

List of Plates

Plate 4.1.1. Velocity measurement	78
Plate 4.1.2. Cross profiling	78
Plate 4.1.3 depth measurement	78
Plate 4.1.4 Coarse sediment size measurement.	78
Plate 4.1.5 Colluvium bedded channel near headwaters, downstream of Chitong Bridge, Upper Ambiok TG (13.01.2016)	96
Plate 4.1.6 Boulder-bedded hilly channel with step-pool morphology, upstream of Mukti bridge, Gorubathan, Darjeeling (08.08.2012)	96
Plate 4.1.7 Gravel stream-bed, 600m upstream of Railway bridge, Odlabari, Jalpaiguri (09.10.2012)	96
Plate 4.1.8 Sand and silt bed channel at Chikenmati near Kranti, Jalpaiguri (15.01.2016)	96
Plate 4.1.9 Braided reach of river Chel in the upstream of railway bridge, odlabari	97
Plate 4.1.10 Near bankfull flow submerging almost all mid channel bars of River Chel during monsoon month, 30.07.2017	97
Plate 4.1.11 Very turbid water during monsoon flowing near under the railway bridge, odlabari, 10.09.2012.	97
Plate 4.1.12 Winter minimum flow, 01.02.2016.	97
Plate 4.1.13 Super critical flow near to mountain front, wherein there are some standing waves	102
Plate 4.1.14 Subcritical flow far downstream wherein waves generated by field assistants are moving upstream on the water surface	102
Plate 4.1.15-4.1.16 Numerous large size boulders strewn across at the cross profile A-A' near Putharjhora Tea Garden.	108

Plate 4.2.1 Field Photograph taken on 10.09.2017 displaying first railway pier from left bank over Chel River at Odlabari showing clearly CWC marked Highest Flood Level recorded during 1968.	134
Plate 4.3.1 Confluence of Chel-Neora,near Majgaon during January, 2014	191
Plate 4.4.1 Huge erosion along the right bank of river Chel shrinking the Apalchand Reserve Forest	194
Plate 4.4.2 Tree trunks lying on the river bed after being washed from Apalchand Reserve Forest by river erosion	194
Plate 4.4.3 erosion of agricultural land along left bank near confluence with Neora River	194
Plate 4.4.4 Extensive left bank erosion near, 4kms downstream of Chel,Sukha and Manzing khola confluence.	194
Plate 4.4.5 Bank erosion along the right bank in the downstream direction at South Odlabari Tea Garden	194
Plate 4.5.1 Field photograph showing highly incised valley floor of Chel with multiple terrace development on the right side of flow in the upper course around 4kms upstream of Gorubathan(view towards north)	220
Plate 4.5.2 Mountain front of Chel Basin (View from south-east)	223
Plate 4.6.1 Field photographs showing Boulder lifting at Toribari, Upper Reach	234
Plate 4.6.2 Mid channel Gravel bar skimping at Odlabari, Middle Reach	234
Plate 4.6.3 and Plate 4.6.4 Sand mining at Rajadanga, Lower Reach	234
Plate 4.6.5& 4.6.6 Manual way of sediment extraction wherein crushing and segregation is done on the river bed only	234
Plate 4.6.7 Manual way of sediment extraction wherein crushing and segregation is done on the river bed only	235
Plate 4.6.8 Mechanized sediment extractions collect large volume but crushing and segregation happens with sieves at processing units.	235
Plate 4.6.9 Field photograph showing sediment processing unit at Toribari	235

Plate 4.6.10 Field photograph showing sediment processing unit at Odlabari	235
Plate 4.6.11 & 4.6.12 Channel bed deformation due to manual sediment mining	239
Plate 4.6.13& 4.6.14 mechanised wet pit mining creating huge longitudinal depressions (negative topography)	239
Plate 4.6.15 Dumping of huge amount of sediments at Odlabari processing unit creating positive topography of sediment mounds	239
Plate 4.6.16 Huge elongated mining pit after mechanized lifting of sediments	239
Plate 4.6.17 and 4.6.18 Huge pools created along mechanized wet pit mining sites	240
Plate 4.6.19 One of the many human breached embankment points for easy access of man and vehicles into the river.	242
Plate 4.6.20 Sediment mining operating barely 100m upstream of the Odlabari rail bridge	242
Plate 4.6.21 Sediment mining operating under the Odlabari road bridge	242
Plate 4.6.22 & 4.6.23 Bed incision at the foot of railway piers	249
Plate 4.6.24 Remnants of old damaged railway piers in between functional Rail and Road Bridge at Odlabari. The number of piers in the new railway bridge has been reduced to only two instead of five in the older one	250
Plate 4.6.25 & 4.5.26 Damaged right embankment at transverse section C-D	252
Plate 4.6.27 & 4.6.28 Repairing and strengthening of embankment by addition of dykes	252
Plate 4.6.29 Copious sediment aggradations forming huge gravel bars in the immediate upstream of railway bridge, Odlabari. Note the least difference in elevation between the river bed and the embankments.	253
Plate 4.6.30 & 4.6.31 Left embankment with dykes and erosion on then opposite along the mid channel bars near Rajadanga.	253
Plate 4.6.32 Extensive Paddy field in the foreground being cultivated on the huge left bank point bar at the upstream of Odlabari Rail Bridge	256

Plate 4.6.33 Betel Nut plantation on mid channel bar at Gorubathan	256
Plate 4.6.34 Road widening at near Ambiok T.G	257
Plate 4.6.35 Road widening near Chittong Bridge	257
Plate 4.6.36 & Plate 4.6.37 Dumping of loose sediments generated during road widening into the channel near Chitong Bridge. A dumper/tipper truck marked with red circle can be seen returning after dumping the sediments marked with blue circle, in Plate 9.37.	257
Plate 4.7.38 Vacant right lower terrace of Chel River just upstream of Mukti Bridge, Odlabari (Photograph- 08.08.2012)	258
Plate 4.6.39 Amenities for tourists and picnickers developed on the same site	258
Plate 4.6.40 Close up photograph showing various amenities developed for tourists and picnickers on the same site (13.01.2016)	258
Plate 4.6.41 Billboard erected by Department of Tourism, Govt. of West Bengal along roadside at Odlabari T.G. near Targhera showing master plan to convert Gazaldoba region into a mega Tourism Hub	258