CHAPTER 6

SUGGESTIONS AND RECOMMENDATIONS
FOR EFFECTIVE IMPROVEMENT
AND THE ROAD AHEAD

1. The Armed Forces, by virtue of their inner strength, motivation, discipline and operational preparedness, have always arisen to the occasion during major disasters, and earned the admiration of the environment for their singular contribution to disaster response. They are well organised and provide support to a full range of public relief services during major disasters. Their structures are intended to respond rapidly in a fully mobile and self-contained manner, to reach out to the remotest areas of the country.

2. While the arrival of the Armed Forces instills confidence in the local populace and gives a boost to the administration, their omnipotence and omnipresence should not engender a sense of fulfillment in the psyche of the State Governments. Over the years, the Armed Forces involvement in aid to civil authority has been steadily increasing, and the administration too has steadily increased its dependence on Armed Forces' resources. This has occurred primarily due to the nation's reactive strategy on Disaster Management. Fortunately, the Government, of late, has arrested this trend, and has reviewed its policy on disaster management, which now envisages the development of a more self reliant administrative structure, through a pro-active strategy. These reforms notwithstanding, the Armed Forces in general, and Army in particular, continues to maintain itself in a high state of preparedness, so as to save the fellow citizens of motherland.

3. The National Disaster Response Plan, as structured by the High Powered Committee on Disaster Management 2001, has identified 14 Emergency Support Functions, and nominated primary and support agencies for each function. The Ministry of Defence is the 'Primary Agency' for the Search and Rescue (SAR) function, and a 'Support Agency' for provision of communications, transportation, rehabilitation, engineering, power and medical services. However, over the years, the Army's role has gradually expanded from the SAR function, to also include major responsibilities in the supportive functions. It is also expected to provide
sizeable quantities of disaster relief material on a single call for both national and international contingencies.

4. **Capabilities and Quality of Responses.** The Army is so structured that it is capable of rapid response and dispatch of self contained mobile and composite task forces to any part of the country, or even overseas, in conjunction with the Navy and Air Force. It is well organised to meet most of the needs, ranging from immediate life supporting assistance to short term rehabilitation requirements.

**Recommendations and the Road Ahead**

5. In India, more than 24 States / Union Territories are vulnerable to natural disasters—droughts, floods, cyclones and earth quakes. Only one state (West Bengal) faces all four types of disasters, while six states (Bihar, Himachal Pradesh, Jharkhand, Sikkim, Tripura, Arunachal Pradesh) face three types of disasters, nine (Maharashtra, Gujrat, Haryana, Chattisgarh, Assam, J&K, Bihar, Uttar Pradesh, Uttarakhand) face two types and six states (Orissa, Andhra Pradesh, Tamilnadu, Kerala, Karnataka, Madhya Pradesh) face one type of disaster. Disasters kill thousands of citizens and destroy million of dollars worth of property and assets every year.

6. Since 1999, we, as a Nation, have come a long way in restructuring our disaster management mechanisms and ushering in a sense of synergy and integrity between the concerned ministries and departments. Our experience gained over the years, and more recently, our adept handling of the ‘Tsunami Disaster, the Jammu & Kashmir Earthquake, as also our observations on the way the US handled the Katrina Disaster, make one fact stand out loud and clear, i.e. India’s basic disaster management mechanism arid structures are fairly matured, and our response quite cogent and effective. We however still, have one serious challenge to overcome. While the Armed Forces continue to contribute to the effectiveness in a big way, the lack of organised infrastructure and non-implementation of national policies at the State/District levels, elude a specialist response to disasters. We still need to consolidate on our attempts to create a functional and responsive organisation and institutionalising various mechanisms and structures, for formulation of a comprehensive response at all levels.
Earthquake Management : Certain Recommendations

7. **Public Awareness.** One of the most challenging tasks in earthquake preparedness and mitigation is the **sensitisation of all stakeholders** to the prevalent seismic risk, and educating and training them to participate in earthquake preparedness and mitigation efforts. If the community recognises the importance of **incorporating seismic safety measures in the construction** of residential buildings, tremendous gains can be achieved in earthquake mitigation. State governments/SDMAs will, in collaboration with nodal agencies and other key stakeholders, make special efforts to mobilize communities to carry out earthquake mitigation efforts. At the national level, **public awareness materials** like brochures, manuals, booklets, action plans, videos, and demonstration kits will be developed for creating public awareness on this subject. Such materials will be fine-tuned by the state governments/SDMAs to suit local needs, especially in rural areas. Electronic and print media will also be used to help create greater public awareness of seismic risk and vulnerability and on structural and non-structural risk reduction measures. The EREC (IMD) and other knowledge institutions such as the IITs and National Institutes of Technology (NITs) will play a major role in producing these materials.

8. A **comprehensive awareness campaign** need to be developed and implemented on the safe practices to be followed before, during and after an earthquake. This campaign will also **emphasise the prevalent seismic risk and vulnerability** of the states as well as highlight the roles and responsibilities of all communities and stakeholders in addressing this risk.

9. **Earthquake Preparedness.** DM plans must be systematically developed to prepare stakeholders to address earthquake risk. These plans will consider the risk profile and the special characteristics of a particular geographic area and will be region specific. Preparedness should include the **formulation of family and community contingency plans.** Mock drills be conducted for industrial units, offices, schools and hospitals, as well as for specific urban and rural areas to create greater public awareness.

10. In metropolitan cities, the managements of **cinema theatres, malls, auditoria, community facilities,** etc., must develop plans for ensuring **public safety** in the event of an earthquake. Emergency managers will be designated, trained and given charge of implementing emergency response activities. **Mock drills** should be conducted, to test the earthquake response capacity, in these buildings periodically, and at least once in six months.
11. NGOs and volunteer groups from within the community must prepare and implement community based DM plans. A **database should be developed** at the state and district levels of these groups, with their core competence and contact details. State governments/SDMAs will set up appropriate DM coordination mechanisms with civil society organisations along the lines of the state level NGO task forces and corporate task forces.

12. **Medical Preparedness.** The DM plans prepared at the state and district levels should have a single ‘**all hazards**’ medical management plan to improve emergency medical preparedness and emergency medical response. Medical preparedness will focus on likely injuries, outbreak of diseases and other post-earthquake public health problems including psycho-social trauma. It should address the need for surveillance and for planning and rehearsing earthquake preparedness through mock exercises.

13. The Medical Management Plan should address the need to **create greater awareness in all medical teams and the medical community** at large, to the most frequent type of injuries, illness and other health problems caused by earthquakes. Trained Medical First Responders (MFRs) for administering first aid and resuscitation measures, at the incident site and during transportation of casualties, need to be kept identified. In addition to MFRs of the National Disaster Response Force (NDRF), DM plans at all levels must identify medical and paramedical staff to supplement manpower resources at district and state levels. All members of the medical and paramedical teams must carry out regular exercises based on the Standard Operating Procedures (SOPs) laid down by the respective DMAs as part of their DM plan.

14. A uniform casualty profile of earthquake injuries must be created and a system of triage to classify casualties must be institutionalised so that the treatment can effectively be facilitated by the list of hospitals and their telephone numbers; the availability of ambulances, doctors, anesthetists, specialists, paramedical staff; sources of public and private sector medical resources; and commonly needed medical supplies and medical stores, blood banks, heli-ambulances and floating hospitals, etc., for easy accessibility. SOPs for medical evacuation, transport of victims and treatment of the injured need also to be included.

15. All public health facilities must develop their own DM plans, with the scope for enhancing their surge capacity in the event of disaster. Training exercises and mock drills should be carried out regularly by doctors as well as paramedical staff. The medical preparedness plans must also include identification of **trained trauma and psycho-social care teams**, with nursing and
paramedical staff. In high-risk earthquake-prone areas, mobile hospitals and Quick Reaction Medical Teams (QRMTs) should be developed as a part of the health-care delivery system of the states, to manage patients with minor injuries at the incident site. The Accident Relief Medical Vans (ARMVs) of the Railways should also be deployed to provide immediate emergency medical services in the event of a major earthquake.

16. **India need to participate in the international effort at improving the quality of preparedness** and response by liaising with international organisations, UN agencies and other humanitarian actors and share the best practices in earthquake preparedness and mitigation.

**DM Plans**

17. In accordance with the various disaster specific Guidelines laid down by the NDMA, the NEC should prepare the National Disaster Management Plan, incorporating the DM plans prepared by the central ministries/departments and state governments. This Plan, inter alia, should include various aspects of earthquake management and be approved by the NDMA. The salient activities covered by this plan must include the following:

(a) Preparation of **state and district DM plans**, with specific reference to the management of earthquakes.

(b) **Revision of town planning bye-laws** and adoption of model bye-laws.

(c) Wide dissemination of **earthquake-resistant building codes**, the National Building Code 2005, and other safety codes.

(d) **Training of trainers** in professional and technical institutions.

(e) **Training professionals** like engineers, architects, and masons in **earthquake resistant construction**.

(f) **Launching demonstration projects** to disseminate earthquake-resistant techniques.

(g) Launching **public awareness campaigns on seismic safety and risk reduction** and sensitising all stakeholders to earthquake mitigation.
(h) Establishing appropriate **mechanisms for compliance review** of all construction designs submitted to ULBs.

(i) **Undertaking mandatory technical audits** of structural designs of major projects by the respective competent authorities.

(j) **Developing an inventory** of the existing built environment.

(k) **Assessing the seismic risk and vulnerability** of the existing built environment by carrying out structural safety audits of all critical lifeline structures.

(l) Developing **seismic strengthening and retrofitting** standards and guidelines for existing critical lifeline structures.

(m) Undertaking seismic strengthening and retrofitting of **critical lifeline structures**, initially as pilot projects and then extending the exercise to the other structures, **in a phased manner** to include schools, hospitals, super malls, entertainment multiplexes, etc., and carrying out mock drills for enhancing preparedness.

(n) **Strengthening the EOC network**.

(o) Streamlining the **mobilisation of communities, civil society partners**, the **corporate sector** and other stakeholders.

(p) **Preparing community and village level DM plans**, with specific reference to management of earthquakes.

(q) **Carrying out the vulnerability assessment of earthquake-prone areas** and creating an inventory of resources for effective response.

(r) Introducing **earthquake safety education in schools, colleges and universities** and conducting **mock drills** in these institutions.

(s) Strengthening **earthquake safety research and development** in professional technical institutions.

(t) Preparing **documentation on lessons from previous earthquakes** and their wide dissemination.
(u) Developing an **appropriate mechanism for licensing and certification** of professionals in earthquake-resistant construction techniques by collaborating with professional bodies.

(v) Preparing an **action plan for the upgradation of the capabilities** of the IMD and BIS with clear roadmaps and milestones.

(w) Developing **appropriate risk transfer instruments by collaborating** with insurance companies and financial institutions.

(x) **Operationalising the NDRF battalions.**

(y) **Operationalising the SDRF battalions** in the states.

(z) Strengthening the **medical preparedness** for effective earthquake response, etc.

(aa) Enforcement and monitoring of **compliance of earthquake-resistant building codes, town planning bye-laws** and other safety regulations.

**Suggestions on Flood Management in India**

18. Every year, from the month of June to September, India receives 75 per cent of the total annual rainfall. Hence, it is not unusual to see floods wreaking havoc in many parts of the country. Millions of hectares of area get affected by it. India remains perpetually vulnerable to floods as every year, 5 to 6 tropical cyclones occur in the Bay of Bengal and other natural disasters like landslides and earthquake also occur on a regular basis. Every year, millions of people get displaced from their homes and huge damage is caused to crops and other assets. Despite National Flood Control Programme being launched in India in 1954, **India has still not managed to evolve a decent flood management system.**

19. Several traditional measures to control floods have been tried so far like **building embankments** to control the flow of river and constructing reservoirs to ensure release of water at a controlled rate. However experience has shown that these structural measures to control floods are **negated by large scale deforestation** that has taken place over the years in several parts of the country. Advancement in construction technology has also has had a negative impact on flood control as large scale construction activities have started to take place on the flood plains. Economic factors become more important and those who support the construction activity on the
flood plain turn a blind eye to the disastrous impact it can have on the environment.

20. It has also been argued by some environmentalists that in order to control floods, the level of water in the reservoir of the dam should be kept at minimum level. However in order to generate hydro-electricity and bring more agricultural area under irrigation, the level of the water in the reservoir is kept high which leads to flooding in the upstream areas. Thus the measure that is often touted as a solution to the flood woes itself becomes a cause of it.

21. It is therefore, high time for the government to look for ecological measures that can help in the management of floods on a durable, long-term basis. **Afforestation of the flood plains** must be encouraged as trees not only absorb rainfall water but also obstruct its flow to the rivers. Construction activities on the flood plains should be stopped altogether. The flood plains, being very fertile, can be used for economic activities like agriculture. Those living in flood plains for these activities should have an efficient early warning mechanism that ensures their evacuation before the calamity strikes. With the advancement in space technology that India has achieved, remote-sensing should be effectively used for prediction of rainfall and floods. It is only with these comprehensive and holistic measures that an efficient management of floods can be ensured in India with least damage to life and property.

**Approach Towards Multi Hazard Safety Measures in Coastal Areas**

22. **General Measures.** Following are the measures that need to be implemented:

   (a) **Adopting integrated multi-hazard approach** with emphasis on cyclone and tsunami risk mitigation in coastal areas.

   (b) Implementation of **early warning system** for cyclones and tsunamis.

   (c) **Streamlining the relief distribution system** in disaster affected areas.

   (d) **Design, practice and implementation of evacuation plans** with emphasis on self reliance for sustenance with the locals (coastal community).

   (e) Component on planning for **reconstruction and rehabilitation** should be added in disaster management plans at all levels.
(f) Emphasis on mental health and to socio-psychological issues should be accorded in every plan.

(g) Identification and strengthening of existing academic centers in order to improve disaster prevention, reduction and mitigation capabilities.

(h) Capacity building programmes to be taken up on priority basis:

(i) Training of all concerned including community.
(ii) Public awareness programmes.
(iii) Enhancing capabilities of the Institutes working in field of disaster mitigation and management.

Management of Tsunamis: A View Point

23. **Structural Measures.** Following are the various structural measures recommended:

(a) Construction of cyclone shelters.

(b) Plantation of mangroves and coastal forests along the coast line.

(c) Development of a network of local knowledge centers (rural/urban) along the coast lines to provide necessary training and emergency communication during crisis time (e.g. centers developed by M.S. Swaminathan Foundation in Pondicherry).

(d) Construction of location specific sea walls and coral reefs in consultation with experts.

(e) Development of break waters along the coast to provide necessary cushion against cyclone and tsunami hazards.
(f) **Development of tsunami detection, forecasting and warning dissemination centres.**

(g) Development of a “Bio-Shield” - a narrow strip of land along coastline. Permanent structures should come up in this zone with strict implementation of suggested norms. Bio-Shield can be developed as **coastal zone disaster management sanctuary**, which must have thick plantation and public spaces for public awareness, dissemination and demonstration.

(h) **Identification of vulnerable structures and appropriate retrofitting** for tsunami/cyclone resistance of all such buildings as well as appropriate planning, designing, construction of new facilities like:

(i) Critical infrastructures e.g. power stations, warehouses, oil and other storage tanks etc. located along the coastline.

(ii) All other infrastructure facilities located in the coastal areas.

(iii) Public buildings and private houses.

(iv) All marine structures.

(v) Construction and maintenance of national and state highways and other coastal roads.

24. **Non-Structural Measures.** The under mentioned measures need to be ensured:

(a) Strict implementation of the **coastal zone regulations** (within 500 m of the high tide line with elevation of less than 10 m above m.s.l.) Table 5(1) is a proposed damage Risk Zone classification on sea coast for consideration.
Table 5(1): Proposed Damage Risk Zone Classification on Sea Coasts

<table>
<thead>
<tr>
<th>Height Above High Tide Level</th>
<th>Damage Risk Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 m</td>
<td>Very High Damage Risk Zone</td>
</tr>
<tr>
<td>1-3 m</td>
<td>High Damage Risk Zone</td>
</tr>
<tr>
<td>3-5 m</td>
<td>Moderate Damage Risk Zone</td>
</tr>
<tr>
<td>5-10 m</td>
<td>Low Damage Risk Zone</td>
</tr>
<tr>
<td>10m or more</td>
<td>No Damage Risk Zone</td>
</tr>
</tbody>
</table>

(b) Mapping the coastal area for multiple hazards, vulnerability and risk analysis up to taluka /village level. Development of Disaster Information Management System (DIMS) in all the coastal states.

c) Aggressive capacity building requirements for the local people and the administration for facing the disasters in wake of tsunami and cyclone, ‘based on cutting edge level’.

d) Developing tools and techniques for risk transfer in highly vulnerable areas

e) Launching a series of public awareness campaign throughout the coastal area by various means including AIR, Doordarshan & Other Media.

(f) Training of local administration in forecasting, warning, dissemination and evacuation techniques.

(g) Awareness generation and training among the fishermen, coast guards, officials from fisheries department and port authorities and local district officials etc., in connection with evacuation and post tsunami storm surge management activities. Regular drills should be conducted to test the efficacy of the DM plans.

(h) Studies focusing on the tsunami risk in India may be taken under NCRM project.
Recommended Actions Required in Coastal Areas for Protection against Tsunami / Cyclone Mitigation

25. To achieve the satisfactory level of disaster mitigation in coastal areas, following activities need to be carried out:

(a) **Revision of Coastal Zone Regulation Act** in wake of tsunami storm surge hazards and strict implementation of the same. This responsibility could be given to respective state disaster management authorities. A special task force for this purpose may have to be constituted comprising the representatives from various departments of the government and other relevant organizations (e.g. Departments of Forestry, Fisheries, Soil Conservation, Town and Country Planning Organization, Navy, Coast Guard, IMD, ISRO/DOS etc.)

(b) **A state of the art EOC** may be established within the authority for monitoring purpose.

(c) **Initiating disaster watch** (bay watch) safety measures along important beaches in the country, providing round the clock monitoring, warning, lifeguard facilities & creation of website for missing personal etc.

(d) **Organization of sensitization workshops** on cyclone/tsunami risk mitigation in various states for senior bureaucrats / politicians for these states.

(e) **Organizing drills on regular basis** to check the viability of all plans and to check the readiness of all concerned.

(f) **Training of professionals**, policy planners and others involved with disaster mitigation and management programmes in the states.

(g) **Retrofitting** of important buildings:

(i) Fire stations / police stations/ army structures/ hospitals.

(ii) VIP residences / offices/ railways, airports, etc.
(iii) Schools/colleges.
(iv) Hazardous industries.
(v) Other critical structures (i.e. power stations, warehouses, oil and other storage tanks etc).
(vi) **Designing incentives:** Providing legislative back up to encourage people to adopt cyclone, tsunami resistant features in their homes e.g. **tax rebate** in terms of house tax and/or income tax.

(h) **Developing public–private partnerships.**

**Nuclear Disaster Management: A Suggested Frame Work**

26. **Elaborate and reliable safety** systems need to be put in place in all the nuclear facilities in India. As a matter of abundant caution, even though highly unlikely, certain ‘beyond design basis accidents’ are also postulated, which can lead to a radiation emergency in the public domain. Accordingly, while preparing the response plans to handle local emergencies within the plant, plans have also been drawn up for handling emergencies in the public domain.

27. Based on the radiological conditions and their consequences, emergencies at nuclear facilities are categorised as emergency standby, personnel emergency, plant emergency, on-site emergency and off-site emergency. For the first three types of emergencies, in the order of severity which are foreseen as possible, though with very low probability, detailed plant-specific emergency response plans must be put in place. In all these situations, the consequences of the accident are expected to be limited to the plant only.

28. Similarly, for the next higher level, viz., on-site emergency, where the consequences of an accident are not likely to cross the site boundary, a detailed response plan must exist. This emergency does not lead to any radiation release in the public domain.

29. The last type of emergency scenario (having the highest level of severity in the category of nuclear emergency in the nuclear facilities), even though with a very low possibility of radioactive releases in the public domain, is off-site emergency for which detailed response plans need to be
put in place by the district magistrate/collector of the area in coordination with the plant authorities.

30. Each nuclear power station of the present generation has an Exclusion Zone surrounding the power station in which no habitation is permitted and this area is under the administrative control of the plant authority. An area of larger radius outside the Exclusion Zone be declared as the **Sterilised Zone** where growth and development need to be restricted. The **Emergency Planning Zone (EPZ)** must extend further beyond the **Sterilised Zone**.

31. It has been made mandatory by the AERB for all nuclear power plant operators to have comprehensive and well laid out plans to deal with all the above types of emergencies. It maybe mentioned that the AERB must not permit the operation of a new power plant until **preparedness plans are in place** for the postulated emergency scenarios. Barring the offsite emergency response plan, the other plans fall within the domain of responsibility of the facility operator and the AERB, in all circumstances, has to approve these plans.

32. As per statutory requirements, the local district administration must be made responsible for drawing up and rehearsing the emergency plan in coordination with the facility operator. It is also mandatory for the power plant operators to periodically rehearse these plans by way of exercises and based on the feedback and experience, take corrective measures. As the first stage of the trigger mechanism, CMG, DAE, and there source agencies are alerted even when a plant or site emergency exercise is conducted.

**Strategies Recommended to Avert Nuclear Disasters/Emergencies**

33. **Capacity Development**: The major **strategies recommended** with regard to capacity development and building of technical support systems are to:

   (a) **Bridge the existing gap** in capacities between current needs and current means.

   (b) **Increase the capacity at all levels** to cope with the enhanced demand for handling nuclear accidents.
(c) Establish/strengthen partnership and liaison among the industrial and hospital clusters handling radiation sources. Encourage technical cooperation among them for management of nuclear emergencies.

(d) Encourage stakeholders (like academia, research institutes, medical facilities) to develop and promote programmes on nuclear safety and undertake R&D work that will assist in capacity development.

(e) Promote coordination and access to information on capacity development for the management of nuclear accidents in a transparent way.

(f) Facilitate adequate financial, technical, and infrastructural support for capacity building through sharing of experience and technical cooperation.

**Education, Knowledge Management, Awareness Generation and Training of Stakeholders**

34. For the success of nuclear/radiological emergency management, the most important factor is the confidence level in the community at large to cope with such an event. Education, awareness generation and knowledge management of information related to nuclear/ radiological emergencies have an important role to play in this context.

35. Once a community becomes familiar with the beneficial aspects of nuclear energy and the capability of nuclear facility operators in India to handle the hazards, their anxiety and fear towards the nuclear energy programme, in general, and nuclear accidents, in particular, will reduce considerably. Education on nuclear emergency/disaster management is essential for both the community as well as for stakeholders.

**Education and Knowledge Management**

36. The strategic approach with regard to education, information dissemination and training of nuclear emergencies should be to ensure that:

(a) All undue apprehensions or panic in the public mind regarding a peaceful nuclear power/radiological programme is allayed completely.
(b) **Knowledge and information** on radiation/radioactive substances and nuclear emergency management is adequate and **widely disseminated across the country**.

(c) The **occupational workers and response forces can perform their duties efficiently during nuclear/radiological emergencies**.

37. Education and upgradation of the knowledge base on nuclear/radiological emergency/disaster management is, therefore, essential for all stakeholders, starting from the community to the government agencies at various levels.

**Student Community and Administrative Personnel**

38. Disaster awareness in the community can be spread effectively through the student community by including relevant topics in the **syllabi of the science streams**, pertaining to nuclear/radiological emergencies/disasters such as radiation, effects of radiation on biological systems and the environment, reduction of exposure through the principles of time, distance and shielding, etc. This can **be done at the school as well as college levels**.

39. The Ministry of Human Resource Development (MHRD), with the active support of MHA, should **ensure that the student community is imparted proper education** on the relevant topics by schools/colleges. The teachers will be specially trained for this purpose, through the Central Board of Secondary Education (CBSE) and State Secondary Education Boards.

40. Similarly, the syllabi of the basic courses in Lal Bahadur Shastri National Academy of Administration (LBSNAA), state Administrative Training Institutes (ATIs), academies of the armed forces, paramilitary forces, police service, and MBA programmes should also include similar topics with added emphasis on the management of nuclear/radiological emergencies/disasters.

41. The institutional training will be imparted by the NIDM with guidance from DAE and NDMA. Education being an area of keen interest to the private organisations in our country, public-private partnerships would be effective in this programme.
42. Such educational programmes will help establish the necessary knowledge base at the preliminary level in the public domain.

Community Education

43. Despite the initiatives taken at various levels to allay apprehensions about radiation and the nuclear energy programme, presently the public perception of the possible adverse affect of any nuclear/radiological accident is far detached from the ground reality. It is necessary to address this issue through an effective community education programme where preliminary information on nuclear/radiological emergencies will be disseminated. Such information must be authentic, accurate, need based, and easy to understand. The agency entrusted with this task must enjoy credibility and acceptability in the community in order to win its confidence.

44. The responsibility for community education should rest with the nuclear installations, industries using radioisotopes, user hospitals of radioisotopes, institutions involved in radiation research, and disaster management authorities at the district and state levels, including NIDM and NDMA.

45. The literature used for dissemination of information should be prepared in vernacular languages and reviewed and updated periodically, by a group to be established by MHRD in consultation with the Core Group on Nuclear Disaster Management set up by the NDMA.

46. As a matter of strategy, information relating to expected community response in case of nuclear emergencies/disasters can also be shared with the community through health camps, etc., for better effectiveness. Hospital authorities can play a major role in community education regarding the effects on health due to radiation exposure as they enjoy greater credibility in the community.

Education of Professional Personnel

47. The availability of professional expertise is a crucial factor for the successful dissemination, monitoring and sustainable implementation of the nuclear emergency/disaster management action plans at various levels (including government agencies).
48. The nuclear DM framework also imposes additional responsibility on the professionals to improve their skills and expertise to stay tuned to best practices the world over for safer nuclear energy/radiation applications, so as to contribute to capacity building. DAE should get actively involved in this programme and guide this effort.

**Enhancing Public Awareness**

49. Most nuclear facilities should conduct a number of public awareness generation programmes, though limited to around the facility to make the public aware of various preparedness/ response plans of the facility operators. This should done be so that the public get the **proper perspective** and confidence and **do not panic** in the event of any nuclear emergency.

50. With the increasing use of nuclear and radiation technologies for societal benefit, conscious efforts should be made to enhance public awareness on the benefits as well as hazards of nuclear/radiological technology and nuclear/radiological emergencies/disasters, including the measures taken to ensure safety at nuclear facilities. The fact that ‘alarm bells’ start ringing in the field of nuclear science and technology much earlier in comparison to other technologies, should be stressed. The awareness programme will also educate the public on the simple measures they can take to protect themselves in the event of their encountering any radiation emergency scenario.

51. **Awareness programmes** should be conducted in the form of symposia, workshops, interactive sessions, exhibitions, etc., using printed material like pamphlets, brochures, etc., which are also to be made available in vernacular languages, so as to reach the maximum number of people in the country. Use should also be made of all forms of media i.e., print, audiovisual and electronic in an appropriate way. The target groups for these programmes will be school and college students, teachers, government officials and technocrats. To start with, the people living in and around nuclear facilities and major metros should be the chosen groups for promoting awareness generation programmes on radiation emergency scenarios.

**Community Participation**

52. The best way to win the confidence of the community for handling nuclear/radiological emergencies/disasters is to **involve them in the various stages of nuclear emergency**
management activities right from the planning stages of the DDMAs, SDMAs, and local bodies through:

(a) Community education, awareness generation, and training.

(b) Participation in off-site emergency exercises.

(c) Sharing of the results of community response in off-site emergency exercises;

(d) Analysis and necessary upgradation of response programmes.

Medical Preparedness for Nuclear Emergencies/Disasters

53. In each constituent unit of DAE, a few doctors need to be dedicated and given the necessary training in the medical management of radiation emergencies. All nuclear power plants and the Bhabha Atomic Research Centre (BARC) must be equipped with radiation monitoring instruments, have personnel decontamination centres and the necessary stock of antidote medicines and specific de-corporation agents for typical radio-isotopes.

54. A few hospitals in the country need also to be equipped with the facilities required for bone marrow transplantation, which will be useful in managing cases of acute whole body irradiation. Further, doctors from various defence units and other organisations in the country are also to be trained in the medical management of nuclear emergencies.

Need for a Network of Emergency Response Centres and Crisis Management Group

55. As a basic regulatory requirement, emergency preparedness exists at all nuclear and radiation facilities to respond to any on-site or off-site emergency in their areas. But to handle radiological emergencies arising from a transport accident or from the movement/handling of ‘orphan sources’ (radioactive sources that have lost regulatory control are called ‘orphan sources’) or due to malevolent acts like explosion of an RDD, Radiation Exposure Device (RED) or IND any time or anywhere in the country, a network of 18 units of Emergency Response Centres (ERCs) has been established by BARC, DAE. This number is far too inadequate and needs to be enhanced. This network is basically meant for responding to such emergencies and also providing timely advice and guidance to first responders at the state and national levels. These ERCs are equipped with radiation monitoring instruments, protective gear and other
supporting infrastructure. The geographical locations of these 18 ERCs are shown in Figure 5(2). Many units of nuclear **Emergency Response Teams (ERTs)**, consisting of personnel from different DAE units, are also being raised. The centralized agency, called the CMG, at DAE must coordinate with the nuclear/radiological emergency management activities not only by activating these ERCs and ERTs but should also mobilise resources from all DAE facilities at the time of crises.

![Image: Location of the Emergency Response Centres (ERCs) established by BARC*](image)

* More of these are planned to be established in due course

### Disaster Management Related To Actions / Coordination By The Armed Forces

56. Some points for consideration which will affect the Armed Forces' response and possible measures to improve upon their capability for the same are enumerated in the succeeding paragraphs.

57. **The Way Ahead For Capacity Building.**

(a) **Contingency Planning.** Our present plans primarily address only floods and earthquakes. We need to identify all possible natural / man-made disasters
and draw out well thought-out, practically feasible and flexible contingency plans for an appropriate and quick response at all levels.

(b) **Synergy and Maximising Capabilities.** Despite the revamping of the structure, adequate interface between the main stakeholders, i.e. the civil Administration, Armed Forces, Public/Private Enterprises, NGOs and the Community is still lacking, resulting in lack of synergy and understanding of each other’s capabilities and work culture. Vital equipment like rail medical vans, bridges, earthmoving plants, cranes and so on, should be identified by respective States/departments, including BRO, and placed at the disposal of Army columns till additional relief effort is mobilised. It is imperative that all agencies, including the Army, are mutually aware of the locations of each other’s equipment. To that extent, the operationalisation of India Disaster Resource Network, a web enabled GIS-based resource inventory, will be a step in the right direction.

(c) **Disaster Relief Bricks.** Despite our vast experience and repeated exposure to various types of disasters over the years, specialist equipment and reserve stocks are not available in the right quantity and at the right place. As a result, the response not only gets delayed, but the civil administration also tends to seek immediate Army assistance in terms of provisioning of critical equipment. This can be obviated by adopting the ‘brick system’ - with a brick (or a standardised unit of certain disaster relief stores for planning purposes). These bricks could be categorised into **immediate rescue and relief bricks (Basic Brick)** and **follow up relief and restoration bricks**, duly complemented with **Incremental Bricks** for each type of disaster, i.e. Cyclone, Floods, Tsunami, Chemical, Biological contamination as also ‘**Medical relief Bricks**’. Based on the vulnerability of each region to a specific type of disaster, these bricks could be strategically located in varying combinations, to facilitate timely movement and deployment. The ideal strategic locations, so identified could be as illustrated below:
CATEGORIES OF BRICKS
- Basic Brick

Incremental Bricks
- Type A - Cyclone / Flood / Tsunami
- Type B - Earthquake / Landslide
- Type C - Avalanche / Snow Storm
- Type D - Surgical Increment
- OT Module Base Hospital
(d) **Evacuation of Cities.** Apart from natural disasters, evacuation of cities could be triggered off by manmade disasters, to include terrorist attacks. The Armed Forces would invariably get involved, and our response plans must cater for such contingencies.

(e) **Early Warning And Communications.** There is an acute need for state-of-the-art early warning systems. However, such warning systems will be effective, only when suitably networked with other means of communication. Army troops, being located in the remotest areas, should be in a position to hook on to the disaster forecasting networks, for timely passage of information. Due thought must be given to achieving a very high level of integration and interoperability, for timely warning and communication amongst the concerned agencies and the affected area.

(f) **National Disaster Response Force (NDRF).** The Government has planned to raise a National Disaster Response Force, with the states too acting on similar lines. Requisite impetus must be given to raise, equip and train these task forces so that they become effective on ground at the earliest. These task forces need to work and train alongside the Army task forces for joint strategies and drills. Legislation should exist for employing ex defence officers and ex-servicemen in these units.

(g) **State of the Art Equipment.** We need to procure state-of-the-art disaster rescue equipment, which would enhance our capability to operate at night as well. Detection sensors, based on audio and video display, would considerably enhance our life saving capability. The equipment, so procured, should be common amongst all responders.

58. **Response and Relief.**

(a) **Dynamic Civil Military Liaison.** The initial stages of any disaster are very critical, wherein the communication link between the Army and Civil Authorities must function dynamically on a ‘two way’ and ‘pro-active’ basis, to facilitate timely deployments of troops. We must not forget that any aid provided immediately after the critical period, howsoever hyperactive and
dynamic may fail to deliver the required impact later if liaisoning links get loose. Thus, it should remain intact throughout operation.

(b) **Damage Assessment.** On occurrence of a disaster, critical time is lost in ascertaining the exact nature and extent of damage. Aerial reconnaissance, utilising helicopters or Unmanned Aerial Vehicles (UAVs) is the most effective method for which the Armed Forces could be incorporated at the possible earliest.

(c) **Dynamic Leadership.** Technological advancements may provide us with adequate warning to prepare for an impending disaster. However, the mere existence of glossy disaster management plans serves no purpose, in case they cannot be effectively implemented on ground. The battle by Army can only be won with the will to act on information and dynamic leadership by the concerned civil hierarchy.

(d) **International Assistance.** In any critical situation demanding regional or international assistance from our side, the Armed Forces are expected to procure sizeable material in the shortest time frame, as also deliver the same. Instead, the Ministry of Home Affairs, in consultation with Ministry of External Affairs, must build on their links with the trade and have standing arrangements for procurement of rate contract items in the shortest possible time frame. The operational stores of the Armed Forces should be tapped only as an exception.

59. **Some Navy Specific Recommendations.** Some important lessons learnt by the Navy in an analysis of efforts post Tsunami will serve as a useful guide for the future and are as below:-

(a) **Force levels.** In most of the Tsunami affected areas, the port facilities/jetties were found damaged, precluding alongside berthing of ships/boats. As a result, landing of relief supplies ashore was severely hampered. In some places the only means of communication with shore was the ship’s helicopters/boats. The Navy is reviewing the existing force levels to plan future inductions accordingly. The review of force levels would have to include the following capabilities:-
(i) Ships with crane facilities.

(ii) Medium and heavy lift capable helicopters.

(iii) Increasing the stock holding of the number of landing crafts (assault) with each command over and above the integral ship fits to cater for disaster relief operations.

(iv) Multi-purpose helicopters; capable of being transported on larger naval ships.

(b) **Logistics.**

(i) **Relief stores.** Creation of separate disaster management stores, readily available in a container are required to help in faster response and easy dissemination in disaster affected areas. The two major Naval commands Western Naval Command (WNC) and Eastern Naval Command (ENC) now cater to relief stores for 5000 personnel while Southern Naval Command (SNC) and Andaman and Nicobar Command (ANC) cater to 3000 personnel. These stores would have to be contained in manageable bricks, which could be dispatched by the commands depending upon the nature and magnitude of the disaster by the fastest means. The relief stores comprising perishable and non-perishable items would have to be stocked in bricks. These could be medical bricks, communication bricks, rescue and rehabilitation bricks, clothing bricks, bricks of **meals ready to eat (MRE)** or a community kitchen brick. Each brick will have to cater to a specific number of people. For example, a community kitchen brick would cater to 250 families with 4 members each and is fully equipped with food items and hardware to handle the task.

(ii) **Financial Powers.** For the first time in post Tsunami financial powers, actually applicable during disaster, were sanctioned by the government. A sum of Rs 30 crores was allocated immediately to meet contingent expenditure. Contingent funds will similarly have to be
created and parked for immediate release for when a requirement comes up. Logistics stores, which are typically non-naval stores but are required specifically for relief will have to be identified and catered for.

(iii) **Commercial Off the Shelf Items.** Most of the items that were dispatched for relief were from store depots. Some items that could have been useful for providing relief are not held in Naval inventory and hence could not be dispatched. Therefore, financial powers of administrative authorities need to be suitably modified / augmented for **procurement of commercial off the shelf (COTS) relief items from the local markets.**

(iv) **Medical Stores.** Medical stores, with which the ships initially depart base ports, were pre-packed and readily available. The medical stores need to be revamped vis-à-vis specific disaster relief operations and follow on supplies ensured. Trained medical assistants should be part of the relief team to carry out water testing, chlorination and mosquito control measures. The Navy is also looking at a contained fully equipped hospital, which could be transported onboard.

(v) **Communication.** Invariably, any major disaster paralyses the local communication system and it takes time and extensive efforts to restore it. Relief operations should therefore provide effective communication in disaster affected areas, through:

(aa) Adequate equipment for timely dissemination of damage assessment and projection of relief requirements

(ab) ISD enabled mobile phones for effective establishment of an informal emergency communication line.

(ac) INMARSAT mobile terminals / mobile phones, for relief detachments especially in foreign countries.

(ad) Self-sufficient communication facilities for all relief teams.
(ae) The telephone numbers / contact procedure of various district authorities must be regularly checked, updated and readily available in the contingency plans.

(vi) **Hospital Ships.** Surveys ships have been exercised in the past for conversion into a hospital ship and the post Tsunami operations were the first occasion that the facilities were actually utilised. Experiences in the Tsunami made us realise that we can improve their utilisation by:

(aa) Providing additional *lifejackets*.

(ab) Adding to the number of stretchers on board as part of relief stores.

(ac) Providing *lightweight tents* for medical camp ashore.

(ad) Providing additional portable V/UHF communication sets (Motorola) between detachments ashore and ship.

(ae) Providing *portable generator sets* for medical and relief camps ashore.

(af) Providing *high speed boats* for undertaking relief ops.

(ag) Positioning *psychiatrist and public health officers* as part of the medical team.

(ah) **Modification of wards and sanitary facilities** on board to accommodate women patients.

(vii) Finally, there is no substitute for mission planning. Good groundwork and liaison before the ships’ arrival at any foreign port needs no emphasis. Broad guidelines to the Defence / Naval attaches in this regard will need to be formulated.
60. **Some Air Force Specific Recommendations.** Certain areas which we need to focus on for the future to synergise efforts are:-

(a) **Understanding the limitations of Air effort** during disaster relief/Rescue work.

(b) **Invest in Air Logistics** Infrastructure.

(c) Need for coordinated take-off during initial response.

(d) **Trained and dedicated relief and Rescue work-force.**

(e) Improve **civil-military coordination.**

(f) Proper packing of relief supplies and **containerisation** of relief material.

(g) Delay on ground because of administration support and infrastructure to be avoided.

(h) **Lessons learned to be shared** with all coordinating agencies.

(j) **Periodic Joint Seminars** to exchange knowledge and information should be conducted.

61. Lastly our approach to disaster management should be based on the **four pillars of Integration, Preparedness, Dynamism and Implementation.**