REVISED ACTION PLAN FOR REJUVENATION OF FOUR IDENTIFIED POLLUTED RIVER STRETCHES OF

SIKKIM

SUBMITTED BY

RIVER REJUVENATION COMMITTEE -SIKKIM

CONSTITUTED VIDE NOTIFICATION NO. GOS/FEWMD/PR.SEC-PCCF/161 DATED 23.01.2019

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ANNEXURES

REVISED ACTION PLAN FOR REJUVENATION OF FOUR (04) IDENTIFIED POLLUTED RIVER STRETCHES OF SIKKIM

CHAPTER 1

1. INTRODUCTION

The Hon'ble National Green Tribunal (NGT) in the matter of original application number 673/2018 on 20/09/2018 has identified 351 stretches of various rivers in India, where water quality is not meeting the desired standard of BOD concentration of less than or equal to 3.0 mg/l.

The Hon'ble NGT has directed all the State and Union Territories of India to prepare Action Plans within two months for bringing all the polluted river stretches to be fit at least for bathing purposes (i.e. BOD< 3mg/l and FC< 500 MPN/100 ml) and implement those plans within six months from the date of finalization of the Action Plans. In view of the above the Hon'ble NGT has directed the state of Sikkim to prepare Action Plans to restore the polluted river stretches identified above, to the prescribed standards.

As per the CPCB document, the plan for restoration of polluted river stretches is proposed to be executed through two fold concepts. One concept is to target enhancement of river flow through interventions on the water sheds/ catchment areas for conservation and recharge of ground water for subsequent releases during lean flow period in a year.

This concept will help on diluting the pollutants in the rivers and streams to reduce concentration to meet desired level of water quality. The other concept is regulation and enforcement of standards in conjunction with the available flow in river/ streams and allocation of discharges with stipulated norms. Restoration of river health can also be achieved by preventing direct entry of domestic sewage and industrial effluents into the river.

Sikkim is bestowed with abundant hydrological resources primarily because of its geomorphology and its locations in the Eastern Himalayas. The Himalayas obstruct the rain bearing winds of the South West monsoon resulting the Himalayas to receive annual rainfall which range as the highest in the world, making the Himalayas a source of a large number of mighty rivers, perennial streams and snow covered mountains. The state of Sikkim is sandwiched between Nepal in the West and the kingdom of Bhutan in the East. On its Northern

border towers the plateau of Tibet whereas it shares its Southern border with West Bengal. On the world map it is just a speck with an approximate latitude of 27^0North and longitude of 88^0 East but its size belies its richness of culture, customs, heritage, flora and fauna.

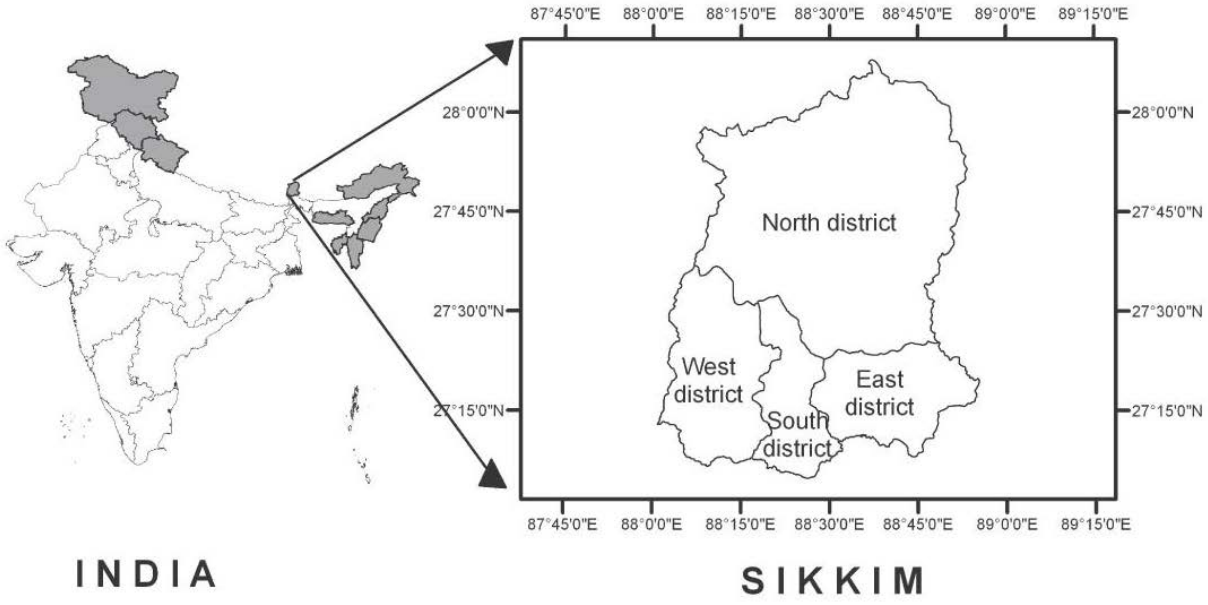

Figure 1. Map of Sikkim

Sikkim is entirely a hilly region and with an area of about 7096 sq. km. Geographically the state can be divided into five zones:

(a) Lower hills
(b) Mid hills
(c) Higher Hills
(d) Alpine zone
(e) Snow land

The mean temperature in the lower altitudinal zone varies between 4.5^o C to 8.5^o C. whereas at high altitudinal zone it varies from 1.5^o C to 9.5^o C. Temperature varies with altitude and slope. The maximum temperature is recorded during July and August and minimum during December and January. The mean annual rainfall is minimum at Thangu (820mm) and maximum at Gangtok (3490 mm). The intensity of rainfall during South West monsoon season decreases from South to North, while the distribution of winter rainfall is in the opposite order. The highest annual rainfall in a particular station may exceed 5000 mm. Average rainy day ranges from 100 days at Thangu to 184 days at Gangtok.

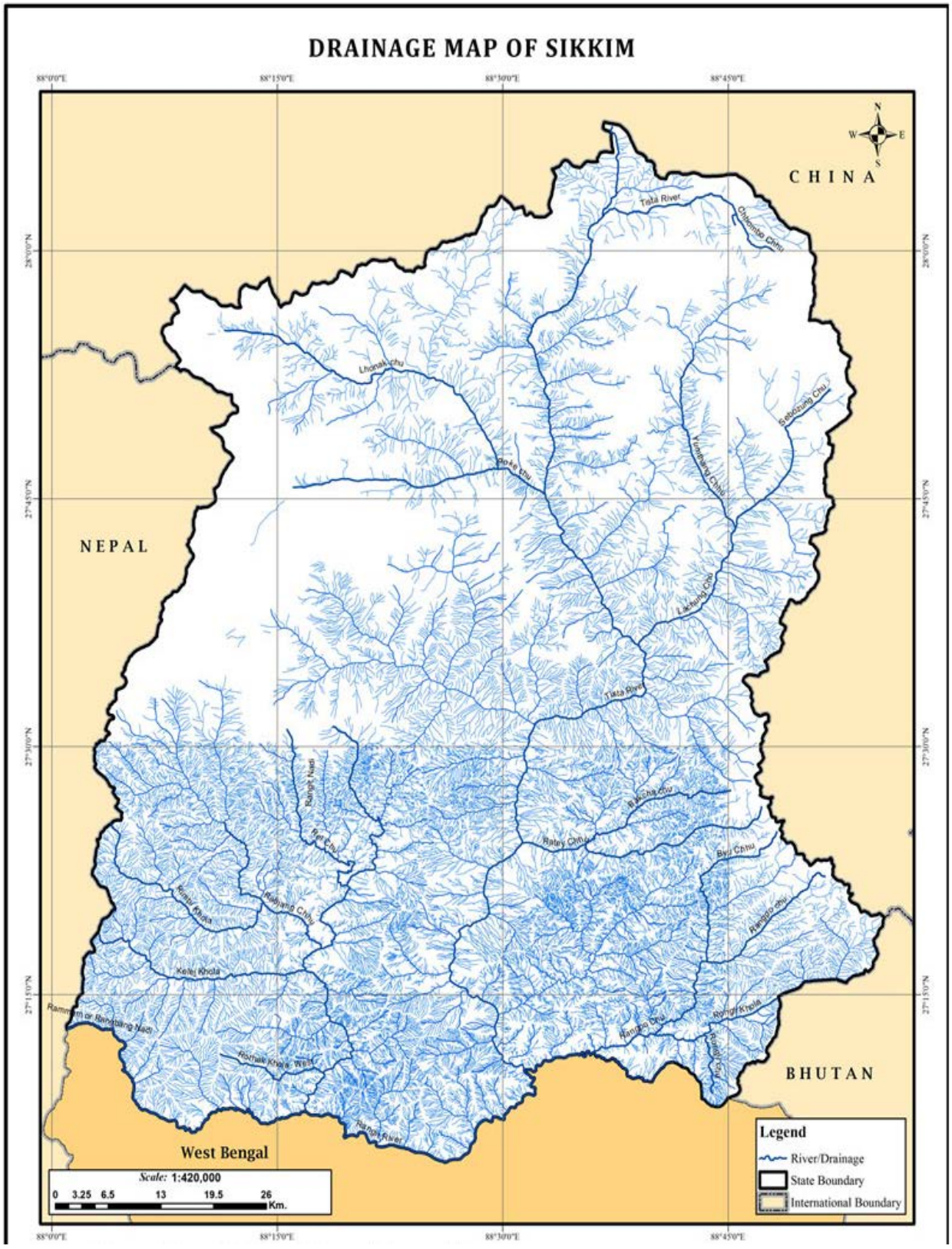

Figure 2. Map showing the rivers of Sikkim

CHAPTER 2

2.1 IDENTIFICATION OF POLLUTED RIVER STRETCHES

As per CPCB Standard, River water is considered to be fit for bathing when it meets the criteria of BOD (Bio chemical Oxygen Demand) less than 3mg/l, DO (Dissolved Oxygen) more than 5 mg/l and Faecal Coliform to be less than 500 MPN/100 ml. As per the latest assessment by CPCB, there are 351 polluted stretches in India where BOD content is more than 3 mg/l. The CPCB has divided the polluted river stretches into five priority categories i.e. I, II, III, IV, V depending upon the level of BOD.

In Sikkim four stretches have been identified by CPCB falling under category V:

1. Maney Khola – Adampool to Burtuk stretch(priority level V with BOD between 3.2-4.5 mg/l)
2. Rangit NHPC Dam site to Triveni stretch (Priority level V with BOD between 3.2-3.8 mg/l)
3. Rani chu – Namli to Singtam Stretch (Priority level V with BOD between 3.8-4.0 mg/l)
4. Teesta – Melli to Chungthang Stretch (Priority level V with BOD between 4.0-4.3 mg/l)

2.2. CRITERIA FOR PRIORITY FIVE

CPCB has identified polluted river stretches by statistically analyzing the water quality data under National Water quality monitoring programme for the year 2016 and 2017. The monitoring locations exceeding the water quality criteria are identified as polluted. The polluted locations in a continuous sequence are defined as polluted river stretches and categorized in five priority classes based on BOD concentration exceeding to BOD levels>30mg/l, BOD between 20&30mg/l, BOD between 10&20mg/l, BOD between 6-10mg/l and BOD between 3&6mg/l.
The criteria for Priority V area as follows:

(a) Monitoring locations having BOD 3.0-6.0 mg/l.
(b) CPCB has already prepared the list of identified stretches.

In Sikkim there are two main river water basins. They are

(1) The Teesta River Basin and
(2) The Rangit River Basin

The State Pollution Control Board of Sikkim under the National Water Monitoring Programme (NWMP) is carrying out monitoring at fourteen (14) stations, nine in the Teesta basin and five in the river Rangit basin. The details of the sampling stations are as follows:

Table 1. NWMP Stations

Sl. No.	Name of Station(Station Code)
1.	Chungthang(1801)
2.	Dikchu(1802)
3.	Burtuk (1803)
4.	Adampool (1804)
5.	Ranipool (1805)
6.	Singtam (1806)
7.	Singtam D.S. (1807)
8.	Rangpo (1808)
9.	Melli (1809)
10.	Rangeet River at NHPC dam Site (2034)
11.	Rangeet River at Legship (2035)
12.	Rangeet River at Reshi (2036)
13.	Rangeet River at Jorethang (2037)
14.	Rangeet River at Triveni (2038)

Monthly River Water Quality data of 14 stations provided by the State Pollution Control Board of Sikkim includes parameters like BOD (mg/l), COD (mg/l) Faecal Coliform (MPN/100 ml), total Coliform (MPN/100ml), Phosphate (PO_4mg/l), Nitrate (N mg/l), Chlorite (C mg/l). Average value of BOD and Faecal Coliform (FC) have been calculated aver the year. As per the data provided by SPCB from January 2018 to November 2018 indicates that the BOD varies from 1.2 mg/l to 3.8 mg/l.

CHAPTER 3

3. COMPONENTS OF ACTION PLAN

The proposed action plan covers following components:

3.1 Source control

Source control includes industrial pollution control and treatment and disposal of domestic sewage.

(a) Industrial pollution control

i. Inventorisation of industries
ii. Categories of industry and effluent quality
iii. Treatment of effluents, compliance with standards and disposal
iv. Regulatory regime.

(b) Channelization, treatment, utilization and disposal of treated domestic sewage.

i. Identification of towns in the catchment of river and estimation of quantity of sewage generated and existing sewage treatment capacities to arrive at the gap between the sewage generation and treatment capacities;
ii. Storm water drains now carrying sewage and sullage joining the river and interception and diversion of sewage to STPs
iii. Treatment and disposal of sewage and controlling open defecation
iv. Identification of towns for installing sewerage system and sewage treatment plants.

3.2 River catchment/Basin management-Controlled ground water extraction and periodic quality assessment

i. Periodic assessment of groundwater resources and regulation of ground water extraction by industries particularly in over exploited and critical zones/blocks
ii. Ground water re-charging /rain water harvesting
iii. Periodic ground water quality assessment and remedial actions in case of contaminated groundwater tube wells/bore wells or hand pumps.

3.3 Flood Plain Zone.

i. Regulating activities in flood plain zone.
ii. Greenery development- Plantation plan**.**

3.4 Ecological/Environmental Flow (E-Flow)

i. Issues relating to E-Flow

CHAPTER 4

ACTION PLAN

4.1. Maps

Maps showing all the towns, industrial estates, distributaries, drains have been enclosed as **Annexure I**.

4.2 Achievable water quality goals within the proposed timeline

As per this action plan, the main goal is to bring water quality in all the identified polluted river stretches i.e. four numbers (Category V) to the quality level fit for at least bathing standards issued by the CPCB.

4.3 Latest water quality polluted rivers and its tributaries, drains including flow characteristics, as well as ground water quality in catchment area

Water quality data of the various sampling location points of Rangpo and Tista river conducted by Assam Pollution Control Board on January 2019 enclosed as **Annexure II**. Directions on the basis of the above mentioned report issued to concerned Departments and Urban Local Bodies enclosed as **Annexure III.** Drainage infrastructure as well as natural drainage network information have also been sought from the concerned Department, Government of Sikkim.

4.4 Town and industry wise water consumption and waste water generation, treatment system, mode of disposal of treated sewage/ industrial effluent

Industry wise water consumption and waste water generation, treatment system, mode of disposal of treated sewage/ industrial effluent has been enclosed as **Annexure IV**. Town wise detailed information has been sought from concerned Departments, Government of Sikkim are still awaited.

4.5 Gap analysis with respect to sewage management and industrial effluent management

Action plan submitted by WS&PHE Department, Government of Sikkim has been enclosed as **Annexure V.**

4.6 Gap analysis with respect to waste management

a) Municipal Solid Waste: The State of Sikkim has one sanitary landfill site at Martam that caters to the waste generated in the towns of East District. The landfill site also has a 50 TPD compost plant for processing of bio-degradable waste. The dumpsite located at Sipshu, South District was being used for dumping of waste generated in South and West District.

b) Bio-Medical Waste: All the major health care facilities in the state have their own captive treatment facilities. Preparation of action plan is being prepared by Health Care, Human Services and Family Welfare Department, Govt. of Sikkim.

c) Plastic Waste – In the year of 2017-18, 99.6 tonnes have been generated in the state of Sikkim. Waste generated is segregated at landfill sites by rag pickers and other agencies and is sent to Siliguri for recycling. Plastic/solid waste generated from industries is collected by authorized scrap vendors.

d) E-Waste-currently due to non establishment of recycling facility in the state all e-waste generated in the state is transported to authorized recycling facility located at West Bengal. However, implementation of EPR conditions as per the E-waste Management Rules, 2016 is under process.

e) Construction and Demolition Waste: As per the decisions of the State Level Committee all service providers have been directed to prepare action plan on the said waste.

f) Hazardous Waste- Due to non-availability of Common Treatment, Storage and Disposal Facility in the state all hazardous waste generated is transported to West Bengal Waste Management Ltd., Haldia West Bengal.

g) Battery waste- Currently there is no manufacture of batteries in the state of Sikkim. All battery waste generated is sent to authorized facilities for recycling.

4.7 ADOPTION OF GOOD WATER UTILISATION PRACTICES

4.7.1 Utilization of treated sewage has been directed to the WS&PHE Department, Government of Sikkim. **Annexure VI.** Ground water abstraction for domestic purposes is not practiced in the state. The population mainly depends on surface/spring waster. Few industrial units are abstracting ground water.

4.7.2 GROUND WATER ABSTRACTION

a) Industries which are abstracting ground water should have rain water harvesting facility to recharge the ground water table. Copy of NOC for Central Ground Water Authority enclosed as **Annexure VII.**

Table 2. No. of Industries abstracting Ground Water

Sl. No.	No. of Industries abstracting Ground Water	District	Permission obtained from Central Ground Water Authority
1.	10 nos.	East	09 nos. (01 under process)
2.	07 nos.	South	07 nos.

b) State Pollution Control Board-Sikkim to ensure that all industries including those industries which are not drawing ground water are equipped with water harvesting system to reduce surface water consumption.

c) State Pollution Control Board-Sikkim to issue necessary direction to all industries which are not drawing ground water should also have water harvesting system in place to reduce the surface water consumption.

d) WS & PHE Department to ensure that the treated water from STP are be utilized for gardening/floriculture purpose and also for sprinkling/wetting of the roads as per NGT order.

CHAPTER 5

5. THE MANEY KHOLA (ADAMPOOL TO BURTUK STRETCH) REJUVENATION ACTION PLAN.

Maney khola (Adampool to Burtuk) stretch lies between River Maney khola, at Burtuk near Army Base camp, 4 KM upstream of Gangtok, the Capital town of Sikkim. Gangtok city is situated in a ridge along the right bank of Manaeykhola. Gangtok being the capital town of Sikkim is totally devoted for administrative and commercial purpose except for service sector industries like Hotel industries, garages and bakery units. There are no industrial units in and around Gangtok town. It has a sound sewerage system covering almost the entire town. The capital town has been declared as the cleanest hill capital. It is a beautiful tourist destination with sound solid waste Management in place. As per the report of the SPCB-Sikkim, the BOD level in this stretch varies from (2.0 mg/l to 3.5 mg/l) between the period of January 2018 to November 2018. Faecal Coliform has been found within the prescribed limit.

a) No industrial units are located in this stretch and major sources of pollution are non-point sources which includes residential houses, hotels, commercial establishments, hospitals and garages.
b) Huge number of garages are situated along the highway (NH-10) between Indira Bye pass upto Burtuk and all wastewater generated from such units requires to be channelied to STP located at Adampool and Sichey. In addition, hotels and bakery also needs to be connected to STPs.
c) Solid waste generated from the Gangtok township is being collected by Gangtok Municipal Corporation (GMC) and transported to Solid waste Management Facility located at Martam, East Sikkim. Disposal of plastic wastes and garbage is already prohibited by the State Government under the Sikkim Non-biodegradable Garbage (Control) Act, 1997. Further, burning of all type of agricultural waste, leaves, litter, paper wastes and garbage are banned by the State Government vide notification no. 196/FEWMD dated 05.01.2015, Gazette no.13 dated 27.01.15.
d) The state has achieved 100% open defecation free status and also the first State to win Nirmal Rajya Award in 2008.

e) Two major Hospitals are located in Gangtok. The details are as follows:

Table 3. List of Hospitals in Gangtok

Sl. No.	Name of the Hospital	No. of Beds	Waste Management
1.	Multi-speciality Government Hospital at Socheygang, Sichey	1000bedded Recently inaugurated on 14.01.2019 which would start functioning from 01.02.2019	Equipped with functional ETPs having 120KLD capacity. The hospital is equipped with Bio-medical waste management facility which includes autoclave and incinerator. The 1000 bedded Super Speciality Hospital has a functional combined ETP and STP facility. The treated waste water is discharged into sewerage network.
2.	Central Referral Hospital, Tadong under Sikkim Manipal University.	500 bedded	The hospital is connected to sewerage network. Equipped with incinerator for BMW treatment.

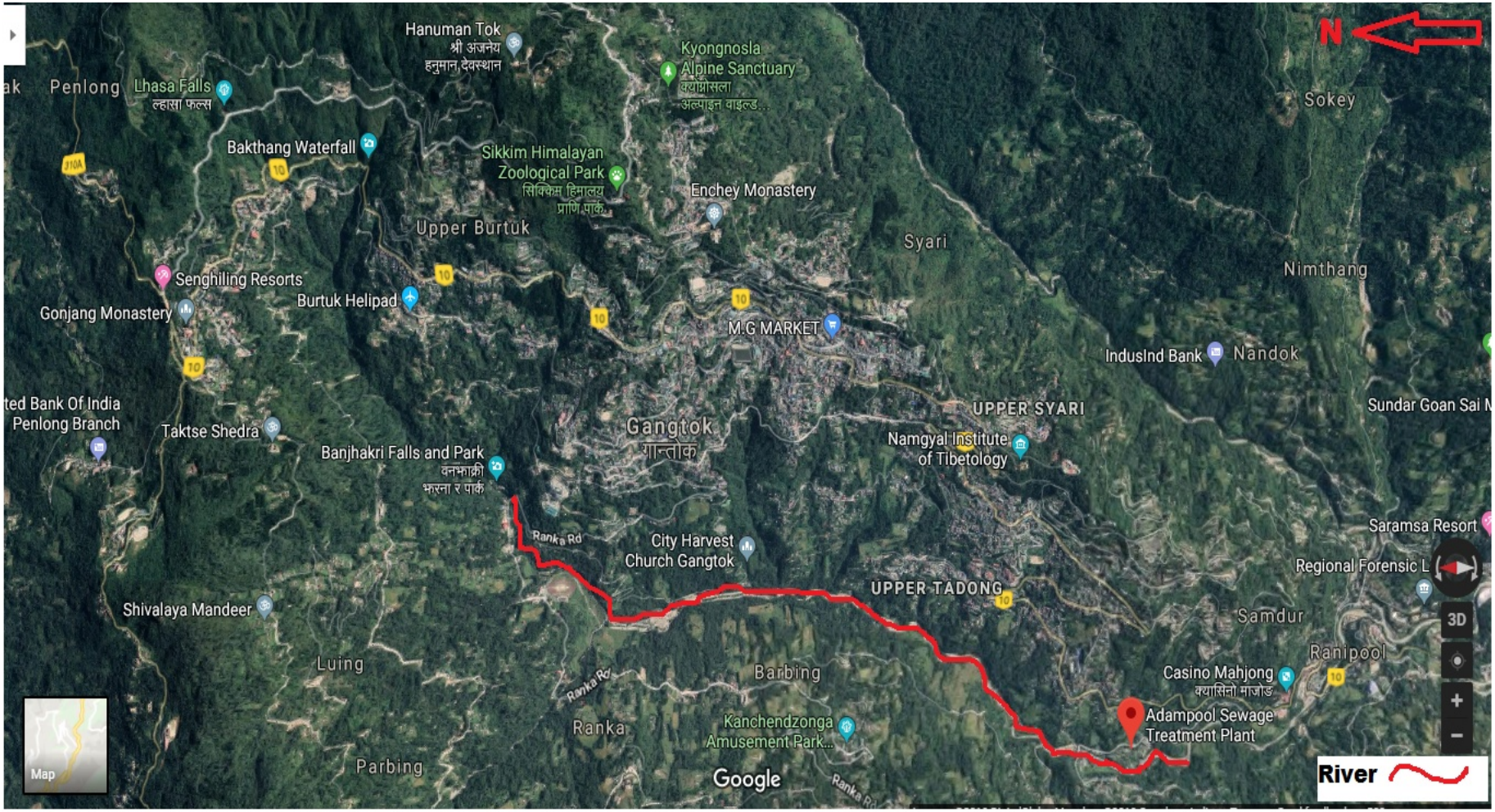

Figure 3. Map showing the river stretch between Adampool and Burtuk.

f) The detailed action plan are as follows:

Table 4. Action Plan for Maney Khola

Sl.No.	Action plan for Rejuvenation of Maney Khola (Adampool to Burtuk stretch)	Organization/ Agency Responsible for Execution of the Action plan	Time frame
I.	**Industrial Pollution Control**		
i.	Hotels, bakery, car washing facility and garages to be connected with sewerage network leading to STPs located at Adampool and Sichey.	State Pollution Control Board-Sikkim (SPCB) and Water Security & Public Health Engineering Department (WS&PHE)	Within 6 months
ii.	Locations where garbage are being dumped in water bodies shall be identified and necessary steps to prevent such wastes reaching the water bodies shall be taken	SPCB & Gangtok Municipal Corporation (GMC)	Within 03 months
iii.	Awareness or sensitization programme to be organized to prevent dumping of wastes into water bodies/ drains etc.	SPCB & Urban Local Bodies (ULBs)	Within 06 months
iv.	Company authorized Car Service Centre to set up ETP as they provide services to huge no. of vehicles.	SPCB	Within 06months
v.	Car washing facilities, garages and hotels needs to be issued	SPCB	Within 1 year

	with direction for treatment of waste water after the inventorization process is complete.		
v.	All unauthorized establishment like hotels, bakey and garages etc. to be issued Directions for obtaining Consents and thereby securing compliance	SPCB-Sikkim	Within 03 months
II.	**Sewage Treatment and Disposal**		
i.	Identification of any households which are not connected to main sewerage network and ensuring its connection	WS&PHE Department	Within 06months
ii.	To secure the compliance of the Direction issued to WSPHE on management of Sewage	SPCB/ WS&PHE Department	Within 03 months
iii.	To bring out an Appeal in the local dailies to generate awareness for prevention of discharge of sewage, if any, into drains or water bodies.	WS&PHE Department/SPCB	Within 03 months
iv.	Sewage treatment plants for each zone and related drains should be properly designed with the interception and diversion plan. No discharge of sewage from Sewerage network during	WS&PHE Department	Action plan submitted by WS & PHE Department

	repair works to be allowed instead provision for cess pool vehicles to be put in place.		Annexure III
v.	Sewage treatment plants (STP) at Adampool having combined capacity of 12.69MLD and at Sichey having 3.9MLD capacity should be operational 24hours and provision for holding of sewage during Maintenance/ repair work to be provided duly ensuring no untreated sewage gets discharged into the river.	WS&PHE Department	Action plan submitted by WS & PHE Department Anexure III
vi.	While getting registration from UDHD by new buildings it may be ensured that prior permission from WSPHE department for sewage connection is obtained	Urban Development & Housing Department (UD&HD) and WS&PHE Department	Within 06 months
vii.	Up-gradation of the laboratory facility at STP to ensure the quality of the treated sewage.	WS&PHE Department	Within 03 months
viii.	The stretch between Adampool and Burtuk does not have any ground water extraction.	-	-
III	**Flood Plain Zone (FPZ)**	All areas fall under hilly terrain and no flood plain identified.	

i.	Not applicable	FEWM Department	
ii.	Plantation on either sides of the river banks wherever possible to be carried out including areas falling under private holdings.	Forest, Environment and Wildlife Management Department (FEWMD)	Within 06 months
IV	**Environmental Flow (E-Flow) and Irrigation Practices**		
	No river water extraction or utilization in this stretch.	--	--

CHAPTER 6

6. THE RANGIT REJUVENATION PLAN [DAM SITE NHPC TO TRIVENI].

River Rangit originates from Zemu Glacier in West District of Sikkim. It travels through the West District passing through one of the important township in the south District and finally mergest with the mighty Teesta River. The Rangit River has a few Power House Project. One of the power project i.e. 60 MW NHPC run Hydel Project is situated at Legship in south District. The stretch between Dam site to Triveni has township like Legship Bazaar and the main commercial hub Jorethang urban local body. In between the Dam site of NHPC and Triveni there is one 96 MW Jorethang loop Hydel Electric Project. Legship which is situated in the upstream of 60 MW NHPC HEP is a small township catering to day to day requirement of the nearby villages. The main township of Jorethang is a business hub for both the West & South Districts of Sikkim. Downstream of the Jorethang town there are few numbers of industrial set up in a place called Manpur. The township has organised waste collection system and the STP has been almost in the verge of competition. Jorethang town as such does not have any industrial units in its boundary however there are small service sector industry like the hotels, garages, bakery units, etc.

The number of water based industries along the Rangit river (the NHPC Dam site to Triveni Stretch) are as follows:

Table 5. List of water based industries along Rangit river

Sl.No.	Type of Industrial units	Numbers
1.	Pharmaceutical Formulation Units	05
2.	Hydro Power Projects	05 [03 HEP under construction]
3.	Distillery	01
4.	Alcohol Blending and Bottling unit	02

a) One Industrial Growth Centre is located at Manpur near Jorethang where mostly Small scale industries including few industries listed above are located.
b) Major sources of pollution are non-point sources which includes residential houses, hotels, commercial establishments and garages.

c) Only one distillery falling under 17Category of highly polluting units exists in this stretch. It is equipped with online Continuous Emission and effluent monitoring System.

d) All industrial units are equipped with functional ETP and no treated effluent is allowed to be discharged ensuring zero discharge.

e) Further all pharma units are directed to install Continuous online effluent monitoring System.

f) Solid waste generated from industrial units are collected by Scrap Collection Agency and transported outside the state for recycling.

g) No bulk drug manufacturing (Pharma) units exist in the State which falls under highly polluting units.

h) Only Pharmaceutical formulation units are operating in the State and all hazardous wastes generated from Pharmaceutical (Formulation) unit are sent to Common Hazardous Waste Treatment, Storage and Disposal Facility (CHWTSDF) by the name M/s West Bengal Waste Management Ltd., located at Haldia, West Bengal.

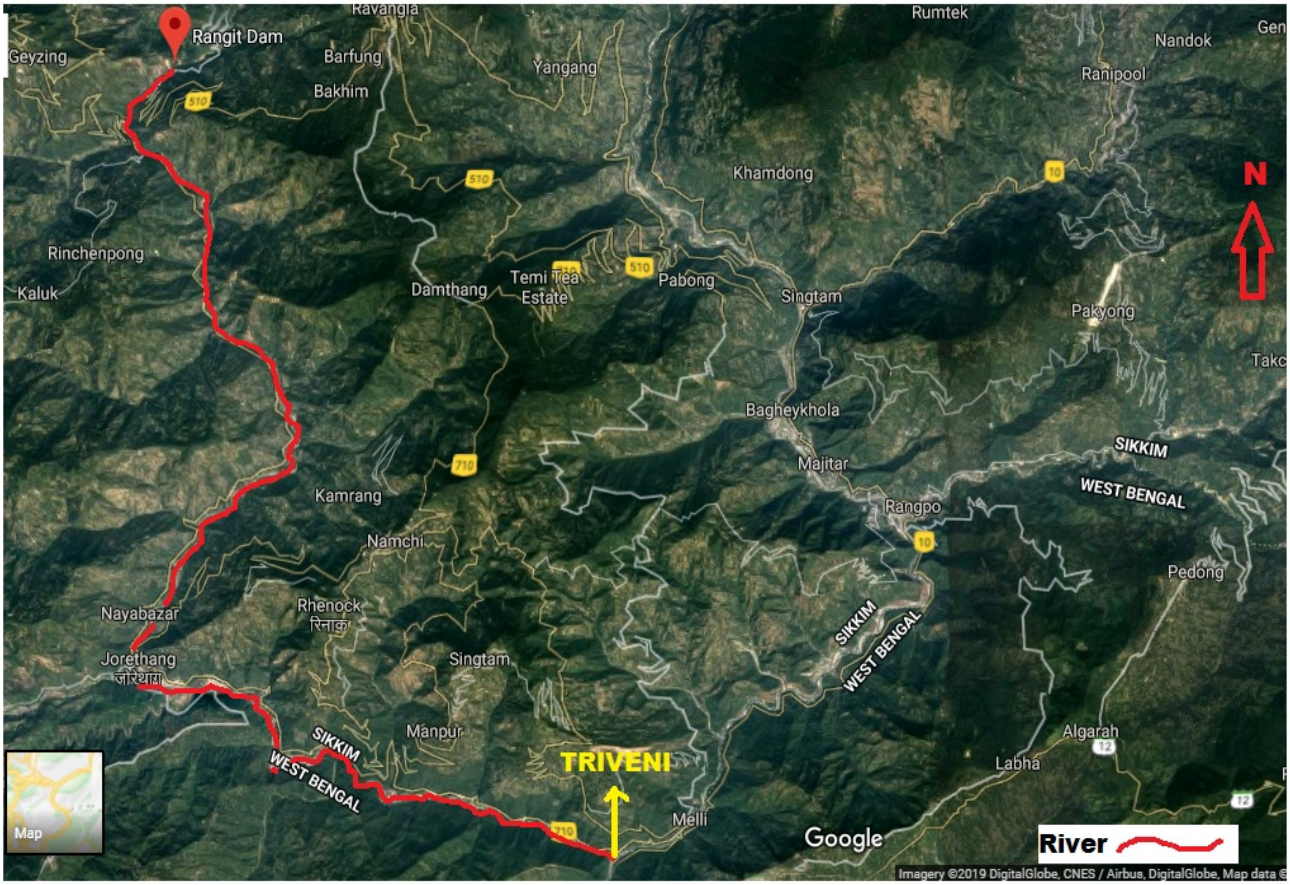

Figure 4. Map showing the river stretch between Rangit NHPC Dam site and Triveni.

The detailed action plan for the rejuvenation of Rangit river [Dam site NHPC to Tirveni stretch] are as follows:

Table 6. Action Plan for Rangit River

Sl. No	Action plan for rejuvenation of river Rangit River [Dam site NHPC to Tirveni stretch]	Organization/ Agency Responsible for Execution of the Action plan	Time frame
I.	**Industrial Pollution Control**		
i.	Installation of Online Continuous Effluent Monitoring System (OCEMS) by all pharma units to be completed.	SPCB	Within 03 months
ii.	Regular monitoring to check the functioning of the OCEMS	SPCB	Within 03 months
iii.	All the major water based industries to appoint Environment Officers to ensure proper functioning of the pollution control devices and compliance with the environmental norms	SPCB	Within 03 months
iv.	Locations where garbage are being dumped in water bodies shall be identified and necessary steps to prevent such wastes reaching the water bodies shall be taken	SPCB & Urban Local Bodies	Within 03 months
v.	Company authorized Car Service Centre to set up ETP as they provide services to huge no. of vehicles.	SPCB	Within 06months
vi.	Car washing facilities, garages and hotels to be issued with direction for obtaining consent and treatment of wastewater after the inventorization process is complete.	SPCB	Within 1 year

vii.	Awareness or sensitization programme to be organized to prevent dumping of wastes into water bodies/ drains etc.	SPCB & Urban Local Bodies	Within 06 months
viii.	All unauthorized establishment like hotels, bakery and garages etc. to be issued Directions for obtaining Consent and securing compliance thereof.	SPCB	Within 03 months
II.	**Sewage Treatment and Disposal**		
i.	Identification of any households which are not connected to main sewerage network and ensuring it s connection	WS&PHE Department	Within 06 months
ii.	To bring out appeal in the local dailies to generate awareness for prevention of discharge of sewage, if any, into drains or water bodies.	WS&PHE Department	Within 03 months
iii.	Sewage treatment plant (STP) at Melli, South Sikkim having 0.48MLD capacity should be operational 24hours and provision for holding of sewage during Maintenance/ repair work to be provided duly ensuring no untreated sewage gets discharged into the river.	WS&PHE Department	Within 03 months
iv.	Sewage treatment plants for each town and related drains should be properly designed with an interception and diversion plan. No discharge of sewage from Sewerage network during repair works to be allowed instead provision for cess pool vehicles to be put in place.	WS&PHE Department	Within 06 months

v.	The treated water from STP should be utilized for gardening/floriculture purpose and also for sprinkling/ wetting of the roads as per NGT order.	WS&PHE Department	Within 03 months
vi.	The proposed Sewage treatment plant (STP) having capacity of 1.7MLD at Jorethang to be expedited for operationalisation.	WS&PHE Department	Within one year.
vii.	While getting registration from UDHD by new buildings it may be ensured that prior permission from WSPHE department for sewage connection is obtained	UDHD and WS&PHE Department	Within 06 months
viii.	Houses with septic tank facilities to be provided with Cess Pool Vehicle for necessary cleaning and disposal at STP	UDHD/ Local Bodies	Within 06 months
II	**Ground water Extraction**	-	-
	Only industries are extracting ground water in this area. These units requires to obtain necessary permission from CGWA.	SPCB	Within 06 months
III	**Flood Plain Zone (FPZ)**	All areas fall under hilly terrain and no flood plain identified.	
i.	All industrial units located in this stretch to develop greenery by preparing a plantation plan.	FEWMD/SPCB	Within 03months
ii.	Plantation on either sides of the river banks wherever possible to be carried out including area falling under private holdings.	FEWMD	Within 06 months

IV	**Environmental Flow (E-Flow) and Irrigation Practices**		
i.	To direct all HEPs (both operational and under construction) to install digital e-flow meter to monitor the minimum discharge during lean period.	SPCB	Within 03 months
ii.	The HEPS to ensure release of minimum 15-20% of environmental flow during lean season	SPCB	Within 06 months

CHAPTER 7

7. THE RANI-CHU (NAMLI TO SINGTAM STRETCH) REJUVENATION PLAN.

The River Ranichu which originates from the East District passes through two main townships namely; the Ranipool Bazaar and Singtam Bazaar. The Ranichu meets the Maneykhola downstream of Ranipool bazaar and finally merges with Teesta in the downstream of Singtam Bazaar. In the stretch between Namli to Singtam there are a few industries. The Madhya Bharat Power corporation Ltd. is constructing a 96MW Hydro Electric project in this stretch and there are small Hydro Electric Projects viz. Lagyap HEP-12MW and Jalipower House -1MW in this stretch. The Ranipool which is located in the upstream of Namli and Singtam stretch has set up sewage Treatment Plant and it also has a good solid waste management system. A waste composting facility also exists between Namli to Singtam stretch. As per the report the BOD values in the stretch during the month of Jan 2018 to Nov 2018 varies from (2.0mg/l to 3.8mg/l)faecal Coliform varies form (18 to 95 per 100 ml).

The number of water based industries along the Rani Chu river (Namli to Singtam Stretch) are as follows:

Table 7. List of waster based industries along Rani Chu

Sl.No.	Type of Industrial units	Numbers
1.	Pharmaceutical Formulation Units	10
2.	Hydro Power Projects	03 [One HEP under construction i.e MBPCL, 96MW]
3.	Fruit preservation Factory	01

a) In addition, one Industrial Growth Centre is located at Samlik-Marchak near Ranipool where mostly Small scale industries are located.
b) At the upstream of the Rani Chu river one Crematorium is also located at Jalipool.
c) Major sources of pollution are non-point sources which includes residential houses, hotels, commercial establishments and garages.
d) No highly polluting units exist in this stretch and all units are equipped with functional ETP and no treated effluent is allowed to be discharged ensuring zero discharge.

e) Further all pharma units are directed to install Continuous online effluent monitoring System..

f) Solid waste generated from industrial units are collected by Scrap Collection Agency and transported outside the state for recycling.

g) No bulk drug manufacturing (Pharma) units exist in the State which falls under highly polluting units.

h) Only Pharmaceutical formulation units are operating in the State and all hazardous wastes generated from Pharmaceutical (Formulation) units are sent to Common Hazardous Waste Treatment, Storage and Disposal Facility (CHWTSDF) by the name M/s West Bengal Waste Management Ltd., located at Haldia, West Bengal.

i) Solid waste generated from the Ranipool area is being collected by Gangtok Municipal Corporation (GMC) and transported to Solid waste Management Facility located at Martam, East Sikkim.

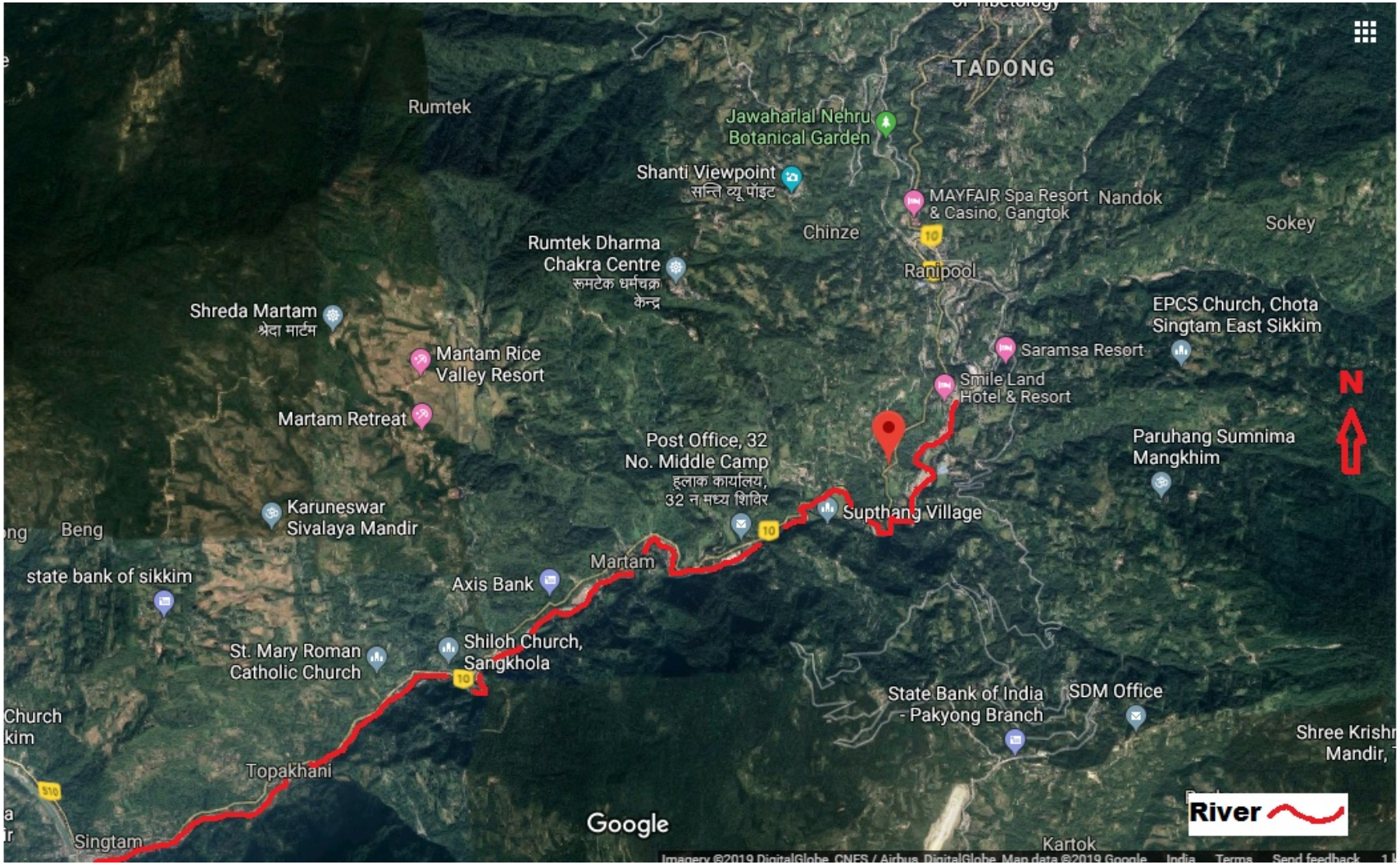

Figure 5. Map showing the river stretch between Namli and Singtam.

The detailed action plan for rejuvenation of Rani-Chu river (Namli to Singtam stretch) are as follows:

Table 8. Action Plan for Rani Chu river

Sl. No	**Action plan for Rejuvination of Rani-Chu River (Namli to Singtam Stretch)**	**Organization/ Agency Responsible for Execution of the Action plan**	**Time frame**
I.	**Industrial Pollution Control**		
i.	Installation of Online Continuous Effluent Monitoring System OCEMS by all pharma units to be completed.	SPCB	Within 03 months
ii.	Regular monitoring to check the functioning of the OCEMS	SPCB	Within 03 months
iii.	All the major water based industries to appoint Environment Officers to ensure proper functioning of the pollution control devices and compliance with the environmental norms	SPCB	Within 03 months
iv.	Locations where garbage are being dumped in water bodies shall be identified and necessary steps to prevent such wastes reaching the water bodies shall be taken	SPCB & Urban Local Bodies	Within 03 months
v.	Company authorized Car Service Centre to set up ETP as they provide services to huge no. of vehicles.	SPCB	Within 06months
vi.	Car washing facilities, garages and hotels needs to be issued with direction for treatment of waste water after the inventorization process is complete.	SPCB	Within 1 year

vii.	Awareness or sensitization programme to be organized to prevent dumping of wastes into water bodies/ drains etc.	SPCB & Urban Local Bodies	Within six months
viii.	All unauthorized establishment like hotels, bakery and garages etc. to be issued Directions for obtaining Consents and thereby securing compliance	SPCB	Within 03 months
xi.	The sanitary landfill site located at Martam requires to operate ETP for proper treatment of leachate generated from the site.	UD&HD/GMC	Within 06 months
x.	Erect wall to prevent littering and dumping of garbage into the river from the landfill site.	UD&HD/GMC	Within 03 months
xi.	Collection of sand and loose stones/boulders along identified sites to be regulated ensuring that no mechanized collection is carried out.	FEWMD	Within 03 months
xii.	No dumping of mucks into the river by under-construction HEPs	SPCB/FEWMD	Within 03 months
xiii.	Proper Sanitation facility at the labour camp site of the HEP to be constructed duly ensuring that no sewage is discharged into the river.	SPCB	Within 03months
xiv.	Regulate washing of vehicles in the water bodies	FEWMD	Within 03 months
II.	**Sewage Treatment and Disposal**		
i.	Identification of any households which are not connected to main sewerage network and ensuring it's connection to	WS&PHE Department	Within 06months

	Singtam STP.		
ii.	To bring out an Appeal in the local dailies to generate awareness for prevention of discharge of sewage, if any, into drains or water bodies.	SPCB/ WS&PHE Department	Within 03 months
iii.	Sewage treatment plants for each town and related drains should be properly designed with an interception and diversion plan. No discharge of sewage from Sewerage network during repair works to be allowed instead, provision for cess pool vehicles to be put in place.	WS&PHE Department	Within 06 months
iv.	The treated water from STP should be utilized for gardening/floriculture purpose and also for sprinkling /wetting of the roads as per NGT order.	WS&PHE Department	Within 03 months
v.	The Sewage treatment plants (STPs) at Ranipool having 1.27MLD capacity and Singtam having 0.66MLD to be operational 24 hours and provision for holding of sewage during Maintenance/ repair work to be provided duly ensuring no untreated sewage gets discharged into the river. Treated sewage which meets the standard may be reused for irrigation in public garden.	WS&PHE Department	Within 06 months
vi.	While getting registration from UDHD by new buildings it may be ensured that prior permission from WSPHE department for	UDHD and WS&PHE Department	Within 06 months

	sewage connection is obtained.		
vii.	Houses with septic tank facilities should be provided with Cess Pool Vehicle for necessary cleaning and disposal at STP	UDHD/ Local Bodies	Within 06 months
viii.	Prevention of littering and garbage dumping from Crematorium located at Ranipool	UDHD/ Local Bodies	Within 03 months
ix.	ETP at sanitary landfill, Martam, East Sikkim to be made functional by GMC for leachate treatment and reuse of the treated water.	GMC	Within 03 months
II	**Ground Water Extraction**	-	-
	Only industries are extracting ground water in this area. These units requires to obtain necessary permission from CGWA.	SPCB	Within 06 months
III	**Flood Plain Zone (FPZ)**	All areas fall under hilly terrain and no flood plain identified.	
i.	All industrial units located in this stretch to develop greenery by preparing a plantation plan	FEWMD/SPCB	Within 03 months
ii.	Plantation on either side of the river banks wherever possible should be carried out even in private holdings also	FEWM Department	Within 06 months
IV	**Environmental Flow (E-Flow) and Irrigation Practices**		
i.	To direct all HEPs (both operational and under construction) to install digital e-flow meter to monitor the minimum discharge during lean period.	SPCB	Within 03 months

ii.	The HEPS to ensure release of minimum 15-20% of environmental flow during lean season	SPCB	Within 06 months

CHAPTER 8

8. THE TEESTA RIVER (MELLI TO CHUNGTHANG STRETCH) REJUVENATION PLAN.

The River Lachenchu and Lachungchu meet downstream of Chungthang Bazaar, forming Teesta River in the North District of Sikkim. The River Teesta after originating from Downstream of Chungthang travels down crossing different towns like Dzongu, Dikchu, Singtam, Rangpo and Melli and finally unite with River Rangit at Triveni in West Bengal. The Chungthanag Melli stretch have important Hydro Electric Projects like the 1200MW Teesta Urja Hydro Electric Projects, 96MW Sneha Kinetic Hydro Electric Projects, 510 MW Teesta Stage-V Hydro Electric Projects, which are in operation. In the stretch between Melli to Chungthang the River Teesta passes through the industrial hub of Sikkim i.e. the Rangpo belt.

Many Pharmaceutical industries, alcohol blending units and other ancillary units are established in these belts. The Sikkim Manipal Institute of Technology is also located in the bank of River Teesta. The township of Singtam and Rongpo are two importance commercial hub of East District. In addition to the manufacturing industries there are service providing industries like hospitals, Health care facilities, Hotels, Garages, and other units in this stretch. As per the report, the BOD value of the water varies from (1.5mg/l to 3.8 mg/l) between the period of January 2018 to Nov 2018. Faecal Coliform varies from (10 to 100 per 100ml of water sample) between the period of January 2018 to November 2018.

The number of water based industries along the Teesta river (Melli to Chungthang Stretch) are as follows:

Table 9. List of water based industries along Teesta river

Sl.No.	Type of Industrial units	Numbers
1.	Pharmaceutical Formulation Units	36
2.	Food processing	1
3.	Distillery/ Breweries	7
4.	Alcohol Blending and Bottling unit	
5.	Hydro Electric Power Projects	05[02 units under construction]

a) In addition, few alcohol blending bottling units, garages, stone crushers, hot mix plant

and ancillary units are also operational in this stretch.

b) Pharmaceutical formulation units are also located in the upstream of Rangpo river which is one of the tributary of the Teesta River.

c) Major sources of pollution are non-point sources which includes residential houses, hotels, commercial establishments and garages.

d) No highly polluting units exists in this stretch and all units are equipped with functional ETP and no treated effluent is allowed to be discharged ensuring zero discharge.

e) Further all pharma units are directed to install Continuous online effluent monitoring System..

f) Solid waste generated from industrial units are collected by Scrap Collection Agency and transported outside the state for recycling.

g) No bulk drug manufacturing (Pharma) units exist in the State which falls under highly polluting units.

h) Only Pharmaceutical formulation units are operating in the State and all hazardous wastes generated from Pharmaceutical (Formulation) unit are sent to Common Hazardous Waste Treatment, Storage and Disposal Facility (CHWTSDF) by the name M/s West Bengal Waste Management Ltd., located at Haldia, West Bengal.

i) An Engineering College by the name Sikkim Manipal Institute of Technology situated at Majhitar, East Sikkim is operating a STP for treatment of sewage generated from the college complex.

j) One Slaughter house under the Department of Animal Husbandry, Live Stock, Fisheries and Veterinary Services Department is operating in Majhitar, East Sikkim.

Figure 6. Map showing river stretch between Chungthang and Melli.

Detailed action plan for rejuvination of Teesta River (Melli to Chungthang stretch) are as follows:

Table 10. Action Plan for Teesta River

Sl. No	**Action plan for rejuvenation of Teesta River (Melli to Chungthang stretch)**	**Organization/ Agency Responsible for Execution of the Action plan**	**Time frame**
I.	**Industrial Pollution Control**		
i.	Installation of Online Continuous Effluent Monitoring System (OCEMS) by all pharma units to be completed.	SPCB	Within 03 months
ii.	Regular monitoring to check the functioning of the OCEMS.	SPCB	Within 03 months
iii.	All the major water based industries to appoint Environment Officers to ensure proper functioning of the pollution control devices and compliance with the environmental norms.	SPCB	Within 03 months
iv.	Locations where garbage are being dumped in water bodies shall be identified and necessary steps to prevent such wastes reaching the water bodies shall be taken.	SPCB & Urban local bodies	Within 03 months
v.	Company authorized Car Service Centre to set up ETP as they provide services to huge no. of vehicles.	SPCB	Within 06months
vi.	Car washing facilities, garages and hotels needs to be issued with direction for treatment of waste water after the inventorization process is complete.	SPCB	Within 1 year

vii.	Awareness or sensitization programme to be organized to prevent dumping of wastes into water bodies/ drains etc.	SPCB & Urban Local Bodies	Within six months
viii.	All unauthorized establishment like hotels, bakery and garages etc. to be issued Directions for obtaining Consents and thereby securing compliance.	SPCB	Within 03 months
ix.	ETP to be constructed in the Slaughter house located at Majhitar, East Sikkim.	Animal Husbandry, Live Stock, Fisheries and Veterinary Services Department	Within one year
x.	Collection of sand and loose stones/boulders along identified sites to be regulated ensuring no mechanized collection is carried out.	FEWMD	Within 03 months
xi.	No dumping of mucks into the river by under-construction HEPs.	SPCB/FEWMD	Within 03 months
xii.	Proper Sanitation facility at the labour camp site of the HEP to be constructed duly ensuring that no sewage is discharged into the river.	SPCB	Within 03months
xiii.	Regulate washing of vehicles in the water bodies.	FEWMD	Within 03 months
II.	**Sewage Treatment and Disposal**		
i.	Identification of any households which are not connected to main sewerage network and ensuring its connection to STP at Rangpo and Melli.	WS&PHE Department	Within 06 months
ii.	To bring out appeal in the local dailies to generate awareness for prevention of discharge of sewage, if any, into drains	SPCB/ WS&PHE Department	Within 03 months

	or water bodies.		
iii.	Sewage treatment plants for each town and related drains should be properly designed with the interception and diversion plan. No discharge of sewage from Sewerage network during repair works to be allowed instead provision for cess pool vehicles to be put in place.	WS&PHE Department	Within six months
iv.	The treated water from STP should be utilized for gardening/floricultural purpose and also for sprinkling /wetting of the roads as per NGT order.	WS&PHE Department	Within six months
v.	The Sewage treatment plant (STP) at Rangpo having 0.96MLD capacity to be operationalized and Melli to be kept operational 24 hours.	WS&PHE Department	Within six months
vi.	While getting registration from UDHD by new buildings it may be ensured that prior permission from WS& PHE department for sewage connection is obtained.	UDHD and WSPHE	Within 06 months
vii.	Houses with septic tank facilities should be provided with Cess Pool Vehicle for necessary cleaning and disposal at STP.	UDHD/ Local Bodies	Within 06 months
II	**Ground Water Extraction**	-	-
	Only industries are extracting ground water in this area. These units requires to obtain necessary permission from CGWA.	SPCB	Within 06 months
III	**Flood Plain Zone (FPZ)**	All areas fall under hilly terrain and no flood	

		plain identified.	
i.	All industrial units located in this stretch to develop greenery by preparing a plantation plan.	FEWMD/SPCB	Within 03 months
ii.	Plantation on either side of the river banks whenever possible should be carried out even in private holdings also.	FEWM Department	Within 06 months
IV	**Environmental Flow (E-Flow) and Irrigation Practices**		
i.	To direct all HEPs (both operational and under construction) to install digital e-flow meter to monitor the minimum discharge during lean period.	SPCB	Within 03 months
ii.	The HEPS to ensure release of minimum 15-20% of environmental flow during lean season.	SPCB	Within 06 months