Chapter – IX:

Disaster Specific Observations

9.1 Earthquakes

India is divided into five seismic zones according to the maximum intensity of expected earthquake. Zone-V is the most active and comprises the whole of Northeast India, the northern portion of Bihar, western Uttar Pradesh hills, Himachal Pradesh and Andaman & Nicobar Islands. India's high earthquake risk and vulnerability is evident from the fact that about 59 per cent of land area could face moderate to severe earthquakes. During the period 1990 to 2006, more than 23,000 lives were lost due to six major earthquakes in India, which also caused enormous damage to property and public infrastructure.

9.1.1 Institutional framework for earthquake management

Ministry of Earth Sciences (MoES) (India Meteorological Department (IMD)) is the nodal ministry for the management and mitigation of earthquakes in the country. IMD is the nodal agency responsible for monitoring seismic activity in and around the country, on round the clock basis and is involved in various seismological related activities. It maintains the National Seismological Network (NSN) consisting of 55 observatories which include 17-station Real Time Seismic Monitoring Network (RTSMN).

9.1.2 Earthquake Management Plan

In terms of National Disaster Management Guidelines on Management of Earthquakes issued in April 2007, MoES was to prepare the Earthquake Management Plan covering all aspects including earthquake preparedness, mitigation, public awareness, capacity building, training, education, research and development, documentation, earthquake response, rehabilitation and recovery. We noted that MoES did not prepare any disaster management plan for earthquakes.

MoES stated that it was involved in core operational activities of the specific hazard related services. It also added that MoES was not responsible directly for any other component of disaster management activities. The reply was not in consonance with the laid down provisions.

9.1.3 Optimum Seismological Network Program

A project on "Optimum Seismological Network Program" was sanctioned in May 2009 by the IMD at an estimated cost of ₹ 48 crore, which was reduced to ₹ 25.17 crore. The project implementation was proposed to be carried out in two phases spread over a period of three years from 2009-10 to 2011-12. The objective of the project was to strengthen and modernize the National Seismological Network for improving the detection and location capability for earthquakes of magnitude greater than or equal to 3.0, occurring anywhere in the mainland of the country. We noted that the project was still in the preliminary stages of implementation even after expiry of three years.

MoES stated (September 2012) that the original plan of establishing optimum

seismological network had to be revisited in view of according higher prioritization to other concurrent networks to optimize resources and communication needs.

9.1.4 Non-conducting of Seismic hazard and risk microzonation study

MOES/IMD had set up the Earthquake Risk Evaluation Centre at Delhi, in February 2004. During 2007-12, IMD proposed to carry out three projects viz.

I. seismic microzonation of Mumbai, Guwahati, Ahmedabad and Dehradun on 1:10000 scale;

II. creation of national database for seismic hazard and regional risk appraisal; and

III. impact assessment of utilization of database in planning and mitigation.

In order to improve the resource allocation for remedial upgradation and information alongwith education of the public, land use planning for policy makers, designers and disaster managers, an allocation of ₹ 298.38 crore was made for these projects.

IMD stated (July 2012) that the proposed activities were not carried out by it as the standard guidelines for microzonation work in the country, were prepared and released by MoES only in October 2011. MoES stated (September 2012) that the microzonation of Guwahati, Bangalore, Ahmedabad, Dehradun and Delhi was completed.

The reply was silent on seismic microzonation of Mumbai city, and the other two projects, namely, creation of national database for seismic hazard and regional risk appraisal and impact assessment of utilization of database in planning and mitigation by various stakeholders.

9.1.5 Non-Archival digitization of the Seismic analogue charts

IMD initiated a project titled "Archival digitization of seismic analogue chart" in May 2008 at an estimated cost of ₹ 13.50 crore for two years.

We noted that the duration of the project was extended from time to time and finally till June 2012. Society for Automation and Technology Advancement (SATA) completed scanning of 100000 seismic analogue charts and vector digitization of 5000 events contained in seismograms by March 2012 and submitted them to IMD for quality checks.

However, IMD could check quality of only 50 *per cent* deliverable like seismic analog charts and vector digitalisation of events, etc., as of March 2012. IMD stated in August 2012 that the main reason for delay in start of the project was late supply of equipment. Thus, the objective of the project was not achieved despite incurring expenditure of ₹ 7.54 crore as of June 2012.

MoES stated (September 2012) that digitizing analogue charts was a highly time consuming effort and the archival of past seismic analogue charts would be pursued till the successful digitization of the hard copy charts takes place. We noted that no time frame for the exercise was proposed in the reply.

9.1.6 Efforts of NDMA

As part of the programme on Vulnerability Analysis and Risk Assessment with respect to various natural hazards, NDMA had undertaken the task of preparing the upgraded hazard maps and atlas of Indian land mass. NDMA awarded the work of these maps to Building Materials & Technology Promotion Council in June 2011.

NDMA has also taken up National Earthquake Risk Mitigation Project. This project was still in preparatory phase after a lapse of five years of its conceptualization.

These are discussed in detail under Chapter-IV, para 4.3.1, 4.3.1.1 and 4.3.3.1 of this report.

9.1.7 Disaster preparedness in the states:

9.1.7.1 Andaman & Nicobar Islands

The Port Blair Municipal Council (PBMC) building bye-laws which were formulated in 1999 have incorporated provisions for safety standards for earthquakes and special hazards. In July 2003, the PBMC also reviewed these building bye-laws for suitable techno-legal regime for safer construction in disaster prone areas. However, the amended byelaws were yet to be approved and notified by the UT administration even after nine years of its preparation.

Union Territory Disaster Management Executive Committee decided (December 2009) that 25 buildings in various Islands would be retrofitted to use them in any crisis situations. Subsequently another 289 buildings were identified for retrofitting in June 2011. However, no work in this regard was taken up.

9.1.7.2 Andhra Pradesh

Under Greater Hyderabad Municipal Corporation's jurisdiction, 144 buildings had been identified in dilapidated condition out of which only five were demolished. Notices were issued to the remaining 139 buildings during 2004-12 wherein 53 buildings were in most dangerous condition and unsafe for living. However, no action was taken as of June 2012.

9.1.7.3 Odisha

OSDMA had issued necessary instructions in August 2007 for taking measures on making urban areas disaster resilient. However, the same was not followed up. In the selected district, no amendment was made in their building regulations.

9.1.7.4 West Bengal

State Disaster Management Plan made an attempt to identify blocks vulnerable to each type of disaster in terms of High (H), Medium (M) and Low (L). This exercise was, however, partial. For instance, two districts (Burdwan and Birbhum) fall in seismic zone III (moderate intensity zone) while Darjeeling falls in Zone-IV, which was a severe intensity zone. However, in these cases vulnerability of blocks to earthquakes was not assessed.

In Darjeeling district, retrofitting was done in two buildings as these were the only identified ones. We further noted that Singhamari Syndicate office building and the bus stand premises were also declared

as unsafe in November 2011 by Darjeeling Municipality but these were in use as of June 2012.

The 'Kolkata Municipal Corporation' had identified 2900 old and dilapidated vulnerable buildings. Buildings were not identified for retrofitting in Suri Municipality (Birbhum). Records of Urban Local Bodies did not indicate that urban planning had factored in avoidance of concentration of economic assets at one place.

9.1.7.5 Uttarakhand

The State Government in May 2005 established Hazard Safety Cell to ensure compliance of building byelaws and safe construction practices and provide technical support to the State Government in carrying out retrofitting of lifeline buildings like hospitals, fire station, etc. The cell had so far identified 7374[1] buildings in three cities out of which 1109[2] buildings were found to be vulnerable to moderate earthquake. These buildings were required to be retrofitted, but no measures had been taken. The Department of Disaster Management stated that the members of the safety cell were not taking interest in their work and thus, no remedial measures were taken yet.

We further noted that 0.10 to 94 *per cent* of houses in 13 districts were constructed of stone walls. Out of these, eight districts[3] had, on an average, 85 *per cent* stone walled structures categorized as Very High Damage Risk in the event of an earthquake.

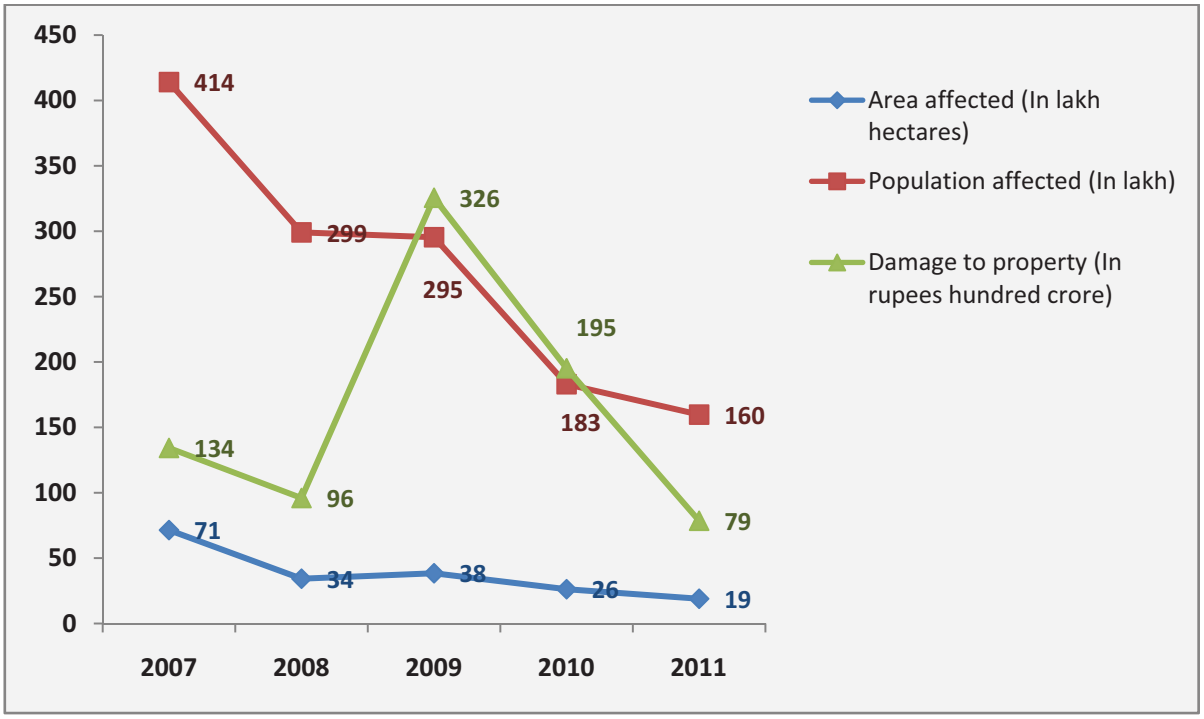
[1] Mussoori-3344, Nainital-2865 and Bageshwar-1165
[2] Mussoori-615, Nainital-401 and Bageshwar-93
[3] Uttarkashi, Chamoli, Rudraprayag, Tehri Garhwal, Pauri Garhwal, Pithoragarh, Bageshwar and Almora

9.2 Floods

Flood is one of the natural calamities that the country faces almost every year in varying degree of magnitude in some areas or the other. Various natural and human factors are responsible for increase in flood damages. The total flood-affected area in the country[4] is 456.40 lakh hectares. An average[5] of 72.25 lakh hectare of land is affected annually by floods of which 37.89 lakh hectare is the cropped area.

The damages due to floods during the last five years are shown in Chart 9.1:

Chart 9.1 --: Damage due to floods in India



Source: Central Water Commission data given by Ministry of Water Resources

[4] Working Group on flood management for the Eleventh Five-Year Plan
[5] Average of data from the years 1953 to 2011

9.2.1 Institutional framework for flood control

The primary responsibility for flood control lies with the states. The action on enactment of suitable legislation for Flood Plain Zoning Bill was yet to be taken by all the states except Manipur.

The Ministry of Water Resources (MoWR) was responsible for laying down policy guidelines and programmes for the development and regulation of the country's water resources. Central Water Commission (CWC) under MoWR had the responsibility of initiating, coordinating and furthering the schemes for the control, conservation and utilization of water resources in the states.

9.2.1.1 Action plan for management of floods

According to the guidelines for management of floods issued by NDMA in January 2008, MoWR was to prepare a detailed Action Plan for management of floods. The Ministry stated (June 2012) that the activities and their timeliness mentioned in the said guidelines were yet to be finally decided in consultation with State Governments and other concerned agencies.

Thus, in the last four years, MoWR had not formulated actionable plan for management of floods as per NDMA guidelines. This had impeded the proposed process for mitigation of floods in the country.

9.2.1.2 Crisis Management Plan

The Crisis Management Plan (CMP) of 2009 identified CWC as the Authority responsible for sending first information relating to flood forecasts. MoWR prepared its Ministry level CMP in March 2011 to handle crisis related to flood forecasting and dam failures. According to CMP, each state was required to establish a Dam Safety Organization (DSO) to address the safety issues of large dams in the states. However, only 14 states had prepared DSO (July 2012).

Similarly, the CWC issued (May 2006) guidelines for development and implementation of Emergency Action Plan (EAP) for large dams in the states.

We noted that only eight states had prepared EAP for 192 (4.06 *per cent*) large dams against 4728 large dams in 29 states as of September 2011. Thus, non-preparation of EAPs by the Project Authorities in respect of 96 *per cent* of large dams renders huge area and property left vulnerable to cascading affects of dam failure.

9.2.2 Contamination of water bodies

In CMPs review meeting held by Cabinet Secretariat in August 2009, MoWR was asked to consider the crisis on account of contamination of water in reservoirs. However, MoWR had not included this aspect in the CMP (July 2012).

Further, in the CMPs review meeting of March 2012, MoWR stated that it did not have the requisite infrastructure or the expertise to monitor the very large number of water bodies in the country. We noted that no headway had been made to mitigate this important environmental hazard.

9.2.3 Flood forecasting

The work of flood forecasting and warning in the country was entrusted with CWC. CWC collects hydro-meteorological data from its sites round the year. The activity of flood forecasting comprised level forecasting and inflow forecasting. The forecasts were issued once the water level in a river touched pre-defined warning level.

9.2.3.1 Absence of proper mechanism for monitoring

There were 4728 reservoirs and barrages in the country as of September 2011. CWC provided inflow forecasts to only 28 reservoirs and barrages. Thus, a large number of reservoirs and barrages were not monitored at all for their water levels.

Indian Institute of Public Administration (IIPA) conducted an evaluation study on Plan schemes for flood control. The report submitted by IIPA to MoWR in November 2009 highlighted various deficiencies. This included (i) non functional telemetry stations, (ii) temporary gauge sites during the flood period, (iii) flood forecasting stations not having dedicated communication facilities, etc. We noted that these shortcomings had not been rectified by MoWR till July 2012.

CWC (July 2012) stated that necessary directions had been issued to address these issues.

9.2.3.2 Modernization of flood forecasting

Expansion and modernisation of flood forecasting and warning system was taken up in successive five year plans by CWC. During Ninth, Tenth and Eleventh Plan periods, 55, 168 and 222 stations respectively were modernized with telemetry[6]. During Eleventh Plan, 222 telemetry stations were to be installed but only 204 telemetry/flood forecasting stations had been installed till March 2012.

We further noted that identification and marking of area on maps was to be done by states. However, as per Flood Forecast Monitoring Directorate, not much work was done in this regard.

9.2.4 Flood Management Programme (FMP)

A Task Force was set up in 2004 by the Government of India for flood management and erosion control. It recommended MoWR schemes related to flood management and anti erosion in respect of Ganga and Brahmaputra basin states for the Tenth Plan and Eleventh Plan periods. The estimated cost of these schemes was ₹ 4,982.10 crore. The works of immediate nature were taken up during Tenth Plan period.

MoWR implemented a state sector scheme, namely Flood Management Programme (FMP) in November 2007 to provide financial assistance to the State Governments for undertaking flood management works in critical areas during the Eleventh Plan period. Under FMP,

[6] Automatic data acquisition and real time data transmission system

Central assistance was provided to all the flood affected states in the country to undertake critical flood control and river management works. The works included river management, flood control, anti-erosion, drainage development, anti-sea erosion, flood proofing works besides flood prone area development programme in critical region.

During Eleventh plan, 420 works at an estimated cost as ₹ 9435.45 crore were approved with central share of ₹ 7739.69 crore under FMP. Out of these, 252 works were completed during Eleventh plan. Central assistance of ₹ 3566.00 crore (including ₹ 89 crore for the spill over works of Tenth plan) was released against the allocation of ₹ 8000.00 crore by Planning Commission up to 31 March 2012.

We noted that till March 2007, against the total flood prone area of 456.50 lakh hectares, 182.20 lakh hectares only had been provided reasonable protection against floods in the country. With the introduction of FMP, another 21.80 lakh hectares was to be protected against floods but new area of only 2.59 lakh hectares had been protected up to March 2011. Thus, a large area of the country was still vulnerable to floods and resultant damage to life and property every year.

9.2.5 Disaster preparedness in the States/UT

9.2.5.1 Andaman & Nicobar Islands

In May 2006, CWC formulated the guidelines for development and implementation of Emergency Action Plan (EAP) for Dams. We noted that EAP on dam failures had not yet been prepared as of July 2012 by the UT Government in compliance with the guidelines.

9.2.5.2 Odisha

We noted that adequate food grain reserves were not maintained. Relief rice (10 days) for the flood of September 2011 was supplied by Odisha State Civil Supply Corporation to 19 flood affected districts only in March 2012. Similar delay was noticed in the case of Balasore district.

Further, in Balasore-Sadar block, 462.08 MT of rice received in March 2012 was retained with storage agents. Thus, the supply did not reach the end users in time. This indicated misuse of relief funds.

Food grain received in March 2012 at Balasore Sadar block for distribution as relief material for Flood 2011

Preparedness for cyclones and floods in Odisha:

- Out of 205 large dams in Odisha, there was no emergency plan for the large dams except for Balimela and Jalaput dams, for which EAPs were under preparation (June 2012).
- State Crisis Management Committee for dam safety under chairmanship of Chief Secretary, had not been formed as per the Crisis Management Plan of MoWR.
- We test checked DDMA, Balasore regarding availability of boats for flood rescue operations for the year 2009-10

to 2011-12. We noted that 14 to 17 power boats had been stationed in various vulnerable places of the district. Out of these, six boats in 2009-10, four in 2010-11 and three in 2011-12 were not in running condition. No steps had been taken to replace/repair the damaged boats to make these functional.

9.2.5.3 Tamil Nadu

There were floods due to cyclone and heavy rainfall during Northeast monsoon 2010 in the test checked districts. In the pre-monsoon meetings, Public Works Department was directed by the District Collector to be prepared with sandbags to strengthen embankments. However, permanent restoration measures to prevent recurrent damage to crop, livelihood, property and infrastructure were not discussed and thus, vulnerabilities to flood had not been identified.

9.2.5.4 West Bengal

Emergency Action Plan of dam failure in respect of large dams in the State was not prepared.

Seventeen projects with a total capital outlay of ₹ 1822.08 crore were sanctioned in 2008-09 to 2010-11 under Flood Management Programme Out of 17 projects, 13 projects had achieved 100 *per cen*t progress. One project on Saraswati river achieved 50 *per cent* progress. The project on Kaliaghai-Kapaleswari-Baghai basin in Paschim Medinipur achieved only 12 *per cent* progress and the project on embankment of Sundarban achieved insignificant progress due to land acquisition problem.

The department attributed (August 2012) the delay to delayed acquisition of land for major projects, less working period in riverine projects, procedural delay in release of central funds, non availability of funds at the appropriate time and changes in design parameters at execution stage.

9.3 Cyclones and Tsunami

India has a coastline of about 7516 km which is exposed to nearly 10 *per cent* of the world's tropical cyclones. About 71 *per cent* of this area is in 10 states[7] and the Islands of Andaman, Nicobar and Lakshadweep are prone to cyclones. Coastal areas are also places that experience tsunami[8].

The tsunami of 26th December 2004 caused extensive damage to life and property in Tamil Nadu, Kerala, Andhra Pradesh, UTs of Puducherry and Andaman & Nicobar Islands. A population of 26.63 lakh in 1396 villages in five states and UTs was affected by this disaster. 9395 people lost their lives and 3964 people were reported missing and feared dead. Most of the missing persons were from Andaman & Nicobar Islands.

Tropical Cyclone along Indian Coast

[7] Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Puducherry, Andhra Pradesh, Odisha and West Bengal.

[8] Tsunami is a series of large waves generated by sudden displacement of sea water caused by earthquake. Tsunamis have great erosion potential and dissipating its energy through the destruction of houses and coastal structure.

9.3.1 Institutional framework

The Ministry of Earth Sciences (MoES) was the nodal Ministry responsible for the management and mitigation of disasters of cyclone and tsunami. Its sub-ordinate office, India Meteorological Department (IMD) was responsible for the issue of warnings and advisories to national and international disaster management agencies, and for monitoring and prediction of cyclone disturbances over the North Indian Ocean.

Indian Tsunami Early Warning Centre was established at Indian National Centre for Ocean Information Services (INCOIS), Hyderabad, an autonomous body of MoES. This centre was responsible for continuous monitoring, detection of tsunamis and issue of advisories to the coastal regions.

Besides these, other institutions viz. National Centre for Medium Range Weather Forecasting and Indian Institute of Tropical Meteorology and Institutions under the Department of Ocean Development i.e. INCOIS, and Integrated Coastal and Marine Area Management, etc,. also provided valuable inputs for cyclone forecasting and monitoring. These institutions were under Earth System Science Organization (ESO), managed by ESO Council.

Role of Ministry of Earth Sciences

As per the NDMA guidelines, MoES was the nodal Ministry responsible for overall management of tsunami and cyclones. However MoES stated that it was not responsible directly for any other component of disaster management activities except for monitoring and detection of cyclones and earthquakes along with forecasting of cyclones. The reply may be viewed in the context of NDMA guidelines for cyclones which clearly define the action points for MoES. Further, MoES is the nodal Ministry for management of cyclones and tsunami.

9.3.1.1 Early warning systems & mechanisms

The following mechanisms to predict the calamities were in place:

(i) IMD's Area Cyclone Warning Centers (ACWCS) at Chennai, Mumbai and Kolkata and Cyclone Warning Centre at Bhubaneswar, Visakhapatnam and Ahmedabad were responsible for originating and disseminating the cyclone warnings at regional level. Cyclone Warning Division at New Delhi had similar responsibility at the national and international levels.

IMD had installed specially designed receivers within the vulnerable coastal areas for transmission of warning using broadcast capacity of INSAT satellite. This was a direct broadcast service of cyclone warning in the regional language meant for the area affected or likely to be affected by the cyclone. There were 352 Cyclone Warning Dissemination System (CWDS) stations along the Indian coast, of which 100 digital CWDS were located along the Andhra Pradesh coast.

(ii) Indian Tsunami Early Warning Centre was involved in continuous monitoring of tsunamis and issuing advisories to the coastal region. Upon generating

of requisite information, IMD disseminated the same to MHA control room, NDMA operation room and other designated government authorities both at the Centre and State level.

9.3.2 Vulnerability analysis and risk assessment

MoES was identified as the nodal Ministry for mitigation efforts towards disasters relating to cyclone and tsunami. As per actionable points of NDMA guidelines on cyclone, MoES was to evaluate the vulnerability of cyclones and its changing profile from time to time.

However, MoES informed (August 2012) that the responsibility of the Ministry is only to provide timely warning on tsunami and cyclones and associated storm surges to various stakeholders for taking action to minimize the risk and damage to loss of life.

MoES further stated (September 2012) that the vulnerability assessment schemes were to be taken up by the states under guidance of NDMA.

Thus, no specific programs related to the assessment of risk, hazard, vulnerability, damage and loss were initiated by the nodal Ministry as required under the national guidelines.

9.3.3 Delay in commencement of project

MoES sanctioned (March 2011) a project on "Multi-Hazard Vulnerability Mapping for the Indian Coast" to INCOIS at a total cost of ₹ 48 crore with a scheduled date of completion by March 2013. The aim of the project was to prepare and deliver vulnerability maps for the identified vulnerable areas of 5000 sq km in coastal states of the country. In March 2011, MOES released ₹ 7 crore to INCOIS, Hyderabad for execution of the project. We noted that INCOIS had not initiated the project as of June 2012. MoES stated (July 2012) that the project involved a lot of manpower with extensive field work for which an Expression of Interest had been issued to identify the firms and for finalization of Request for Proposal (RFP). An expenditure of ₹ 1.56 lakh was incurred under the project. We however noted that the MOES did not follow up the matter with INCOIS to expedite the project.

MoES stated (September 2012) that it had taken up, in pilot mode, the 3-D GIS digital data during the Eleventh plan under Tsunami Warning and Dissemination Initiative at INCOIS, Hyderabad and the project would be continued during Twelfth Plan.

The reply was not tenable as the Ministry released ₹ 7.00 crore in March 2011 but the nodal institute i.e. INCOIS, Hyderabad could spend only ₹ 1.56 lakh till July 2012 and the project activities were not initiated. The non-commencement of the project had delayed the development of vulnerability maps.

9.3.4 Non-preparation of disaster management plans

9.3.4.1 Action plan for management of tsunami and cyclone

NDMA guidelines required MoES to prepare a detailed action plan for

management of tsunami and cyclones with specific tasks, activity targets and time-frames. This would also be a part of the national disaster management plan. However, MoES did not prepare any disaster management and action plan for tsunami and cyclone management. MoES stated that only a user manual based on its Standard Operating Procedure (SOP) had been prepared by the Indian Tsunami Early Warning Centre at INCOIS, Hyderabad. Thus, the guidelines of NDMA had not been complied with.

9.3.4.2 Non-preparation of the National Mitigation Plan

MoES was the nodal Ministry for mitigation efforts in respect of disasters related to 'Earthquake', 'Tsunami' and 'Cyclone'. We noted that the MoES did not prepare the mitigation plans as of September 2012 due to lack of coordination between IMD and the MoES.

MoES stated (September 2012) that they had expressed their inability/difficulties to NDMA in 2010 for taking up these responsibilities as MoES institutions had no experience of coordinating and implementing the associated components of the disaster management cycle.

9.3.5 Upgradation of weather forecasting in the country

As per the National Policy of Disaster Management, forecasting climate change is the most important element of disaster management.

To modernize and upgrade the existing system of weather forecasting MoES submitted a proposal for implementation of the project in three phases. The Cabinet Committee on Economic Affairs, in December 2007, approved the proposal for phase-I at a total estimated cost of ₹ 920 crore with the project duration of 24 months from December 2007.

9.3.5.1 Budget estimate and actual expenditure

We found that out of the sanctioned amount of ₹ 920.00 crore during 2007-2012, IMD was able to spend only ₹ 438.63 crore (47.68 *per cent*) till March 2012. Slippage of over three years indicated slow pace of scheme implementation.

9.3.5.2 Shortfall in the achievement of the targets

MoES constituted a committee to specify the optimum requirement for observation, forecasting, aviation, agro meteorology and human resource in the field of meteorology to provide weather service of world standard. The committee recommended the optimum requirements for the modernization of IMD; however there was a shortfall in the achievements of the targets fixed even for phase-I. Details are in **Annex-9.1.**

Out of 17 projects undertaken in the modernisation scheme, five projects costing ₹ 84.15 crore were yet to be initiated. Another five projects costing ₹ 256.85 crore were under implementation. Only seven projects, costing ₹ 186.90 crore were completed.

MoES accepted (September 2012) the delays and lapses in modernization plan of IMD. It attributed the delay to (i) obtaining clearance for land in different states (ii) delays in finalization of tenders and award of contracts, and, (iii) delay in obtaining

security clearance from Ministry of Defence for commissioning coastal Doppler Weather Radars at Kochi, Goa, Karaikal and Paradeep etc.

9.3.5.3 Delay in implementation of phase-I

The nine project management councils formed to monitor the project never met during the project. Due to the lack of monitoring, the phase-I of modernisation project which was scheduled to be completed by December 2009 could not be concluded till July 2012.

The delay was also attributable to IMD's inability to adhere to the time schedule and failure in timely processing of tender, issue of purchase orders, and selection of site for installation of equipment etc.

MoES accepted (September 2012) the fact and stated that the administrative and technical supervisory/financial scrutiny systems would be revamped in future to ensure the improved implementation of standardized preparation of tender documents and RFPs for various procurements.

9.3.5.4 Non-implementation of the programmes/projects

IMD proposed a scheme on District Meteorological Information Centres (DMIC) throughout the country and an allocation of ₹ 204 crore was made in the Eleventh Plan for the purpose. The DMICs were envisaged to provide meteorological information at district levels. However, IMD stated (August 2012) that no work was taken up for setting up of the DMICs during Eleventh plan period.

9.3.5.5 Non-procurement of UAV and aircraft

IMD being the nodal agency in the country for cyclone forecasting sought to enhance the scientific understanding in three identified areas viz. cyclonic storms, fog and thunderstorms as major sources of hazards. Based on this, MoES sanctioned (March 2010) a Forecast Demonstration Project for severe thunder storms over east and north-east India, fog forecasting system and in tropical cyclones over the Bay of Bengal at an estimated cost of ₹ 49 crore.

The project to be implemented by IMD was scheduled to be completed in two years i.e. by March 2012. The project was to include procurement of Unmanned Aerial Vehicle (UAV) and hiring of probing aircraft.

We noticed that there was no progress after October 2010 despite incurring an expenditure of ₹ 1.32 crore on machinery and equipment till 2011-12. Thus, IMD/MoES failed to complete the project in a timely fashion.

MoES stated (September 2012) that the project was not successful due to delay in administrative approval.

9.3.5.6 Multi-Hazard Early Warning Support Interfaces for Emergency Response Planning

MoES sanctioned (May 2008) a project on 'Development of Multi-Hazard Early Warning Support Interfaces in support of Emergency Response Planning' to INCOIS at a total cost of ₹ 20 crore. This was meant to develop capacity for disaster risk reduction through monitoring and

forewarning system, training and dissemination of information. The project was scheduled to be completed by the end of Eleventh Plan i.e. 2007-12.

MoES released ₹ 3.82 crore to INCOIS for implementation of the project during 2008-10. We found that the centre failed to initiate the project as no expenditure was incurred on the project up to March 2011.

MoES stated (September 2012) that the delay was due to delay in commissioning of the real time data acquisition.

9.3.5.7 DTH-based Disaster Warning Dissemination System (DWDS)

As mentioned in para 9.3.1.1, IMD had three Area Cyclone Warning Centres (ACWC) and three Cyclone Warning Centres for providing cyclone warning services to the maritime states[9].

IMD decided (2009) to replace all ACWDSs receivers by the new DTH-based DWDS receivers. A total of 500 such systems were to be installed all over the country. In March 2011, an MOU was signed by IMD, ISRO and Doordarshan for replacement of the existing CWDS system with the proposed DTH–based DWDS.

We noted that IMD was to provide the final list of 350 sites under phase-I containing coordinators identified for each of the sites to ISRO by September 2010. However, IMD was able to provide the list of 358 stations only by March 2011. BEL and ISRO were able to supply only 59 numbers of Receive Only Terminals (ROT) as of July 2012 for DWDS stations in Tamil Nadu and Puducherry which were yet to be installed. Thus, the ambitious scheme of upgradation could not be implemented effectively.

9.3.6 Disaster preparedness in the States/UT:

9.3.6.1 Andaman & Nicobar Islands

The State Control Room was established in the Directorate of Disaster Management. It was manned by 12 temporary labourers in the absence of regular staff.

In the aftermath of tsunami, the UT Administration installed seven tsunami sirens. Status of sirens at inhabited islands was as under:

Name of district	Inhabited islands	Inhabited Islands with Tsunami siren	No. of siren installed
South Andaman	10	1	4
Nicobar	13	3	3
North & Middle Andaman	14	0	0

In February 2009, the UT administration purchased 24 additional tsunami sirens at a cost of ₹ 6.79 lakh to be installed in South Andaman district. The same were yet to be installed.

Thus, only 4 of 37 inhabited islands had tsunami sirens.

[9] West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Puducherry, Kerala, Karnataka, Maharashtra, Goa and Gujarat

Tsunami siren at Kamorta

The UT administration, in December 2011, assessed that in order to install the tsunami sirens in every single inhabited island of ANI, 146 tsunami sirens were required which were not procured (April 2012).

Relief materials

The leftover relief materials donated by various organizations for tsunami rehabilitation from 2005 onwards were lying in the central godown. The UT administration did not formulate any plan to utilize the leftover relief materials and the disaster preparedness materials. In November 2009, it was decided that these may be distributed to all the tehsils of ANI for storing and meeting future contingencies. We noted that some of the materials were lifted by the different districts during 2011 and were kept at the identified relief godowns in the three districts. However, a substantial portion was still lying in the central godown. Meanwhile, Directorate of Disaster Management paid rent of ₹ 18.21 lakh to Port Management Board as godown rent and area rent for the storage space used by them at central godown.

Central godown, Haddo

In **Nicobar** district, a godown constructed to store disaster preparedness material along with relief material was handed over to Civil Supplies Department in January 2012.

Inspection of relief godowns were not carried out during the period 2007-08 to 2011-12. In the absence of this, no information was available on the condition of relief material stored there and their usefulness.

9.3.6.2 Gujarat

NDMA was implementing the National Cyclone Risk Mitigation Project (NCRMP) with a view to enable states to mitigate the effects of cyclone. The project proposed to create/repair physical infrastructure that could potentially reduce the effect of any cyclone. Gujarat State Disaster Management Authority (GSDMA) conducted a vulnerability study of the coastal areas and identified vulnerable villages which required cyclone shelters. GSDMA (December 2008) requested district collectors of 12 districts to identify suitable lands for construction

of cyclone shelters. GSDMA identified 175 shelters to be built in 12 selected districts. The construction work on any of the land identified/allotted had not yet started. Delay in construction of cyclone shelters affected the preparedness of the state for mitigating the effects of cyclone.

9.3.6.3 Odisha

We noted the following deficiencies:

- Construction of building was completed at Paradeep but the radar was not installed after procurement for want of clearance from Ministry of Defence (May 2012). Three other Doppler Weather Radar Stations were not set up (June 2012).
- Risk Management Plan having early warning indicators had not been prepared.
- Out of 220 Automated Weather Communication Systems (AWCs) planned to be set up with assistance from ISRO, only 37 were set up (June 2012). Out of these, seven AWCs were not functioning properly and at two AWCs (Koraput and Malkangiri) necessary equipment was not installed.
- The rain gauge at the Balasore Sadar Block was positioned un-evenly on roof top supported by some bricks without any permanent structure. The two inner rain water collecting jars were in damaged condition with small holes due to rusting of the pot. Daily recording of the rainfall was taken from this damaged and unevenly positioned rain gauge.
- 15 VHF sets placed at the District Emergency Operation Centre and blocks were not working.
- HAM radio station in Bhadrak district was not in running condition (June 2012).
- Test check in six cases revealed that time taken by the State authority in communicating alert message to District Authority was 60 to 90 minutes during 2007-12. Dissemination of message by district authority to all concerned took another 60 to 330 minutes.

9.3.6.4 Tamil Nadu

While the state gets copious rainfall during the North-East monsoon, the coastal districts are highly vulnerable to cyclonic storms. We test checked the District Disaster Management Plans (DDMPs) relating to cyclone preparedness and found that:

- The DDMPs of test checked districts were not yet approved.
- Provision of High Power coastal radio stations, VHF network etc., had not been discussed in the plans.
- The life line infrastructure had not been listed.
- All weather link roads to be laid were not identified.
- The areas where saline embankments were to be constructed to prevent ingress of saline water associated with cyclonic storm surge were not identified.

There are 124 cyclone shelters in the state, 114 cyclone shelters located in the state were repaired and reconstructed. In addition approval of construction of 121 multipurpose evacuation shelters at a cost of ₹ 262.86 crore was given in December 2011. The construction of cyclone shelters was in progress.

9.3.6.5 Andhra Pradesh

(i) Two shore stations were established at Balusutippa and Antharvedi in East Godavari district to disseminate cyclone and weather forecast. These became non-functional due to breakdown of the communication system after the effect of Jal Cyclone in November 2010. No funds were provided for its restoration and these remained dysfunctional till July 2012.

Early warning systems (wireless networks) were procured at a cost of ₹ 8.25 lakh by the Project Officer, UNDP, East Godavari district and installed in December 2008 in East Godavari district. These became unusable due to lack of maintenance and were not in working condition from October 2009 i.e. within one year of their procurement. No steps were taken by the district to get the systems repaired.

(ii) For East Godavari district, cyclones and floods were identified as the most common disasters occurring every year.

We found that out of 168 cyclone shelters constructed between 1985 and 2001 in 13 vulnerable mandals of the district, 99 shelters were not in usable condition. No shelters were constructed in another 10 mandals identified as likely to be affected being adjacent to the cyclone prone mandals.

In 22 test checked shelters, we noted that the accommodation was not sufficient. They were lacking basic amenities and required major repairs. Two shelters were located in low lying areas, which can even be submerged during floods. We also noted that eight shelters were unauthorisedly occupied and used for the purposes other than what they were meant for.

Pedabapanapally shelter in low lying area

All the 12 rescue boats available in the district required repairs and were not in usable condition. Due to lack of sufficient equipment like rescue boats, life saving appliances, fishermen safety kits etc., the evacuation of victims and their belongings to safer places during disasters would be difficult.

9.3.6.6 West Bengal

The State Government constructed flood, cyclone and multi-purpose shelters and identified schools and government buildings as shelters.

Flood shelter at Dainhat, Katwa-II, Burdwan lying incomplete due to lack of funds

During 2007-12, the department released ₹ 7.17 crore for construction of 73 shelters and 132 relief godowns. Out of this, two test checked districts, Birbhum and Burdwan received ₹ 96.65 lakh for construction of nine flood shelters and six relief godowns. We noted that as of July 2012, construction of three shelters and five godowns of Birbhum district were completed at a cost of ₹ 43.65 lakh while three shelters in Burdwan and one in Birbhum were incomplete due to lack of funds. One shelter each in Burdwan and Birbhum was not taken up as the funds were returned citing cost escalation (Burdwan)/funds remained unutilized (Birbhum). Thus, department's failure to release requisite funds in time and apathy of the executing agencies to execute the work had resulting in four flood shelters being incomplete while two flood shelters were not constructed.

9.4 Droughts

Drought suggests a situation of water shortage for human, cattle and agriculture consumption resulting in economic losses primarily in the agriculture sector. The need is not just to provide immediate relief but also undertake long term mitigation measures for drought. It requires a more comprehensive approach to drought management which encompasses early warning, monitoring, relief and mitigation.

9.4.1 Institutional framework for drought control

As per NDMA guidelines on Drought Management (September 2010), Ministry of Agriculture was the nodal Ministry for coordinating the response to challenges of drought. The Department of Agriculture & Cooperation (DAC) in the Ministry of Agriculture was entrusted with coordination of relief measures necessitated by drought, hailstorm and pest attacks. The Drought Management Division of the DAC was the focal point for coordinating and monitoring response for drought management. It provided logistic support on requisition of the State Governments and was also responsible for drought preparedness and response.

9.4.2 Action on NDMA guidelines

NDMA issued National Disaster Management Guidelines for management of drought in September 2010. The guidelines envisaged the following role and responsibilities of DAC:

- Setting up of India Drought Management Centre (IDMC) as an autonomous body under DAC.
- Developing specific guidelines for the use of Information and Communication Technology for online interaction and availability of real-time drought related information.
- Formulation of cloud seeding policy.
- Establishing a dedicated faculty in selected ATIs and organizations exclusively for research and training in drought management by instituting chair positions.

DAC stated in November 2012 that a system for online interaction and availability of real time drought related information would be developed. It further added that other activities were also under consideration by the department. The fact remained that these activities were yet to be undertaken.

9.4.3 Contingency crop plan

Ministry of Agriculture with the help of Indian Council of Agricultural Research (ICAR), State Agriculture Departments and agriculture universities had to prepare the 'Contingency Crop Plan' and disseminate it among farmers with the help of support agencies. Central Research Institute for Dryland Agriculture under ICAR was entrusted with the task of preparing district wise contingency plans. DAC stated (October 2012) that the contingency plans for only 353 districts spread across 19 states had been prepared

and the work was in progress in remaining states.

9.4.4 National Disaster Response Fund funding

9.4.4.1 Delay in providing immediate relief

As explained in Para 5.2.2, the procedure followed for consideration of financial assistance from the National Disaster Response Force for **drought, hailstorm and pest attacks** was same as for other disasters, except that for these, Ministry of Agriculture processes the request instead of MHA.

Response time is the crucial factor in providing immediate relief to the affected people. We noted that the lengthy procedure for processing the State Memorandum was taking enormous time keeping in view the severity of disasters and affected people.

There were 15 cases of drought and hailstorm reported during the year 2009-10. In nine cases, time taken for release of assistance ranged between two to nine months. Similarly, during the year 2010-11 and 2011-12, eight cases were reported and in four cases time taken for release of assistance ranged between two to ten months.

The Ministry stated (November 2012) that declaration/notification of drought was the prerogative of State Government and many a time, drought assessment required a longer time frame. After careful assessment of the situation, State Government declared drought in affected districts/talukas and submitted relief memorandum at that stage seeking additional financial assistance.

Audit noted that for ensuring timely assistance for relief and suffering of the victims of the disasters, time interval of occurrence of disaster and reporting to Centre by State needed to be minimized and fund under State Disaster Response Fund should be readily available.

9.4.5 State Disaster Response Fund utilisation by the states

9.4.5.1 West Bengal

State Disaster Response Fund guidelines stipulate that funds should be used for meeting expenditure for providing immediate relief to disaster victims. However, in the case of West Bengal we noted that an amount of ₹ 46 crore was released (March 2011) from State Disaster Response Fund to 13 districts for creation of spot sources of drinking water as a part of drought management. This was in contravention of State Disaster Response Fund norms.

9.4.5.2 Andhra Pradesh

In the case of drought, input subsidy was to be distributed before the next cropping season to keep farmers in a position to have adequate funds for sowing the next crop. We noted that although 14 Mandals in East Godavari district were declared as drought affected in November 2011, no funds were provided by State Government till March 2012. Further, although ₹ 11 crore was provided in April 2012, no disbursements were made to the affected farmers (July 2012) defeating the very purpose of providing State Disaster Response Fund.

Undue delay in release of input subsidy served only as a handout, without providing rehabilitation of agricultural activities.

9.4.6 National Agricultural Drought Assessment and Monitoring System (NADAMS)

NADAMS was initiated by National Remote Sensing Agency, Department of Space, with the support of IMD and various state departments of agriculture, towards the end of 1986. All the activities of NADAMS project starting from procurement of satellite data till dissemination of information to user community were currently being carried out under Disaster Management Support Programme of ISRO.

At a later stage, Agricultural Division, National Remote Sensing Centre submitted a project proposal under in-house project mode funded under DMS programme of ISRO in 2010-11. The objective of the project was the assessment of agricultural drought conditions in terms of prevalence, intensity and persistence at district or sub district level in 13 states[10] during kharif season every year.

As per the proposal of NRSC, monthly drought reports were the deliverables from NADAMS project. The drought reports were to be used by the Ministry of Agriculture, Government of India; State Departments of Agriculture, Revenue and Relief, Scientific Organisations and Training Institutes. While sending the drought report every month, users was requested for feedback on the report.

We noted that during 2010-11 and 2011-12, NRSC had received feedback from a few[11] state governments and departments. Most of the states had not sent their feedback. Further the feedback was not received on monthly basis.

As per the project proposal, the Head of the Agriculture Division was to review the project activities every fortnight during the execution period, June-December, to ensure smooth implementation of all the activities. However, no review report was found on record.

The efficacy of NADAMS was to be assessed on the feedback and review of project activities. Due to non-receipt of feedback on the monthly drought reports and non-conduct of review of the project activities, the effectiveness of the project could not be ascertained.

[10] Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Maharashtra, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu and Uttar Pradesh.

[11] Ministry of Agriculture, IMD, Pune, State Governments of Jharkhand, Tamil Nadu, Haryana and Karnataka State Disaster Monitoring Centre, Karnataka

9.5 Forest Fire

The most common hazard in forests is fire which is the major cause of their degradation. They pose a threat not only to the forest wealth but also to the entire regime of fauna and flora seriously disturbing the bio-diversity and the ecology and environment of a region. These fires are sometimes caused by inhabitants intentionally, to collect fodder for cattle but mostly fires are caused unintentionally.

The year wise details of cases of forest fire for the period 2007-08 to 2011-12 (during the fire season from 1 November to 30 June) are shown as under:

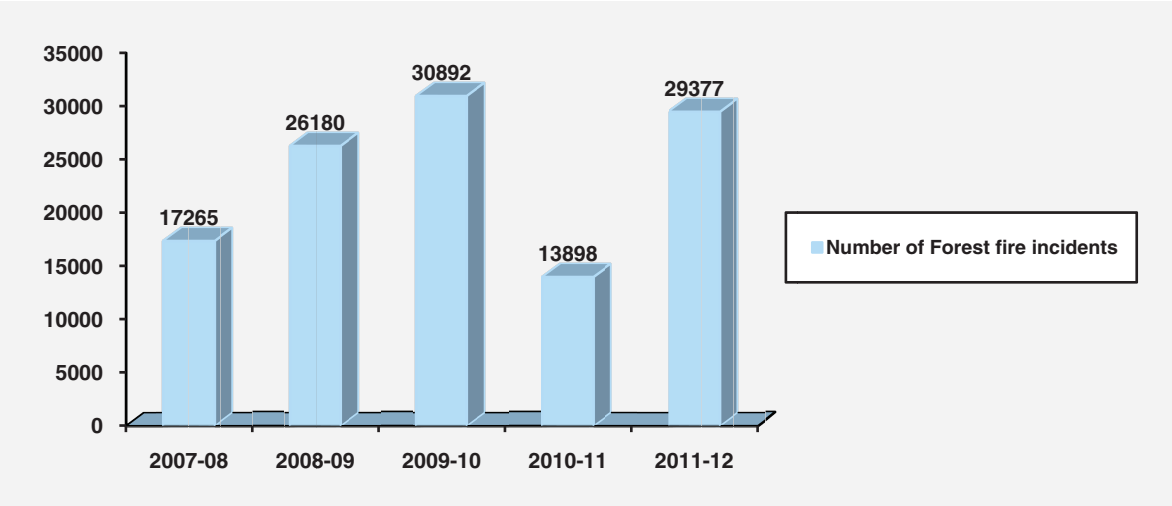


Chart 9.2: Incidents of forest fires in India

9.5.1 Institutional framework

Ministry of Environment and Forests (MoEF) was the nodal Ministry for forest fires. The role of the Ministry in respect of the forest fire disaster management were:

(i) to obtain Annual Work Programmes from the states which included the fire components and ensure that sanction is accorded to them well before the fire season;

(ii) to facilitate preparation of Crisis Management Plan of each State;

(iii) to evaluate and give feedback on forest fire management in the States.

In the Contingency Plan for Forest Fires prepared by MoEF, a four tier Crisis Management Group had been envisaged for coordinating the efforts and to align the duties and functions of the various levels of government machinery as depicted below:

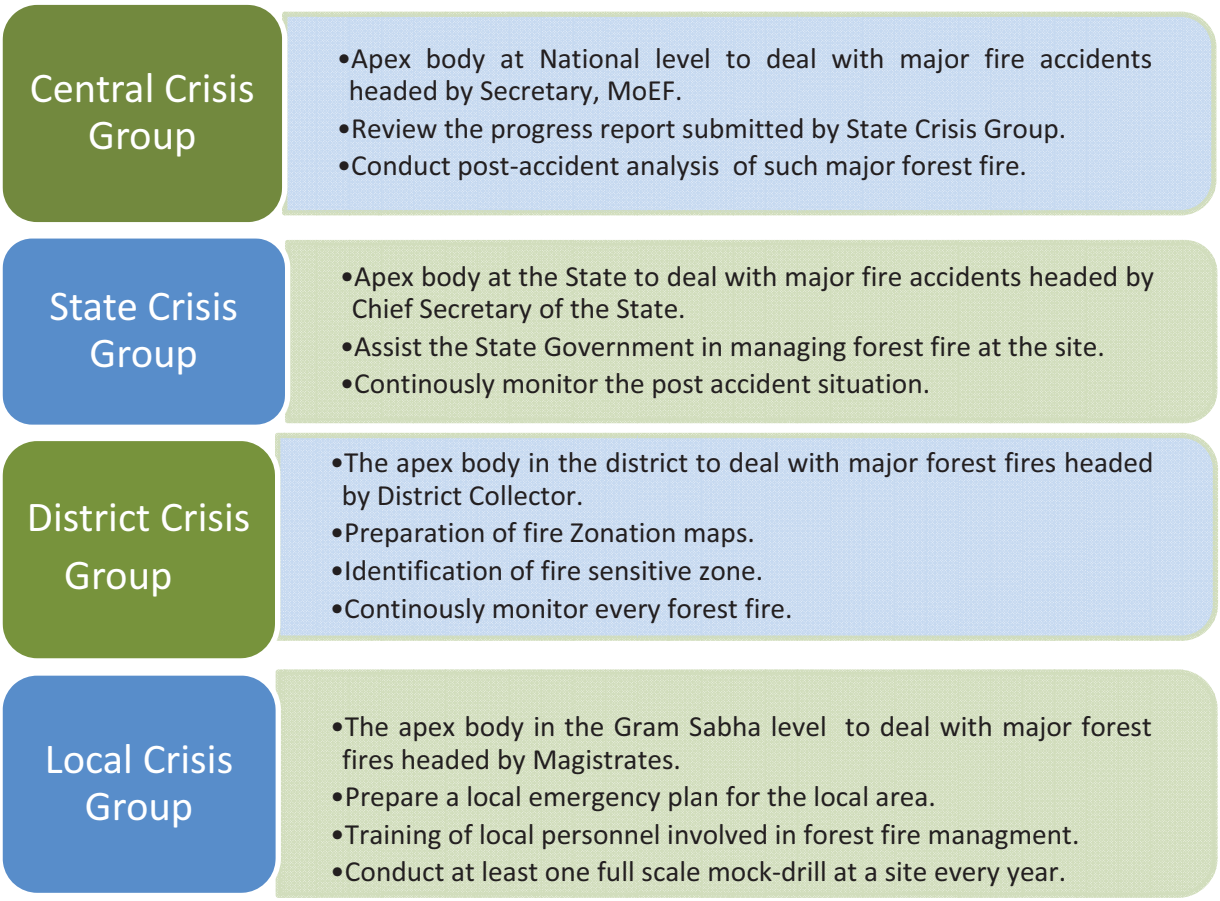


Chart 9.3: Multi level set up to deal with forest fires

9.5.2 Contingency Plan and State Forest Fire CMP

As per the Crisis Management Plan (CMP) of the Cabinet, MoEF was required to prepare contingency plan for dealing with forest fires. MoEF also had to issue detailed guidelines to the State Governments for the preparation of local contingency plans.

In January, 2010 (i.e. after a delay of about three years of formulation of CMP), MoEF requested the states for formulation of State Forest Fire Crisis Management Plan (SCMP)[12] and circulated format for the same.

Every state was to submit (a) the Forest Fire Plan which would include Emergency Fire Fighting Methodology latest by October of each year, and, (b) Forest Fire evaluation details latest by May of each year.

State crisis management plans are vital documents required for preparedness for forest fires. However, only five states viz. Chhattisgarh, Uttar Pradesh, Haryana, Bihar and Tripura and UT of Andaman & Nicobar had submitted the SCMP as of October 2012. Even these were pending with MoEF for approval.

[12] State Forest Fire Crisis Management Plan includes State Contingency Plan.

MoEF stated (October 2012) that it was actively pursuing with the various State Forest Departments regarding preparation of the SCMPs.

9.5.3 Forest fire early detection and monitoring mechanism

The Forest Survey of India (FSI) under MoEF had developed an indigenous methodology to detect forest fires from the given fire spots. The objectives of the project were to find and report forest fires at the nascent stage and to provide quick and reliable information to State Forest Departments (SFDs).

The forest fire early detection and monitoring mechanism had helped state forest agencies in obtaining forest fire information. It is being sent on a real time basis through SMS alerts and emails. The data is also provided to MoEF and is readily available on the official website of FSI[13].

There had been a marked improvement in timely dissemination of information to SFDs due to technological advancements. As a result, the time gap in providing such information to SFDs, which was around 24-36 hours prior to year 2011, had been reduced to two to three hours.

We noted that the data on the website of FSI provided only the location and time of forest fire but information about the magnitude of forest fire and loss due to fire was not available.

The utilization of this data by states and UTs could not be ascertained as majority of states and UTs had not prepared their SCMPs.

MoEF stated (October 2012) that attempts would be made to collect the data to the extent that it helps in evaluating the efficacy of the Fire Protection Plan of the states at the national level.

In our opinion, mere availability of data would not lead to better management of forest fires. It should form basis of national and State level planning. MoEF should utilize the same by analyzing it for future forest fire preparedness.

9.5.4 Central Crisis Group

MoEF had established a Central Crisis Group (CCG) in 2006, for management of forest fires at the national level, comprising Deputy Inspector General of Forests and Assistant Inspector General of Forests of Forest Protection Division. However, it was not headed by Secretary, MoEF and did not include members from other Ministries as prescribed in the Crisis Management Plan of the Ministry. Thus, MoEF did not follow the norms for setting up of CCG.

CCG was entrusted with the task of continuously monitoring the post-accident situations and to suggest measures for prevention of recurrence of forest fire accidents. We noticed that CCG was not playing its role effectively.

MoEF stated (October 2012) that collection of data as per the Crisis Management Plan would be done as a part of Crisis Management on an ongoing basis. Post fire analysis of the efforts of the State Government would be carried out at the Ministry and suitable initiatives would be taken.

[13] www.fsi.nic.in

9.5.5 Assessment of Intensification of Forest Management Scheme (IFMS):

MoEF provided funds for forest fire control and management mainly through Intensification of Forest Management Scheme (IFMS)[14]. During 2007 to 2012, MoEF had released an amount of ₹ 146 crore to various states and UTs under forest fires component of IFMS, against which the states had spent ₹ 92.40 crore during 2007-2011[15].

9.5.5.1 Release of funds and targets for states

We found that MoEF did not ascertain the gaps between existing infrastructure and ideal requirement of State Governments for which these funds were released. MoEF replied that the same had been sought from State Governments.

Moreover, MoEF merely fixed the targets on the basis of feedback received from the states and UTs Governments. Ministry did not prepare any list of forests prone to fire for prioritising funds to those areas.

MoEF stated (October 2012) that Fire Vulnerability Map of the forests of the country was being prepared by Forest Survey of India.

9.5.5.2 MoU under IFMS

As per operational guidelines of IFMS, a Memorandum of Understanding (MoU) was required to be signed by each implementing state and UT. We noted that only 17 states and UTs signed MoUs (October 2012).

We also noted that MoEF continued to release funds to the states and UTs which had not signed the required MoU. MoEF stated (October 2012) that the matter would be followed up with the remaining states/UTs which had not signed the MoU and the task would be completed in a time bound manner.

9.5.5.3 Monitoring of the scheme

MoEF was to arrange for periodic monitoring and evaluation of the scheme. However, no such monitoring and evaluation was done. MoEF stated that site visits and reviews had been done by officers of the Ministry from time to time. However, no reports of such evaluation were made available to audit.

Further, a Review and Monitoring Committee under the chairmanship of Principal Chief Conservator of Forests of State was to be constituted for half yearly review of the scheme. We noted that MoEF was not even aware of constitution of such committees indicating the absence monitoring mechanism at the Ministry's level.

MoEF stated (October 2012) that it had sent (in July 2012) directions to the states to conduct monitoring of sanctioned work programs under IFMS. Monitoring report had been received only from Haryana (October 2012).

[14] Funds for fire protection works are also released under (i) National Afforestation Programme (NAP) of National Afforestation and Eco-Development Board (NAEB) (ii) by 13th Finance Commission (major funding) and (iii) Integrated Development of Wildlife Habitat by Wildlife Division of MoEF as a part of their schemes.

[15] As per MoEF, the expenditure figures from States for the period 2011-12 are under compilation.

9.5.6 Preparedness for forest fires in Andhra Pradesh

The Crisis Management Plan (CMP) for forest fire of the state was submitted by the State Government to MoEF for approval only in June 2012.

In 12 districts of the state, 7357 forest fires occurred between 2009 and 2012. However, no forest fire evaluation details were submitted to Government of India during the period by the State Government.

The Central and State funds under the Intensification of Forest Management (IFM) scheme were not fully utilized during 2007-12. The utilization of the Central and State funds under the IFM scheme ranged between 47 and 89 *per cent* during 2007-11. The funds provided in 2011-12 remained unutilised.

9.6 Chemical disaster

Rapid industrialization in the country has increased the chemical hazard risk and vulnerability to the industry and the environment. The frequency and severity of chemical disasters have also increased over the last few years due to rapid development of chemical and petrochemical industries and increase in the size of plants, storage and carriers, specifically in densely populated areas. Common causes for chemical accidents are deficiencies in safety management systems and human errors. The nature of chemical agents and their concentration during exposure ultimately determines the level of toxicity and its damaging effects on living.

9.6.1. Institutional Framework

The Ministry of Environment and Forests (MoEF) is the nodal Ministry for chemical disaster as per Crisis Management Plan (CMP), 2007 of GoI. The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 envisage constitution of four tier Crisis Management System as depicted in the following figure:

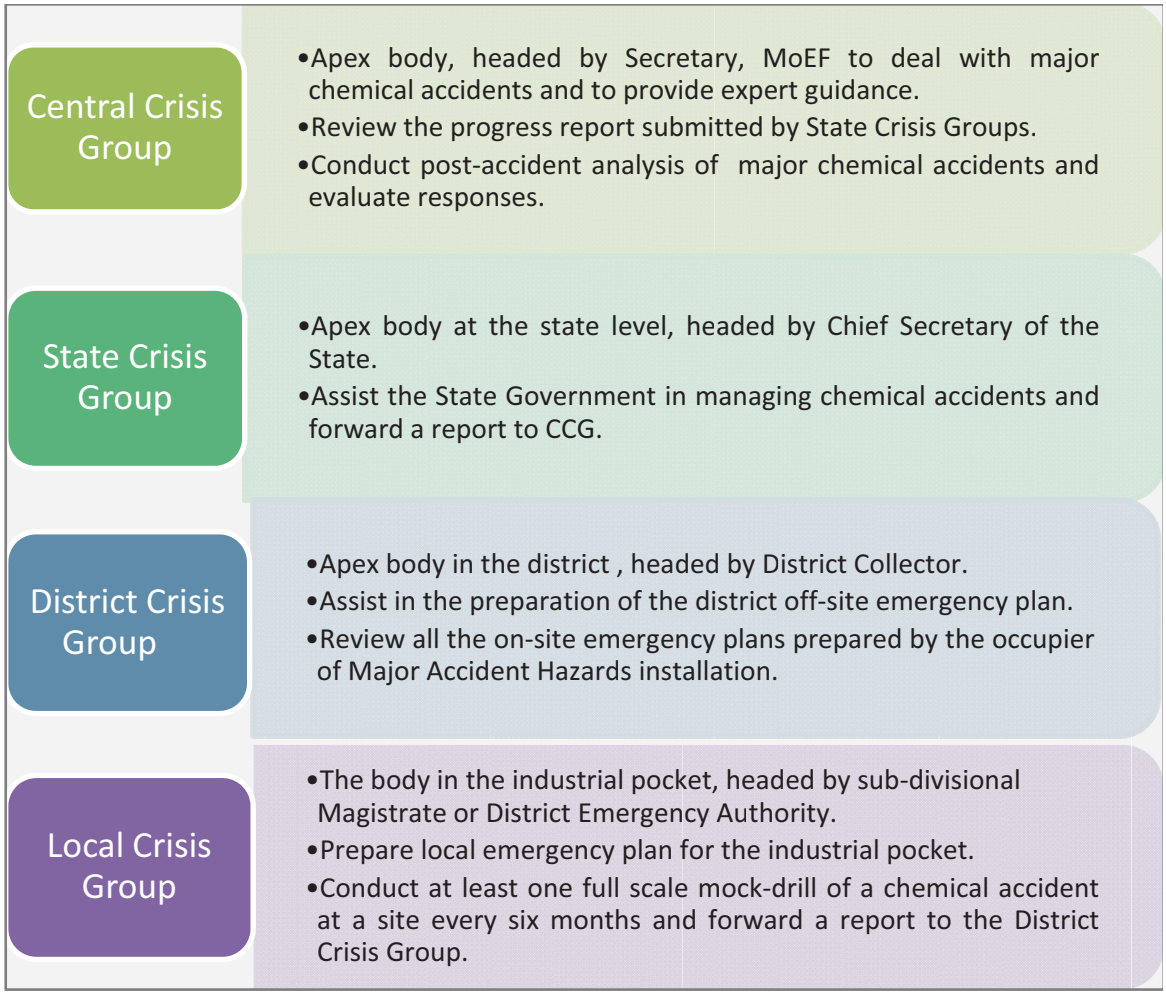


Chart No. 9.4: Multi level set up to deal with chemical disasters

9.6.2. Rules framed by the Ministry and their compliance

MoEF had notified two sets of rules namely:

(i) the Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 and the amendment (MSIHC Rules), and

(ii) the Chemical Accidents (Emergency Planning, Preparedness and Response) Rules 1996 [CA (EPPR) Rules].

The MSIHC rules prescribed preparation of on-site emergency plan by the occupier and off-site emergency plan by the District Authority.

9.6.3. Compliance of MSIHC Rules:

9.6.3.1 Off-site emergency plan

The effects of a major accident in an industrial set up are not always restricted to the boundaries of the industrial installations. They may spill over to the community and the environment in the vicinity. It is the duty of the District Collector (or District Emergency Authority designated by the State Government) to prepare and keep up-to-date an adequate off-site emergency plan containing particulars specified and detailing how emergencies relating to a possible major accident on that site would be dealt with.

As of October 2012, there were 1889 Major Accident Hazardous (MAH) units located in 298 districts in the country. Off-site emergency plans were available for 189 districts of 1477 MAH units. The off-site emergency plans for another 50 districts of 315 MAH units were under preparation. Thus, 59 districts of 97 MAH units in the country did not have off-site emergency plans to deal with major accidents on their sites.

9.6.3.2 Rehearsal of the off-site emergency plan

The concerned authorities had to ensure that a rehearsal of the off-site emergency plan is conducted at least once in a calendar year.

MoEF reported (October 2012) that it had provided financial assistance to 45 districts for conducting rehearsal of the off-site emergency plans as a part of the plan preparation. However, MoEF did not provide any details of rehearsal of the off-site emergency plans actually conducted by these 45 districts.

9.6.3.3 On-site emergency Plan

The occupier of MAH units was to prepare and keep up-to-date, an on-site emergency plan containing details specified and detailing how major accidents would be dealt with on the site on which the industrial activity is carried on.

There were 1889 MAH units located in 298 districts in the country. Out of these, 1838 had prepared on-site emergency plans. Thus, the remaining 51 MAH units were still not prepared to deal with major accidents on their sites.

9.6.3.4 Mock drill of the on-site emergency plan

The occupier had to ensure that a mock drill of the on-site emergency plan was conducted every six months and a detailed report of such mock drill be made immediately available to the concerned authority.

MoEF did not provide the details about number of mock drills and stated that it would be available with the concerned State Labour Departments.

MoEF further stated (October 2012) that it receives this information from the concerned Chief Inspector of Factories as a part of its Annual Report.

9.6.3.5 Chemical Accident Information and Reporting System (CAIRS)

MoEF sanctioned (January 2006) a project of National Informatics Centre Services Inc. for development of an Online Web Based-CAIRS. The total cost of the project was ₹ 12.32 lakh. As per the recommendation of Central Crisis Group, in May 2009, MoEF requested all the Chief Inspector of Factories and the Labour Secretaries of the states and UTs to furnish the information pertaining to the chemical accidents that occurred in their States.

We noted that there were only 12 incidents reported since 2009. The authorities were however, not reporting all the chemical accidents regularly as even chemical accidents reported in the National Chemical Disaster Database published by MOEF, were not reported in CAIRS. Thus, CAIRS was yet to generate adequate response either due to lack of awareness or due to operational issues of website.

MoEF stated (October 2012) that there were operational difficulties in uploading of information in the CAIRS and they had taken up this matter with NIC.

9.6.4. Compliance of EPPR Rules:

9.6.4.1 Meetings of Central Crisis Group

The Central Crisis Group (CCG) was last constituted in August 2004. CCG has to meet once in every six months to monitor and discuss the major chemical accidents occurring in the country.

We noted that since 2007 the CCG had met only seven times and the time lag between the two meetings ranged as high as 21 months. It was evident that MoEF was not carrying out proper supervision and guidance for preparing and managing of chemical accidents in the country.

9.6.4.2 Progress reports submitted by the State Crisis Groups

The CCG had to review the progress reports submitted by the State Crisis Groups (SCG). However, we noticed that such progress reports were not being received from the SCGs by MoEF leaving them unaware of the status.

9.6.4.3 Red Book

MoEF was to publish a list (Red Book) of Members of the Central, State and District Crisis Group in the country. The Co-ordination Committee of MoEF, in 1998, decided that there was a need to review, update and print the Red book annually.

The latest available version was of 2010. Thus, Red Book was not being regularly updated by MoEF. As a result, the latest contact details of all the authorities and experts concerned with the handling of chemical accidents were not readily available to those who may need it. The

work of updation and printing of Red Book was awarded by the MoEF only in January 2012.

9.6.5. National Action Plan on Chemical (Industrial) Disaster Management

NDMA Disaster Management Guidelines on Chemical Disasters mandated MoEF with preparation of National Action Plan on Chemical (Industrial) Disaster Management. MoEF entrusted (June 2009) the task of preparation of Plan to Disaster Management Institute (DMI), Bhopal. The project including finalization of the draft report was to be completed in eighteen months i.e. by December 2010. We noted that there was a delay of more than 18 months. There was a further delay in evaluating and approval of the draft report by MoEF. Thus, the National Plan meant to minimize the occurrence of chemical and industrial disasters was yet to be put in place.

9.6.6. Emergency Response Centres

MoEF approved (July 1992) a scheme for setting up of Emergency Response Centres (ERC) in the country. The ERCs primarily dealt with chemical emergencies in a defined area and were round the clock facilies, with system for quick retrieval of information on hazards.

The ERCs were set up on mutual cost sharing basis between Central Government, State Government and the local Industries.

We noted that only eight ERCs in four states were funded by the Ministry. Thus, the spread of ERCs in the country was not uniform and ERCs were not established in most of the states/UTs even though there were considerable numbers of MAH units, as depicted in Table 9.1:

Table 9.1: Details of MAH units in states and ERCs funded by MoEF

Sl. No.	State	Total No. of MAH Units*	Number of ERCs funded by MoEF
1.	Gujarat	428	Nil
2.	Maharashtra	327	1
3.	Andhra Pradesh	144	5
4.	Uttar Pradesh	118	Nil
5.	Tamil Nadu	118	Nil
6.	Rajasthan	107	Nil
7.	West Bengal	85	Nil
8.	Karnataka	78	Nil
9.	MP	71	1
10.	Punjab	56	Nil
11.	Haryana	52	Nil
12.	Orissa	39	Nil
13.	Kerala	38	1
14.	Uttaranchal	30	Nil

***Source "National Profile of Major Accident Hazard Installations" published by MoEF in March 2011**

Thus, an effective system for chemicals crisis management was not available in the majority of states/UTs.

MoEF stated that as per the scheme, the commitment and share of State Government was required for establishment of ERCs. Therefore, it had fixed no targets for the same.

MoEF needs to follow up the matter with the State Governments to ensure setting up of ERCs at least in these states where MAH units were in abundance.

9.6.7. Disaster preparedness in the states:

9.6.7.1 Andhra Pradesh

We noted that:

- The Major Accident Hazardous units carried out independent safety audit of the industrial activities and forwarded the reports to the Director of Factories, Hyderabad. However, out of 343 safety audit reports due for the period from 2007 to 2012, just 211 reports were received.
- Though State Crisis Group (SCG) was constituted in the State in February 1998, yet no SCG meetings were conducted during the period 2007-2012. SCG had neither reviewed district off-site emergency plans nor forwarded any reports relating to off-site emergency plans of the districts to Central Crisis Group (CCG) during 2007-2012. Thus, the SCG was largely ineffective.
- District Crisis Groups (DCG) meetings were conducted, once in year, in only 5 out of 23 districts in the State during 2007-2012. No progress reports were submitted by the DCGs to the SCG during 2007-2012.
- Off-site emergency plans were prepared only for 11 out of 23 districts during 1995 to 2011. These off-site plans were not updated since 2007, although new MAH units were added in many of the districts.

9.6.7.2 Rajasthan

- ❖ In Jalore and Barmer districts, we noted that legal instrument for management of hazardous waste was not established and off site emergency plan was not prepared.
- ❖ No meetings were held by the DCG and LCG in the test checked districts.

9.7 Biological Disasters

Biological disasters are scenarios involving disease, disability or death on a large scale among humans. Such disasters may be natural in the form of epidemics or pandemics of existing, emerging or re-emerging diseases and pestilences. Biological disasters of natural origin are largely the result of the entry of a virulent organism into a congregation of susceptible people living in a manner suited to the spread of the infection.

9.7.1 Institutional Arrangement:

Ministry of Health and Family Welfare (MoH&FW) was the nodal Ministry for coordinating the response to challenges of biological disasters. MoH&FW was vested with the responsibility of:

- framing the national health sector guidelines,
- providing guidance and technical support for capacity development in surveillance,
- early detection of any outbreak,
- supporting the states during outbreaks in terms of outbreak investigations,
- deployment of Rapid Response Teams (RRTs),
- manpower and logistic support for case management, etc.

The apex decision-making body was the Crisis Management Group headed by the Secretary, which was advised by the Technical Advisory Committee headed by Director General Health Services (DGHS).

9.7.1.1 EMR Division

The Emergency Medical Relief (EMR) Division of the Directorate General of Health Services was the focal point for coordination and monitoring response for biological disasters of national and international concern. During 2007-12, EMR division had dealt with avian influenza, pandemic influenza and Cremean Congo Hemorrhagic fever.

The core function for preparedness for biological disasters was surveillance which was undertaken through Integrated Disease Surveillance Project (IDSP).

This project was run by National Centre for Disease Control (NCDC). IDSP was responsible for surveillance, detecting early warning signs and informing the government.

9.7.1.2 National Centre for Disease Control (NCDC)

NCDC was the nodal agency for implementing the International Health Regulations 2005[16] and for investigating disease outbreaks.

The functions of the NCDC broadly covered three areas viz. trained health manpower development, outbreak investigations, specialized services and operational and applied research. The NCDC provided teaching/training, research and laboratory support as well.

[16] IHR (2005) is to prevent, protect against, control and provide a public health response to the international spread of disease.

9.7.2 Legal framework

9.7.2.1 Epidemic Act

Health is a State subject and the primary responsibility of dealing with biological disasters rested with the State Governments.

The Epidemic Diseases Act, 1897 provided the states the authority to designate any of its officers or agencies to take measures for the prevention and control of epidemics. NDMA in its guidelines had observed that the Act did not provide any power to the Centre to intervene in the cases of biological emergencies. Further, the Act also did not take care of the prevailing and foreseeable public health needs including emergencies such as bioterrorism attacks and use of biological weapons by an adversary, cross-border issues and international spread of diseases.

In 2008, NDMA pointed out the need for amending the Epidemic Diseases Act 1897, with a more contemporary Act suggesting a time frame of three years for enactment of such legislation. We noted that even the draft bill was not finalised.

The Ministry stated (July 2012) that a draft Public Health (Prevention, Control and Management of Epidemics, Bio-terrorism and Disasters) bill was under consideration.

9.7.2.2 National Code for bio-security and bio-safety

NDMA guidelines (2008) suggested preparation and promulgation of a national code of practice for bio-security and bio-safety. This code would have provided the basis of accreditation of laboratories with respect to the handling of microbial material at the national level. Audit noticed that such a code had not been prepared by the nodal Ministry (October 2012).

The Ministry stated (November 2012) that there were existing guidelines for bio-security and bio-safety which were being followed by National Accreditation Board for testing and calibration Laboratories (NABL). Laboratories in the country were receiving accreditation from NABL on the existing guidelines.

We noted that NABL was accrediting laboratories in the country even without the formulation of national guidelines by NDMA which had highlighted the need for national code of practice for bio-security and bio-safety. Such a code was yet to be promulgated in the country.

9.7.3 Disease surveillance and early warning systems

NCDC performed the task of investigating disease outbreaks through its Integrated Disease Surveillance Project (IDSP). This project was launched with World Bank assistance in November 2004. The objective of the project was to strengthen the disease surveillance in the country by establishing a decentralized state based surveillance system for epidemic prone diseases to detect the early warning signals.

The project duration was extended for two years up to March 2012[17], with domestic

[17] From April 2012 the IDSP is proposed to be funded under NRHM in the 12th Plan

funding in 26 states and UTs and with World Bank support in nine states.

Under IDSP, a Central Surveillance Unit (CSU) at Delhi, State Surveillance Units (SSU) in each state and District Surveillance Units (DSU) aim all districts in the country were established to keep a track of disease outbreak.

9.7.3.1 Non Reporting to CSU

Central Surveillance Unit (CSU) received disease outbreak reports from the states and UTs on weekly basis. We noted that states and Union Territories did not send report on outbreaks to CSU every week.

Reporting from five states and union territories was below 50 *per cent* during the year 2012. Further, reporting from another seven states and union territories was between 50 and 79 *per cent* during 2012. Seven districts in the country had never reported data for IDSP till July 2012. Further, 22 *per cent* of the reporting units did not report data during 2012.

In the absence of regular reporting, IDSP would not work effectively. NCDC (September 2012) accepted the facts and stated that CSU was following up with states to obtain reports every week to ensure that every disease outbreak was reported.

EMR division also stated (October 2012) that notifications of epidemics was the prerogative of State Governments and information on epidemics declared by the State Governments was not available with them. This was indicative of gaps in coordination between Central and State units, which could effect the response to epidemics.

9.7.3.2 Strengthening of laboratories

In February 2009, fifty district laboratories were identified for strengthening with a view to obtain accurate lab based surveillance data. However, task of strengthening 15 out of 50 labs was incomplete (September 2012).

Lab Facilities in India

Laboratories were graded by Bio Safety Levels[18] (BSL) Bio-safety laboratories were required for the prompt diagnosis of the agents for effective management of biological disasters. Prior to the appearance of avian influenza, the health sector had only one BSL-3 laboratory at National Institute of Virology **(**NIV), Pune but subsequently six more BSL-3 labs were established. However, no BSL-4 lab was functional in India. BSL-4 lab at NIV, Pune was ready but not yet functional. NCDC informed that setting up of BSL-4 labs was not included in its upgradation proposal.

9.7.3.3 Manpower management

766 posts of technical personnel were sanctioned in SSU and DSU. Of these, only 420 posts were filled up till October 2012. NCDC (November 2012) stated that there was overall low availability of technical manpower and efforts were being made to increase manpower availability by starting new courses at National Centre for Disease Control, Public Health Foundation of India, etc.

[18] A method for rating laboratory safety. Laboratories are designated BSL 1, 2, 3, or 4 based on the practices, safety equipment, and standards they employ to protect their workers from infection by the agents they handle.

9.7.3.4 Telecommunication network for IDSP

To enable instant transfer of data, in 2005, ISRO was given the task of establishing satellite network for IDSP through EDUSAT. It was decided to set up a country wide network connecting all district headquarters, major medical colleges and the CSU. ISRO earmarked eight megahertz bandwidth under IDSP for establishing satellite network. Funds amounting to ₹ 12.93 crore were released to ISRO in September 2005 and January 2006 for installing VSAT system at 400 sites in the country.

We noted that:

No agreement or MoU was entered into with ISRO. There was no binding provision for implementation of the project with in a fixed time frame. Despite making available the entire funds to ISRO for installation at 400 sites, 33 sites were incomplete due to non availability of space and required infrastructure and short shipment by the suppliers.

In September 2010, the VSAT network stopped functioning due to technical problems. ISRO stated that IDSP network would be restored with the launch of GSAT-12 in July 2011. However, we noted that the services had not been restored to IDSP even after launch of GSAT-12.

NCDC stated (September 2012) that ISRO had allotted the bandwidth in February 2012 and awarded the contract to migrate the sites to new satellite GSAT-12. It further added that only when the satellite connectivity is available, remaining sites would be installed and network would be functional again.

Thus, the network for IDSP was not functional despite incurring an expenditure of ₹ 12.93 crore (September 2012).

9.7.3.5 Call Centre for IDSP

IDSP established a toll-free call centre in February 2008 as one of the tools to receive alerts and information regarding outbreaks of epidemic prone diseases.

We noted that the centre was non functional since April 2012, which coincided with switchover from World Bank funding to domestic funding.

The web-site of NCDC was still displaying the call centre toll free number but the call centre was not in operation.

Surveillance at entry points in the country:

The country had 25 airports, 12 ports and seven international land borders which catered to international traffic. Increase in the volume of traffic led to an emergence and re-emergence of a number of deadly diseases of global concern like SARS, swine flu, avian influenza and Ebola virus etc.

Surveillance at these entry points against dangerous global pathogens, capable of being brought in India by international passengers, is low in the country.

The Ministry stated in October 2012 that there is a need to establish health units at 23 entry points. Similarly health units at 21 entry points need to be strengthened. A proposal in this regard is underway for the Twelfth Plan period.

9.7.4 Upgradation of NCDC

In August 2005, it was decided to transform National Civil Defence College as an apex organization with the mandate of effective and exhaustive disease

surveillance and control activities. The Cabinet Committee on Economic Affairs approved the proposal for upgradation of NCDC in December 2010 at a cost of ₹ 382.41 crore. The project was to be completed by March 2013.

We found that the agreement for civil works was signed in September 2011. The layout plan for the NCDC was yet to be approved by Delhi Urban Arts Commission and Delhi Fire Services. Commencement of the project was delayed due to non obtaining of the timely approval of lay out plan. Further, out of the 103 newly sanctioned posts for 2011-12, only 13 Group B posts were filled and no Group A post was filled. Thus, proposed upgradation for effective surveillance was delayed.

9.7.5 A case study on Pandemic influenza 2009:

Pandemic Influenza (H1N1 flu) 2009

Influenza virus can infect both human beings and animals notably pigs, birds, horses etc. Three types of influenza viruses are known, namely A, B and C. Humans can be affected by all the three influenza viruses. Influenza A virus causes infection in humans all round the year and is responsible for most of the seasonal epidemics and pandemics. Influenza B causes sporadic and less severe outbreaks whereas the type C causes mild respiratory illness.

Influenza A [H1N1] is a subtype of Influenza A virus, which was first reported in Mexico in March, 2009 and then spread to other countries. In India the pandemic began with an imported case from U.S.A in May 2009. This was declared as a public health emergency of international concern in 2009 by WHO. In India, 31 states/ UTs were affected by this disease since 2009.

The Central Teams visited 22 states for assessing the preparedness for containment of Influenza-A H1N1 in September 2009. The Central Teams reported deficiencies in facilities for treatment of the disease such as inadequate ventilators, shortage of medicines and fumigation equipment etc.

The preparedness for containing the influenza was found deficient for such a pandemic situation.

Lessons learnt: Since 2009, every year a number of H1N1 infection cases have been reported from different parts of the country – repeatedly from Maharashtra, Assam and West Bengal etc. These repeated occurrences point towards a failure in institutional mechanism to prevent repeated outbreak of a particular contamination.

45 diagnostic laboratories (26 in government sector and 19 in private sector) were up-scaled to test Pandemic Influenza A H1N1 virus by March 2010. However, a comprehensive assessment of lab requirement in the country was yet to be made.

9.8 Radiological and Nuclear Emergencies

Radiation and radioactive substances have many beneficial applications, ranging from power generation to use in medicine, industry and agriculture. At the same time, the risks of radiation that may arise from these applications to the people working in these fields, the general public and the environment are enormous. These risks, therefore, need to be assessed and controlled effectively. Regulating safety is a national responsibility.

We have discussed the results of our audit on emergency preparedness for nuclear and radiation facilities in the country in Chapters-VI and VII of CAG's Performance Audit Report (Report No. - 9 of 2012-13 for the period ended March 2012) on Activities of Atomic Energy Regulatory Board (Department of Atomic Energy). A gist of these audit findings on emergency preparedness for nuclear and radiation facilities are discussed hereunder.

9.8.1 Institutional framework

Department of Atomic Energy (DAE) was the nodal agency for responding to any nuclear or radiological emergency. Atomic Energy Regulatory Board (AERB) was set up in 1983 to lay down safety standards and to assist DAE in framing rules and regulations for regulatory and safety functions.However, MHA is the nodal ministry to coordinate with various response agencies in the event of any nuclear or radiological disaster in the public domain.

9.8.2 Absence of coordinated implementation mechanism

NDMA brought out the National Guidelines for management of nuclear and radiological emergencies in February 2009. Various issues were identified by NDMA like sensitisation of people to remove the fear, adequacy of resources in the event of off-site emergency, strengthening regulatory and security aspects in industry and hospitals using radioactive sources etc.

We noted that although these gaps were identified in 2009 by issuing the guidelines and recommendations, no authority had taken the responsibility of acting on them.

9.8.3 Database relating to radiation facilities

Prior to the establishment of AERB, radiation facilities were under the regulatory control of BARC. AERB did not obtain sufficient data relating to radiation facilities operating in the country when the regulatory work was assigned to it.

AERB did not have an effective system in place to ensure continuous collection and updating of its inventory of all radiation sources.

9.8.4 Non monitoring of disposal of radioactive material

AERB issued consents for disposal of decayed radioactive materials from medical, industrial and research institutes for safe disposal to the original supplier or

to one of the approved radioactive waste disposal facilities[19] in India.

We noted that although several consents had been given so far, there was no proper mechanism to verify whether the sources had actually been disposed of in accordance with the safeguards prescribed in the consent letter. Records for all the sources disposed of, so far, at their facilities were being maintained by the National Waste Management Agency.

9.8.5 Orphan sources

International Atomic Energy Agency (IAEA) Safety Glossary defines an 'orphan source' as a radioactive source which was not under regulatory control.

We noted that there was no effective mechanism in place to prevent radioactive sources from getting out of regulatory control. The regulatory response mechanism to trace and discover lost and/or orphan radioactive sources in the country was also not effective. AERB should strengthen its current approach to deal with the issue of orphan sources by adopting the best practices laid down by the IAEA.

9.8.6 Emergency preparedness for nuclear and radiation facilities:

We reviewed the regulatory effectiveness of systems and procedures relating to emergency preparedness, both on-site and off-site and the general adequacy of emergency preparedness and coordination between various authorities.

9.8.6.1 On-site emergency preparedness

On-site emergency preparedness plans were put in place by the plant managements of Nuclear Power Plants (NPPs) and nuclear fuel cycle facilities. These emergency preparedness plans were tested by actual periodic exercises prescribed, based on the types of emergencies, by the plant managements of NPPs. Plant Emergency Exercises (PEE) were conducted once in a quarter, while Site Emergency Exercises (SEE) were conducted once a year. AERB only reviewed the report of these exercises conducted by the plant managements and did not directly associate itself in these exercises, even as observers.

As the nuclear safety regulator, AERB should associate itself as an observer in these exercises on selection basis to exercise adequate regulatory supervision in these exercises.

9.8.6.2 Off-site emergency preparedness

For the purpose of planning an off-site emergency, an emergency-planning zone was specified, up to a 16 km radius from the plant. The Emergency Response Manual of AERB specified the criteria to determine an off-site emergency. The protective measures in the public domain were also specified in the Manual.

Review in audit of off-site emergency preparedness in the country revealed the following:

- In the case of NPPs, the Off-site Emergency Exercise (OSEE) was

[19] National Waste Management Agency, BARC

conducted once in two years, in coordination with District Authorities and the public. We observed that there was no significant deviation in the conduct of OSEE and AERB was associated with these exercises as an observer.

- In all, 26 such emergency exercises were conducted during the period 2005-2011 in various NPPs. AERB submitted observer's reports to the plant authorities and the CMG for taking necessary action to rectify or revise the offsite emergency plans.

AERB stated (February 2012) that presently, it was not mandated to take follow-up action with the district and state authorities on deficiencies in emergency preparedness pointed out by it. However, it was considering asking the plant managements to obtain and submit information on the status of corrective measures taken, subsequent to the OSEEs by the local authorities.

The reply confirmed the weakness in the regulatory regime since the AERB had no authority to enforce rules in the instances of malpractices and departures from the approved plans.

9.8.6.3 Emergency plans for radiation facilities

We noted that codes for emergency preparedness plans for NPPs and nuclear fuel cycle facilities of Department of Atomic Energy had been framed and issued. However, no specific codes on emergency preparedness plans for other types of radiation facilities such as industrial radiography, radiotherapy and gamma chambers, etc. had been brought out even though the hazard potential of these were rated as high.

9.8.7 Case Study: Radiation incident in Mayapuri, New Delhi

The University of Delhi procured radiation equipment containing a gamma cell in 1970, which was operated till 1985. AERB stated (June 2010) that this unused equipment containing the gamma cell was sold to a local scrap dealer in a public auction. Thereafter, the equipment was dismantled and the source assembly was handled by persons with bare hands. This resulted in serious radiation injuries to these persons, including the death of a person. These casualties occurred due to unsafe and unauthorized disposal of radiation equipment at Mayapuri, New Delhi in April 2010. It is apparent that the accident was the result of ignorance about practices for safe disposal of radioactive waste.

Pin pointing the contaminated Soil at Mayapuri, New Delhi

AERB further stated (February 2012) that the incident occurred primarily due to violations by University of Delhi of the clear and unambiguous requirements specified in the applicable rules, about safe disposal practices of radioactive wastes.

Recommendations:

- *MoES should prepare the Earthquake Management Plan in consonance with National Guidelines issued in this regard. Communication between MoES and MHA needs to improve as MoES seem to be unaware of its responsibilities as spelt out in the NDMA guidelines.*
- *NDMA should complete its project on 'Vulnerability Assessment and Risk Analysis' with respect to various natural hazards.*
- *Ministry of Water Resources should ensure preparation of EAPs of the states covering all the major dams.*
- *There is a need to ensure timely completion of various projects undertaken by MoES for modernization of IMD.*
- *DAC should ensure that the activities envisaged in the National Guidelines on drought management are completed expeditiously to provide impetus for disaster preparedness for mitigation of droughts.*
- *Submission of monthly drought reports should be ensured by all the stakeholders so that the project activities of NADAMS may be reviewed periodically.*
- *Forest fire monitoring data could be utilized in preparation of the Contingency Plan for forest fires.*
- *An effective system for chemical crisis management at the state level and to provide a link between the accident sites and expert group is required to be devised.*
- *CAIRS need to update information of chemical accidents expeditiously.*
- *The Central Crisis Group needs to play its role in monitoring the post-accident situation and suggesting measures for prevention and recurrence of forest fires.*
- *The deficiencies reported in IDSP need to be rectified. Surveillance at the entry points and laboratory infrastructure in the country need to be strengthened.*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