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# THE HIGHEST EVER RECORDED FLOODS IN THE MAJOR INDIAN RIVERS – A BRIEF APPRAISAL

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ABSTRACT : A catalogue of the highest ever recorded floods in 52 major Indian rivers at 212 gauge sites have been presented on the basis of flood data upto and including the year 1985. A list of unprecedented floods which were 10 metres and more above their respective danger levels has been separately given. Month-wise, yearwise and statewise distribution of all these floods during the last two decades (i.e. 1966 to 1985) has also been studied. Meteorological causes of major floods in India have been discussed and two most severe floods of the country, viz. (i) the Teesta flood in October, 1968 and (ii) the Narmada flood of September, 1970, have been briefly described.

## INTRODUCTION

Bulk of our country's annual rainfall is received during the four monsoon months of June to September which results in frequent floods in most of the Indian rivers. Every year some part or the other of the country gets flooded in the monsoon season and causes heavy loss of life, damage to property and disruption of communications. On an average, per year, about 78 lakh (i.e. $78 \times 10^5$) hectares of land is affected by the ravages of these recurring floods. The average flood damage per season is estimated to be of the order of 240 crores of rupees (Varma, 1978). There are, however, instances in the past when flood damage in a year had gone upto 1000 crores of rupees or more and the land area affected had exceeded 150 lakh (i.e. $150 \times 10^5$) hectares.

An attempt has been made in this paper to present an up-to-date catalogue of the highest ever recorded floods in the major rivers of the country. With the help of this data, monthly, yearly and statewise distributions of the highest floods has been attempted with a view to highlight which parts of the country are prone to these highest floods, and in which monsoon months their frequency is maximum. Attendant meteorological situations which resulted in causing the two severe most floods of the country in the past have also been briefly touched upon.

## 2. BASIC FLOOD DATA USED

Relevant flood statistics for the present study were collected from the following publications:

a) Flood News Letters issued by the Central Water Commission (CWC), New Delhi from 1959 to 1985;

b) Danger levels of rivers in India issued by the Central Water Commission, New Delhi from time to time;

c) Catalogue of Floods issued by the Central Water Commission; and

d) Publications of the India Meteorological Department (IMD) and State/ Provincial Governments on floods, etc.

## 3. METEOROLOGICAL CAUSES OF MAJOR FLOODS IN INDIA

According to Parthasarathy (1954), Bose (1966), Chakraborty (1954), Das (1954), Dhar (1959), Dhar and Changrani (1966), Jaganathan (1970), Dhar et al (1973, 1980, 1981) and Ramaswamy (1981), the meteorological situations which were responsible in causing major floods in this country in the past were as follows:

a) Incidence of heavy rainfall in association with the passage of monsoon depressions and cyclonic storms from the adjoining seas of the Bay of Bengal and the Arabian Sea;

b) Passage of low pressure areas or upper air cyclonic circulations in quick succession, one after another, almost along and near the same track,

c) Monsoon "Break" situations or the shifting of the axis of the seasonal monsoon trough from its normal position over the Indo-Gangetic plains to the foot of the Himalayas, and

d) Active to vigorous monsoon conditions prevailing over a region for a number of days at a stretch.

Apart from the above meteorological causes of floods, the following factors also play an important role in causing floods:

i) Man made obstruction to the free flow of river waters such as road embankments, river bunds, restricted bridge openings etc.;

ii) Indiscriminate destruction of forests and vegetal cover in the upper reaches of a basin causes the absorptive capacity of the soil to decrease, thereby increasing the surface runoff which also helps in increasing soil erosion;

iii) Huge quantities of soil and silt washed down from the bare and poorly covered hill slopes get deposited in river beds which reduce the flood carrying capacity of river channels;

iv) Improper agricultural practices in a river basin causing increased runoff, and

v) Failure of dams and other man-made obstructions across rivers causing floods in downstream reaches which can be serious at times.

## 4. CATALOGUE OF HIGHEST EVER RECORDED FLOODS IN INDIAN RIVERS

In all the earlier studies by Dhar et al (1975, 1980 and 1981) catalogues of the highest ever recorded floods in the major Indian rivers were prepared on the basis of flood data then available. In the present study the period covered has been extended upto and including 1985 flood season. Compared to earlier studies, in the present study flood data for more number of gauge sites have been included for most of the major rivers (see Fig. 1). Table 1 shows a list of highest ever recorded floods in major rivers of the country at different gauge sites. From a perusal of Table 1, it is seen that 52 major rivers of India recorded the highest floods at 212 gauge sites and these floods were 0.15 m to 18.10 m above their respective danger levels (DLs) at different gauge sites.

## 5. MOST SEVERE FLOODS OF THE COUNTRY

A most severe flood has been defined as the one which is 5 metres and more above the danger level at a given gauge site on a river. As per this classification, from Table 1, it was found that 18 major rivers of this country recorded highest floods which were 5 metres and more above their respective danger levels at 28 gauge sites. A list of major rivers has also been prepared which recorded floods which were 10 metres and more above their respective danger levels (see Table 2). These floods have been called as the worst floods of the country.

From Table 2, it is seen that only 6 major rivers at 8 gauge sites recorded the worst floods in the past. From a perusal of Table 2 it is seen that the Teesta flood at Anderson Bridge in North Bengal on 4th October, 1968 was the highest recorded flood in India which stood 18.10 metres above the danger level at this site. Next to it was the Narmada flood of 6th September, 1970 at Gurudeshwar in Gujarat which was 17.87 metres above the danger level. As the above two floods were of unprecedented nature, the attendant meteorological situations responsible for causing them have been briefly described below:

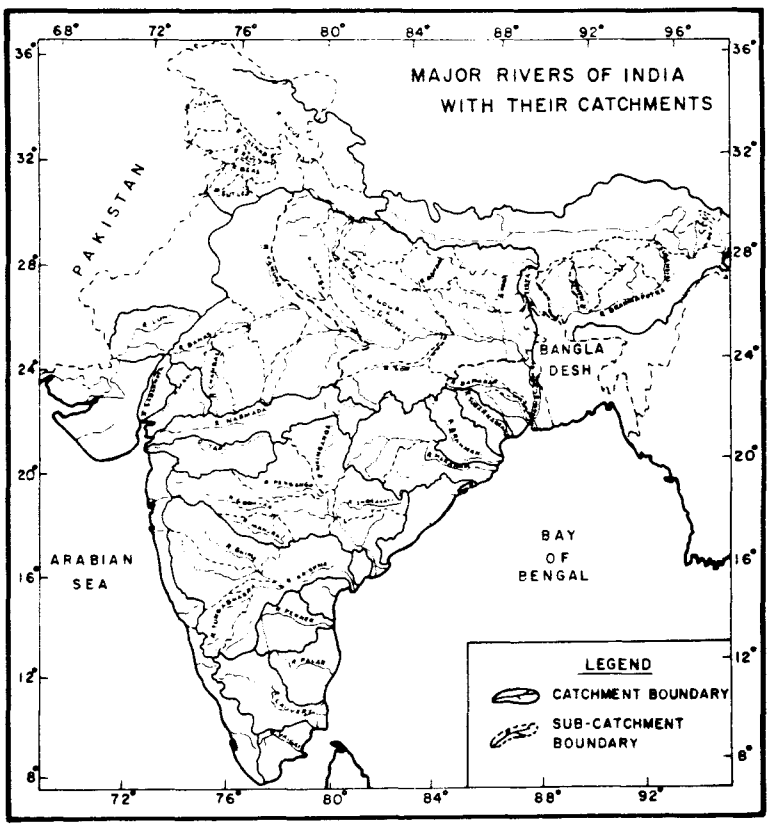


Fig. 1

### 5.1 Teesta Flood of October, 1968

This flood was caused by exceptionally heavy rains associated with the passage of a Bay of Bengal depression. This depression crossed the Andhra coast near Kalingapatnam on 2nd October as a cyclonic storm and centred near Phulbani in Orissa. Thereafter, it moved in a northwesterly direction and lay near Daltonganj on 4th October as a depression. On 5th October evening, it broke over the Himalayan region of Eastern Nepal and adjoining Sikkim. In association with this cyclonic disturbance, very heavy and widespread rain occurred over North Bengal and adjoining Sikkim from 3 to 5 October and caused devastating floods in the downstream reaches of the Teesta basin. Chief amounts of rainfall associated with this rainstorm were as under:

**Table A**

| Name of the Station | Rainfall (cm.) | | |
|---|---|---|---|
| | 3rd Oct. 1968 | 4th Oct. 1968 | 5th Oct. 1968 |
| Mongpoo | 11.5 | 31.9 | 52.1 |
| Kurseong | 15.2 | 30.1 | 63.8 |
| Darjeeling | 8.5 | 21.5 | 27.5 |
| Kalimpong | 7.3 | 25.8 | 41.9 |
| Hashimara | 6.1 | 15.5 | 17.8 |
| Jalpaiguri | 12.0 | 11.3 | NA |
| Bagdogra | 17.6 | 14.7 | 34.5 |
| Cooch Behar | 6.3 | 12.0 | 28.7 |

### 5.2 Narmada Flood of September, 1970

The unprecedented flood in the Narmada at Garudeshwar on 6th September, 1970 was caused by exceptionally heavy rains due to a land depression which formed near Chakulia in Gangetic, West Bengal on 2nd September morning. This depression intensified into a deep depression and moved westwards across Madhya Pradesh and centred near Jabalpur on 5th September. On the next day it was located near Indore and thereafter it weakened into a depression near Gujarat on 7th September with its centre near Ahmedabad. In association with this disturbance very heavy rains occurred from 3 to 7 September over west M. P. and adjoining south Gujarat causing unprecedented floods in the Narmada at Garudeshwar In the case of west flowing rivers like the Narmada and the Tapi, it is observed that the magnitude of the flood wave gets augmented due to the fact that the movement of monsoon disturbance and the river flow are in the same direction. The flood wave from the upper reaches and the heavy rainfall in the middle and lower reaches travel almost together in the same direction causing severe floods in the lower reaches. Principal rain amounts in and around the Narmada basin during this rainspell are as follows:

**Table B**

| Name of the Station | Rainfall (cm.) | | |
|---|---|---|---|
| | 5th Sept. 1970 | 6th Sept. 1970 | 7th Sept. 1970 |
| Nandurbar | 0.7 | 5.9 | 5.5 |
| Dhaboi | 1.1 | 23.6 | 20.0 |
| Chota Udepur | 6.0 | 17.8 | 10.8 |
| Sankheda | 2.4 | 15.0 | 16.8 |
| Tilakwada | 0.2 | 22.6 | 12.8 |
| Hansot | 0.8 | 12.2 | 24.8 |
| Surat | 0.4 | 12.5 | 24.7 |
| Dediapada | 1.7 | 21.5 | 19.5 |
| Harsud | 5.2 | 13.2 | 0.1 |
| Mandhata | 8.1 | 15.9 | 0.5 |
| Maheshwar | 15.0 | 24.0 | 1.1 |
| Barwani | 6.4 | 25.4 | 0.6 |
| Rajpur | 5.1 | 22.1 | 1.0 |
| Bhopal | 3.1 | 10.7 | 0.3 |

## 6. MONTH, YEAR AND STATEWISE DISTRIBUTION OF HIGHEST RECORDED FLOODS DURING THE PERIOD 1966–1985

Floor data for a good number of sites for most of the major rivers of the country are available from about 1966 onwards. Using this data space-time distribution of the highest ever recorded floods have been attempted here in order to know which states of the country are prone to these worst floods and in which month of the monsoon period their frequency is highest. Table 3 shows the monthly distribution of the highest ever recorded floods during the 20-year period from 1966 to 1985. From a perusal of this table, it can be seen that monsoon months of August and September are the worst flood affected months of the country and the worst flood years were 1973, 1975, 1978 and 1982.

Table 4 shows the statewise distribution of the highest recorded floods during the period 1966-1985. From an examination of this table, it is seen that the states, worst affected by the highest floods were Bihar, Uttar Pradesh and Assam. To a lesser extent West Bengal and Gujarat states also experienced worst floods in some of their major rivers. This study has shown that very few highest recorded floods have occurred in the rivers of Peninsular India. From this it can be said that India's flood problem is mainly confined to the states located in the Indo-Gangetic plains where remedial measures should be taken to save these states from recurring ravages of devastating floods.

*(Contd. on Page No. 25)*

TABLE 1 :

HIGHEST EVER RECORDED FLOODS IN THE 52 MAJOR RIVERS OF THE COUNTRY AT DIFFERENT GAUGE SITES

| Sr. No. | River | Gauge Site | State | Danger Level (D.L.) (m) | Highest Flood Level (m) | Date and Year | Difference between Highest Flood Level & D.L. (m) |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 1 | Bagmati | Dheng Bridge | Bihar | 70.10 | 71.80 | 28.07.75 | 1.70 |
| | | Benibad | " | 48.68 | 49.65 | 8.09.85 | 0.97 |
| | | Hayaghat | " | 45.72 | 48.06 | 3.08.75 | 2.34 |
| 2 | Baitarni | Anandpur | Orissa | 38.36 | 41.20 | 1975 | 2.84 |
| | | Akhuapada | " | 19.20 | 21.18 | 1975 | 1.98 |
| | | Dasarathpur | " | 3.81 | 13.13 | 16.08.60 | 9.32 |
| | | Ballavaghat | " | 3.05 | 4.57 | 16.08.70 | 1.52 |
| 3 | Barak | Chottabekra | Assam | 26.20 | 28.59 | 12.09.79 | 2.39 |
| | | Lakhipur | " | 23.88 | 29.93 | 12.09.79 | 6.05 |
| | | Silchar | " | 20.74 | 21.94 | 17.06.69 | 1.20 |
| | | Annapurnaghat | " | 19.83 | 21.45 | 20.06.85 | 1.62 |
| | | Badarpurghat | " | 16.85 | 17.06 | 18.06.59 | 0.21 |
| 4 | Beas | Mandi Hill | Himachal Pradesh | 732.57 | 734.10 | 4.10.55 | 1.53 |
| | | Dera Gopipur | " | 412.55 | 414.30 | 22.08.51 | 1.75 |
| | | Naushehra | Punjab | 258.67 | 258.76 | 9.08.61 | 0.09 |
| | | Mandi Plain | " | 213.66 | 215.19 | 6.10.55 | 1.53 |
| 5 | Betwa | Matatila Dam | Uttar Pradesh | 305.49 | 308.46 | 10.09.78 | 2.97 |
| | | Paricha | " | 194.77 | 197.94 | 1901 | 3.17 |
| | | Shahjina | " | 104.55 | 108.43 | 12.09.83 | 3.88 |
| 6 | Bhagirathi | Gariya | West Bengal | 20.57 | 24.29 | 1800 | 3.72 |
| | | Jangipur | " | 20.27 | 23.30 | 1890 | 3.03 |
| | | Berhampore | " | 17.22 | 20.27 | 27.08.69 | 3.05 |
| | | Katwa | " | 13.71 | 13.86 | 7.09.70 | 0.15 |
| 7 | Bhima | Dhond | Maharashtra | 506.48 | 510.96 | 3.08.56 | 4.48 |
| | | Pandharpur | " | 452.20 | 456.05 | 5.08.56 | 3.85 |
| | | Davangaon Tal | Karnataka | 404.46 | 405.67 | 10.09.62 | 1.21 |

TABLE 1 (Contd...)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 8 | Brahmaputra | Sai Khowa | Assam | 128.30 | 129.36 | 19.08.62 | 1.06 |
| | | Dibrugarh | " | 104.24 | 105.95 | 16.08.77 | 1.71 |
| | | Neamatighat | " | 85.04 | 86.91 | 25.07.84 | 1.87 |
| | | Tezpur | " | 65.23 | 67.60 | 26.08.69 | 2.37 |
| | | Gauhati | " | 49.68 | 51.06 | 23.08.62 | 1.38 |
| | | Pandu | " | 48.77 | 49.94 | 23.08.80 | 1.17 |
| | | Goalpara | " | 36.27 | 37.43 | 29.07.54 | 1.16 |
| | | Dhubri | " | 28.65 | 29.92 | 5.07.74 | 1.27 |
| 9 | Brahmini | Talchar Bridge | Orissa | 62.79 | 65.53 | 08.75 | 2.74 |
| | | Jenapur | " | 20.12 | 23.44 | 20.08.75 | 3.32 |
| | | Talchar | " | 9.14 | 13.41 | 08.60 | 4.27 |
| | | Ponposh | " | 7.92 | 13.11 | 1971 | 5.19 |
| 10 | Burhi Dehing | Margherita | Assam | 136.86 | 137.35 | 06.73 | 0.49 |
| | | Naharkatia | " | 120.40 | 120.85 | 29.08.77 | 0.45 |
| | | Khowang | " | 102.11 | 103.68 | 16.07.84 | 1.57 |
| 11 | Burhi Gandak | Champatia | Bihar | 73.68 | 76.38 | 1936 | 2.70 |
| | | Lalbeghiaghat | " | 62.19 | 66.00 | 2.08.75 | 3.81 |
| | | Ahirwalia | " | 56.62 | 60.91 | 1.08.77 | 4.29 |
| | | Sikandarpur | " | 52.53 | 53.74 | 2.08.75 | 1.21 |
| | | Samastipur | " | 46.02 | 48.69 | 09.75 | 2.67 |
| | | Rossera | " | 42.63 | 45.82 | 10.08.84 | 3.19 |
| | | Khagaria | " | 36.58 | 39.66 | 19.08.78 | 3.08 |
| 12 | Cauvery | Chunchunkatta | Karnataka | 7.47 | 7.47 | 1924 | 0.00 |
| | | Mettur Dam | Tamil Nadu | 240.80 | 242.25 | 20.07.61 | 1.45 |
| | | Agreshwarswami Temple | " | 26.51 | 30.48 | 25.07.24 | 3.97 |
| 13 | Chambal | Dholpur | Rajasthan | 129.79 | 144.00 | 25.08.82 | 14.21 |
| 14 | Damodar | Amta | West Bengal | 5.63 | 7.54 | 5.10.59 | 1.91 |
| 15 | Dhansiri | Bokajan | Assam | 129.00 | 133.11 | 21.09.80 | 4.11 |
| | | Golaghat | " | 89.50 | 90.68 | 07.74 | 1.18 |
| | | Numaligarh | " | 77.22 | 79.43 | 18.07.80 | 2.21 |
| 16 | Gandak | Valmik Nagar | Bihar | 109.67 | 112.79 | 1954 | 3.12 |
| | | Khadda | " | 96.04 | 96.87 | 3.08.78 | 0.83 |
| | | Piprasi | " | 88.06 | 88.48 | .07.75 | 0.42 |
| | | Rewaghat | " | 54.41 | 57.38 | 1.08.77 | 2.97 |

TABLE 1 (Contd....)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 17 | Ganga | Hardwar | Uttar Pradesh | 294.00 | 295.75 | 1973 | 1.75 |
| | | Gurumukteshwar | " | 198.72 | 199.02 | 17.06.63 | 0.30 |
| | | Narora Bridge | " | 178.00 | 179.94 | 30.07.79 | 1.94 |
| | | Dalmau | " | 99.36 | 99.84 | 1973 | 0.48 |
| | | Allahabad | " | 84.73 | 88.39 | 1948 | 3.66 |
| | | Phaphamau | " | 84.73 | 86.73 | 14.09.83 | 2.00 |
| | | Mirzapur | " | 77.72 | 81.67 | 9.09.78 | 3.95 |
| | | Varanasi | " | 71.26 | 74.68 | 1882 | 3.42 |
| | | Gazipur | " | 63.10 | 65.13 | 1.09.82 | 2.03 |
| | | Ballia | " | 57.65 | 59.92 | 4.09.82 | 2.27 |
| | | Buxar | Bihar | 60.32 | 62.09 | 1948 | 1.77 |
| | | Dighaghat | " | 50.45 | 52.52 | 1975 | 2.07 |
| | | Gandhighat | " | 48.60 | 50.03 | 3.09.82 | 1.43 |
| | | Hathidah | " | 41.76 | 43.13 | 7.08.71 | 1.37 |
| | | Monghyr | " | 39.33 | 40.94 | 20.09.76 | 1.61 |
| | | Bhagalpur | " | 33.68 | 34.18 | 19.08.78 | 0.50 |
| | | Colgong | " | 31.09 | 32.29 | 18.08.78 | 1.20 |
| | | Manik Chak | West Bengal | 26.35 | 27.08 | 15.08.14 | 0.73 |
| | | Rajmahal | " | 24.82 | 27.08 | 1913 | 2.26 |
| | | Farakka | " | 22.25 | 24.52 | 7.09.80 | 2.27 |
| | | Nurpur | " | 21.03 | 22.54 | 26.08.55 | 1.51 |
| 18 | Ghaggar | RD 149666 | Punjab | 260.11 | 260.85 | 21.09.62 | 0.74 |
| | | RD 460797 | " | 228.96 | 229.97 | 24.09.62 | 1.01 |
| | | RD 640050 (Narwana Branch) | Haryana | 187.89 | 190.84 | 24.09.62 | 2.95 |
| 19 | Ghagra | Katarnighat | Uttar Pradesh | 136.78 | 137.00 | 1970 | 0.22 |
| | | Elgin Bridge | " | 106.07 | 107.88 | 1950 | 1.81 |
| | | Chowka Ghat | " | 104.85 | 106.35 | 21.08.76 | 1.50 |
| | | Guptar Ghat | " | 94.79 | 95.00 | 22.08.76 | 0.21 |
| | | Ayodhya | " | 92.73 | 93.53 | 16.09.83 | 0.80 |
| | | Turtipar | " | 64.01 | 65.09 | 19.09.83 | 1.09 |
| | | Darauli | Bihar | 60.82 | 61.82 | 6.08.74 | 1.00 |
| | | Gangpur | " | 57.04 | 59.21 | 17.08.80 | 2.17 |
| | | Chapra | " | 53.68 | 53.89 | 18.09.83 | 0.21 |
| 20 | Godavari | Madhavmeshwar | Maharashtra | 612.34 | 612.77 | 3.08.56 | 0.43 |
| | | Nanded | " | 357.84 | 359.02 | 9.09.69 | 1.18 |
| | | Dummargudam | Andhra Pradesh | 56.39 | 58.18 | 14.08.83 | 1.79 |
| | | Bhadrachalam | " | 48.77 | 51.97 | 14.08.83 | 3.20 |
| | | Kunavaram | " | 40.32 | 44.13 | 21.09.62 | 3.81 |
| | | Rajhamundry | " | 19.51 | 19.81 | 1953 | 0.30 |
| | | Dowlaishwaram | " | 16.15 | 19.28 | 4.09.76 | 3.13 |
| 21 | Gomati | Caughat | Uttar Pradesh | 110.49 | 113.20 | 1960 | 2.71 |
| | | Monkay Bridge | " | 108.28 | 110.08 | 7.09.71 | 1.80 |
| | | Sultanpur | " | 84.73 | 88.94 | 18.09.71 | 4.21 |
| | | Jaunpur | " | 74.01 | 77.74 | 1971 | 3.73 |

TABLE 1 (Contd....)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 22 | Jaldhaka | Nagarkata | West Bengal | 185.60 | 193.35 | 1954 | 7.75 |
| | | NH 31 Crossing | " | 80.10 | 81.23 | 24.08.54 | 1.13 |
| | | Mathabanga | " | 48.70 | 49.85 | 6.07.83 | 1.15 |
| 23 | Kamla Balan | Jainagar | Bihar | 67.75 | 70.87 | 9.07.65 | 3.12 |
| | | Jhanjharpur | " | 50.00 | 52.17 | 1965 | 2.17 |
| 24 | Kangsabati | Mohanpur | West Bengal | 25.76 | 29.03 | 1950 | 3.27 |
| 25 | Ken | Bariarpur | Uttar Pradesh | 189.88 | 191.37 | 1906 | 1.49 |
| | | Banda | " | 102.00 | 110.03 | 30.08.80 | 8.03 |
| 26 | Kosi | Barakshetra | Bihar | 120.93 | 128.07 | 24.08.54 | 7.14 |
| | | Nirmali | " | 53.75 | 55.30 | 1974 | 1.55 |
| | | Basua | " | 47.75 | 48.36 | 25.07.79 | 0.61 |
| | | Baltara | " | 33.85 | 35.37 | 7.08.81 | 1.52 |
| | | Kuarsella | " | 30.00 | 32.55 | 10.07.80 | 2.55 |
| 27 | Koyana | Jalkawadi | Maharashtra | 591.92 | 593.33 | 21.07.50 | 1.41 |
| 28 | Krishna | Karad | " | 566.01 | 566.93 | 1914 | 0.92 |
| | | Sangli Bridge | " | 14.02 | 15.70 | 11.07.61 | 1.68 |
| | | Kusnal Tal | Karnataka | 533.40 | 535.84 | .07.61 | 2.44 |
| | | Muddebihal | " | 497.43 | 501.27 | 14.07.61 | 3.84 |
| | | Ingalgi | " | 487.68 | 489.20 | 14.07.61 | 1.52 |
| 29 | Lohit | Tezu | Arunachal | 195.99 | 197.18 | .07.74 | 1.19 |
| | | Dholla | " | 128.70 | 129.45 | 16.08.77 | 0.75 |
| 30 | Mahanadi | Mahud | Madhya Pradesh | 365.46 | 366.07 | 2.08.67 | 0.61 |
| | | Rajim | " | 284.27 | 285.29 | 2.08.67 | 1.02 |
| | | Sri Narayan | " | 224.03 | 225.07 | 3.08.67 | 1.04 |
| | | Naraj | Orissa | 26.40 | 27.75 | 1973 | 1.35 |
| | | Jobra | " | 22.25 | 23.22 | 1955 | 0.97 |
| | | Alipangal | " | 11.76 | 12.80 | 31.08.82 | 1.04 |
| | | Nimpara | " | 10.82 | 11.58 | 31.08.82 | 0.76 |
| | | Sambalpur | " | 10.06 | 11.46 | 1927 | 1.40 |
| 31 | Mahananda | Taibpur | Bihar | 66.00 | 67.73 | 7.08.76 | 1.73 |
| | | Dhengraghat | " | 35.65 | 38.09 | 1965 | 2.44 |
| | | Jhawa | " | 31.40 | 33.40 | 2.08.85 | 2.00 |
| 32 | Mahi | Dam Axis | Gujarat | 94.75 | 106.55 | 8.09.73 | 11.80 |
| | | Wanakbori | " | 71.93 | 75.92 | 8.09.73 | 3.99 |
| | | Vasaol | " | 16.76 | 29.55 | 8.09.73 | 12.79 |

TABLE 1 (Contd....)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 33 | Manas | Mathanguri | Assam | 99.06 | 100.69 | .06.73 | 1.63 |
| | | NH Crossing | " | 47.56 | 58.59 | 13.07.84 | 11.03 |
| 34 | Narmada | Mandla | Madhya Pradesh | 438.91 | 441.66 | 1926 | 2.75 |
| | | Jamtara | " | 374.90 | 380.86 | 1973 | 5.96 |
| | | Burmaghat | " | 323.30 | 331.32 | 1973 | 8.02 |
| | | Hoshangabad | " | 296.46 | 301.84 | 30.08.73 | 5.38 |
| | | Mortakka | " | 163.98 | 173.72 | 17.09.61 | 9.74 |
| | | Dharamrai | " | 122.83 | 129.00 | 1.09.73 | 6.17 |
| | | Garudeshwar | Gujarat | 23.77 | 41.64 | 6.09.70 | 17.87 |
| | | Broach | " | 6.71 | 12.65 | 7.09.70 | 5.94 |
| 35 | Periyar | Periyar Barrage | Kerala | 32.50 | 33.91 | 1924 | 1.41 |
| | | Shankaracharya Bridge | " | 8.87 | 13.72 | 1924 | 4.85 |
| | | Alwaye | " | 6.00 | 7.92 | 1924 | 1.92 |
| 36 | Punpun | Palmerganj | Bihar | 96.00 | 99.09 | 16.09.76 | 3.09 |
| | | Sripalpur | " | 50.60 | 53.91 | 1971 | 3.31 |
| 37 | Raidok | Teliapara | West Bengal | 47.94 | 48.90 | 1952 | 0.96 |
| | | Tufanganj | " | 34.22 | 35.95 | 6.08.81 | 1.73 |
| 38 | Ramganga | Baimi Hd. Works | Uttar Pradesh | 210.92 | 211.96 | .09.79 | 1.04 |
| 39 | Rapti | Kakardari | Uttar Pradesh | 130.15 | 130.39 | 18.06.70 | 0.24 |
| | | Bhinga | " | 115.86 | 119.47 | 22.07.70 | 3.61 |
| | | Balrampur | " | 104.62 | 105.90 | 23.08.69 | 1.28 |
| | | Bansi | " | 85.00 | 87.44 | 1966 | 2.44 |
| | | Sahjanwa | " | 76.51 | 77.57 | 9.09.60 | 1.06 |
| | | Birdsghat | " | 73.76 | 76.84 | 9.08.74 | 2.08 |
| 40 | Ravi | Mukesar | Punjab | 398.80 | 405.44 | 5.10.65 | 6.64 |
| | | Madhopur | " | 349.45 | 349.91 | 17.07.75 | 0.46 |
| 41 | Sabarmati | Ahmedabad | Gujarat | 46.03 | 47.24 | 31.08.73 | 1.21 |
| | | Fatewadi | " | 38.70 | 41.75 | 1.09.73 | 3.05 |
| 42 | Sankosh | Golakganj | Assam | 28.51 | 29.99 | 28.07.82 | 1.48 |
| 43 | Sarda | Banbassa | Uttar Pradesh | 223.30 | 225.22 | 1934 | 1.92 |
| | | Sarda Nagar | " | 135.49 | 136.95 | 15.07.79 | 1.46 |

**TABLE 1 (Contd....)**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 44 | Sone | Chopan | Bihar | 171.00 | 175.61 | .08.75 | 4.61 |
| | | Japla | " | 125.09 | 126.94 | 21.08.75 | 1.85 |
| | | Indarpuri | " | 108.20 | 109.50 | 9.08.79 | 1.30 |
| | | Koelwar | " | 55.52 | 58.88 | 07.71 | 3.36 |
| | | Maner | " | 52.00 | 53.68 | 4.09.82 | 1.68 |
| 45 | Subansiri | Chalduaghat | Assam | 100.43 | 100.91 | .07.71 | 0.48 |
| | | Dhalghat | " | 90.40 | 91.90 | 16.08.80 | 1.50 |
| | | Badatighat | " | 82.53 | 86.21 | .07.72 | 3.68 |
| | | Bhonipurghat | " | 96.77 | 96.87 | 9.08.57 | 0.10 |
| 46 | Subarnarekha | Jamshedpur | Bihar | 6.00 | 14.72 | 12.10.73 | 8.72 |
| | | Jamsalashat | Orrissa | 34.14 | 41.76 | 13.10.73 | 7.62 |
| | | Rajghat | " | 4.57 | 6.46 | 3.09.73 | 1.89 |
| 47 | Sutlej | Bilaspur | Himachal Pradesh | 466.95 | 467.04 | 5.08.57 | 0.09 |
| | | Harike Hd. Works | Punjab | 210.31 | 211.19 | 6.10.55 | 0.88 |
| | | Ferozpur | " | 197.66 | 198.33 | 7.10.55 | 0.67 |
| 48. | Tapi | Burhanpur | Madhya Pradesh | 220.98 | 232.06 | 1968 | 11.08 |
| | | Savangkheda | Maharashtra | 119.74 | 127.34 | 16.09.59 | 7.60 |
| | | Bhusaval | " | 185.32 | 189.89 | 1959 | 4.57 |
| | | Gidhade | Gujarat | 137.77 | 146.30 | 1968 | 8.53 |
| | | Ukai dam site | " | 100.74 | 102.96 | 18.09.79 | 2.22 |
| | | Kakrapar | " | 52.27 | 55.32 | 6.08.68 | 3.05 |
| | | Surat | " | 28.96 | 31.39 | 6.08.68 | 2.43 |
| 49 | Teesta | Anderson bridge | West Bengal | 210.50 | 228.60 | 4.10.68 | 18.10 |
| | | Coronation bridge | " | 149.40 | 160.05 | .10.68 | 10.65 |
| | | Domohani | " | 85.30 | 89.25 | 5.10.68 | 3.95 |
| | | Kingsghat | " | 81.38 | 82.05 | 5.10.68 | 0.67 |
| 50 | Torsa | Hasimara | West Bengal | 109.70 | 110.65 | NA | 0.95 |
| | | NH Crossing | " | 57.84 | 59.06 | 19.07.60 | 1.22 |
| | | Ghuguman | " | 40.40 | 42.60 | 20.07.60 | 2.20 |
| 51 | Vamsadhara | Gunupur | Orissa | 82.90 | 86.57 | 18.09.80 | 3.67 |

TABLE 1 (Contd....)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| 52 | Yamuna | Tajewala | Haryana | 325.68 | 327.86 | 25.09.47 | 2.18 |
| | | Railway bridge | Delhi | 204.83 | 207.50 | 6.09.78 | 2.67 |
| | | Okhala Hd. Works | Uttar Pradesh | 200.27 | 202.96 | 15.10.56 | 2.69 |
| | | Mathura | " | 165.20 | 169.40 | 9.09.78 | 4.20 |
| | | Agra Water Works | " | 152.09 | 154.71 | 9.09.78 | 2.62 |
| | | Etawah | " | 121.92 | 126.02 | 12.09.78 | 4.10 |
| | | Auraia | " | 108.96 | 114.38 | 27.08.82 | 5.42 |
| | | Kalpi | " | 105.00 | 112.70 | 27.08.82 | 7.70 |
| | | Hamirpur | " | 103.68 | 108.37 | 12.09.83 | 4.69 |
| | | Chillaghat | " | 100.00 | 104.85 | 6.09.78 | 4.85 |
| | | Naini | " | 84.73 | 87.66 | 9.09.78 | 2.93 |
| | | Partappur | " | 83.52 | 88.72 | 30.07.71 | 5.20 |

TABLE 2

WORST FLOODS OF THE COUNTRY WHEN THE FLOOD LEVELS WERE 10 m OR MORE ABOVE THEIR RESPECTIVE DANGER LEVELS

| Sr. No. | River | Gauge Site | State | Danger Level (m) | Highest Flood Level (m) | Date and Year | Difference between Highest Flood level and D. L. (m) |
|---|---|---|---|---|---|---|---|
| 1. | Chambal | Dholpur | Rajasthan | 129.79 | 144.00 | 25.08.82 | 14.21 |
| 2 | Mahi | Dam Axis | Gujarat | 94.75 | 106.55 | 8.09.73 | 11.80 |
| | | Vasaol | " | 16.76 | 29.55 | 8.09.73 | 12.79 |
| 3 | Manas | NH Crossing | Assam | 47.56 | 58.59 | 13.07.84 | 11.03 |
| 4 | Narmada | Garudeshwar | Gujarat | 23.77 | 41.64 | 6.09.70 | 17.87 |
| 5 | Tapi | Burhanpur | Madhya Pradesh | 220.98 | 232.06 | 1968 | 11.08 |
| 6 | Teesta | Anderson Bridge | West Bengal | 210.50 | 228.60 | 4.10.68 | 18.10 |
| | | Coronation Bridge | " | 149.40 | 160.05 | .10.68 | 10.65 |

## TABLE 3

## MONTHWISE AND YEARWISE DISTRIBUTION OF WORST FLOODS AT DIFFERENT GAUGE SITES OF MAJOR RIVERS OF THE COUNTRY DURING THE PERIOD 1966 TO 1985.

| Year | Month | June | July | Aug. | Sept. | Oct. | Total |
|---|---|---|---|---|---|---|---|
| 1966 | | – | – | – | – | – | 0 |
| 1967 | | – | – | 3 | – | – | 3 |
| 1968 | | – | – | 2 | – | 4 | 6 |
| 1969 | | 1 | – | 3 | 1 | – | 5 |
| 1970 | | 1 | 1 | – | 3 | – | 5 |
| 1971 | | – | 3 | 1 | 2 | – | 6 |
| 1972 | | – | 1 | – | – | – | 1 |
| 1973 | | 2 | – | 2 | 6 | 2 | 12 |
| 1974 | | – | 3 | 2 | – | – | 5 |
| 1975 | | – | 3 | 7 | 1 | – | 11 |
| 1976 | | – | – | 3 | 3 | – | 6 |
| 1977 | | – | – | 5 | – | – | 5 |
| 1978 | | – | – | 4 | 8 | – | 12 |
| 1979 | | – | 3 | 1 | 4 | – | 8 |
| 1980 | | – | 2 | 4 | 3 | – | 9 |
| 1981 | | – | – | 2 | – | – | 2 |
| 1982 | | – | 1 | 5 | 4 | – | 10 |
| 1983 | | – | 1 | 2 | 6 | – | 9 |
| 1984 | | – | 3 | 1 | – | – | 4 |
| 1985 | | 1 | – | 1 | 1 | – | 3 |
| Total | | 5 | 21 | 48 | 42 | 6 | 122 |

## TABLE 4

## STATEWISE DISTRIBUTION OF MAJOR FLOODS OF THE COUNTRY DURING THE PERIOD 1966 TO 1985 IN DIFFERENT MAJOR RIVERS AT DIFFERENT GAUGE SITES

| Sr. No. | State Month | June | July | Aug. | Sept. | Oct. | Total |
|---|---|---|---|---|---|---|---|
| 1. | Andhra Pradesh | – | – | 2 | 1 | – | 3 |
| 2. | Arunachal Pradesh | – | 1 | 1 | – | – | 2 |
| 3. | Assam | 4 | 9 | 5 | 3 | – | 21 |
| 4. | Bihar | – | 5 | 19 | 7 | 1 | 32 |
| 5. | Delhi | – | – | – | 1 | – | 1 |
| 6. | Gujarat | – | – | 3 | 7 | – | 10 |
| 7. | Madhya Pradesh | – | – | 4 | 1 | – | 5 |
| 8. | Maharashtra | – | – | – | 1 | – | 1 |
| 9. | Orissa | – | – | 4 | 2 | 1 | 7 |
| 10. | Punjab | – | 1 | – | – | – | 1 |
| 11. | Rajasthan | – | – | 1 | – | – | 1 |
| 12. | Uttar Pradesh | 1 | 4 | 7 | 17 | – | 29 |
| 13. | West Bengal | – | 1 | 2 | 2 | 4 | 9 |
| | Total | 5 | 21 | 48 | 42 | 6 | 122 |

*(Contd. from Page No. 16)*

## 7. SUMMARY AND CONCLUSIONS

From the foregoing the following broad conclusions can be drawn:

i) On the basis of available flood data at different sites of major rivers in this country, an up-to-date catalogue of the highest ever recorded floods has been prepared which is given in Table 1. From this table it is seen that 52 major rivers of this country recorded highest floods at 212 sites. These floods were 0.15 m to 18.10 m high above their respective danger levels;

ii) 18 major rivers recorded the highest floods which were 5 m and more above their respective danger levels at 28 gauge sites. Only 6 major rivers at 8 gauge sites recorded the highest floods, also called the worst floods, which were 10 m and more above their respective danger levels;

iii) The highest ever recorded flood in India was recorded on the Teesta river in October, 1968 at Anderson Bridge in North Bengal which stood 18.10 m above the danger level at this site, and

iv) Monsoon months of August and September were found to be the worst flood affected months of the country during the 20-year period from 1966 to 1985. During this period the worst flood years of the country were those of 1973, 1975, 1978 and 1982 and the worst flood affected states were those of Bihar, Uttar Pradesh and Assam.

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