

An Analysis of Hydrographs of the Brahmaputra River at the Gauge Site of Goalpara, Assam

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Abstract:- A hydrograph generally refers to a graph that shows flow characteristics of river water in respect to time. It is generally used for studying the hydrological characteristics of a river such as variations in water level, volume, discharge etc. with time. In the present study an analysis of the hydrographs of The Brahmaputra River has been made using its monsoonal stage discharge recorded at the gauge station of Goalpara. The data have been collected from Water Resources Department, Chandmari, Guwahati-3, Assam. The analysis has been done based on the water level or stage (maximum, minimum and danger level). The maximum water level is found in 2002 in the month of July (37.12m) which has crossed the danger level (36.27m), while the minimum water level is found in 2014 in the month of May (31.15m).

Keywords:- Hydrograph, Hydrological Characteristics, Monsoonal Water Flow.

I. INTRODUCTION

The flow of water in a river can never be the same for all the time. It changes according to the variations in availability of water flowing in a river in course of time. To

understand the hydrological characteristics of a river it is important to study the variations of water flow in reference to different periods of time. The Hydrographs are the graphs that are used to depict various flow characteristics of river water with time.

II. STUDY AREA

The Goalpara district is generally situated at the southern bank of the Brahmaputra River in between $25^{\circ}57'00''\text{N}$ to $26^{\circ}12'00''\text{N}$ latitude and $90^{\circ}12'00''\text{E}$ to $91^{\circ}06'00''\text{E}$ longitude. It is bounded by the southern bank of the mighty Brahmaputra River in the north, while eastern side is marked by the Deosila River and Kamrup district of Assam. The western side is bounded by Dhubri district and the southern side is bounded by the Meghalaya plateau. The administrative boundary is determined by Bongaigaon and Barpeta district in the north, Kamrup in the east, Meghalaya in the south and Dhubri in the west. Most of the part of the Kamrup district is characterized by dissected hill and hillocks, while entire Dhubri district in the west is a low-level plain, Majority of this region are being under frequent floods. The river enters in the district at Simlitola and runs for about 80km up to Jaleswar.

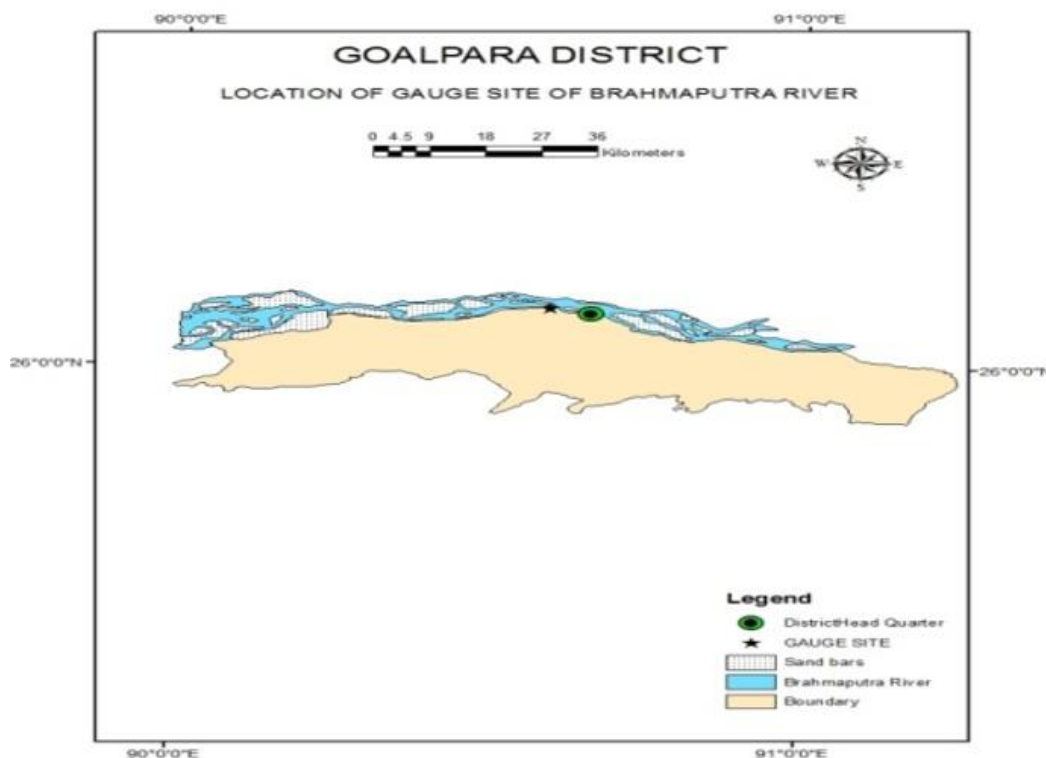


Fig1: Map of the Goalpara Gauge site of The Brahmaputra River.

III. METHODOLOGY

The whole work of the study is generally based on Descriptive Analytical method of investigation. Data has been collected from the Water Resource department, Chandmari, Guwahati 3. Systematic sampling method has been applied while selecting data of different time period. Various annual, monthly and daily hydrographs are prepared using MS Excel Sheet in order to present the nature of flood and hydrological analysis of the Brahmaputra River at the Goalpara site. A map of the site is also made using Arc GIS software.

IV. REVIEW OF LITERATURE

Study of river and flood always remain as a core area of interest for many Geographers, scholars, Environmentalist etc. As a result, a number of problems and prospects were identified and various ideas and views have been made in this regard. Various attempts have been done by the Geographers for studying the frequency and intensity of flood, fluvio-geomorphic characteristics of river and various aspects of river basins. In NE India the numbers of works are done by

many scholars and researcher. They made contribution on various aspects from morphometric analysis to hydrological and fluvio-morphometric determinants of landforms over river basin and other fields. D.C. Goswami (1982) worked on Brahmaputra River; Barman (1988) worked on geomorphology of Kamrup district, A.K Bora work on the Jia Bharali River of Assam.

V. ANALYSIS OF HYDROGRAPHS

To analyse the monsoonal flow characteristics, here the data taken from the year 2002, 2006, 2010 and 2014 at an interval of four years. Monsoonal stage hydrographs have been prepared using maximum and minimum water levels for these years. The maximum water level found in these years are 37.12m, 35.53m, 36.99m and 36.88m for the year 2002, 2006, 2010 and 2014 respectively. Among these four years danger level was crossed in three years i.e. 2002 2010 and 2014. Whereas minimum water level is found about 31.29m, 31.93m, 33.80m and 31.15m for the year of 2002,2006,2010 and 2014 respectively. The danger level of water for Goalpara is 36.27 meter. Hence hydrographs are made considering all these aspects.

TABLE 1.1: Monsoonal water level (in meter) of the Brahmaputra River at Goalpara site in 2002.

Date	May	June	July	Aug	Sept	Oct
1		32.59	34.83	36.36	34.18	34.24
2		32.57	34.97	36.26	34.06	34.33
3		32.46	35.19	36.09	33.91	34.86
4		32.35	35.35	35.99	33.79	35.12
5		32.43	35.41	35.9	33.71	35.04
6		32.5	35.45	35.8	33.61	34.71
7		32.67	35.59	35.68	33.52	34.3
8		32.8	35.66	35.57	33.4	34.08
9		32.84	35.75	35.41	33.23	33.84
10		32.84	35.8	35.26	33.08	33.53
11		32.81	35.86	35.16	32.96	33.29
12		32.88	35.89	35.19	32.88	33.01
13		32.95	35.87	35.26	32.8	32.77
14		33.36	35.81	35.39	32.7	32.57
15	31.29	33.56	35.73	35.56	33.8	32.38
16	31.39	33.81	35.73	35.61	32.87	
17	31.61	34.26	35.7	35.53	32.85	
18	31.87	34.6	35.52	35.37	32.9	
19	31.87	34.89	35.4	35.21	33.06	
20	31.7	35.03	35.28	35.33	33.26	
21	31.66	35	35.37	35.45	33.48	
22	31.76	34.95	35.55	35.5	33.38	
23	31.84	35.06	35.88	35.54	33.1	
24	32.07	35.1	36.41	35.3	32.87	
25	33.37	35.16	36.94	35.14	32.88	
26	33.82	35.16	37.12	35	33.09	
27	33.63	35.13	37.12	34.85	33.27	
28	33.23	34.96	37	34.68	33.47	
29	33.98	34.76	36.81	34.53	33.85	
30	32.76	34.7	36.63	34.44	34.17	
31	32.65		36.46	34.3		

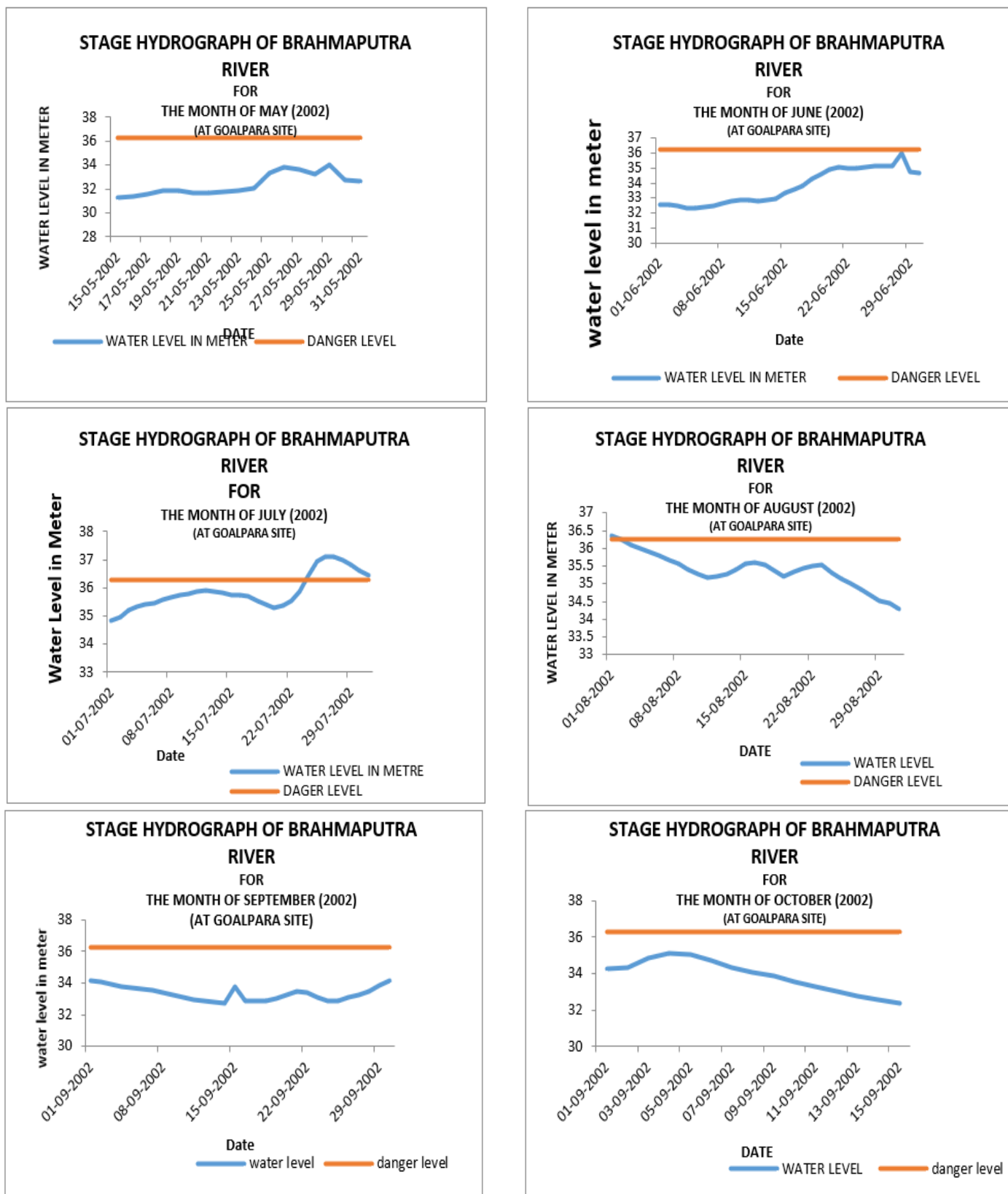


Fig 2.1: Daily Stage Hydrograph of the Brahmaputra River at Goalpara site (2002)

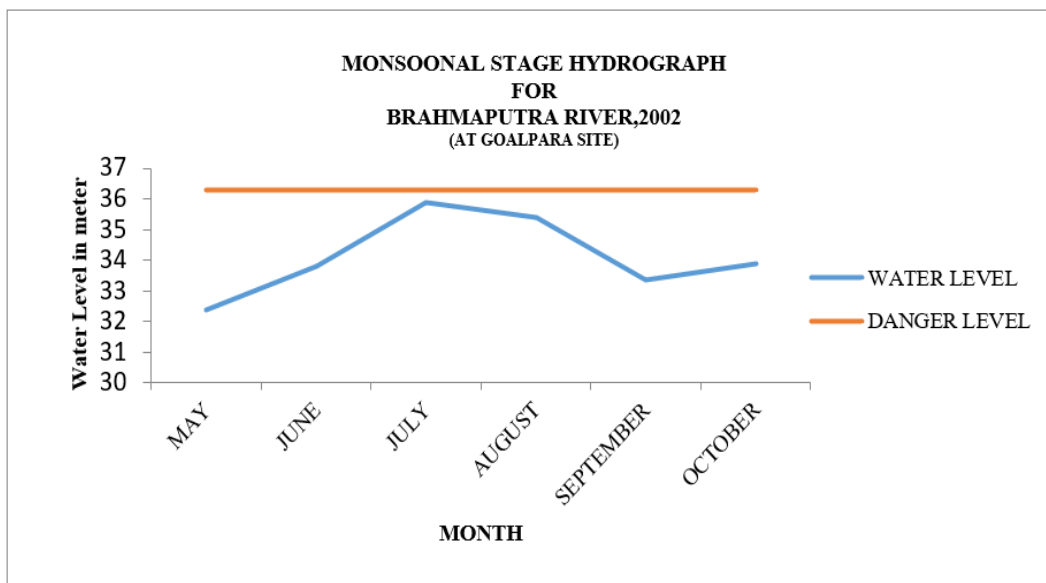


Fig 2.2: Monsoonal Average Stage Hydrograph (2002)

TABLE: 1.2.Monsoonal water level (in meter) of the Brahmaputra River at Goalpara Site 2006.

Date	May	June	July	Aug	Sept	Oct
1		32.89	34.39	34.56	34.21	33.3
2		34.26	34.55	34.37	34.06	33.32
3		34.84	34.58	34.25	33.91	33.25
4		34.85	34.56	34.93	33.79	33.07
5		34.78	34.49	34.03	33.68	33
6		34.62	34.37	33.91	33.54	32.99
7		34.42	34.47	33.84	33.44	32.98
8		34.25	34.55	33.77	33.59	33.05
9		34.18	34.54	33.63	33.74	33.15
10		34.18	34.79	33.54	33.78	33.28
11		34.23	35.04	33.54	33.79	33.23
12		34.48	35.21	33.48	34.12	32
13		34.86	35.13	33.36	34.5	32.65
14		35.18	35.03	33.32	34.84	32.44
15	31.93	35.43	35.02	33.18	34.99	32.29
16	32	35.53	35.03	33.13	35.16	
17	32.28	35.43	35.02	33.12	35.38	
18	32.68	35.31	34.96	33.07	35.4	
19	32.8	35.2	34.92	33.04	35.18	
20	32.6	34.94	34.96	32.97	34.89	
21	32.28	34.68	34.92	32.92	34.62	
22	32.09	34.42	34.86	32.92	34.36	
23	31.91	34.28	34.85	32.96	34.12	
24	31.81	34.18	34.88	33	34.02	
25	31.76	34.17	34.96	33.04	33.88	
26	31.82	34.21	35.04	33.23	33.62	
27	31.89	34.34	35.15	33.49	33.43	
28	31.8	34.52	35.21	33.58	33.32	
29	31.9	34.49	35.19	33.88	33.24	
30	32.22	34.42	35	34.09	33.24	
31	32.41		34.77	34.21		

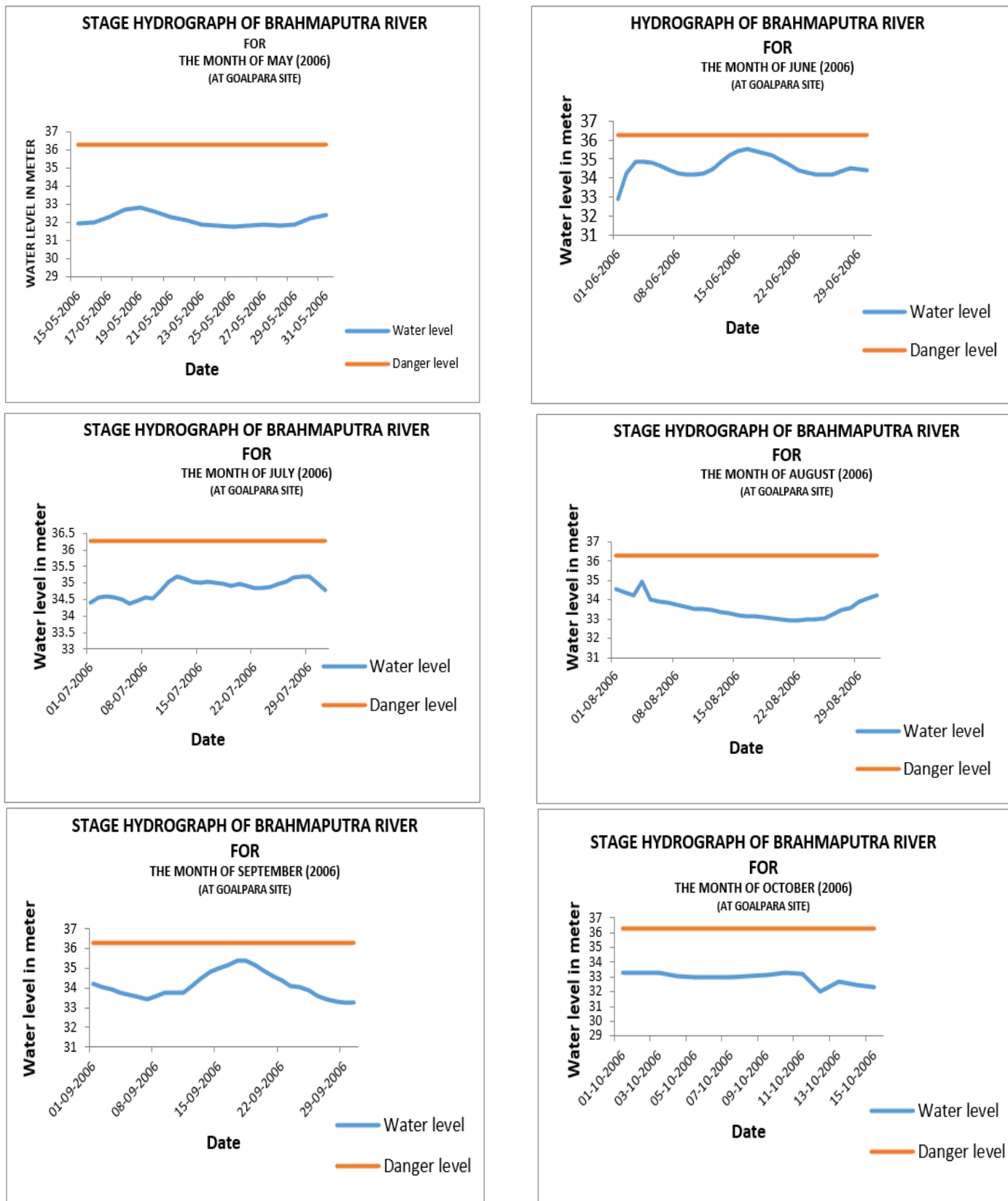


Fig 2.3: Daily stage hydrograph of the Brahmaputra River at Goalpara site (2006)

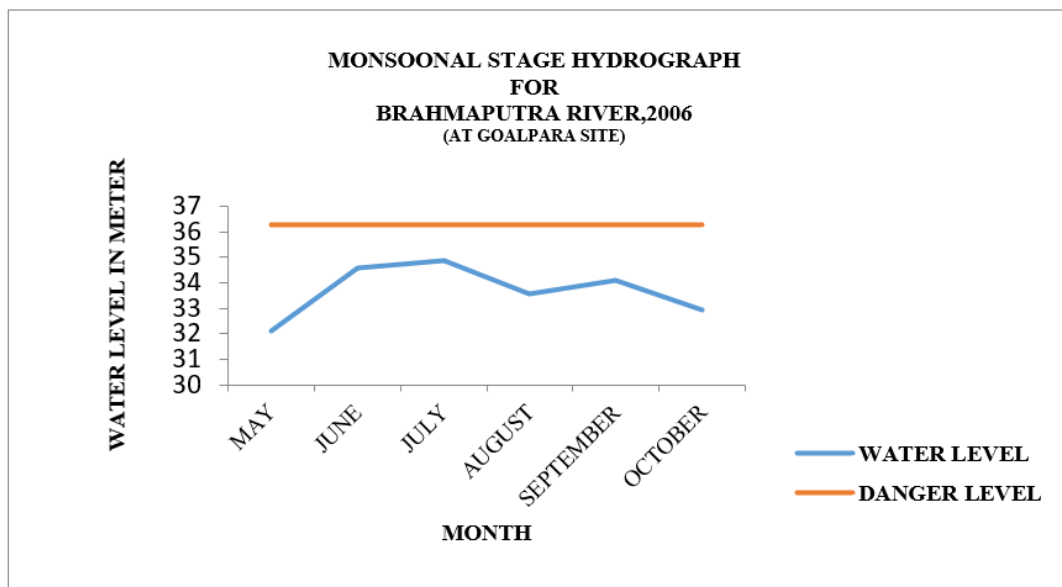


Fig 2.4: Monsoonal Average Stage Hydrograph (2006)

TABLE: 1.4 Monsoonal water level (in meter) of the Brahmaputra River at Goalpara in 2010

Date	May	June	July	Aug	Sep	Oct
1		33.89	35.93	35.65	35.86	34.98
2		33.85	35.95	35.5	35.79	35.06
3		33.82	35.98	35.45	35.77	35.05
4		34.08	35.97	35.45	35.76	34.74
5		34.36	35.84	35.45	35.76	34.44
6		34.58	35.75	35.39	35.72	34.2
7		34.61	35.64	35.37	35.66	34
8		34.63	35.59	35.35	35.72	33.86
9		34.96	35.64	35.3	35.82	33.8
10		35.53	35.67	35.14	35.97	33.83
11		35.63	35.82	35.01	36.1	33.89
12		35.43	35.86	34.9	36.26	33.8
13		35.16	35.88	34.79	36.35	33.74
14		35	35.87	34.74	36.37	33.8
15	33.98	34.97	35.88	34.69	36.3	33.97
16	34.72	34.92	35.88	34.66	36.12	
17	34.99	34.89	35.88	34.7	35.96	
18	35.05	34.93	35.81	34.91	35.85	
19	35.06	34.87	35.87	34.94	35.79	
20	34.91	34.93	35.91	34.97	35.75	
21	34.62	34.97	35.9	34.99	35.68	
22	34.42	35.11	35.02	35.26	35.67	
23	34.29	35.15	36.05	35.47	35.65	
24	34.53	35.24	36.99	35.56	35.57	
25	34.96	35.32	35.9	35.67	35.43	
26	34.94	35.4	35.85	35.78	35.24	
27	34.63	35.6	35.87	35.87	35.09	
28	34.4	35.92	35.87	35.07	35	
29	34.23	36.02	35.82	36.08	34.95	
30	34.11	35.94	35.78	36.01	34.92	
31	34.03		35.72	35.93		

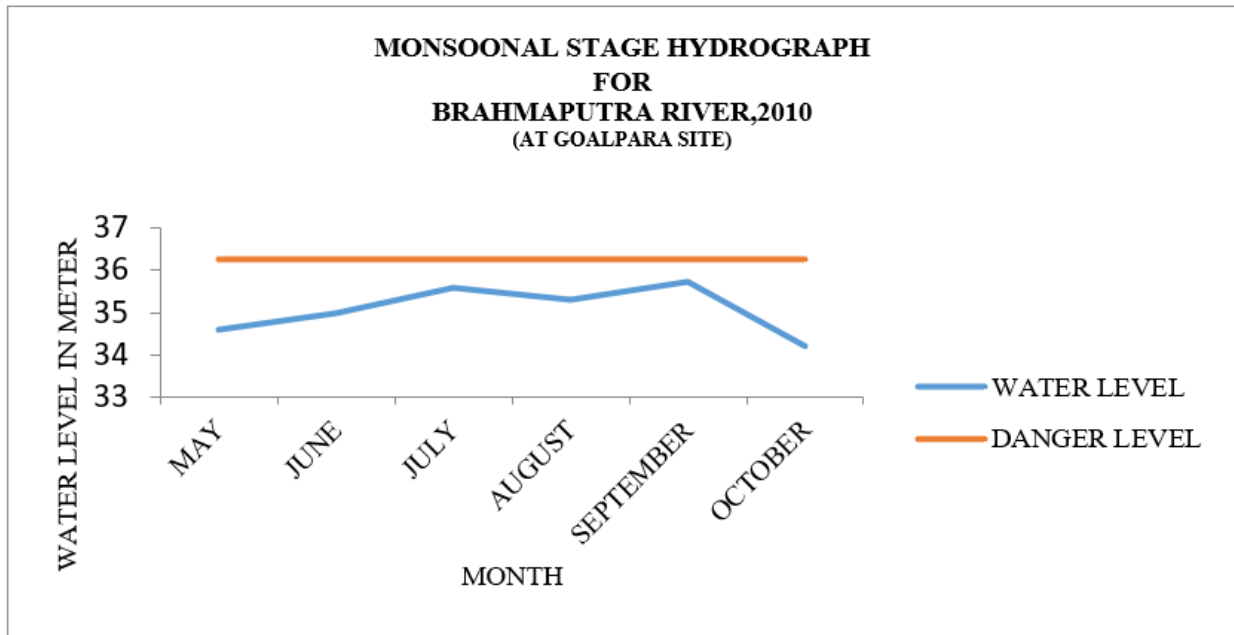
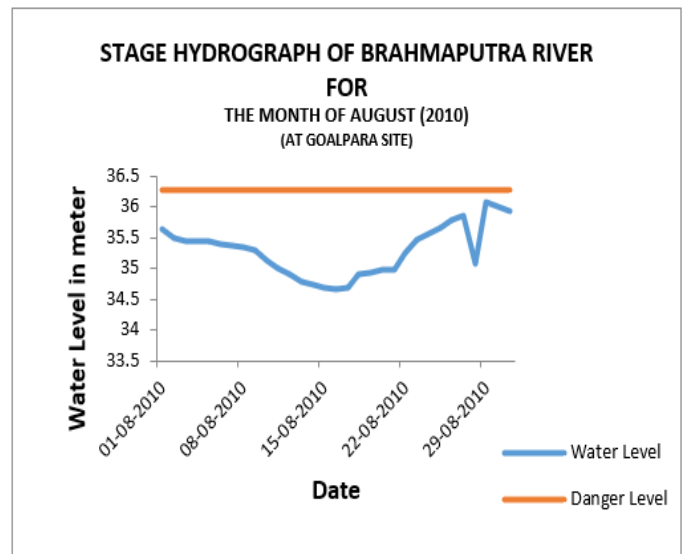
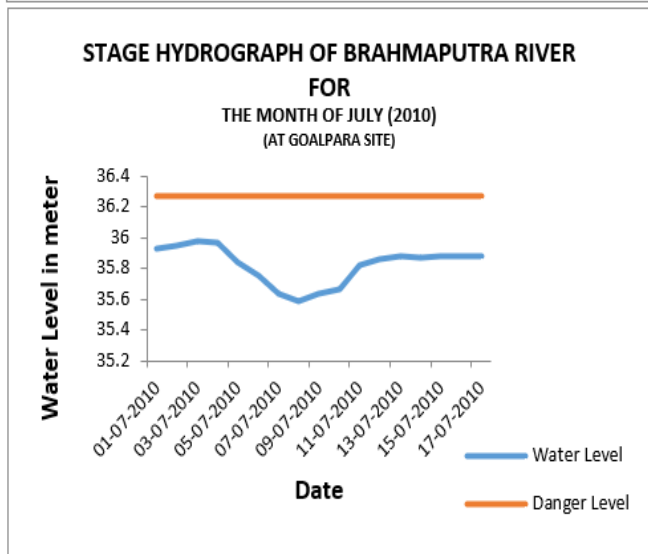
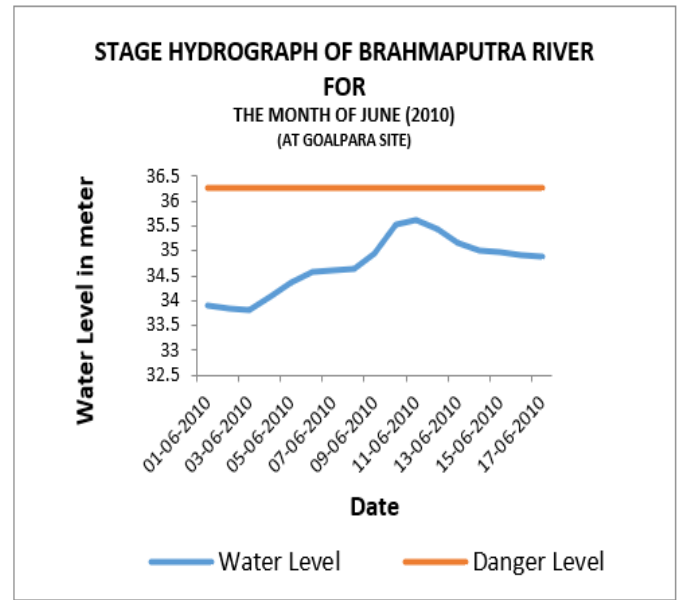
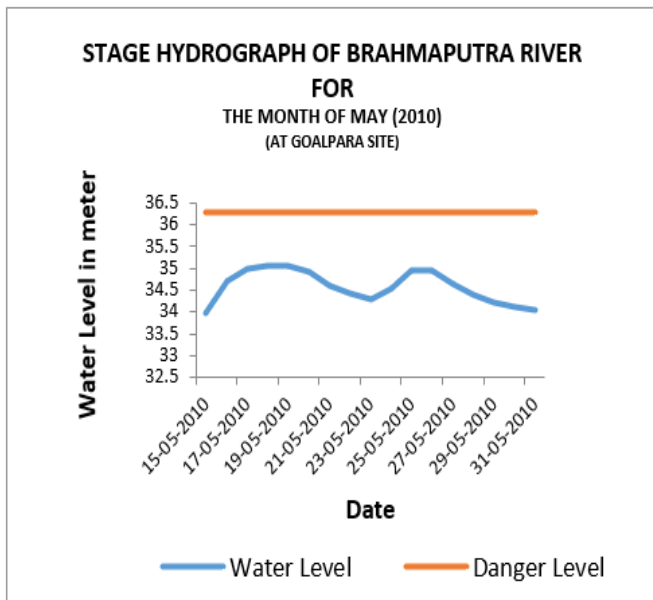


Fig 2.5 Daily stage hydrograph of the Brahmaputra River at Goalpara site (2010).



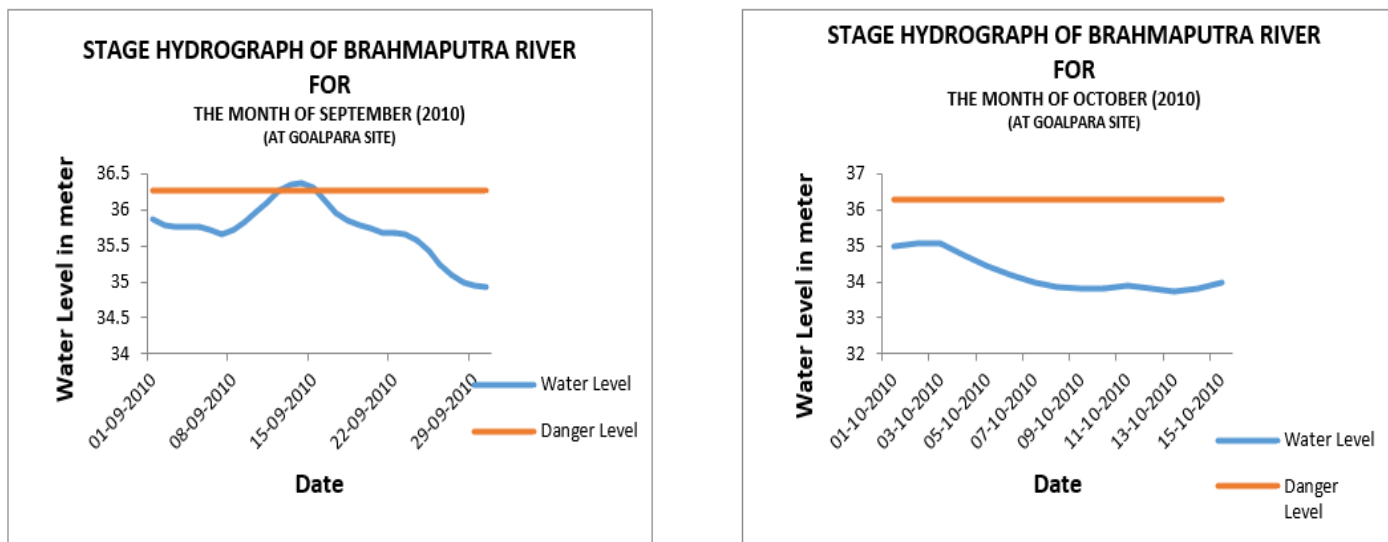


Fig 2.6: Monsoonal Average Stage Hydrograph (2010)

Date	May	June	July	Aug	Sep	Oct
1		32.56	35	35.1	36.23	35.35
2		32.73	34.97	35.05	36.11	35.26
3		32.97	35.1	35.05	35.86	35.15
4		33.02	35.28	35.08	35.63	34.83
5		32.87	35.41	35.05	35.47	34.39
6		32.71	35.36	35.04	35.23	34.15
7		32.64	35.24	35.02	35.1	33.91
8		32.8	35.17	35.05	34.89	33.59
9		33.02	35.21	35.11	34.83	33.33
10	31.15	33.18	35.22	35.14	34.74	33.09
11	31.31	33.35	35.16	35.14	34.63	32.91
12	31.51	33.44	35.22	35.11	34.64	32.83
13	31.95	33.58	35.29	35.13	34.7	32.62
14	32.93	33.71	35.2	35.19	34.76	32.54
15	33.6	33.95	35.06	35.45	34.97	32.47
16	33.81	34.03	35.01	36	35	32.36
17	33.73	33.94	35	36.33	34.89	32.31
18	33.71	33.82	35.1	36.48	34.7	32.22
19	33.91	33.66	35.24	36.51	34.58	32.1
20	33.95	33.46	35.61	36.47	34.51	32.04
21	33.61	33.5	35.72	36.42	34.44	32.03
22	33.18	33.62	35.75	36.31	34.94	32.07
23	32.89	34	35.77	36.24	35.59	31.98
24	32.7	34.32	35.69	36.26	35.70	31.79
25	32.56	34.85	35.59	36.29	35.59	31.71
26	32.61	35.1	35.51	36.41	35.50	31.63
27	32.78	35.26	35.46	36.74	35.61	31.51
28	32.78	35.23	35.4	36.88	35.64	31.42
29	32.74	35.15	35.3	36.84	35.55	31.35
30	32.8	35.05	35.23	36.69	35.44	31.27
31	32.6		35.14	36.45		31.21

TABLE: 1.4 Monsoonal water level of the Brahmaputra River at Goalpara (in meter) in 2014.

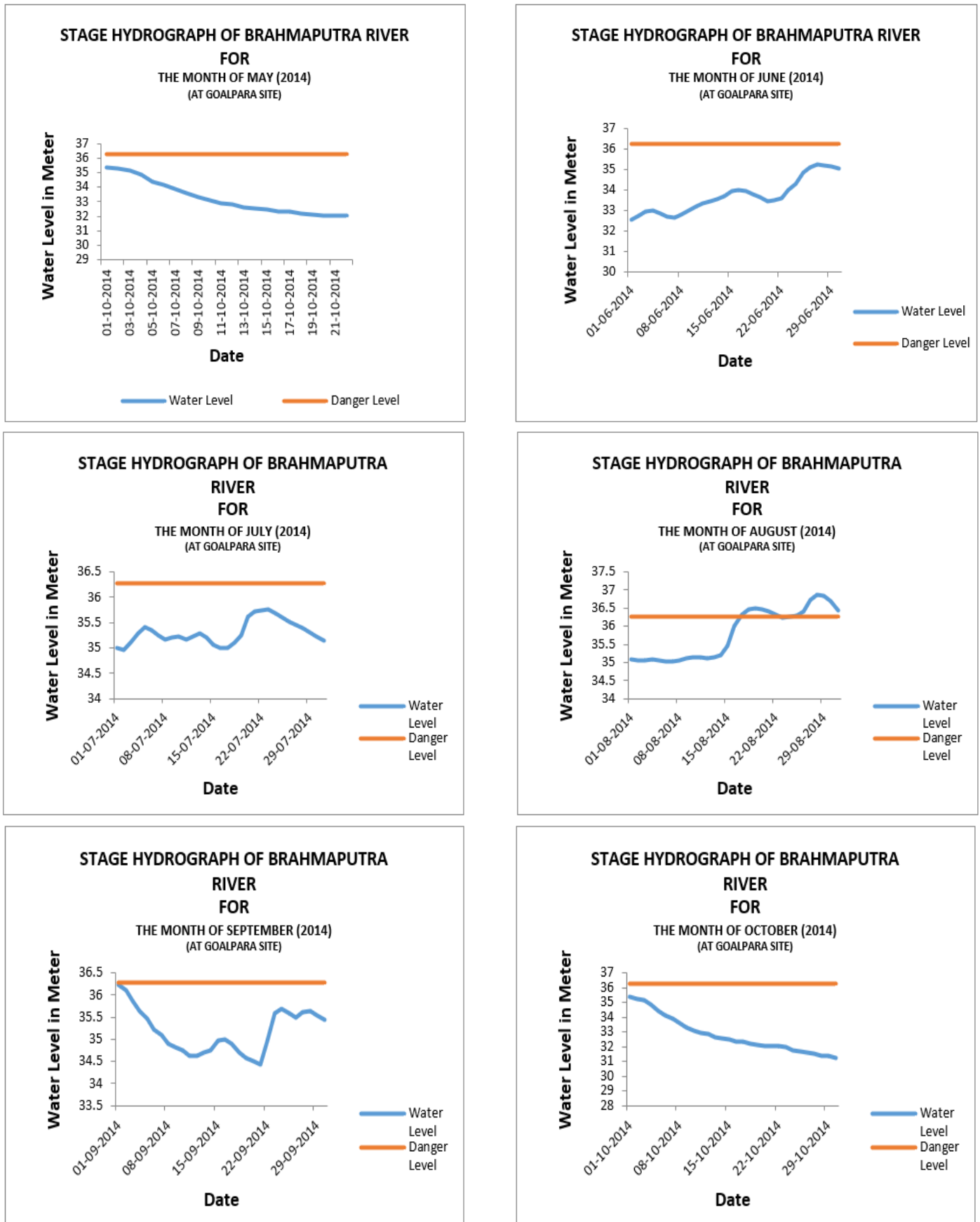


Fig 2.7: Daily stage hydrograph of the Brahmaputra River at Goalpara site (2014).

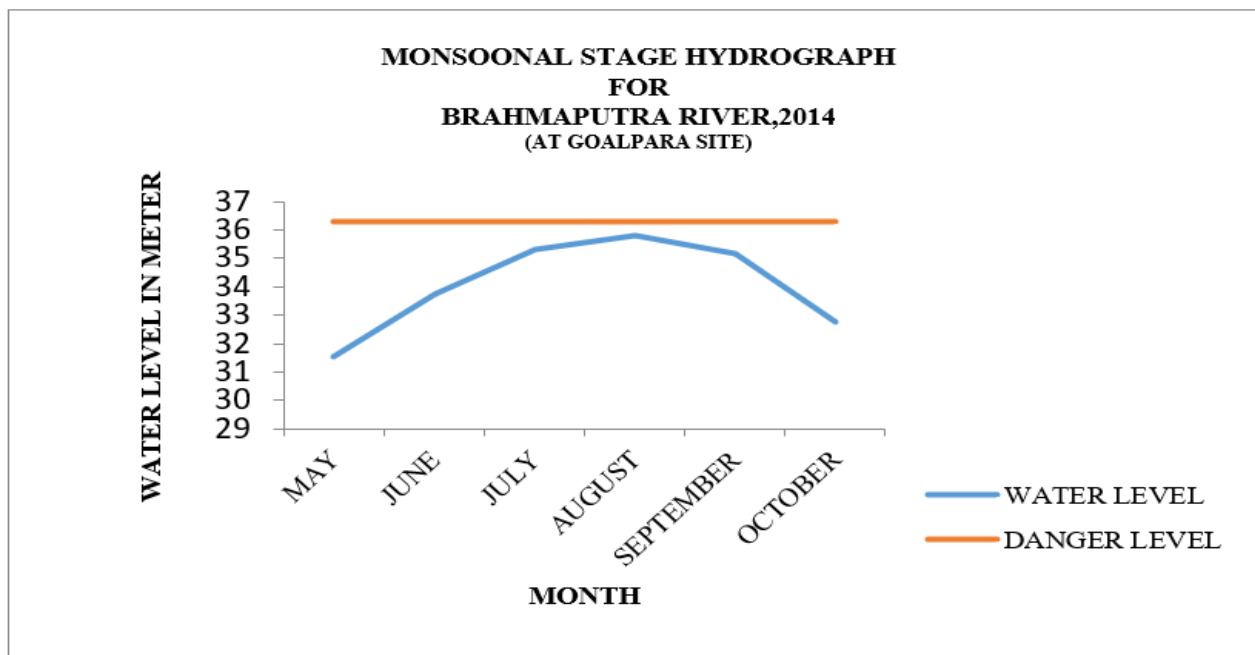


Fig 2.8: Monsoonal Average Stage Hydrograph (2014)

VI. CONCLUSION

Flood is a common natural phenomena in a river course, which causes more fatalities than any other natural hazard. It is a state of high water level along a river channel or on coast that leads to inundation of land which is normally submerged. The study area Goalpara District always experienced this flood hazard as it in the southern bank of the River Brahmaputra. That is why it is necessary to analyse the flood characteristics created by the Brahmaputra River and its tributaries. The present study focuses on analysing of variations in water level of The Brahmaputra River at Goalpara. Therefore monsoonal stage hydrographs are analysed so that proper comparison can be made using data of different time period. The data have been taken at an interval of four years from 2002 to 2014. Maximum water level and minimum water level is considered while making the hydrographs.

The maximum water level in 2002 was recorded in the month of July (37.12m) which has crossed the danger level (36.27m). While the minimum water level was recorded in the month of May (31.29m). Again in 2006 the maximum flow was found in the month of June (35.53m) and minimum in May (31.93m). During 2010 the peak flow was in July (36.99m) and minimum level was in October (33.80m). On the other hand in 2014 the maximum water level was found in the month of August (36.88m) and minimum water level was found in May (31.15m). among these years highest level of water has been recorded in 2002 again lowest in 2014. If we consider the monthly water flow, the year 2002 and 2010 has maximum water level in the month of July and minimum water flow was recorded in the month of May (except in 2010). Moreover among these years minimum water flow was found in 2014 (31.15m). A fluctuation can be seen in daily water flow. Again Among these four years danger level was crossed in three years i.e. 2002 2010 and 2014.

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