

**ORISSA STATE WATER PLAN  
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**THE SUPER CYCLONE**

The Super Cyclone that originated in the Bay of Bengal near Andaman-Nicobar Islands on 25th Oct. concentrated into a severe cyclonic storm and finally had landfall at Paradeep on the 29th October morning. Lashing practically the entire coastal stretch of Orissa with wind velocity of around 300 km/h at Paradeep, the Super Cyclone penetrated up to 150 km inland and caused torrential precipitation over 45,000 km<sup>2</sup> from the 29th October to 1st November.

The largest concentration of urban population of 1.5 million in Cuttack and Bhubaneswar suffered unprecedented damage from intense rainfall of 500 to 600 mm and cyclonic gale of 200-250 Km/h. The densely populated districts and district towns of Jagatsinghpur, Kendrapara, Jajpur and Bhadrak were also totally devastated. Coastal stretches in the districts of Puri and Balasore on the north also severely affected in the cyclonic gale and rain.

The tidal surge of 6 to 7 m arising out of 300 km/h, on the morning of 29th October rapidly swept across the coastal stretch in Jagatsinghpur and Kendrapara district, submerging a vast stretch of area and destroying all the houses and infrastructures. Saline inundation of 200,000 ha of extremely fertile agricultural land struck a deathblow to standing Kharif crop. More than 8000 inhabitants were officially declared as deceased.

## **FLOOD**

The deltaic tract that received the most intense rainfall particularly in Mahanadi, Brahmani and Baitarani basin is extremely flat with slope of the order of 1 in 5000 to 10,000 comprises of Kanas, Astarang area in Puri district, Balikuda, Ersama area in Jagatsinghpur district, Rajnagar, Mahakalapada in Kendrapara district, Kanika, Dhamnagar, Basudevpur area in Bhadrak district.

The two largest river basins Mahanadi and Brahmani received intense rainfall only in the tail and consequently did not generate high flood at the head of their delta. It is however interesting to note that all the deltaic branches of these rivers were flowing above danger level, at locations as far as 20 km inland from their sea mouth.

The two smaller basins, Baitarani (14218 km<sup>2</sup>) and Burhabalang (4837 km<sup>2</sup>) received the most severe rainfall over most of the basin and consequently generated extremely high flood.

## **BAITARANI**

Consequent to the most intense rainfall between 29th October to 1st November, the peak flood discharge is assessed as 498,000 cusec at Akhuapada against safe carrying capacity of 100,000 Cusec in the main channel and 50,000 Cusec in Budha. The floods in Baitarani and its branches caused serious damage to all the embankments and canals of Keonjhar, Jajpur, Bhadrak and Kendrapara districts. Both Andandpur and the district town of Jajpur on the bank have been seriously affected by flood spill.

Major contribution to the catastrophic flood was from River Musal (basin area 531 km<sup>2</sup>) and River Kusei (basin area 870 km<sup>2</sup>) on the right and from several smaller rivers on the left of overall basin area 700 km<sup>2</sup>.

The river Kusei before its confluence with Baitarani carried almost 200,000 cusec from a basin area of 870 km<sup>2</sup>. A major State High Way bridge constructed on this river about 10 km upstream of its confluence with Baitarani was outflanked, and due to heavy concentration of flow, has collapsed by scour. Kusei's contribution 200,000 cusec resulted in abnormal increase of flow to 498,000 cusec at the delta head.

Baitarani basin had not experienced a flood of this magnitude earlier although the rainfall was intense (average 450mm) over the downstream 7000 km<sup>2</sup> out of the overall basin area of 10200 km<sup>2</sup> at the head of its delta (Akhuapada). The upper basin of 3000 km<sup>2</sup> did receive rainfall of only 100 mm.

As the river's safe carrying capacity at the head of the delta is less than 200,000 cusec, massive breaches occurred in the left and right embankments of the river and all its branches.

The river Baitarani through its deltaic branch Budha spilled almost 250,000 cusec into Brahmani basin causing flooding of practically the entire delta of both the rivers and even 30 to 40 km upstream in the sub mountaineous region.

### **SALANDI**

A dam intercepting 670 km<sup>2</sup> of this basin has been constructed in 1965 at Hadgarh, 50 km upstream of the district town of Bhadrak. This dam in Keonjhar district received 700 to 900 mm rainfall in 3 days over 90% of its catchment. The consequence was generation of a peak flood of 8345 m<sup>3</sup> ( 295,000 Cusec) into the reservoir on the 30th October. The spillway design flood assessed in 1961 was only 3256 m<sup>3</sup> (115,000 cusec).

The spillway release coupled with downstream contribution from 200 km<sup>2</sup>. Has resulted in a high flood at Bhadrak urban area of the order of 3000 m<sup>3</sup> (106,000 cusec) causing serious damage to the urban property, breaching of all embankments up to the sea. The town of Bhadrak got submerged up to 2 m over 10 km<sup>2</sup>. The river downstream of Bhadrak receives two major tributaries Reba, Kapil along with spill of Baitarani and drains an over all area of 1800 km<sup>2</sup>. The entire basin, where 90,000 ha are irrigated through this major project and 20,000 ha through lift irrigation projects has sustained catastrophic loss.

Flooding occurred in these two basins due to

- **Heavy precipitation**
- **High storm surge.**

### **MAHANADI AND BRAHMANI**

One million ha arable land in coastal district of Puri, Khurda, Nayagarh, Jagatsinghpur, Kendrapara, Cuttack, Dhenkanal and Jajpur were affected in these basins primarily by stagnation due to 600 to 700 mm. of precipitation received.

Strong cyclonic gale of 300 km/h at Paradeep, which caused a tidal wave 5 to 6 m high travel inland and spill laterally through all the coastal rivers and creeks up to 20 to 30 km parallel to the coast from Astaranga in Puri district to north of Basudevpur in Balasore district. The length of coastal stretch affected is 250 km. Earlier on October 17th to 19th

cyclone almost 100 km length in Ganjam, Khurda and Puri Districts were affected. The saline inundation that occurred over 20 to 30 km wide coastal stretch was also caused by overtopping, breaching and severing scouring of saline embankment along the coast of almost 1400 km length.

The agricultural land area that has been affected by salinity is 2 lakhs ha, which was covered with paddy and plantation crops, coconuts in particular. The cyclone not only flattened out the paddy crop but totally destroy the cash crops.

The district of Jagatsinghpur and Kendrapara where the wind velocity was 250 to 300 km/h and rainfall in the range of 400 to 600 mm, has suffered massive loss due to wind and submergence in the lower reach.

The spills from rivers Baitarani, Brahmani, Burhabalanga and their branches caused extensive breaches in embankments. The fertile agricultural land of eleven coastal districts got inundated by storm water in upper delta of Madhanadi and Brahmani to minimum one metre depth. Almost 1.5 million ha in ten districts has been affected.

The lower delta of Mahanadi Brahmani including the entire Brahmani basin below Anandapur to sea got submerged up to a depth of 3m totally damaging crops over 0.5 million ha.

The most extensive damages have been caused in Baitarani basin where rainfall was the most intense. Almost the entire basin got rainfall in excess of 600 mm with wind up to 150 km/h.

### **DAMAGE TO DAMS**

Damages to head works, canal systems have occurred, rendering the irrigation projects incapable of providing any irrigation although the reservoirs are absolutely full on November 10, 1999.

The distribution system over a command area of 86,824 ha of total of 156,178 ha in these districts has been totally/partially damaged.

Rabi coverage to 32,703 ha cannot be provided due to system distress.

Almost 1090 km of distribution channels have suffered erosion through 1052 breaches and 306 canal structures had massive damage.

A large number of minor (flow) projects were washed away.

### **MINOR PROJECTS**

Due to Super Cyclone, 5636 LIPs in 12 coastal districts namely Cuttack, Jagatsinghpur, Kendrapara, Jajpur, Puri, Khurda, Nayagarh, Balasore, Bhadrak, Mayurbhanj, Keonjhar and Dhenkanal have been seriously affected. This includes disruptions of power supply in many LIPs and damage of head works and distribution system

The torrential rainfall, consequential high flood in major rivers from Ganjam in the south to Balasore in the north accompanied by super cyclone gale has caused unprecedented damage to the entire coastal belt comprising of 2.5 million ha arable land. A major cause for the crippling blow to agricultural production (which would have been otherwise good

due to a normal monsoon) is the continuous submerged of flat medium and low land for 10 to 15 days, due to impeded drainage.

### **Mitigation measures**

The 1999 super cyclone alerted every body to sit up and think possible mitigation measures. A permanent agency OSDMA was created to devise mitigation measures for such disasters. Cyclones are natural events and cannot be prevented to occur. But properly tackled the loss and damage can be lessened. The following measures needs consideration

Early warning system.

- Computer based storm surge simulation
- Structural and non structural interventions

The state has no means to launch protection measures in a big way. OSDMA has installed some measures like

- construction of cyclone shelters in the cyclone prone areas.
- stock pile of cyclone fighting equipment: :boats, DG sets, tents, satellite phones etc.
- maintaining and training Disaster Action Force(DAF)