Chapter -3

STUDY AREA AND DATA COLLECTION

3.1 INTRODUCTION

3.2 GEOGRAPHY OF STUDY AREA

3.3 RIVER BASIN OF BTAD

3.4 DATA COLLECTION

3.1 INTRODUCTION

This chapter gives a description of the study area, administrative structure, population, River basin and the secondary data collected from different sources for the study and analysis of the present work. There are about more than 49 numbers of big and small River basin of most of which are originates from the Himalaya that is the Bhutan Hills

3.2 GEOGRAPHY OF STUDY AREA

The Bodoland Territorial Council (BTC) is a territorial council established ia assam state by carving out some areas of eight districts of Assam namely Kokrajhar, Dhubri, Bongaigaon, Barpeta, Nalbari, Kamrup, Darrang, and Sonitpur within the stateof Assam. The area under the BTC jurisdiction is called the Bodoland Territorial Area District (BTAD). It is an autonomous Administrtive Unit constituted under the Sixth Schedule of the constitution of India covering an area of 8851 (Provisional). The BTAD consist of four contiguous districts namely kokrajhar, Chirang, Baksa and Udalguri. The geographical Boundary of BTAD lies between 26° 7'12'' N to 26° 7'50'' N latitude and 89° 47'40'' E to 92° 18'30'' E longitude and it is the north-western part of Assam. Kokrajhar town the administrative head quarter lies between 26° 25' N longitude and 99° 16'38'' E latitude. BTAD is situated on the north bank of Brahmaputra waterway in Assam in the North-East India by the lower regions of Bhutan and Arunachal Pradesh. The district is hindered dominatingly by Bodo language talking ethnic gathering and Bengalis, Assamese, Rabha, Rajbongshi, Garo, and different indigenous Mongoloid clans blessed with natural beauty withlivers and vast forests covers and abundant flora and fauna. It is located in the foothills of Bhutan and barderining North Bengal .Administrative Structure of the study area is shown in the table 3.1.

Table 3.1

Administrative structure of BTAD

Name District	**Name of Sub-Division**	**Name of Revenue circles (R.C)**
Kokrajhar	Kokrajhar(HQ)	(5 -R. C.)Kokrajhar, Dotma, Bhowraguri, Gossaigaon and Bagribari
	Gossaigaon	
	Parbatjhora	
Chirang	Kajolgaon(HQ)	(6-R.C.) Kokrajhar (Pt), Bengtol, Sidli(Pt), Bongaigaon(Pt), Bijni(Pt) and Barnagar(Pt)
	Bijni	
Baksa	Mushalpur(HQ)	(13-R C) Baska, Barama, Tamulpur , Goreswar, Baganpara , Ghograpar, Barnagar , Bajali, Jalah , Patharighat, Rangia Sarupeta , Tihu
	Tamulpur	
	Salbari	
Udalguri	Udalguri(HQ)	(9-R.C) Udalguri , Mazbat, Harisinga Kalaigaon, Khoirabari ,Dalgaon Patharighat, Mangaldoi , Dhekiajuli
	Bhergaon	

3.2.1 Population

The total population of the study area is 31, 51,047 with a density of 325 per sq. km. The male population is 50.8 % to total population and the percentage of female population is 49.2% .The sex ratio of this area is 968 per thousand male according to 2011 Census. The no. of females per thousand males is increasing in the study area. Male population is greater than female population in most of the districts of the study area. The lowest sex ratio is 959, which is observed in Kokrajhr and the highest sex ratio is 974 in Baksa. The main economic activity of this area is agriculture. But flooding is a recurrent problem in this area. Hence almost each and every year agriculture is greatly damaged by flood. Here flooding is a push factor

for migration. Male persons migrate for job in other states as they lose their job opportunity.

Table 3.2.

Demographic structure in BTAD region

District	Male	Female	Total	Area sq km	Density	Sex ratio/1000
Kokrajhar	452905	434237	887142	3296	269	956
Chirang	244860	237302	482162	1923	251	969
Baksa	481330	468745	950075	2457	387	974
Udalguri	421617	410051	831668	2012	413	973
Total	1600712	1550335	3151047	9688	325	968

Source: Census Handbook, Four District-2011

3.2.2 **Climate**

The climate of BTAD has sub-tropical with hot summer and cold winter. Humid hot summer with high humidity (75% to 80%), monsoon rainfall dry winter and dust storm during the months of February to April are some of typical characteristics of the climate of the study area.

The average temperature is about 24°C and its seasonal temperature ranges from 9°C to 35°C and maximum temperature often exceeds 36°C. The average temperature during the pre monsoon summer season is about 28.5°C with relative humidity 75%, associated with occasional thunderstorm. Most of the rainfall (80%) occurs due to the onset of summer monsoon (May to August). The annual rainfall varies from 1600mm to 2680 mm. The winter is really comfortable. Its temperature varies between 10°C to 17°C. Heavy fogs sometimes occur during the winter season. Heavy rainfall during the months of June and late August is the important factor of flood

District wise rainfall of BTAD for last three years shown in the table 3.3, 3.4, 3.5

Table 3.3

District wise Rainfall BTAD 2014

Month	Kokrajhar		Chirang		Baksa		Udalguri		Total	
1	2	3	4	5	6	7	8	9	10	11
	Normal mm	Actual mm	Normal mm	Actual mm	Normal mm	Actual mm	Normal mm	Actual mm	Normal mm	Actual mm
January	11.04	-	5.64	-	15.20	14.50	2.00	-	33.88	14.50
February	21.46	51.40	13.33	66.31	35.00	30.60	2.00	-	71.79	148.31
March	76.29	13.60	39.46	35.40	52.20	70.70	-	-	167.95	119.70
April	223.52	25.90	202.62	651.55	147.20	140.00	2.20	75.00	575.54	892.45
May	470.41	554.60	462.21	1261.30	234.00	227.30	2.00	200.00	1168.62	2243.20
June	899.70	847.80	475.54	847.80	570.20	298.20	300.00	437.00	2245.44	2430.80
July	585.54	377.50	448.98	1239.44	721.00	297.30	290.00	443.00	2045.52	2357.24
August	622.35	804.10	320.09	941.24	531.51	265.30	340.00	267.75	1813.95	2278.39
September	430.60	360.40	250.61	451.47	273.87	180.50	140.00	134.00	1095.08	1126.37
October	189.20	3.40	65.43	39.89	133.70	150.00	30.00	28.75	418.33	222.04
November	5.11	-	6.68		28.20	18.70	20.00	5.00	59.99	23.70
December	2.42	2.40	1.44		10.70	9.20			14.56	11.60
Source: Statistical Hand Book of BTC									9710.65	11868.30

Figure 3.1 Year round rainfall of BTAD, 2014

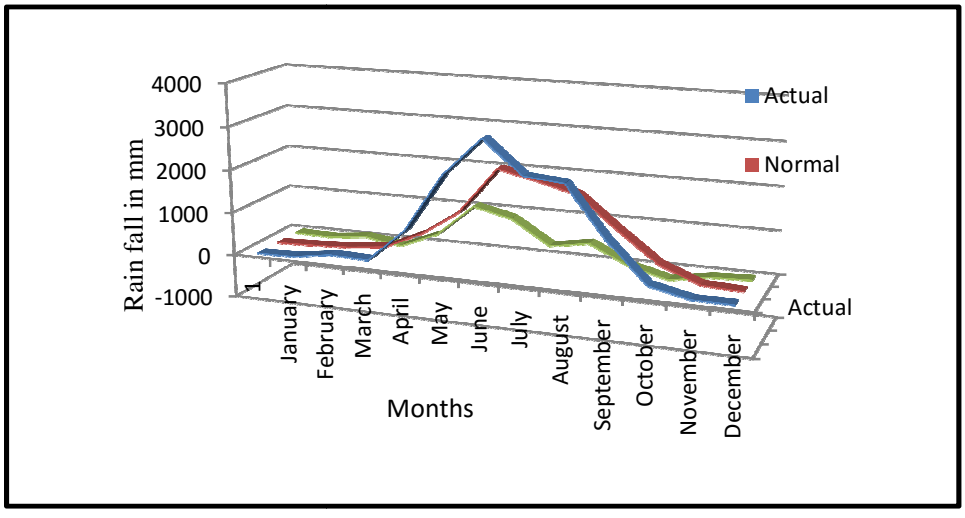

Table-3.4

District wise Rainfall BTAD 2015

Month	Kokrajhar		Chirang		Baksa		Udalguri		Total	
1	2	3	4	5	6	7	8	9	10	11
	Normal mm	Actual mm	Normal mm	Actual mm	Normal mm	Actual mm	Normal mm	Actual mm	Normal mm	Actual mm
January	10.90		5.54	1.00	10.30		13.10	9.00	39.84	10.00
February	20.80	-	13.33		26.90	18.10	21.40	19.50	82.43	37.60
March	68.40	49.90	33.46	20.00	54.00	43.10	53.50	17.00	209.36	130.00
April	23.40	22.10	202.60	61.10	175.70	301.50	168.80	245.50	570.50	630.20
May	507.40	682.70	462.21	577.00	391.50	182.40	320.00	382.00	1681.11	1824.10
June	750.60	905.10	475.54	1130.60	694.30	436.60	434.50	617.00	2354.94	3089.30
July	585.50	526.10	448.98	1441.00	757.30	519.80	345.00	260.00	2136.78	2746.90
August	631.70	674.70	340.00	466.00	527.30	416.20	271.20	794.00	1770.20	2350.90
September	430.06	154.20	250.61	344.00	462.10	209.70	221.50	246.00	1364.27	953.90
October	136.90		65.43		142.10	144.00	95.40	56.00	439.83	200.00
November	36.80	6.30	6.68	1.00	20.40	13.20	17.20	12.50	81.08	33.00
December	2.80	4.20	1.44	13.8	12.70		9.30	9.50	26.24	27.50
Source: Statistical Hand Book of BTC									10756.58	12033.40

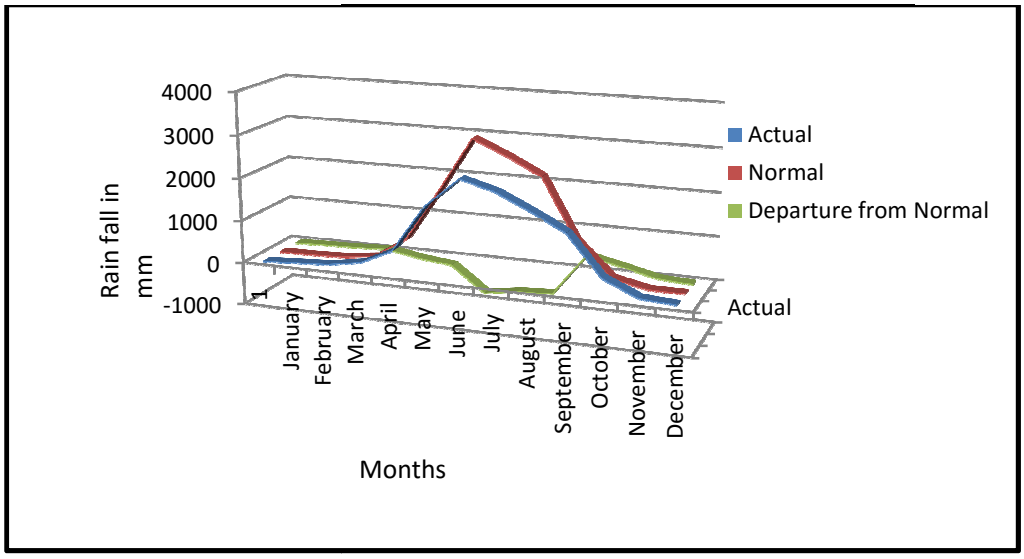

Figure 3.2 Year round rainfall of BTAD, 2015

Table 3.5

District wise Rainfall BTAD 2016

Month	Kokrajhar		Chirang		Baksa		Udalguri		Total	
1	2	3	4	5	6	7	8	9	10	11
	Normal mm	Actual mm	Normal mm	Actual mm	Normal mm	Actual mm	Normal mm	Actual mm	Normal mm	Actual mm
January	9.41		5.54	1.00	10.30		13.10	9.00	38.35	10.00
February	19.20	-	9.94	-	26.90	21.10	21.40	21.50	77.44	42.60
March	75.60	73.60	37.70	53.43	54.00	120.40	53.50	24.20	220.80	271.63
April	262.90	354.50	197.49	483.12	175.70	122.50	169.50	340.40	805.59	1300.52
May	492.50	241.60	303.59	307.93	391.50	139.00	322.00	350.20	1509.59	1038.73
June	707.00	369.80	542.90	760.35	694.30	522.00	436.20	620.00	2380.40	2272.15
July	558.70	518.00	550.69	829.85	757.30	718.00	346.20	255.00	2212.89	2320.85
August	604.02	67.00	318.59	133.07	527.30	168.00	275.20	785.39	1725.11	1153.46
September	407.60	369.40	248.26	306.80	462.10	214.00	220.50	250.10	1338.46	1140.30
October	155.30	309.70	46.82	94.44	142.10	54.00	95.00	60.50	439.22	518.64
November	2.00		2.54		20.40		17.25	5.00	42.19	5.00
December	0.92		13.80		12.70	2.00	9.00	3.00	36.42	5.00
Source: Statistical Hand Book of BTC									10826.46	10078.88

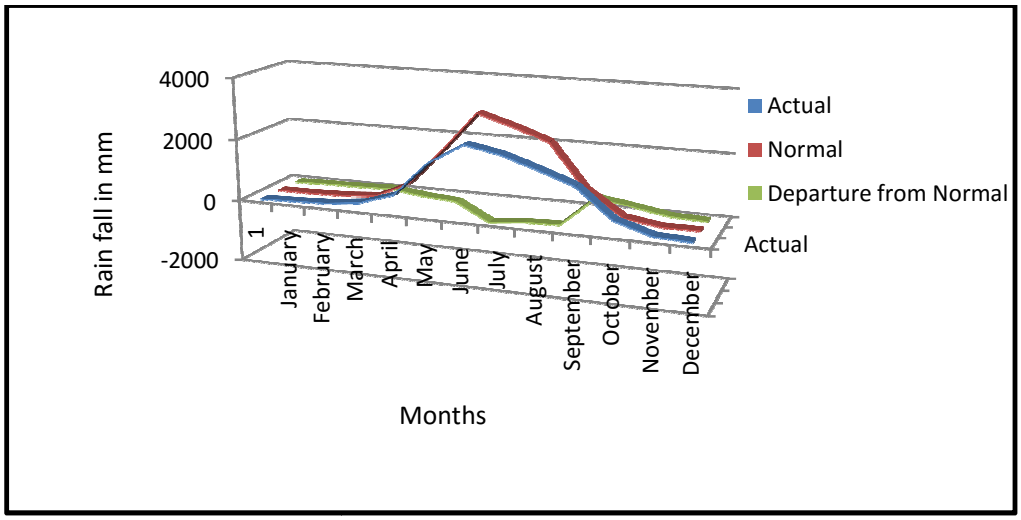

Figure 3.3 Year round rainfall of BTAD, 2016

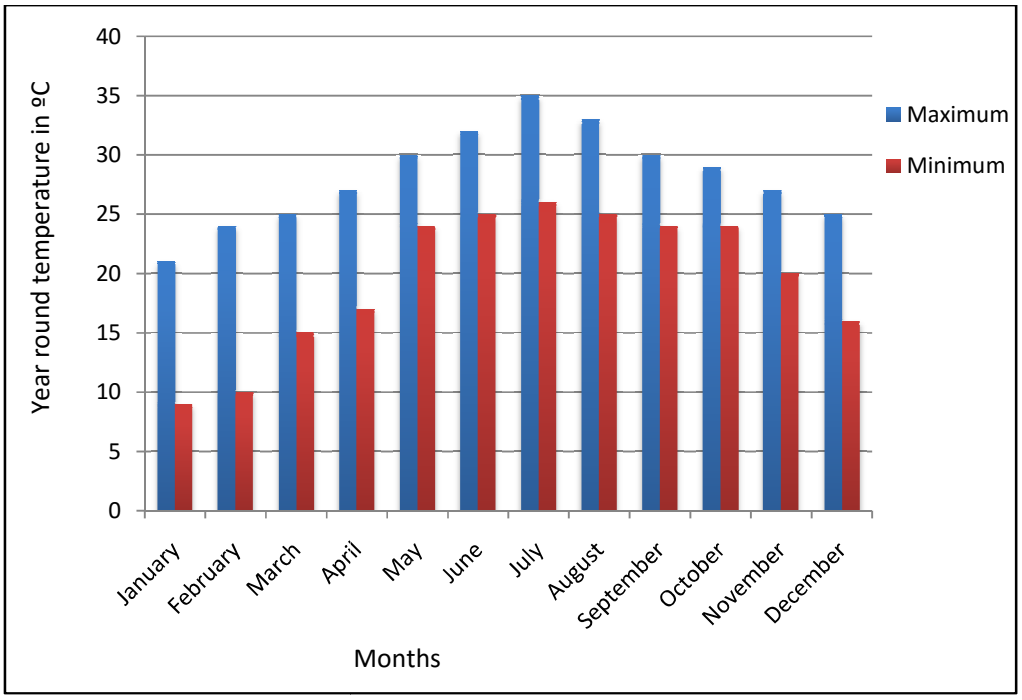

Figure 3.4: Average yearly maximum and minimum temperature of BTAD recorded for the year 2014 to 2016

3.3 **RIVER BASIN OF BTAD**:

BTAD lies on the north Bank of the Brahmaputra River Basin. There are several no of tributaries and sub- tributaries passing through BTAD and most of which originates from the Himalaya Mountain, Bhutan foot hills and Arunachal Pradesh. These tributaries during rainy season become flashy and cause flood and erosion in various part of BTAD.

River system under the BTAD comprises of various tributaries and sub-tributaries are shown in the Figure 3.5 enlisted in the table 3.6

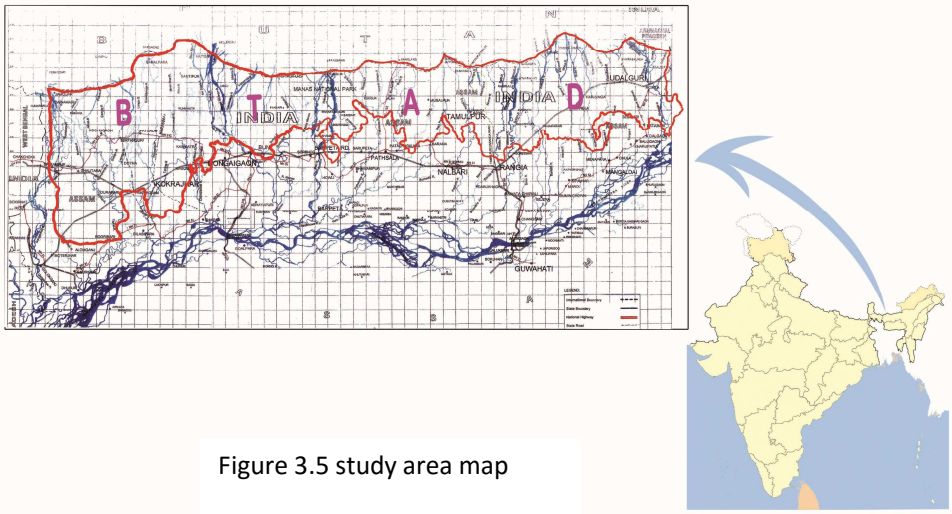

Figure 3.5 study area map

Table-3.6

River system under BTAD

Sl. no.	Name of River	Category of river
1	2	3
1	Sankosh	B
2	Modati	D
3	Janali	D
4	Jakati	D
5	Pekua	D
6	Gangia	C
7	Garupehella	C
8	Joyma	C
9	Tipkai	B
10	Longa	C
11	Saralbhanga	B
12	Gaurang	B
13	Champabati	C
14	Tarrang	D

15	Burachara	C
16	Hel	D
17	Laksa	D
18	Aie	C
19	Taklai	C
20	Kanamaka	D
21	Dulani	C
22	Burisuti	D
23	Mara Manas	D
24	Manas	B
25	Hakua	D
26	Kalapani	D
27	Pahumara	C
28	Rupahi	C
29	Anguili	D
30	Kalda	D
31	Tihu river	C
32	Mara pagladia	D
33	Pagladia	C
34	Noonai	C
35	BaraLia	C
36	Phuthimari	B
37	Suklai	D
38	Barnadi	B
39	Nonoi	C
40	Kalanadi	C
41	kulsi	D
42	Bikhanti	D
43	Kalyani	D
44	Lakhi	D
45	Chans	C
46	Chandara	D
47	Mara Dhansiri	D
48	Dhansiri	C
49	Rawta	C

Source: Water Resource Department, Assam

3.2.1 **River Sankosh Sub-Basin**: The River Sankosh originates from the snow clad mountain of greater Himalaya Ranges of Tibet at an elevation of about 7300 m above the mean sea level. The Sankosh sub-basin lies between latitude 25

°43' to 28 °28'N and 89 °34' to 90 °23'E. Out of total catchment area of 10345 sq km, 849 sq km lies in Assam and the 9496 sq km lies Bhutan. The River is known as Gangadhar after crossing NH 31c at Srirampur.

3.2.2 **River Joyma (Garuphella) River sub-basin**: Originating from the lower reaches of Himalayan in Bhutan if flows through the forest land and inter populated area the river modati meets Garuphella after crossing NH 31C and takes the name joyma which again meets the Gangia at Sapatgram and then take the name Tipkai and ultimately outfalls into mighty Brahmaputra.

3.2.3 **Giver Gangia River sub-basin**: The Hel after flowing from foothills of Bhutan enters BTAD, Assam and passes through the Ripu reserved forest in braided pattern and crosses NH 31C at Serfanguri, it starts meandering and flows through the populated area ultimately meets the river Joyma.

3.2.4 **River Saralbhanga-Gaurang** – Samukha sub-basin: The river Saralbhanga originates from the Bhutan foothills and travels through the Kashugaon forest and enters into the plain area meet with Gaurang at Mogormari 7km upstream of Kokrajhar town and ultimately outfalls into river Brahmaputra.

3.2.5 **River Champamati sub-basin:** The river Champamati originating from the Bhutan hills and traversing through the Bhutan territory where it is known as Bhur, it enters in kokrajhar district taking two names Dhalpani and Laopani , again joint together takes the name Champamati and outfalls into Brahmaputra near at Chapar town.

3.2.6 **River Manas- Beki- Aie sub basin**: It is one of the biggest and important sub-basin of the Brahmaputra river basin. The sub basin lies between altitude 26 °15' N to 28°40'N and longitude 90 °13'E to 92 °18'E. The catchment area lies in Tibet, Bhutan, and India.

The entire river system of the sub basin may be divided into three group of river system (i) Aie river system (ii) Beki-manas river system

(i) Aie river system: Aie river, which originates in the Black mountain of Bhutan at an altitude of about 4915 meters near the

village of Bangpani, is about 110 km. The Aie river is heavily braided in nature with marked with characteristic braided channels and frequent changes of course. It carries a huge of sediment during flood and continuous erodes its banks thereby causing threat to thousands of inhabitants and hundreds of villages nearby. The entire course of river Aie has been experiencing the natural process of self adjustment of its section and parameters. Active erosion and inundation are found in the above mentioned areas also adjoining area for last 20 years. The river ultimately outfalls on the Brahmaputra.

(ii) **Beki-Manas River:** Originating from Bhutan foot hills it meets the Tongsa river before interring in India. It enters in India (BTAD) at Mathanguri and divided into three rivers namely Mora manas, Hahua ans Manas rivers, all the rivers then flow through the Manas National Park and enters the populated area again meets together near Barpeta Road and then takes the name Beki river. The other rivers in these basin area are Dulani and Burisuti. Chawlkhowa river basin area does not fall under BTAD.

3.2.7 **River Pahumara**- Pagladia sub basin: originating from Bhutan river pomara, river rupahi river, thebor river and Anguli river meets and takes the name Pahumara river. The other rivers in this sub basin are tihu river , Mora Pgladia and Pagladia river.

3.2.8 **River Phutimari**- Suklai-barnadi sub basin: All these rivers are originating from Bhutan foot hills and important sub basin of Brahmaputra river basin.

3.2.9 **River Dhansiri sub basin**: originating from Bhutan and then passing through Arunachal Pradesh it inters through Bhairubkunda into Udalguri, BTAD . The other rivers in this basin area are Rowta river, Lalnadi, Mora dhansiri Golanadi etc.

Most of all these river during the flood season become flashy, cause flood and erosion in various parts of BTAD.

3.4 DATA COLLECTION

The required data for this study are under hydrology (environmental), Social, economical components. The hydrological (environmental) data are collected from the water resources department Assam, population data from National census, govt. of India 2011, economics data from statistical hand book BTAD, Daily flood report from Assam Disaster management Assam Flood reports from Deputy commissioners' offices from BTAD and experts opinion through the technical meeting and discussion.