

# FLOODS IN INDIA – DISASTER AND MANAGEMENT

By

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*“The river broke through at Huzi.  
What could we do ?  
Beneath its rushing waves,  
Villages became rivers,  
The villages have all become rivers,  
There is no safety for the land,  
Our labours know no rest,  
Our mountains crumble.”*

- *Chinese Emperor Wu.  
2<sup>nd</sup> Century B.C.*

## 1. Introduction

In years past the response around the world to such catastrophies was predictable, more dams, higher levees and sturdier embankments to contain rising waters. These days, however water – management experts are increasingly questioning whether traditional remedies make sense; in fact some contend that dams and other barriers do more harm than good. “You can never control floods,” observes Philip William, President of the International Rivers Network, “Yes can simply try to reduce the risk”. But are human activities making India more flood-prone? The recent floods in Delhi, Mumbai Kolkata and others metropolises around the country definitely point towards an affirmative answer. Building cities on the world’s worst flood-prone plains – the Indo-Gangetic plains – is not new. Cities like Prayag, Kashi and Pataliputra are thousands of years old. But a study of settlements in the middle Indo-Gangetic plains by the Banaras Hindu University shows that in those days sites were chosen carefully and cities were built with discipline and ingenuity. Major cities were situated near rivers for navigation advantage, but had highbanks to withstand floods. Where mistakes were made, the cities, especially along the turbulent northern tributaries of the Ganges, got washed away.

Somehow modern city builders seem to be less disciplined. And Delhi, Mumbai and Kolkata are prime examples. As Delhi, Mumbai and Kolkata grew by leaps and bounds, lack of housing sites pushed people to any land they can find, much of which is near the Yamuna, Hooghly and Mith river flood plains or the drainage channels leading to these. Farmers also found it more profitable to convert their farms into housing sites. This was partly encouraged by flood control embankments which tend to congest the natural drainage to the river. Then, as settlements grew and became legalised, road and rail embankments appeared, further congesting natural drainage. And as culverts are the most expensive part of road laying, so contractors tried to avoid them or cut corners. The result : the monsoons, in which half the year's rain can come in one day's downpour, causes disastrous waterlogging.

Over the past 40 years billions of dollars have been spent on river containment in India, China and Bangladesh. Critics insist the impact has been limited and in some cases has had the perverse effect of aggravating damage caused by rain swollen rivers. Flood is the penalty human beings have to pay when they interfere with the rivers' right of way.

India's first Prime Minister Jawaharlal Nehru, believed that dams to produce power, irrigation and control flooding would be the "temples" of a modern, secular state. Since his day, 400 large dams have been built in India, along with thousands smaller levees as well as 16,000 km of river embankments, but the area affected by floods has expanded from 2 million hectares to 9 million due to deforestation, poor urban drainage and other factors.

In addition, says Anil Agarwal, India's leading environmentalist, "the government's anti-flood measures have actually boomeranged. Dams and embankments have now become an important cause of floods". The manmade barriers, he says, prevent drainage of excess water from floodplains into the main channels of rivers and streams. Embankments also tend to break when rivers rise suddenly, sending water gushing into the countryside. Sixteen major dams have burst in India; the worst disaster, in 1979, sent a wall of water through the town of Morvi in Gujarat state, killing 1,500 people.

## **2. Decade of Floods – Report**

1993 – The monsoon followed particularly harsh summer, when the mercury touched 47 degrees in some parts of central India, while other regions suffered incessant heat waves. But once the rains came, they refused to stop. The trickle soon turned into a torrent, and a vast region- stretching from Kashmir in the north-west to Arunachal Pradesh in the north-east – came under water. The loss in human lives was high and the damage to property ran into

billions of dollars. Punjab witnessed its worst floods in over 45 years, and so did Haryana, eastern Rajasthan and Himachal Pradesh. Even Jammu and Kashmir, one of the least flood-prone states, had large areas submerged under several feet of water. Even in those states where the floods are so much a recurring phenomenon – Delhi, Gujarat, Arunachal Pradesh and Meghalaya – the people were completely caught unaware. Town planning is always based on certain probabilities. If the flood level is higher or the rainfall is much heavier than what is anticipated, it may be difficult to protect the town.

As far as flood management is concerned, no town is planned on an area which is not well drained. Towns are always located on places that are well protected. Also, towns must have access to water resources. But if a town is close to its water source which, at the same time, is its drainage basin, it becomes flood-prone.

1994 – Another year of major floods in India. More than 147 people died in Kerala since the onset of monsoon that year. The flood related deaths were 138 in Gujarat. According to rough estimate 100,000 were marooned in Madhya Pradesh. Other places like Bihar, Orissa and Uttar Pradesh experienced flashfloods. About 60 persons were feared killed in two cloud bursts in Shaat village of Kullu district and Khariana in Dharmashala area of Kangra district in Himachal Pradesh. The loss due to floods in Karnataka that year had been estimated at 17.5 million dollars. The most affected had been the Dakshina Kananda district where loss to private and Public property was estimated at 80 million dollars.

1995 – In Uttar Pradesh, Haryana and Arunachal Pradesh more than 214 people died in flash flood that year. In Himachal Pradesh increment rain led to house – collapses and landslides. Six people killed in Shimla in separate incidents. Haryana the worst hit areas were Rohtak, Bhimani, Hissar, Jind and Rewari. Major rivers like Ganges and Jamuna continued to be in state and flowed above danger level. West Bengal and Sikkim also experienced the flood that year.

1996 – Major floods throughout the country paralysed life, killed people and animals. More than 58 people died in Rajasthan and 150 villages were marooned. The 300 km Jammu & Kashmir National highway was closed for more than 10 days cutting it with rest of the world. The death toll in that year's flood in southern Andhra Pradesh went up to 137 with another 147 missing. The floods were caused due to the breaching of a number of medium and minor

irrigation sources following heavy down pour of couple of days. Massive crop damage in Andhra Pradesh that year.

1997 – One hundred and thirty-five people were dead in a devastating cloudburst which washed away a large part of the village of Chirgaon about 120 km from Simla in Himachal Pradesh. Rescue teams which had a difficult time inreaching the site recovered 33 dead bodies. The administration in our towns neglect the essential services, especially the drainage system. Most towns do not have drains because they have not been provided in the planning stage. However, in many cases, even the existing drains do not serve the purpose, because they have been allowed to degenerate. The municipalities do not pay adequate attention to these essential services.

Floods have caused havoc because of inadequate town planning. The drainage systems have not been able to withstand the unprecedented rains this year. Above all, basic infrastructure, such as water supply, solid waste disposal and drainage, has been given the last priority. This has nothiing to do with planning. There is water logging een in places where proper planning has taken place. Therefore, it is not only because of design, but also poor management that has led to a great deal of suffering.

1998 – Macabre ? Morbid ? Gruesome ? Call it what you will, but the word is real. And reaity has hit Kaziranga – (one of the primier wild life sanctuary of the country) hard time. Its hog deers, wild buffaloes, elephants and rhinos have had to fight three phases of floods that began in June. In the first week of September, they gave up the search. Some 18 rhinos have diedas a result of the floods. Another seven have been poached. With 95 per cent of the park flooded, there were very few places to hide. They were almost room service for the poachers. Two successive floods in 1987 and 1988 had such an effect on the animal population that it is yet to recede. The hog deer population of Kaziranga prior to those years hovered around 11,000. Now, even after protacted recuperation, the numbers are down to the 6,000 mark. As the water goes down in Kaziranga, the stench of rotting flesh will rise. But even then we will only gt a preliminary report on the damage. Nature takes its toll. It also takes it time.

1999 – Capital New Delhi was hit severely in that years flood. The most affected colonies were in north-east, east and north-west Delhi where accumulated rain left people wading out of knee-deep water. Delhi is water-logged only in pockets. That is bcausethe drainage system

is not maintained properly. Moreover, the areas, which were to be kept under the green belt, have been encroached upon or taken up for development. The drainage basin of the city has been eaten away by unauthorised construction.

In most cases, a city is surrounded by ecologically fragile areas like a flood plain or a lake. In Delhi, we have the Ridge and the Yamuna flood plains. The pressure of population in the towns is so much that these fragile areas tend to get urbanised – both unauthorised and by planned methods as in the case of East Delhi (Trans – Yamuna Belt). These areas at one time were left outside the preview of development. But today, due to population pressure, the expansion is cutting into the fragile areas. This is happening in Delhi, Calcutta and Mumbai. Other cities like Ahmedabad and Bangalore are also facing a similar situation.

Our policy makers have encouraged investment and growth in few megacities despite contrary advice. In 1961, the authorities in Delhi were told to stop new offices and relocate existing ones. But no one listened. On the other hand, enormous amount of investments have been made in subsidises to infrastructure.

People come from such a long distance for treatment just because there are no hospitals in their areas. If money is pumped only into Delhi, there will be no hospitals in other regions. Therefore, people will come to the cities. The same applies to employment opportunities. Majority of immigrants are poor and they come in search of jobs.

The direction of development and financial planning have not responded to the issues adequately. That is one of the reasons why cities are expanding physically, and physical expansion invariably results in this kind of problem.

2000 – Himachal flood toll exceeded 130 with major parts of Kinnaur a district of Himachal Pradesh cut off for more than 10 days. The Himachal Government was intrigued at the cause of sudden flash flood in the Sutlej river. Ruling out any sabotage by the Chinese authorities, as reported in the section of the press, they said that it was just being ensured in that regions were the cloud bursts, so as to know the reasons for the steep rise of the river level, that had never been witnessed before.

2001 – More than 60,000 people were affected by floods across Tripura triggered by torrential rain. The west Tripura district bore the brunt of the most deluge in 25 years. Urban management in India is shockingly poor. The government is allocating more and more money

to megacity projects. The beneficiaries will be only 10 per cent. But the real beneficiaries will be only two per cent, who are rich, due to which other regions are neglected.

This kind of financial mismanagement results in poor urban management. The criteria for allocating funds needs to be re-examined. Money is going into the larger towns while other areas are suffering.

The Town and Country Planning Act takes into consideration the environmental factors such as conservation of groundwater, flood plains, ecologically-fragile areas.

However, it requires proper implementation and sustained adherence to the precepts of the plan. But planning in India is not undertaken by the planners, but by the government. We are just the advisers. Planning, like all other sectors, has been usurped by the bureaucracy. There is no participation by the people.

### **Devastating floods affect millions in India 2005**

**India** - Operation Blessing teams are responding with emergency disaster relief after heavy monsoon rains prompted severe flooding in western India. More than 1,000 people have already perished after weeks of incessant rainfall.

The city of Mumbai, formerly known as Bombay, was deluged with 37 inches of rain in 24 hours -- the most any Indian city has ever received in one day.

Officials estimate 25 million people have been impacted by the widespread flooding.

OBI relief workers navigated treacherous roads to reach the hardest hit areas in the state of Gujarat, where up to 10,000 different villages have been inundated by floodwaters. Food distribution efforts began immediately, and OBI medical teams soon arrived to care for the sick and injured.

More than 6,000 flood victims have received meals from Operation Blessing, while OBI doctors have treated 9,870 people in need.

OBI relief efforts are also underway in Uttar Pradesh and Yavatmal, Maharashtra, where more than 3,000 people have received medical care and 350 families were given temporary housing materials.

Additionally, Operation Blessing is supplying community assistance through providing temporary shelters, burying animals and other debris removal and distributing supplies at one local prison that was impacted by the flooding.

As damage assessment persists, concerns are growing over the threat of water-borne diseases as well. Indian authorities have distributed medicine to many survivors, but thousands remain stranded in amid huge lakes of standing water.

Train services, telecommunications and electricity supplies have been disrupted throughout the region by driving rains, floodwaters and resulting landslides. Estimated losses from the floods have been placed at \$2.3 billion.

## **The Situation**

Seven weeks following the torrential deluge which flooded large areas of the western state of Maharashtra including the state capital Mumbai, the waters have receded and basic services have been re-established. The disaster claimed approximately 1,200 lives and affected 20 million people.

Much of Mumbai's drainage system collapsed and as the flood waters subsided, there was a continued risk from water-borne diseases. The most serious of these has been leptospirosis which is a disease people get when they wade through water infected by animal urine. Water-borne diseases have caused an estimated 150 deaths in the weeks following the flooding.

As of 6 September 2005, the Ministry of Home Affairs (National Disaster Management Division) reported that 3,200 people continued to be living in 44 relief camps. This is a significant reduction from a month ago when approximately 200,000 people were living in relief camps.

The Maharashtra state government reports the following impacts of the disaster include;

- 20,000 hectares of farmland have become waste due to topsoil being washed away
- 550,000 hectares of crops were damaged
- Over 26,000 cattle losses
- Over 350,000 houses partially damaged and over 14,000 homes destroyed
- Damage to roads and bridges estimated at CHF 330 million (USD 266 million, EUR 214 million)

The Indian government is looking at addressing reducing long-term vulnerability of the flood-affected areas, especially Mumbai which has a population of over 20 million people. Among the recommendations being examined by the government are:

- The large number of people living in low quality housing in highly vulnerable areas, particularly the bed of the Mithi River.
- Replacement of the Mumbai drainage system which is more than 100 years old. A Maharashtra state government report notes that unless this is done, monsoon preparedness measures will not be effective in the face of severe flooding.

The central and state governments launched a major relief effort and coordinated extensively with NGOs, UN bodies, etc. There was a significant financial response from the Indian corporate sector.

#### **GOVERNMENT ACTION**

The central government of India gave a support of INR 1,000 crores (CHF 285 million) to the state, further assistance will be offered as required. Cash assistance is being provided to the next of kin of those who have died and to the affected. According to government sources, so far a total of 14.8 million CHF has been disbursed. 10 kg of wheat, rice and 10 litres of cooking fuel are being provided to each of the affected families through a government distribution system. Within Mumbai, the Brihanmumbai Municipal Corporation (BMC) has engaged sanitary teams in collecting garbage and cleaning drains. According to BMC, 100,000 metric tons of garbage has been collected in the last ten days within Mumbai only. A detailed survey on damages is being carried out by the government. The government is still running 401 relief camps throughout the state and approximately 213,000 people are in these camps. About 1,162 medical teams are providing services in the affected areas. A hygiene awareness campaign has been initiated by the government through mass media.

#### **Spontaneous assistance**

In the immediate aftermath of the flooding, local religious groups, community groups and citizens of Mumbai mobilized whatever resources they could and rushed to help those in need. There are many media reports of neighbours helping each other while water continued to rise in many places within Mumbai. In some of the severely affected areas that the Red

Cross assessment team visited, certain food and milk distribution ns were still being carried out. The Indian Red Cross Society (IRCS) has been monitoring the situation through its Maharashtra state branch and the response was immediate by the state and district branches. The information flow is facilitated through the following network:

**ECHO** - The mission delegation of Humanitarian Aid Department of the European Commission has been in Maharashtra state since 30 July to conduct a need-based assessment. Today, ECHO met with its partners in Delhi (attended by representatives of the Federation, Médecins Sans Frontières (MSF), Caritas, Actionaid, Danish Church Aid, Catholic Relief Services and CARE) to discuss the India floods with special focus on Maharashtra where food security can be a concern. The meeting highlighted the following issues facing Mumbai City:

1. There may be increase of migrant population into Mumbai due to loss of livelihood in the affected districts.
2. The slum dwellers of Mumbai who have no identity documents will be excluded from government aid.
3. The people of Maharashtra are not used to floods and have limited coping mechanisms, resulting in such widespread devastation.

This meeting suggested agencies to complement government efforts on food security issues. ECHO has made no decision but invited interested agencies to send a letter of intent (LOI) for funding.

**United Nations Children's Fund (UNICEF)** has initiated the inter-agency coordination role by organizing meetings in Mumbai. The first was held on 3 August chaired by BMC. In addition, it was decided to set up a facilitating group of NGOs based on the needs/requirements that would distribute relief items to the affected community. The meeting was attended by Indian relief and rehabilitation department, NGOs, IRCS and the Federation. UNICEF has also initiated mobile teams of health and water and sanitation for Mumbai. Times Foundation provided a local platform to all the NGOs to share information and represent themselves. The meeting which took place in early August also launched a Maharashtra floods resource centre. IRCS participated in the meeting and shared information on their response.

**NGOs action** - Catholic Relief Service (CRS) together with CARITAS are considering providing assistance in Ratnagiri, Mumbai, Thane, Raigad and Pune. CARE has released 13,000 family kits and 2,000 water tanks with a capacity of 70 litres each in schools and other public institutions. This relief was complemented by the government with dry rations and school books with each kit. A multi-agency assessment is being conducted by RedR together with Concern Worldwide. ADRA is planning a needs assessment Red Cross and Red Crescent action

## **RELIEF**

1. Procurement of 25,000 family packs in addition to the 5,000 packs already in place and will be replenished (15,000 for Mumbai and 15,000 for other most affected districts). Each family pack is comprised of one kitchen set, plastic bucket with cover, stove, bed sheet, saree, plastic mat (6' x 4'), and towel.
2. Replenishment of the 5,000 family packs mobilized from Bahadurgarh warehouse.
3. Mobilization of two IRCS national disaster response team (NDRT) members for logistics and relief support to the state branch during the relief operation.
4. Mobilization of volunteers and Youth Red Cross for the relief operation in Mumbai and districts.
5. Distribution to be carried out by IRCS volunteers through survey and identification of the most vulnerable families according to the targeting criteria established (below poverty line, single women households, temporarily displaced households, old and infirm).
6. Deployment and continuous use of three IRCS disaster water sanitation response units (DWSRU) of the trailer mounted type (LMS) each unit providing 10,000 litres of treated water per day per unit. The units are to be deployed for two months under a letter of understanding for maintenance and upkeep of the unit between IRCS Maharashtra state branch and the concerned government department. The units are to be returned to IRCS at the end of the two month period. Technical staff for successful deployment of these units to be mobilized by IRCS nationally, and if required regionally.
7. Additional mass water treatment unit (TWA6) to be mobilized from Bahadurgarh warehouse producing 12,000 liters per hour.
8. 500,000 chlorine tablets be mobilized immediately, covering drinking water needs for 71,000 people for one month.

### **National capacity building**

9. The DM department within the IRCS national headquarters to fill the positions that have fallen vacant namely -- disaster response coordinator, disaster preparedness coordinator and warehouse coordinator. 10. Indian Red Cross is now emerging with a prominent national role in water and sanitation. In view of this emerging reality, national headquarters must appoint a watsan engineer.

### **Branch capacity building**

10. The Maharashtra state branch should immediately appoint one storekeeper for the state branch. 12. Volunteer's training in relief distribution, targeting criteria, survey methodologies to be undertaken.

11. Two IRCS relief supervisors to be hired, one each for one district in the coastal belt and one district in the Vidharbh areas of the state.

12. IRCS national headquarters/Federation to provide all necessary assistance to the branch with appointment of these personnel based on request from the branch. 15. In order to enable the branch to undertake the relief operation within the state, one of the 6-tonne carrier truck and one eight-seater passenger car to be purchased and made available at the earliest for the operation. Two additional trucks may be made available to the branch, mobilized from Bahadurgarh warehouse. 16. Procurement of IT- communication equipment (one computer with peripherals, digital camera, one fax machine) 17. In order to facilitate the procurement process, Federation logistics and procurement personnel be deployed as required.

### **Warehousing**

13. The regional warehouse at Vikhroli, close to Mumbai is serving the warehousing needs during the operation.

Additionally, the warehouse will serve to help maintain a facility for maintaining stock that may be mobilized quickly, should the need arise. An assessment study should be undertaken and estimated costs of renovation and warehouse equipment are prepared. Additional funds to be mobilized for renovation of Vikhroli warehouse 19. The Vikhroli warehouse has an existing assistant store officer. In addition, a store keeper is appointed for Vikhroli warehouse.

## **Coordination**

14. Close coordination to be maintained between Federation, IRCS national headquarters and state branch. 21. Coordination to be maintained with government and other humanitarian agencies by IRCS at all levels.

## **State branch action**

A comprehensive Maharashtra state branch action was included in the previous Information Bulletin No. 9. Apart from the relief distribution undertaken, the Maharashtra state branch organized a press conference on 6 August, which was attended by the chief minister of Maharashtra, Federation vice-president and IRCS vice-chairman, Federation's head of Asia Pacific department and acting head of delegation (India) along with representations from American and Canadian Red Cross. A private contribution of INR 5 crore (CHF 1.5 million) by Reliance Industries was announced along with a pledge of CHF 2 million by the Federation from available fund.

The state branch has set a good example in local resource mobilization. In order to further strengthen their resource mobilization process they have flashed a request for assistance through local media to the public .

## **National headquarters action**

The IRCS national headquarters continue to monitor the flood situation in Maharashtra. A total of 5,000 family kits (consisting of tarpaulin, bed sheet, saree, dhoti, bed sheet, cotton blanket, towel, kitchen set and plastic bucket), 10,000 water purification tablets and a cash grant of INR 100,000 (approximately CHF 3,000) have been sent to supplement the relief work. Three water treatment units capable of meeting drinking water needs of 10,000 people have been airlifted for deployment in the affected areas in collaboration with the Maharashtra state water supply department. One unit has been deployed in Mumbai, while the other two have been deployed in Sangli and Parbani districts.

Presently, the national headquarters is engaged in reviewing the recommendations of the assessment team. The Federation delegation's logistics and procurement officer will be sent to Mumbai to support the IRCS national headquarters and Maharashtra branch in the procurement of relief goods.

The operation will primarily focus on procurement of 30,000 family kits of which 5,000 is replenishment of the distributed stock. The rest of the family kits will be distributed in

Mumbai (10,000) and other affected districts (15,000). The three water and sanitation units have already been installed and are operational. There is a 200,000 litres watsan unit on standby if needed. Water purification tablets have been sent and more can be supplied if required. The Federation watsan delegation from the Sri Lanka delegation is providing technical support.

This operation will also address the evolving health-related needs. Community-based health awareness campaigns through the existing Red Cross volunteer's network will be reinforced. Awareness will be raised through banners, pamphlets and other forms of communication. The prime focus of this operation will be to complement the government's efforts. The operation will also build on the capacity of the Maharashtra state branch to deliver its programme in terms of providing additional human resource and support staff to the branch. Recruitment and training of Red Cross volunteers to establish long-term interaction with the community and help people restore their lives will be initiated.

The IRCS national headquarters will provide support to the Maharashtra state branch throughout the operation, assisted by the Federation country and regional delegations, Asia Pacific Service Centre in Kuala Lumpur, the secretariat in Geneva and the partner national societies. The IRCS disaster management centre will continue to monitor the flooding situation 24 hours a day and link up with other state branches for information sharing. Regular coordination and interaction between the IRCS national headquarters and the Federation delegation has been taking place through joint meetings to deal with the disaster situation in the most effective and efficient way.

### **Federation Coordination**

The Federation India delegation has been coordinating the response of the IRCS with other agencies through participating in various information-sharing forums like Sphere. The IRCS is a member of the managing body of Sphere. The Federation hosted a Sphere meeting on 5 August regarding Maharashtra floods. This meeting was attended by Oxfam, ADRA, Effcor, CRS, UNDP and a representative from the Sphere secretariat. The Federation has been instrumental in mobilizing the Sri Lanka watsan delegate and India delegation's logistics/procurement officer to be stationed in Mumbai. The Federation delegation's DM team will be monitoring the situation and provide the IRCS national headquarters with back-up and technical support. Since the beginning of the disaster, the Federation has been preparing

information bulletins almost on a daily basis. The Federation will provide monthly updates on the operation.

India counts the cost of floods



Monsoon in Mumbai

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**Heavy monsoon rain in and around India's financial capital, Mumbai (Bombay), is estimated to have caused damage worth 30bn rupees (\$690m).**

Others say the cost to agriculture and industry is likely to be much higher. Indian officials who have died could soon rise to 1,000. Rescue workers are still trying to recover bodies. More than 20 million people have been affected by the rains, which began more than a week ago. The government is forecasting heavy rain and strong winds in the state of Maharashtra, of which Mumbai is a part. The heavy rain and accompanying floods have had a major impact on agricultural production and industry.

**Bollywood hit Eyewitness: Wading all night**

**Mumbai's reputation battered**

The Indian Merchants' Chamber estimates that the total damage thus far is 30 billion rupees (\$690m), according to the Economic Times newspaper. The Mumbai Chamber of Commerce and Industry has given a figure of 40 billion rupees (\$888m). But it says this figure only represents the tip of the iceberg. "One has to do the assessment very carefully," says Abheek Barua, chairman of the Mumbai Chamber of Commerce and Industry. "The chamber's estimate of damages at 40 billion rupees is only a ballpark figure. It will be much higher," the AFP news agency quotes him as saying.

## Insurance claims

Maharashtra is one of the largest producers of sugar and oilseeds, both major cash crops, and production is expected to take a big hit. But it is also a big base for the pharmaceutical and automobile industries.



New rains will hamper the clean-up work in Mumbai

With many warehouses flooded, there are fears that any more rain could lead to a shortage of drugs. The rains have also led to record-breaking insurance claims. India's four biggest private insurers - ICICI Lombard General Insurance, Iffco-Tokio General Insurance, Bajaj Allianz General Insurance and Tata AIG General Insurance - have received claims for damages totalling 10bn rupees.

## Record rain

Last Tuesday Mumbai received more than 65cm (26in) of rain - the heaviest recorded in India's history, causing havoc in a city known for its inadequate infrastructure. About half of those killed in Maharashtra have died in Mumbai - drowned, electrocuted or buried in landslides. Rescue workers are still trying to recover bodies from flooded areas of Raigad district, 150 km south of Mumbai.



Kalina is one of the worst affected areas of Mumbai

The district's senior administrator, Sanjay Yadav, said that more than 20 villages have been evacuated due to fears of fresh landslides. The spread of waterborne disease remains a major concern. Mumbai workers have sprayed insecticide to prevent malaria. Non-governmental organisations are calling on the government to set up a centralised team to coordinate relief operations across the state. About 200 medical teams have left Mumbai for affected towns and villages elsewhere in the state, while 30,000 health workers have been deployed in the city. But hundreds of people are complaining that they have received insufficient help from the government. They are taking shelter in temples and churches. Sikander Zhaid, a resident of the Sanjay Nagar suburb in western Mumbai's Kalina district, told AFP that, "For the past seven days there has been no electricity nor drinking water. Taps are churning out muddy and filthy water." The flood-related problems in Maharashtra are of "its own making" and its allegation and argument that the increase in the height of Alamatti reservoir and its present level of storage are responsible for the inundation of some of the villages in that State are incorrect and far-fetched, Chief Minister N. Dharam Singh, Deputy Chief Minister M.P. Prakash and Minister for Water Resources M. Mallikarjuna Kharge have asserted. They told presspersons here on Monday that the inflow at the Alamatti Dam on Monday was 4,13,000 cusecs and the recorded outflow was 4,50,000 cusecs. During the last week, the dam received an average inflow of 3,20,000 cusecs and maintained an outflow of 4,20,000 cusecs. That kind of inflow and outflow situation cannot give room for backwaters. They said Maharashtra has built five major dams — Koyna, Warna, Dhoodganga, Ujani and Veerbhatkal reservoirs — across the Bhima and the Krishna along the State borders. It filled all its dams well before August, instead of September, flouting the rule that reservoirs should not be filled up to the full levels in the initial days of monsoon. But, contrary to its expectations, the monsoon has proved more than bountiful. "Maharashtra suddenly discharged all its excess rain waters into the reservoir system and made Karnataka suffer extensive loss and damage. The purpose behind Maharashtra's allegations even as Karnataka is fully engaged in fighting the natural calamities is to "build up a false record to bolster its arguments before the Krishna Tribunal." The State will place all the facts with "supporting and unflinching evidence" that would prove the exact quantum of waters being released, the Chief Minister and his colleagues said.

All officials have been instructed to camp in the region for one month and carry out the rehabilitation work, Mr. Singh said.

### **India: Severe floods hit Maharashtra State**



© UNICEF Denmark/2005/Blanchet

These boxes of IV fluid are destined for flood-affected Maharashtra State, India, where supplies are urgently needed to help protect against waterborne disease. 29 July 2005 – Prolonged heavy rains in India's Maharashtra State have caused severe flooding. Earlier this week, floodwaters paralyzed the city of Mumbai, leaving thousands injured or stranded. Across the state 513 deaths have been reported so far; the actual number may be higher. The flooding has severely impeded travel. Relief organizations like UNICEF have found it difficult to deliver essential supplies, such as medicines and water purification materials, to people in affected areas. UNICEF has prepared packets of oral rehydration salts and I.V. fluid and will attempt delivery this weekend. These supplies will help protect children from waterborne diseases and treat dehydration – both of which often occur during flood conditions. It is estimated that 7.7 million people, including 2.2 million children, are affected by the floods. "UNICEF's focus is to make sure not even a single life is lost to waterborne diseases," said Emergency Programme Officer Vinod Menon. Mr. Menon said UNICEF was concentrating efforts on immunizing children and providing safe drinking water, sanitation equipment and medical supplies for affected areas.

Maharashtra is just one of several Indian states hit by floods, which were caused by heavy rains which began in late June. Rising floodwaters and strong winds have caused widespread destruction in Madhya Pradesh, Orissa and Gujarat.

### 3. Conclusion

Few cities observe the principle that low lying areas are best preserved as wet lands and drainage channels act as flood cushions, unencroached upon by humans. In Calcutta (Kolkata) the wetlands issue has centred on the argument that if the city expands into these areas, it would wipe out a major source of fish and related jobs out also exacerbate waterlogging, a problem which Mumbai and Chennai also face during the monsoon. Invariably, the poor suffer the most as they get pushed into the lowlands.

Good land planning and management are critical for urban development. Otherwise we will see what we saw recently in Delhi and Mumbai city administrators offering pumps to drain out water from waterlogged colonies. Burning coal to do something that gravity can do, does not make sense.

All Indian flood plains are getting increasingly waterlogged because of indiscipline in land use systems. The embankments can protect people from floods permanently has been proved false. Newspaper photographs showing people marooned on flood control embankments are not unusual. During the monsoons water collects along all road and rail embankments and little effort is made to drain it off into natural channels.

The basic problem seems to be the mind set of decision-makers who believe that floods are a nuisance and must be controlled. This attitude has boomeranged. Following the massive 1988 floods in Bangladesh, efforts were made to launch a multi-billion dollar flood action plan. Fortunately, wiser counsel prevailed and the idea that the Brahmaputra and Ganges can be straitjacketed like tiny European rivers is being questioned and resisted despite pressure from engineering interests.

Little has been done to live with floods or use the water advantageously. There is still no real model for agricultural water management though silt-rich flood waters be a real boom. In the late 1920s, faced with recurrent famine in Bengal, the British invited an irrigation expert from Egypt, Sir William Willcocks, to propose an irrigation system. Willcocks delivered three lectures at the University of Calcutta in 1928, giving a fascinating description of the ancient flood irrigation system of Bengal, which in pre-British times, made it one of the most prosperous regions, next possibly in importance only to the Thanjavour delta.

The silt laden Himalayan flood waters not only enriched the soil and provided bumper crops but the fish brought down by it kept malaria down. Willcocks said the British steadily destroyed the system by making permanent embankments. Traditional irrigators, regularly

breached embankments to draw flood waters down canals to every field and pond. But the British made breaching illegal and productivity in most districts of Bengal. Willcocks' analysis certainly needs to be sharply debated in these days of 'sustainable development'.

The description of the traditional dike-pond system of the Pearl River delta in China is also fascinating. George Chan, an American Chinese who studied the system has aerial photographs of this system extending over hundreds of kilometres. Water from every stream is drawn into a series of interconnected ponds; around each pond is a dike which goes up every year when the farmer desilts the tank. Thus, the flood cushioning capacity increases every year. The Chinese practice their famous pyculture of fish in these ponds, and the carp feed on the grass grown on the dikes. They easily get 10-15 tonnes per hectate of fish produce. The dikes also support a population of pigs whose excreta, together with human excreta, goes into the ponds, thus closing the nutrient loop. It is zero external input system. But growing vegetables and poultry, even small farmers are able to do well.

India's biggest challenge in sustainable development will lie in how it learns to use the Indo-Gangetic plains, which have the potential to feed not just India but large parts of Asia. The ecologically appropriate water utilisation model is yet to be developed, but the region's rich tradions should provide some useful pointers. However, to use this rich annual tift appropriately, what is also needed is political will and discipline.