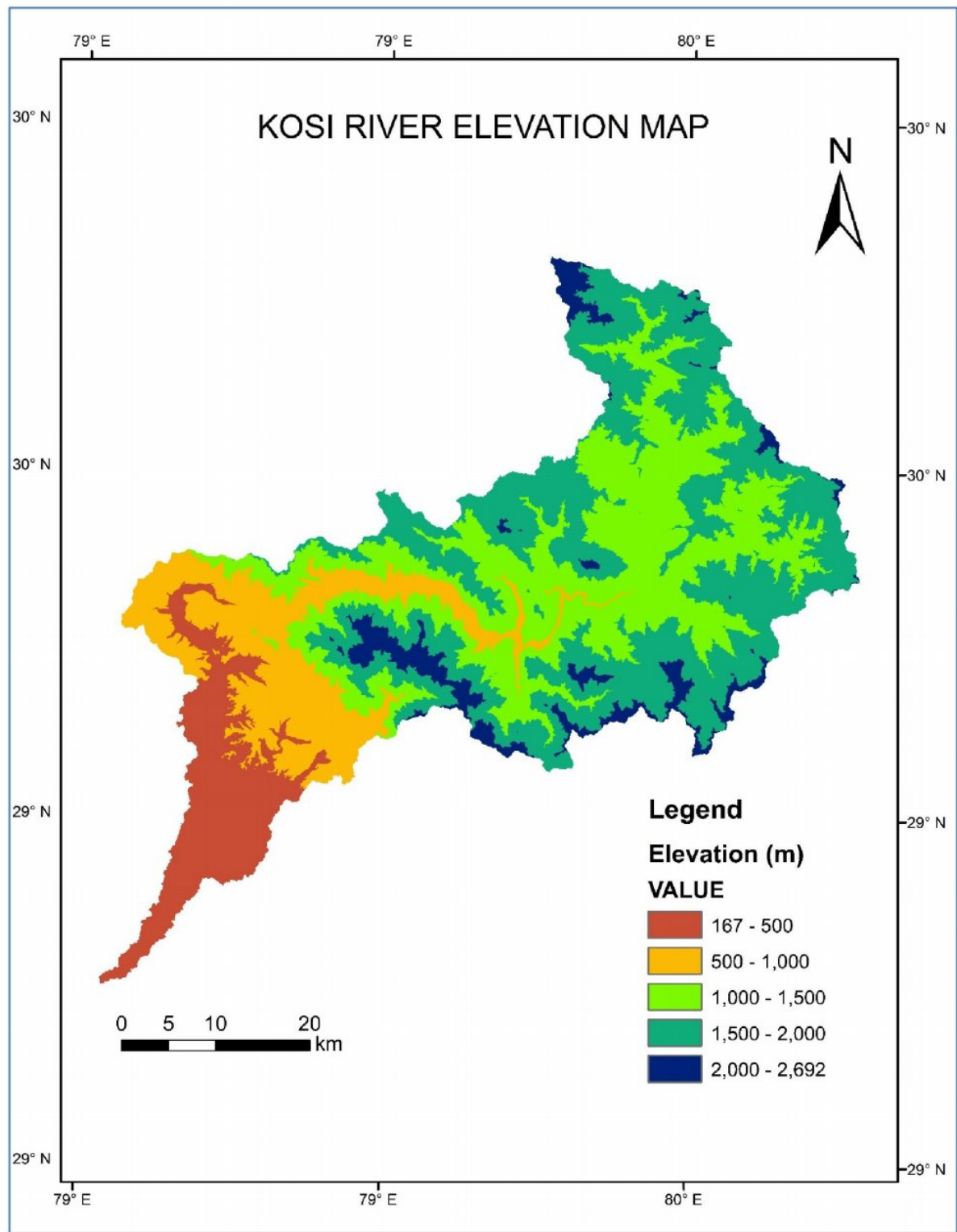
KOSI RIVER BASIN MAPPING DETAILS

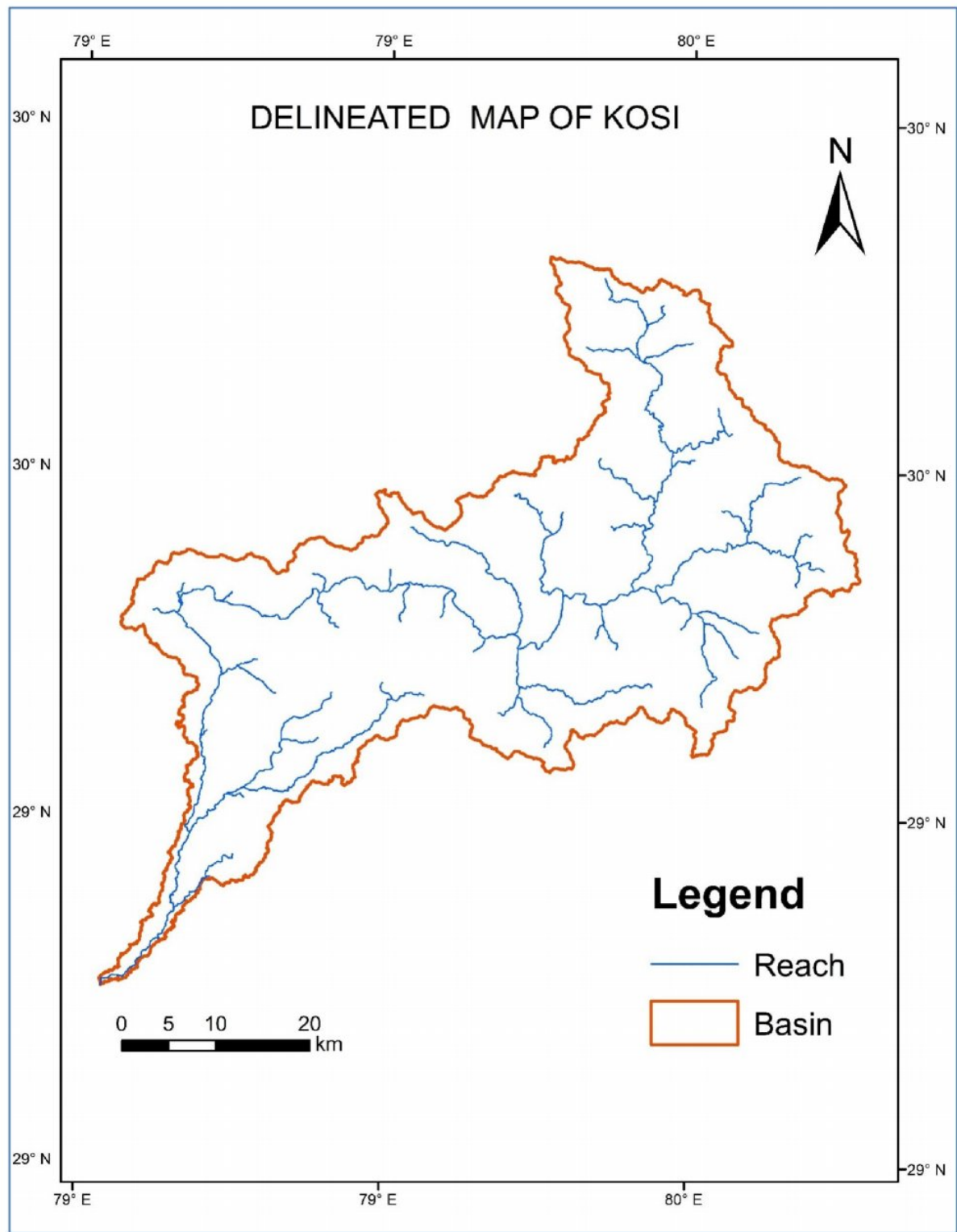
BASIN DETAILS:

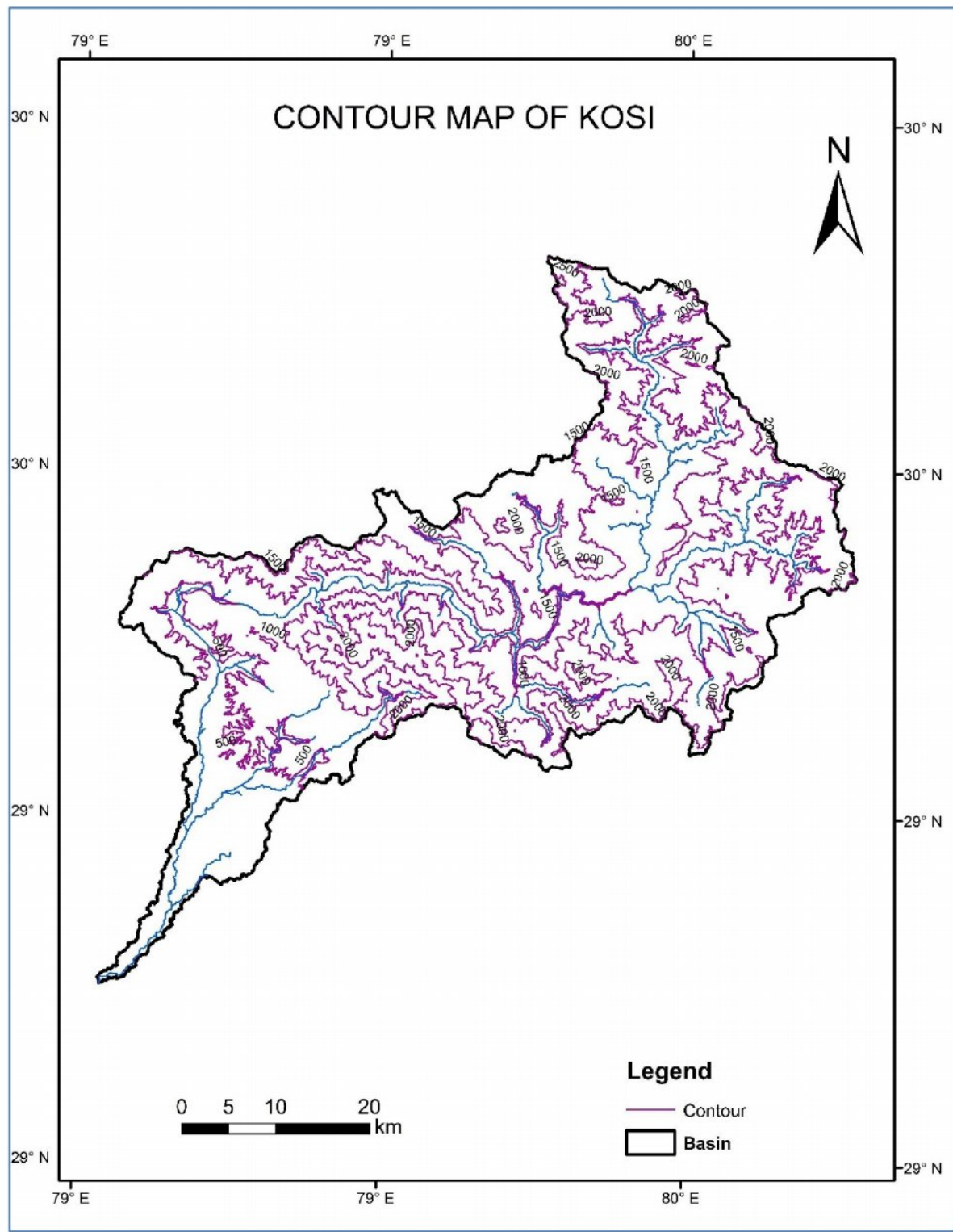
BASIN AREA, ha	222572.46875
BASIN PERIMETER, km	514.025
Longitude	79.026 E to 79.854 E
Latitude	29.168 N to 29.873 N

AREA (ha) UNDER DIFFERENT ELEVATION RANGE:

1. 167-500 m	25248.05 ha
2. 500.01- 1000 m	34003.23ha
3. 1000.01-1500 m	69873.56ha
4. 1500.01-2000 m	81190.08ha
5. 2000.01-2692 m	12256.52ha







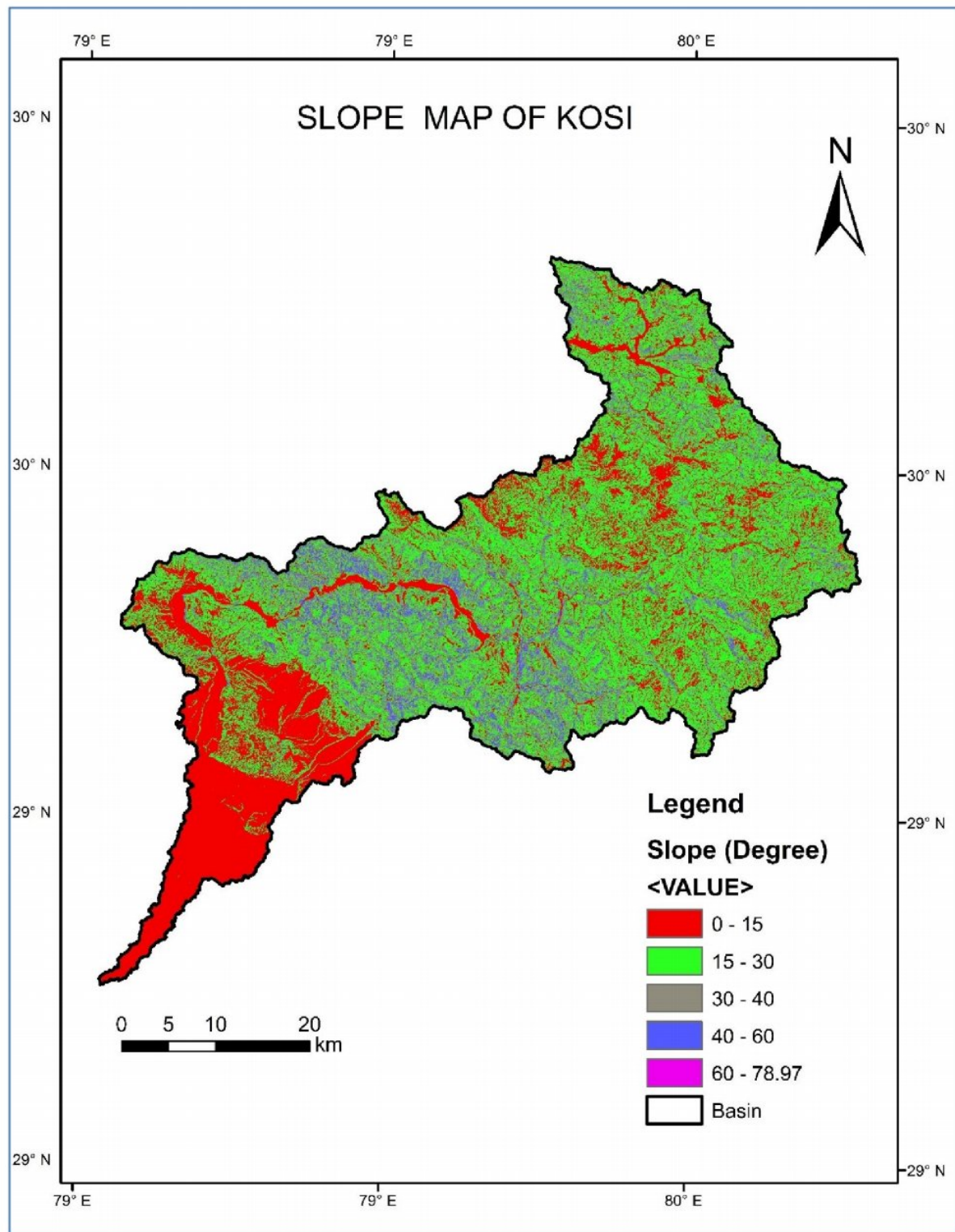




Photo : Survey of river Kosi - DabkaII for RBM estimation

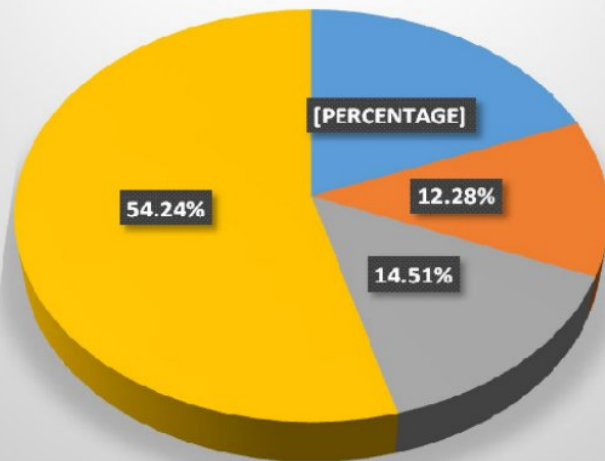


Photo ; Deposition of RBM in the surveyed river reach



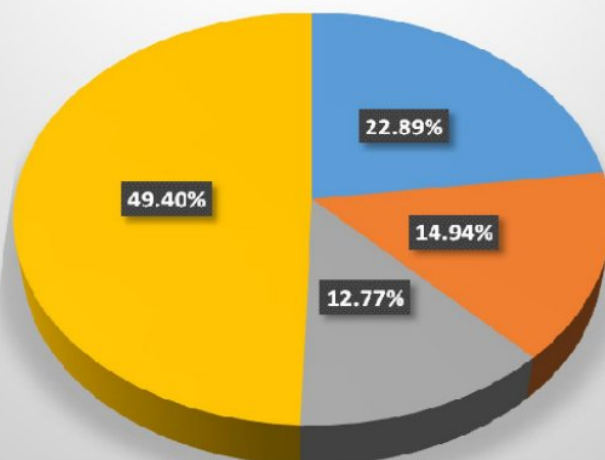
Photo : Constituents of RBM

RBM in Koshi river (top site)



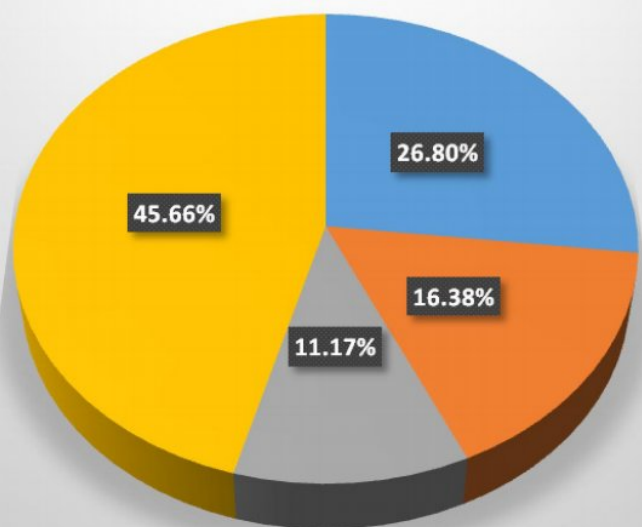
■ Less 2 mm ■ 2 mm to 10 mm ■ 10 mm to 20 mm ■ more 20 mm

RBM in Koshi river middle site



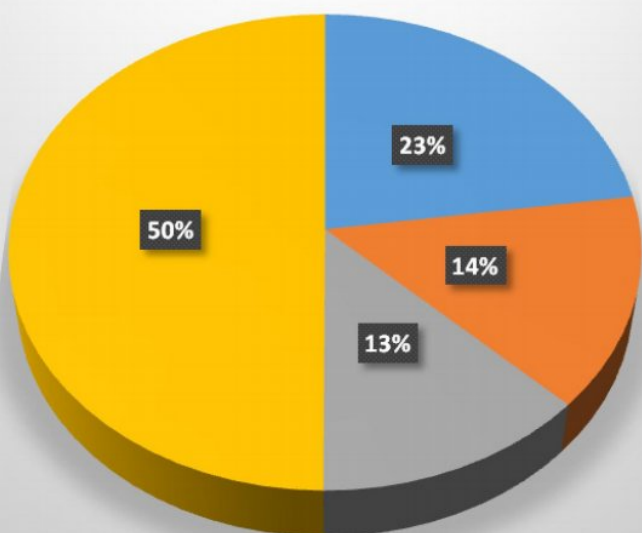
■ Less 2 mm ■ 2 mm to 10 mm ■ 10 mm to 20 mm ■ More 20 mm

RBM in Koski river (lower site)



■ Less 2 mm ■ 2 mm to 10 mm ■ 10 mm to 20 mm ■ More 20 mm

RBM in Koshi river (average)



■ Less 2 mm ■ 2 mm to 10 mm ■ 10 mm to 20 mm ■ More 20 mm