



Flood Problem of Puthimari River Basin: History and Present Pattern

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ABSTRACT: Flood is one of the most devastating natural disasters that occurs in all depths, from just a couple inches to many feet. Assam has the vast network of its two major rivers viz. the Brahmaputra and the Barak and their tributaries. However, the Brahmaputra river valley is the most flood prone area in Assam. The research article is made to understand the history and pattern of the damage caused by the flood in the Puthimari basin in Kamrup District of Assam. The study has been carried out using both field survey as well as remote sensing techniques. The hydrological data such as water level and water discharge have been collected from Water Resource Department and Brahmaputra Board, Govt of Assam. The water discharge data has been collected from 1955 to 2010 and the flood damage report from 2016 to 2020 have been collected from different newspapers and Flood Report of Assam State Disaster Management Authority. The flood of 2004 has been recorded as the highest from the danger perspectives. The stage hydrographs have been prepared using maximum and minimum water level from 1958 to 2016 where the flood of 1958 has been recorded as the highest devastating with (54.81- 49.79) 5.02 metre deviation from the danger level.

KEYWORDS: Flood; GIS & Remote Sensing; Inundation; Puthimari River.

INTRODUCTION

Flood is a period of high discharge of a river caused by heavy rainfall, rapid snowmelt, or the breaching of a barrier. It may exceed a channel's capacity and lead to inundation of adjacent low-lying areas (Goudie, 2014) It is the positive departure from the mean flow condition of the river (Kale, 1998). In a flood prone river valley, the occurrences of flood is a rule rather than an exception (Bhattacharjee, N, 2008)

Flood is mainly confined in almost all the major riverine states of Assam, Bihar, West Bengal, Orissa, Uttar Pradesh and Gujarat. It has been estimated that 40 million hectares of land in India is prone to flood (Mukherjee, 2010). About 60 per cent areas of India are vulnerable to earthquake, 8 percent area prone to cyclones and 12 percent area vulnerable to floods (Kumar, 2009). The vulnerability of flood hazard increased significantly in the recent period. In India, annually more than 8 million hectares of land and 32 million people are affected by floods (Valdiya, 2004).

The Brahmaputra river valley is the most flood prone area in India (Kumar and Rao, 1986). The Puthimari River is one of the north bank tributaries of the Brahmaputra and it also experiences flood every year now a days. Field study reveals that flood is a recurring problem in the adjacent floodplains of the river Puthimari. It is observed that flood water inundates extensive areas of the basin particularly in the downstream part of the basin (Kalita, N, 2017)

STUDY AREA

The Puthimari River is one of the north bank tributaries of the river Brahmaputra. The latitudinal and longitudinal extent of the Puthimari river basin falls between $26^{\circ} 10' 50''$ N to $27^{\circ} 20' 27''$ N and $91^{\circ} 25' 57''$ E to $91^{\circ} 56' 12''$ E. The basin is extended in north-south direction from the high Tethyan Himalaya to flat flood plains of the river Brahmaputra in the state of Assam in India (Roy and Hussain, 2014). The shape of the basin is elongated nature. The Puthimari river basin covers an area of 3,090.11sq. km out of which 1,315.87 sq km (43%) lies in Bhutan and 1,774.24sq km (57%) falls in Assam (Roy,P, 2017).

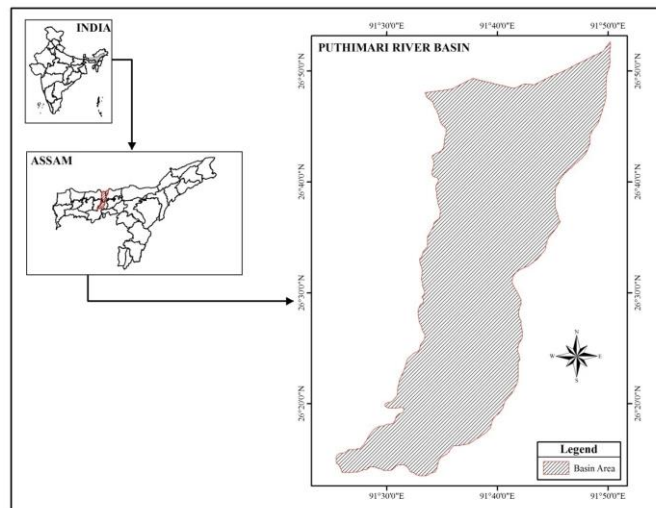


Figure 1. Location Map of Puthimari River Basin

Flood and bank erosion is the most threatening problem in the Puthimari river basin. The north bank tributaries of the Brahmaputra River, originating from the Bhutan Himalaya, are comparatively longer, more sediment laden and faster than the south bank tributaries. Therefore, basins of most of the north bank tributaries have been witnessing floods and bank erosion (Roy,P, 2017).

The Puthimari river basin receives an average annual rainfall of 236 cm. Flood in the Puthimari river is caused by heavy seasonal rainfall that occur in the Bhutan Hills and foothills along with that in the plain portion of the catchment area. The Puthimari is a flood prone river. The water discharge in the river increases very rapidly during the rainy season, overflows the banks and inundates large areas regularly, (Choudhury, 2014).

DATABASE METHODOLOGY

The research work has been carried out using by both field survey as well as Remote sensing based techniques. To develop a sound base of the problem relevant secondary sources has been used like books, journals, magazine, newspaper, articles, maps, satellite images etc. For primary data and information field observations have been conducted. Direct interviews were held with concerned public and affected people during the flood period.

The secondary data in regards to flood hazards have been made available from different departments.

Table1. The details of the secondary data used for the present study are shown below.

| Data Collected | Description of Data | Year | Source |
|---|-----------------------------|-----------|---|
| Water level | At N.H road crossing | 1958-2016 | Water Resource Department, Govt of Assam |
| Water Discharge | Rangia Gauge Discharge Site | 1955-2010 | Water Resource Department, Govt of Assam and Brahmaputra Board |
| Master Plan Report | Puthimari River | 2001-2011 | Brahmaputra Board |
| District Disaster Management Plan | Kamrup District | 2011 | Internet |
| Flood Damage Report | Puthimari River | 2016-2020 | Different Newspapers (The Assam Tribune, Niyomia Barta, Dainik Assam and Dainik Janambhumi. |
| Study Area Map and Flood affected village Map | Puthimari River | 2020 | ARSEC |
| Flood Damage Data | Puthimari River | 2016-2020 | Flood Report of Assam State Disaster Management Authority(2016-2020) |

HISTORY OF FLOOD IN PUTHIMARI RIVER BASIN

The flood problem of Puthimari River basin has a chronic history. The flood of 1988 (hydrograph 1958-2016) has been found as the highest flood ever recorded in the puthimari river basin with (54.81-49.79) 5.02 m deviation from danger level. The flood marked the highest water level (54.81) and water discharge (1588.31 cumecs) ever recorded in the flood history of Puthimari River. This flood has been found 2nd largest from the hazard perspectives also. In this flood, 388 numbers of villages were affected and the total population affected by flood was 4.22 lakhs of the puthimari river basin (Revenue Department, Govt of Assam). In the year 1988, the Puthimari River inundates vast area in Kamalpur Revenue circle due to breach on the left bank. Heavy damages of the dykes and embankment were occurred due to seepage, leakage, boiling and overtopping in many areas (Master Plan, Brahmaputra Board, 1995).

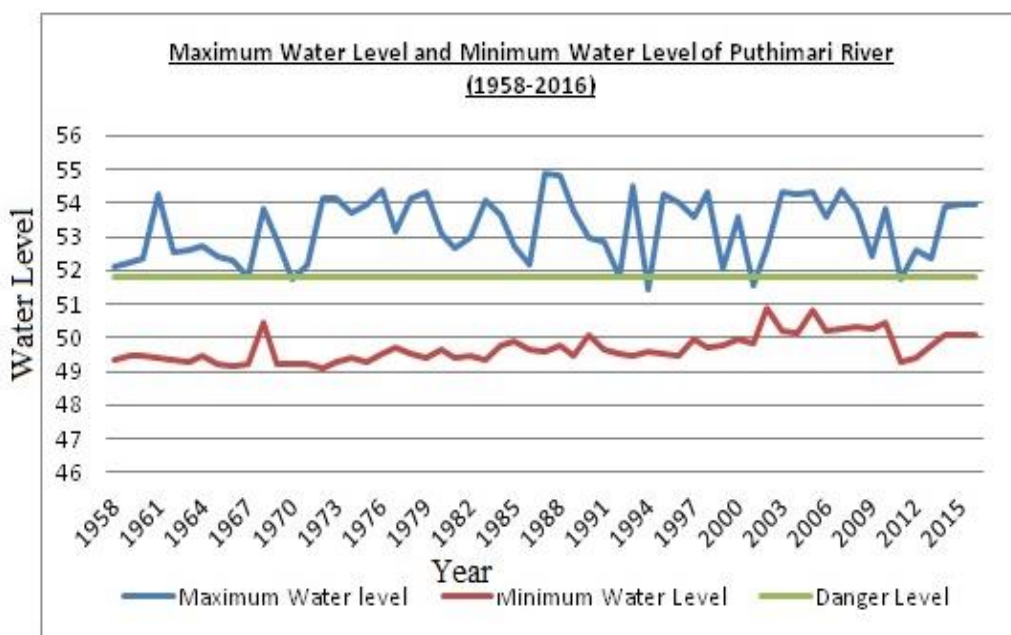


Diagram 1. Showing the Maximum and Minimum Water level in Puthimari Basin since 1958 to 2016

The second and third largest floods of the Puthimari River basin have been identified in the years of 1993 and 2007 flowing (54.54m-49.97m) 4.57 m and (54.42-50.29m) 4.13 m above the danger level . From the hazard viewpoint, both the floods of 1993 and 2007 have been ranked as 4th and 3rd largest. In the year 1993, 0.33 lakh hectare of land area was totally damaged, nearly 360 villages were affected and 4 people and 324 cattle were lost in that flood (Revenue Department, Govt. of Assam)

The flood of the year 2004 has been recorded as the highest from the damage perspectives of the Puthimari river basin. The highest water level was 54.25m and lowest water level was 50.14m with a flood lift of 4.11m. Total area damaged in this flood was 0.79 hectare and 424 numbers of villages were submerged, 22 people were died and 842 cattle were lost due to heavy flood (Revenue Department, Govt of Assam). In the below diagram a pattern of water discharge by Puthimari river flood has been highlighted.

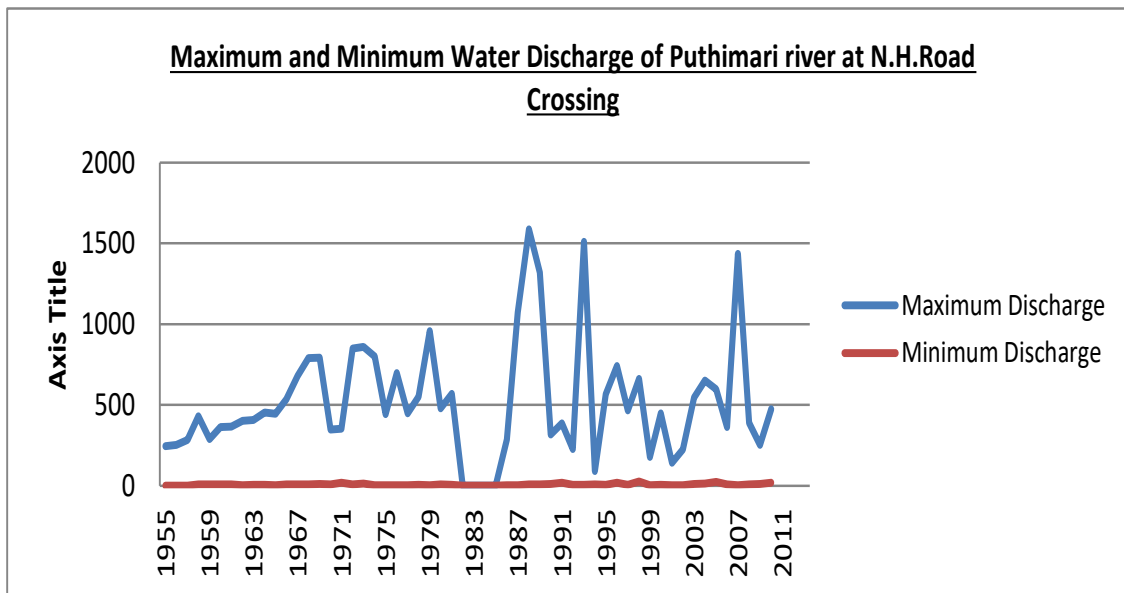


Diagram 2. Maximum and Minimum water discharge of Puthimari River Flood in 2004

The flood waters of Puthimari River have submerged several areas of Kamalpur and Rangia revenue circle causing untold miseries for the common people. The embankment of Puthimari River was breached at Pub-Bogribari and Maregaon on 30th October, 2008 while the river breached its embankment at Pachim Moukuchi, Dipteswari and Hahara on 1st September, 2008(The Assam Tribune, Guwahati, Monday).

The devastating flood has made a large number of people of Dipteswari, Moukuchi, Hahara, Lechakona, etc homeless. Several villages were inundated and hundreds of people rendered homeless as the flood waters of Puthimari River breached the west embankment.

Due to the breach of embankment over river Puthimari and Nona in 2012, influx of flood water caused severe devastation affecting about 1,16,515 nos of population of 67 numbers of villages in Rangia revenue circle. In the year 2019, heavy flood occurred in puthimari river basin. The village Maregaon, Bogribari, Dholkuchi, Khatpara of Goreswar Revenue Circle of Baska District was totally submerged by the River. Heavy floods occurred in this area due to the rising water level of river puthimari and its tributary Sukla (Niyomiya Barta, 16th July, 2019)

In the year 2019, heavy floods occurred in Rangia and Kamalpur revenue circle area. The puthimari river breached its embankment in Athgaon(12th July ,2019) and caused heavy damages to the villages namely Sonapur, Dhanuka, Singra, Borka, Kusumpur, Khudrasessa, Palara, Moihati, Sourakara and Guiya villages of kamalpur revenue circle. In the Rangia revenue circle, Tulshibari, Balagaon, Udiana, Pachim Sitara, Pub Sitara, Gurkuchi, Doloigaon, Dakhin Sitara, Kachari Salmari, Hiragata, Uttar Bordol, Dakhin Bardol, Pitambor Hatbajalia, Issapur, Khopnikuchi, Tarani and Karara Garbhiton villages were affected by puthimari flood in the year 2019(Flood Report of Assam State Disaster Management Authority, 2019).

Following incessant rainfall in an around 24th May,2020 the water level of Puthimari River has been rising above danger level, thereby posing serious threat to thousands of people on both banks. Several villages including Madhukuchi, Hahara, Nakul, Khoirabari, Kekenikuchi are located on the both sides of the Puthimari River. Due to the rising water level and the strong current, a dilapidated wooden bridge at Kekenikuchi village near Puthimari was under threat.

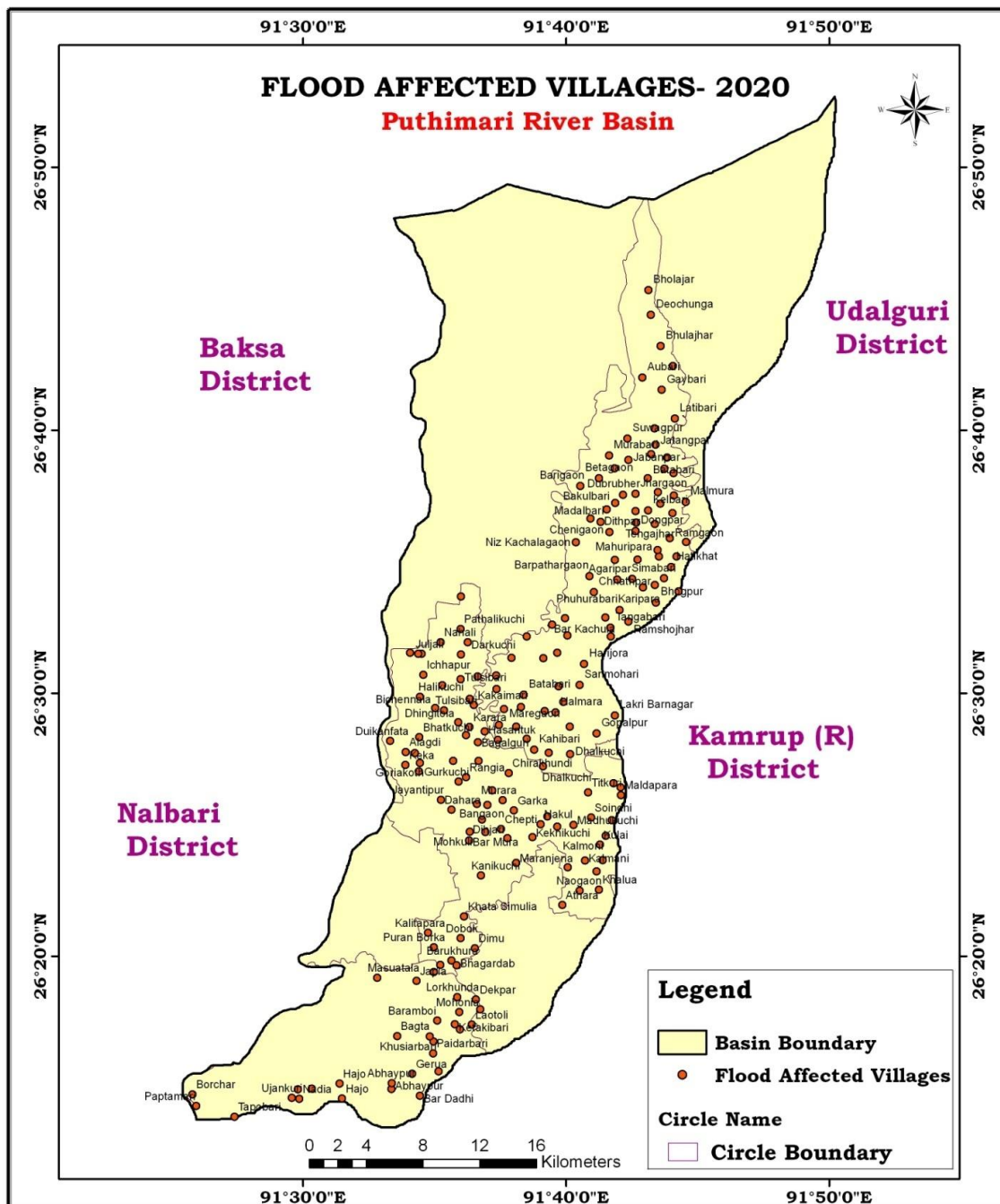


Figure 2. Map showing the Flood affected Villages in Puthimari River Basin (2020)

The bridge was the only mode of communication for people from both sides. The rising river water has worsened the condition as deposits on the wooden pillars of the bridge are posing a threat of it being washed away. A little further from the wooden bridge lies an under construction RCC bridge whose loose materials are also being carried away by the water current, and are getting deposited at the wooden bridge(Assam Tribune, 24th May, 2020)

Several villages in Tamulpur revenue circle in Baska District like Niz-Kasula, Chenigaon, Gandhibari, Nagrijuli, Kauli and Kumarikata have been flooded following incessant downpour.residents of several villages have been forced to set up temporary



shelters on high land after flood waters entered their houses and farmland. The water levels of the Puthimari and Barnadi rivers flowing through Tamulpur Subdivision have crossed the warning mark (Assam Tribune, 24th May, 2020)

The river water level has increased due to heavy rainfall in the hills of neighbouring Bhutan. Bhutan released water from the Kurishu dam into the Puthimari and Barnadi Rivers posing serious threat to the Tamulpur Subdivision. (Assam Tribune, 24 May, 2020).

Following incessant rain in the foothills of Bhutan and release of excess water from the Kurichhu Hydro power project in the neighbouring country, the rivers in the downstream areas have overflowed their banks in 12th July, 2020. The water level of Puthimari, Suklai, Barnadi etc. flowing through Tamulpur sub-division have crossed the danger level and breached their embankments, thus causing widespread floods in many villages of Baksa District (Assam Tribune, 13th July, 2020)

In the year 2020, the Puthimari River breached its embankment in eight places. It breached its embankment in four places of Baksa District and four places of Kamrup District. The name of the places where it breached its embankment in Baksa District were Niz-Kushula, Barpathar, Harijora, and Bogribari and the places of Kamrup District were Athgaon village of Kamalpur revenue circle, Kachuarbari, 2 no. Manahkuchi and 3no. Monahkuchi of Hajo revenue circle. It should be mentioned here that the Puthimari River also breached its embankment in Athgaon village of Kamalpur revenue circle in the year 2019 in the same day, 12th July.

The embankment of Puthimari River was breached at Niz-Kuchula, Barpathar, Harijora and Bogribari in 12th July, 2020 and several villages under Tamulpur sub-division were inundated within Baksa District. While villages like Niz-Kuchula, Barpathar, Chenigaon, Balabari, Harijora, Naramari, Balahati and Sonmahari were submerged, several other neighbouring villages too faced the flood threat (Assam Tribune, 13th July, 2020)

The PWD road connecting Goreswar with Rangia was also inundated. Overflowing waters of the Deosunga River in the meantime submerged Bangalipara area due to non construction of the Deosunga river embankment. While members of the flood-affected families were displaced, the dwelling houses and property too sustained severe damage. During the melee that followed, a section of domestic animals were shifted to safer places. The heavy floods have been caused due to the overflow of the Puthimari River and this has affected Gandhibari people, especially of Gandhibari North and South totally submerged under water. This has led to a chaotic condition for people in and around the Gandhibari road (Assam Tribune, 13th July, 2020)

The source of water is coming from Bhutan overflowing especially from Balti, Matanga and Pagladiya and other distributaries. This has entered villages and affected badly. In the Puthimari river water in Gandhibari, more than 100 bighas in farmlands are affected. Along with those veggies, which include ladies finger, chillies, pumpkin etc. all destroyed. The water has entered house and animals are also affected and people are not able to even cook because water is inside the house. The name of the villages totally submerged due to heavy floods in the year 2020 in Goreswar revenue circle were Bogribari, Balabari, Balahati, Bangalipara, Barpathar, Betaigaon, Bhehbari, Bihapara, Chenimara, Deochunga, Chenigaon, Maharipara, Deolkuchi, Dhepargaon, Dhulabari, Gurmow, Harizora, Khandikar, Lahapara, Madoikata, Niz-Kchula, Kaurbaha, Soulmari, Gandhibari, 2no. Dongargaon, Madalbari, Nathkuchi, Mukaldang, Naramari, Nagrijuli, Kauli, Kumarikata, Pipleni, Garobasti, Amborish Nagar etc (Assam Tribune, 13th July, 2020)

The Puthimari River breached its embankment in Bogribari area, almost 7km away from Rangia town in 12th July, 2020 and caused serious damages to the life of the people of Goreswar and Rangia revenue circle.

The water from the breached embankment of Sonmohori entered North Kamrup and submerged several villages like Gurmow, Kamargaon, Titkuri and Dagaon. There is no embankment of Puthimari river in Mukaldonga area of Goreswar revenue circle and water from this part reached Kolajol and submerged several villages like Baihata Chariali, Bihdia, Muktapur, Kolajol, Piyolikhata, Modartala, Deodwur, Madanpur, Dora-Kohora, and Sangswari (Dainik Assam, 13th July, 2020)

CONCLUSION

It has been observed from the available historical records and present field based study in Puthimari river basin that the entire basin area has experienced a very devastating type of flood in all around the past years. Most of the flood prone area is mainly concentrated in the North-East and the Central part of the basin. Higher rate of load carrying nature and upheaval of the river bed are some of the major points responsible for annual flood in Puthimari river basin. Effective flood measurement steps by Govt. departments can play an important role in proper management of annual flood in the region.



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