

Draft Blue Book on management of cyclone – inviting comments of all stakeholders

As per the directive of the PMO, a Committee was constituted vide MHA letter no. 1-7/2014-NDM-I dated 20th October 2014 to draw lessons from the experience of management of 'Hudhud' cyclone and prepare Blue Book for better management of Cyclones. The committee is chaired by the Joint Secretary (Disaster Management), MHA has representatives of IMD, Ministry of Road Transport & Highways, Ministry of Information Technology and Communication, Ministry of Defence, NDMA, NIDM and State Government of Andhra Pradesh. Though a representative of Government of Odisha was formally not a part of the Committee, the views of the Government of Odisha were obtained, keeping in view their experience in dealing with 'Phailin' as well as 'Hudhud'. After incorporating the views of all concerned, this draft Blue Book on management of cyclone has been prepared.

2. It may be noted that NDMA had already published a detailed "Guidelines on Management of cyclones". This Blue Book does not seek to duplicate the work of the above NDMA guidelines. However, this is meant to be a brief document containing the practical points essential for management of cyclones, to minimise the loss of human lives and property.

3. This Blue Book has been attempted based on the best practices in the management of cyclones. It demarcates the management of cyclones in three phases i.e. pre-disaster preparedness, Response phase and post disaster recovery and reconstruction phase. This Blue Book also contains a list of do's and don'ts for the people living in the cyclone prone areas.

4. It is requested that views/comments/suggestions on this draft 'Blue Book on management of cyclones' may be forwarded to this Ministry latest by **30.04.2015** at the following address:

Deputy Secretary (DM-I)
Disaster Management Division
Ministry of Home Affairs
NDCC-II Building, Jai Singh Road
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Draft Blue Book on Management of Cyclones

1.0 Introduction:

1.1 Cyclones are ocean-atmospheric phenomena. They form a part of nature's meteorological cycle. Cyclones are rapid-onset events characterized by violent winds and storm surges. These characteristics, coupled with rains, consequential flooding and inundation of the land area, cause major damage. The frequency of cyclones in Bay of Bengal and Arabian Sea and the long Indian coastline make us vulnerable to Cyclones.

1.2 Damages due to cyclone occur in two stages. The first one is during the inception of the cyclone and the land-fall, which is associated with high velocity whirling winds coupled with rainfall and storm surges leading to saline water inundation that damages fragile infrastructure, trees and horticulture crops. The other one is land-fall and post-landfall damage due to inland flooding.

2.0 Major cyclones that affected India in recent period:

2.1 The Very Severe Cyclonic Storm PHAILIN had landfall near Gopalpur, in Ganjam District, Odisha, around 2105 hrs IST of 12th October 2013 with a sustained maximum surface wind speed of 200-210 kmph gusting to 220 kmph. The influence of Phailin, of 2013, had a large land spread and a telling effect on two front-line States - Odisha and Andhra Pradesh- involving a dislocation for and evacuation of 12.65 lakh people- 11 lakh people in Odisha covering 14 districts, and the remaining in Andhra Pradesh. It also influenced the States of West Bengal, Bihar and Jharkhand through rains, land sub-mergence and other dislocations. Phailin that battered two States was managed with a minimum loss of life. This low level of human casualty, was attributed to the commendable role of the IMD (Indian Meteorological Department) in accurately forecasting the track, intensity and landfall point & time of the storm and the periodicity of advisories bearing enough lead time for enabling responsive follow up action by the Governments of Odisha and Andhra Pradesh and thus became a bench-mark event.

2.2 The Very Severe Cyclonic Storm 'HUDHUD' (07-14 Oct. 2014) developed from a low pressure area which lay over Tenasserim coast and adjoining North Andaman Sea in the morning of 6th Oct. 2014. It concentrated into a Depression in the morning of the 7th Oct. over the North Andaman Sea. Moving west-northwestwards it intensified into a Cyclonic Storm (CS) in the morning of 8th Oct. and crossed Andaman Islands close to Long Island between 0830 and 0930 hrs IST of 8th Oct.. It then emerged into Southeast Bay of Bengal and continued to move west-northwestwards. It intensified into a Severe Cyclonic Storm (SCS) in the morning of 09th Oct. and further

into a Very Severe Cyclonic Storm (VSCS) in the afternoon of 10th Oct. It continued to intensify while moving northwestwards and reached maximum intensity in the early morning of 12th with a maximum sustained wind speed of 180 kmph over the West Central Bay of Bengal off Andhra Pradesh coast. It crossed north Andhra Pradesh coast over Visakhapatnam (VSK) between 1200 and 1300 hrs IST of 12th Oct. with the same wind speed. After landfall, it continued to move northwestwards for some time and weakened gradually into SCS in the evening and further into a CS in the same midnight. It then, weakened further into a Deep Depression in the early morning of 13th and weakened into a depression in the evening of 13th. Thereafter, it moved nearly northward and weakened into a well-marked low pressure area over East Uttar Pradesh and neighborhood in the evening of 14th Oct. 2014.

2.3 In both the above cyclones, due to coordinated and timely measures taken by Central Government and State Governments, the human casualties were restricted to the minimum.

3.0 Learning from the experience of cyclone HUDHUD

3.1 Very Severe Cyclone 'HUDHUD' has crossed Andhra Pradesh Coast at Visakhapatnam. It is the first in the recent history that a storm with such an intensity has crossed urban area leading to higher degree of devastation. The event has been attended by the Central Government and the State Governments efficiently roping all the available technical options to minimize the impact. In spite of the best efforts and leadership, the event has thrown some light on the requirements of preparing better for future events.

3.2 As per the directive of the PMO, a Committee was constituted vide MHA letter no. 1-7/2014-NDM-I dated 20th October 2014 to draw lessons from the experience of management of 'Hudhud' cyclone and prepare Blue Book for better management of Cyclones. Details of the composition of the Committee are at **Annexure-A**.

3.3 The Committee was mandated to assess the preparatory measures taken and identify areas requiring improvement. The Committee was required to suggest long-term plans for cyclone prone areas, which may include (a) building norms (b) permanent evacuation routes (c) permanent helipads on roads (d) using other facilities as shelters (containers, etc.) (e) having alternate emergency communication channels (HAM radio) and (f) underground power lines. Further, the Committee was mandated to prepare a Blue Book of dos' and don'ts to all those living in cyclone prone areas on the steps to be taken once a cyclone warning is issued such as stocking upon food supplies, preparation for likely loss of power and water supply and other precautions.

3.4 It may be noted that NDMA had already published a detailed “Guidelines on Management of cyclones”. This Blue Book does not seek to duplicate the work of the above NDMA guidelines. However, this is meant to be a brief document containing the practical points essential for management of cyclones, to minimise the loss of human lives and property.

3.5 The suggestions of the members of the Committee were obtained. Though a representative of Government of Odisha was formally not a part of the Committee, the views of the Government of Odisha were obtained, keeping in view their experience in dealing with ‘Phailin’ as well as ‘Hudhud’. After incorporating the views of all concerned, this Blue Book on management of cyclone has been prepared.

4.0 Best practices for management of cyclone

This Blue Book has been attempted based on the best practices in the management of cyclones. It demarcates the management of cyclones in three phases i.e. pre-disaster preparedness, Response phase and post disaster recovery and reconstruction phase. This Blue Book also contains a list of do’s and don’ts for the people living in the cyclone prone areas.

4.1 Preparedness measures:

4.1.1 Long term preparedness: These are structural measures including construction of cyclone/ flood shelters, capacity building, policy planning, etc, which need to be carried out 2-12 months in advance and are given below:

- i. Disaster Management Plans at State and District level should be available on the ground to the field functionaries. The following salient points should be covered in the disaster management plans:
 - a) District Disaster Management Plans(DDMPs) should be based on actual field requirements. On the other hand, State Disaster Management Plans (SDMPs) need to reflect the aggregated district requirements. Mitigation Plan, Incident Response System may be included in the SDMP and DDMP.
 - b) While the SDMP has to be a Planning tool, DDMPs need to be an operational (reference) manual with specific physical details covering (i) all vulnerable areas, (ii) evacuation routes, (iii) alternative routes to shelters and (iv) shelter Maps indicating the nearby facilities. In addition, the DDMP can contain (i) work plans for teams constituted for various activities, (ii) activity segmentation within the team, (iii) inter activity coordination and monitoring by identified official/units in the

district Admn. and (iv) addresses and other contact details of local community leaders and their activity support etc.;

- c) The DDMP may include listing of the critical/essential resources required, equipment required, details of availability of such resources with contact address and contact numbers;
 - d) The DDMP may clearly define the role of Panchayati Raj Institutions (PRIs) and Urban Local Bodies (ULBs) in the Procurement/ arrangement of critical essential resources/ equipment (in peace-time) and also in relief operations.
 - e) The contribution of the NGO and corporate sector in the disaster response activities should be planned sufficiently in advance and clearly spelt out in DDMP;
 - f) The DDMP may delineate responsibilities for supply of Drinking water, distribution of essential items etc.. The private sector may be involved in the response activities;
 - g) The Preparedness Plan should be field-tested by way of mock drills and rehearsals; NGOs, Self Help Groups (SHGs) and local community leaders be involved in the mock drills;
 - h) Detailed SoPs may be prepared for each major area of Preparedness Plan. The SOPs should be a part of the DDMP. These SOPs should be reviewed annually.
- ii. All the major cities and towns may also prepare City Disaster Management Plans in synchronisation with the District Plans, as Urban Local Bodies play a major role in their jurisdiction during disasters. DDMPs need to be linked with sub district plans and concerned departmental plans for emergency response and mitigation work under development programme. Disaster management in small and medium towns need to be defined in line with the local district administration.
 - iii. The State Disaster Response Force might be created and strengthened to act as effective and specialised responders. Disaster response teams need to be formed at State, District and City levels. Instead of deploying officers on adhoc basis during emergencies, dedicated response team need to be constituted with predetermined responsibilities. The capability of disaster response team can be tested during mock drills and rehearsals.
 - iv. Fire services can be developed into 'multi-hazard response units', because of the fact that the number of fire stations in any State will be much higher than the number of possible NDRF / SDRF battallions. Fire

service Units in the Districts be strengthened with modern search and rescue equipment. Identification of the equipment be made in consultation with NDRF.

- v. Telecommunication network may get disrupted during a disaster. The State administration should procure adequate communication back-up including satellite phones. These satellite phones should be tested and kept in working conditions.
- vi. The DDMP must take into account the possibility that electricity may be disrupted. Therefore, alternative mechanisms at all critical places must be put in place well before. For example, heavy duty diesel pumps to take care of drinking water supply in urban areas.
- vii. Adequate numbers of cyclone shelters should be built in the cyclone prone areas. Management and maintenance of the cyclone shelters during the 'normal' time is crucial. These assets need to be used for all community based activities, so that the assets are in good working condition, operating expenses like diesel, electrical bulbs, toilet articles etc., are taken care of and the keys are available with a reliable custodian.
- viii. The PWD authorities need to undertake detailed pre-inspection of the roads and bridges before onset of the monsoon in order to take advance preventive action for dealing with any natural disaster and to minimize damage by disasters.
- ix. The Public Works Departments in the States may maintain a list of agencies/ places, where essential machineries and equipments for clearing highways, putting up temporary bridges etc. are available. This list should be updated every year in April. They may identify the locations, where essential construction materials for rehabilitation and repair of damaged roads are available. They may maintain an inventory of stock and update it regularly.
- x. As power supply may get affected during disaster, a list of agencies/ institutions where alternative power systems are available should be maintained and put into service for immediate repair and restoration of roads and Highways.
- xi. The NSS, NCC, NYK and student volunteers need be roped in to do the disaster management work. Volunteers of Red Cross, Civil Defence, and other Community Based Organisations should be involved. The process of involving all stakeholders needs to start during the normal time.
- xii. During a disaster, NGOs of various approaches and focus areas come in with offers to help. In order to ensure that the NGO support reaches all the affected areas, there should be active NGO coordination cells under

the chairmanship of the District Collector during normal times so that they can be effectively used to guide the private relief efforts at the time of need. NGO coordination may be done at State and district levels with clear-cut guidelines for relief and post disaster non relief works. Local NGOs and Donor agencies may be coordinated for evenly provisioning of their resources.

- xiii. The district authorities shall identify civil defence volunteers and train them with techniques of swimming, first aid, search and rescue operations. They should be provided with identity cards in all coastal villages and towns. The database of these volunteers with contact details shall be available in all forums. They need to be involved in mock drills. Skills/techniques of volunteers like Shelter Management, Relief and Coordination, Post Disaster Need Assessment, Trauma Counseling, Restoring Family links, Carcasses Management, Family Survival Kit may be included.
- xiv. An Annual Mock Drill needs to be conducted in a comprehensive manner. A fixed day for this activity can be considered for this purpose by the State Government (say 2nd Saturday of May every year). Depending on the hazard profile of the State, the State can plan one more mock drill in October every year. PRIs and ULBs need to be associated in the conduct of these mock drills.
- xv. An independent evaluation of mock drills by a pre-designated agency/ expert team must be conducted to look into the weakness and to take corrective actions.
- xvi. A nodal officer shall be designated in all key departments at State/ District/ City levels to coordinate with other departments on all aspects including mobilisation for community level preparedness.
- xvii. The guidelines of 'Incident Response System' need to be made use of in the training programme, so that at the time of need the team is effective

4.1.2 Medium term preparedness: These are contingency planning, preparedness meetings at different levels, structural and non-structural preparedness including organizing human resources etc., to be carried out during 2 months to 5 days preceding the cyclone and are given below:

- i. IMD has developed reasonably accurate advance warning capabilities. The pre-cyclone period should be made use of, by the district authorities, to take up pruning of tree branches along important highways.

- ii. The Urban local bodies may remove the hoardings immediately, on receiving the warning messages on cyclone, as the hoardings can be blown away and can cause immense danger.
- iii. The State administration should make arrangement for pre-deploying adequate number of boats in the flood prone areas.
- iv. Maintenance of the multipurpose cyclone shelters should be ensured in normal times, in a participatory manner, so that the assets are not usurped by the powerful sections of the society. They should be made use of in normal times for community events like marriage etc. This will ensure their upkeep and will also ensure that at the time of need, situations of 'watchman missing with keys' etc do not happen.
- v. The access roads to these shelters shall be laid/ upgraded/ maintained before on set of monsoons. The shelters can be used for storing relief material. All schools identified as shelters shall be prepared before on set of monsoons. The shelters shall have power back up. The railways stations, railway coaches, etc., can also be used as shelters.
- vi. The early warning alerts need to be widely disseminated. Sirens and loud speakers, etc., can be used in coastal villages/ towns. Traditional improvised dissemination methods of early warning such as conch, bells, Ghanta, drums may be kept ready to provide last mile connectivity.
- vii. Prior procurement of relief material is absolutely necessary, as several requirements can be anticipated. States should also try to have a rate contract system for essential relief items, so that they can be procured at short notice, without much of tender formalities. Annual meetings with vendors/providers of various equipment / resources/ ambulances shall be conducted and rate contract, shall be finalized. The vendors can also be involved during mock drills so that they are better exposed to emergency response.
- viii. Guidelines indicating type of ready-to-eat food materials and other items to be put in the bags may be formulated showing the air dropping specifications. Since air dropped bags are generally captured by able bodied men and community heavy weights, written appeals and awareness campaigns in local language in leaflet forms may be put in the air dropping bags.
- ix. Many districts in flood prone areas have the tradition of engaging boats from private sources for disaster duties. It should be ensured well before the rainy season that the previous dues of the boatmen are cleared, as otherwise they are not going to lend their boats when you need them. In the pre-monsoon season, all natural drainage channels to river systems in the district be checked and cleared for ensuring free flow of flood water.

- x. The States and districts should ensure that details of all the equipment, ambulances, drinking water bottling plant, resources including manpower resources, etc are uploaded in the website of 'India Disaster Resource Network' at the following link: <http://idrn.gov.in/default.asp> and make use of the same for optimization of resources.
- xi. Latitude and longitude details of all cyclone shelters and other multi-purpose shelters like schools etc along with their connectivity with main road network should be available in digitised form and hosted on SDMA/ State Government website, which will help speed up the relief efforts by the Indian Air Force.
- xii. All roads to be used as relief lines need to be identified long before the occurrence of the cyclone. The relief line data could be plotted on GIS platform for better assessment of the requirement and deployment of response forces.
- xiii. The State and UT administration should test their preparedness measures based on a check-list as indicated at **Annexure-B**.
- xiv. The Department of Telecommunications, Government of India may explore and popularise technology solutions to provide last mile connectivity for dissemination of early warnings through mobile telephones.
- xv. Wild life sanctuaries and zoological parks require special attention during cyclones. Authorities of all the concerned wildlife sanctuaries and zoological parks should remain vigilant during disasters, and take immediate steps with regard to restoration of barbed wire fencing or ring fencing. Timely attention in this regard can prevent poaching of protected animals and also prevent secondary disasters in the contingency of the wild animals escaping to civilian areas.

4.1.3 Measures immediately preceding an imminent disaster: These include preparedness measures like evacuation of the population likely to be affected, making man and material arrangement for shelter, food, etc. and ensuring disaster preparedness by Government offices at different levels within 120 hours to 6 hours preceding the landfall of cyclone and are

- i. Cutting equipment, road clearance equipment and machinery must be kept ready well before the event.
- ii. Alternatives to electricity should be kept ready. These can be diesel operated generator sets, pedal operated mobile phone chargers, solar lanterns etc. Petromax light may be another option for alternative light.

- iii. Proper telecommunication back up shall be maintained by the service providers so that the communications system won't collapse after disasters due to power failure. Each State Government shall deploy adequate number of satellite phones in cyclone prone areas.
- iv. The State Administration should take appropriate action on the warnings received from the designated agencies like IMD, CWC and INCOIS.
- v. Immediately on receiving the early warning message from IMD, Public road transport services be informed of the same by District Admn. and alerted not to ply transport to and fro in threatened areas. Their services of transport be ensured for relief operation.
- vi. After receiving the advance warning from the designated agency, the State Government should make arrangement for transporting and storing the relief material in safe places in the likely affected District/ Division/ Taluk head quarters, to ensure prompt supply of relief items to the affected people.
- vii. In urban areas, proper awareness generation shall be created to store essential goods like drinking water, milk, gas vegetable in advance. The departments should ensure the supply of these before disaster so that the breakdown of services cannot hamper normal life for 1-2 days after disaster.
- viii. Whenever relief material is required to be transported by air, the district administration should ensure that the relief kit, consisting of dry food, candles, match boxes, water purification tablets etc is packed in reasonable packages, during the night time and kept ready before the dawn, so that the air effort time is not wasted during the day and that the material is not too heavy to injure any person. Similarly, efforts should be taken to resort more to 'air-landing' of relief material wherever feasible, rather than 'air-dropping' so that precious resources are not allowed to get wasted.
- ix. The use of PDS outlets/ Ryatt Bazaars can be used to supply essential goods without giving any scope for hoarding/ black marketing.
- x. Prepositioning men and materials in vulnerable districts- NDRF (located within State), State Disaster Response Forces, State Fire service personnel deployed with equipment in strategic locations.
- xi. Evacuate the people from vulnerable areas to cyclone shelters and safe places. Due care needs to be accorded to women, children, senior citizens and to the disabled. Care must be taken to ensure that the rescue and relief support is given to everybody, without any discrimination of caste, community, religion, or language.
- xii. Make adequate arrangement of food, water, sanitation, lighting arrangement at shelters

- xiii. The State Govt should project all airlift requirements to the DCMG/HQ IDS, directly or through the Resident Commissioner. These airlift requirements should be deliberated by the DCMG and suitably informed to IAF, preferably in writing.
- xiv. Representative of State Govt/ Resident Commissioner should be available at the time of loading/ offloading of aircraft and would be required to sign all requisite documents (Indent Form, Flight Acceptance Certificates etc).
- xv. A check list of most essential activities during preparedness phase, after getting alert, during the event and after the event is given at **Annexure-C**.
- xvi. State administration may widely circulate the list of "Do's and Don'ts" for the people living in cyclone prone areas. Sample copy is given at **Annexure-D**.
- xvii. Before taking a decision on requisitioning Indian Air Force for air support activities during the response phase, the State Government authorities should ensure necessary preparedness. **Annexure-E** gives details of the steps needed.
- xviii. The Department of Food, Government of India will ensure that sufficient stocks of food grains are available at the designated godowns.
- xix. The Ministry of Petroleum and Natural Gas will ensure sufficient stocks of diesel, petrol, kerosene oil and aviation fuel at all the required locations.

4.2 Response Phase

- a) Search, rescue and First Aid may be taken up either during the cyclone or within one hour of the abatement of the cyclonic wind gust reaching safe levels (around 80 kmph).
- b) During rescue and relief operations, priority should be given to children, disabled people, elderly people and women.
- c) Relief line clearance is the first activity to be taken up immediately after the abatement of the cyclonic wind.
- d) Adequate provision of relief for human and animals (e.g. food, drinking water, medicine, clothes, etc.) may be ensured.
- e) Ensure co-ordination of different agencies by appointing nodal persons.

- f) Ensure that no epidemic is caused by taking care of speedy disposal of carcasses.
- g) To expedite decision making, concern agencies particularly road, power, rail, telephone etc. should constitute a special group in the concerned Ministry for quick assessment of damages and for taking rapid necessary action for making arrangements for rectification of damages and easing relief operations.
- h) If any relief material is looted by the restless crowd, the strategy should be to send more relief material along the same route, in order to saturate the need at the intervening areas and to ensure that the material reaches interior areas quickly, as police action during a disaster situation is neither feasible nor will serve the need to roll out the relief work.

4.3 Mitigation measures

- i. Helipads should be built at regular intervals along the highways. If the roads are constructed on a BOT mode, this should be a part of the construction agreement/ contract. Besides, helipads along the highways, School playgrounds and other open spaces in isolated vulnerable locations may be identified with their geographic coordinates long before the cyclone to be used as helipads or sites for air landing.
- ii. Support should be given to amateur radio volunteers during normal times so that they can play effective role during disaster.
- iii. Normal maintenance of the embankments should be done with high quality workmanship, in order to mitigate the flood risk.
- iv. There should be an incentivising mechanism to reward States/districts on the basis of their efficiency and rigour in preparedness.
- v. Care should be taken to see that the call for 'zero casualty' should not lead to artificial suppression of data.
- vi. List of volunteers trained in Cyclone Shelter Management and list of equipment in the Multipurpose Cyclone Shelter and their functioning status may be documented for easy access to shelter volunteers during emergency and normal time.
- vii. Long term mitigation measures, as identified in District Plans, shall be given priority and budgeted by stakeholder departments. They shall earmark at least 5-10% of budget for these measures in their Annual Budgets. There should be budgetary provision by line departments for Disaster Management and Mitigation.

- viii. In the Coastal towns and cities, the building rules/ bye –laws need to be revisited and necessary amendments on structural safety, use of material, guidelines on elevation height etc., may be done so that disaster resilient structures are built along coast.
- ix. The infrastructures in the vulnerable areas like roads, bridges, public buildings, communication systems and critical infrastructure like hospitals, air ports etc should be disaster resilient.
- x. An Aging test and assessment of retrofitting requirements be made mandatory for all /major city Buildings beyond the age of 15-20 years of the building life. Mandatory use of corrosion-resistant building material for all the buildings in the coastal zone, be made part of the Building laws for coastal Zone which may be revisited under the aegis of a technical Committee. Assessment of life of service structures of power & communication facilities in coastal zone be made annually together with aging test and assessment of retrofitting requirements. For all new installations use of corrosion-resistant material may be resorted to. Engineers, Architectures & Masson may be trained in disaster resilient construction practices as per the context.
- xi. Coastal Regulation Zone (CRZ) norms shall be strictly enforced.
- xii. A Coastal Zone (Regulatory) Authority may be created under the Central auspices, with their State counterpart organizations covering the entire coastal region in the country, to regulate the coastal green cover and management of marine resources for maintenance of marine resources including coastal infrastructure on the lines of Reserve forests.
- xiii. Planning and balancing the coastal vegetation and green cover, (planning for mangroves, casuarinas on coastal belt) may be taken up as a Centrally Sponsored Schemes in selected States. To start with, Self-help groups and non-governmental organizations (NGOs) may be involved in the maintenance of vegetations along the river banks as the same help in absorbing high velocity winds.
- xiv. State administration shall devised suitable guidelines/policy for erection of hoardings.
- xv. Permanents evacuation routes: All the evacuation routes identified in Disaster Management Plans shall be laid or restored before on set of monsoons. The critical infrastructure identified shall be given priority in budgeting. The evacuation routes, shelters, the lifeline buildings shall be marked with GIS mapping and be made available in public domain.
- xvi. Telecommunication systems need to be made robust and fail proof. Coastal mobile towers need to be built to withstand 250 km / hr speeds.

- xvii. Alternate channels of Communication: All means of communication network including VF/HUF sets, satellite phones, radios, internet, community radio, loud speakers shall be maintained in coastal districts. An emergency communication officer from Police Department can be designated to oversee the functioning of this network on regular basis.
- xviii. Underground power cable: An underground duct with power, communication, gas etc., utility lines shall be planned in all urban bodies along coast in first phase. Pilot projects may be taken up in two to three selected districts to assess and establish the functional and financial viability .
- xix. There is need to enhance the last mile connectivity especially for those along the coast and at the sea (e.g. fishermen, farmer, ships/trawlers etc) through SMS broadcast, coastal radio stations, NavTex network, satellite communication etc.
- xx. A comprehensive state insurance cover to people, homes & cattle covering loss and damage caused by most types of storms, flood and other hydro-meteorological disasters like torrential rains, hail storms, wind and damage caused by flooding from rivers, streams, canals and other naturally occurred disasters, is essential for the States which are prone to natural disasters.
- xxi. A synergized standard operation procedure (SSOP) needs to be developed by the concerned State Administration involving various stakeholders, as there is still lack of coordination among the agencies dealing with disaster management. As a result, the same targeted group gets different warnings from different government agencies leading to confusion in decision making. For example while IMD would be issuing coastal inundation warning due to cyclone, central water commission would be issuing the flood warning for the river catchment experiencing the heavy rainfall due to cyclone. Similarly, the SOP of the district/state/centre should be in tune with the SOP for early warning by designated agencies. There is a need for inter-agency and intra-agency SSOP. Various agencies to be involved for development of SSOP are as follows:
 - a. Early warning service providers (IMD, CWC, INCOIS in case of cyclones)
 - b. Advisory service providers (e.g. Agromet Advisory Service of IMD, Potential Fishing Zone Advisory service of INCOIS and Agriculture advisory service of Department of Agriculture)
 - c. Disaster management agencies at district, state and national levels
 - d. Civil aviation and navigation authorities for air and water transport
 - e. Road and Rail authorities
 - f. Defense, Police, Power, Telecom, Health, Water & Sanitation and Education authorities

- g. Print and electronic media
 - h. NGOs
 - i. Industry and corporate sectors along the coast etc.
 - j. Agriculture, Horticulture, Fisheries Department
- xxii. After each major disaster, all the concerned stakeholders should meet together and bring out lessons learnt from the disaster. The exercise should not be a fault finding one, but needs to be conducted with an objective to draw lessons for better preparedness in future. These sessions need to be conducted in the same fora that had planned the preparedness and response i.e., DDMA or SDMA/ SEC or the National Executive Committee as the case may.

Annexure-A
10

Most Immediate

No. 1-7/2014-NDM-I
Government of India
Ministry of Home Affairs
(Disaster Management Division)

'C' Wing, 3rd floor, NDCC-II,
Jai Singh Road, New Delhi
Dated the 30th October, 2014

OFFICE MEMORANDUM

Subject:- Constitution of the Committee to prepare the Blue Book – As suggested by Hon'ble Prime Minister - regarding.

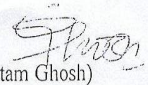
The undersigned is directed to inform that the Prime Minister has suggested constituting a Committee to draw lesson from the experience of management of 'hudhud' cyclone. The Committee will assess the preparatory measures taken and identify areas requiring improvement. The Committee will take up a quick review of the existing cyclone manuals and NDMA guidelines on management of cyclones. The committee will suggest long-term plans for cyclone prone areas, which may include (a) building norms (b) permanent evacuation routes (c) permanent helipads on roads (d) using other facilities as shelters (containers, etc.) (e) having alternate emergency communication channels (HAM radio) and (f) underground power lines.

2. The composition of the Committee is as under:-

- i) Joint Secretary (DM), Ministry of Home Affairs (Chairman)
- ii) A representative of National Disaster Management Authority (NDMA).
- iii) A representative of Ministry of Defence.
- iv) A representative of Ministry of Telecommunications.
- v) A representative of Ministry of Road Transport and Highways.
- vi) A representative of India Meteorological Department.
- vii) A representative of National Institute of Disaster Management (NIDM).
- viii) A representative of Andhra Pradesh.

3. The concerned Ministries/ Departments/ State Government are requested to send the name, telephone etc. of their nominee for the Committee to the undersigned by 5th November 2014.

4. The Committee is required to submit its report by 30th November 2014.


(Goutam Ghosh)
Deputy Secretary (DM-I)
Telefax 23438123

Distribution:

- i) Secretary, Department of Telecommunications, Sanchar Bhawan, Parliament Street, New Delhi.
- ii) Secretary, Ministry of Defence, South Block, New Delhi.
- iii) Secretary, Department of Road Transport & Highways, Parivahan Bhawan, New Delhi (Ph. 23714104, Fax: 23356669).

- iv) Secretary, National Disaster Management Authority (NDMA), A-1 Safdarjung Enclave, NDMA Bhawan, New Delhi. (Fax: 26701717/ 18).
- v) The Director General, **India Meteorological Department**, Mousam Bhawan, Lodi Road, New Delhi. (Fax: 24616602, 24623220, 24699216, 24611792, 24652484, 24635667).
- vi) Executive Director, National Institute of Disaster Management (NIDM), IIPA, New Delhi
- vii) Chief Secretary and Relief Commissioners of the State of Andhra Pradesh.

Copy to:

Sr.PPS to Home Secretary/ PPS to Secretary (BM)/PS to JS(DM) DS (DM-II)/Director (DM-III)/ Master folder.

Annexure-B

Check List on disaster preparedness

1. **Status of State Disaster Management Plan (SDMP) and District Disaster Management Plans (DDMPs) as required by DM Act, 2005.** The State Governments are requested to furnish the latest status in the matter.

2. **Vulnerability Assessment:**

Whether a profile of the various districts vulnerable to different disasters has been prepared. This includes vulnerability assessment, past history, geographical feature and the impact and intensity as also the damage of the past disasters. Based on this, whether a list of most vulnerable village-district wise has been prepared.

3. **Dissemination of Warning System:**

Whether a review of the exiting Warning and Forecasting System has been made in the context of floods, heavy rains, cyclone, landslides, avalanches and Tsunami in association with concerned Departments of the State Government and the Government of India office located in the State. This includes India Meteorological Department (IMD), Central Water Commission, Indian National Centre for Ocean Information Service (INCOIS), Geological Survey of India (GSI), Snow & Avalanche Study Establishment, All India Radio, T.V., Electronic media, local sirens, DoT, Police Wireless and other traditional means.

4. **Emergency Response Activities:**

- i) *Coordination:* Whether State and District level coordination Committees have met and reviewed the preparedness with all concerned stakeholder.
- ii) *Rapid Damage Assessment:* Whether the mechanism for rapid assessment of damage has been put in place. The rapid damage report is required to be prepared immediately and forwarded to all concerned including State Government and Control Room of Ministry of Home Affairs (MHA).
- iii) *Maintenance of Essential Services:* During disasters like flood, heavy rains, cyclone, the first causality is the essential services line Power, Tele Communications, Roads. Whether coordination meeting has been organized with these Departments to ensure the immediate restoration of these services in the event of disruption due to floods, cyclone.
- iv) *Stocking of essential commodities:* Whether adequate stocks of essential commodities like food grains, kerosene oil, salt, edible oil etc., have been made at different places.
- v) *Medicines:* Whether review of availability of essential medicines, needed in the wake of floods and heavy rains for likely diseases like diarrhea have been adequately stocked at various vulnerable centres.

- vi) *Arrangements of Drinking Water:* Whether position has been reviewed with all concerned for ensuring supply of safe drinking water during crisis period. This includes transportation of drinking water.
- vii) *Temporary Shelters/ Relief Camps:* A list of the shelters identified for organizing relief camps for persons evacuated from the low lying areas has been made. Whether adequacy of these shelters has been reviewed and Plan for putting up temporary shelters put in place. These include arrangements for organizing relief camps like provision of essential food, drinking water supply, sanitation, medicines etc. Whether provision of shelter material like tarpaulin, tents have been reviewed.

5. **Pre-Contract:** Whether a list of relief material required during emergency response phase has been prepared based on the past experience. This Ministry had advised the State Governments to enter into pre contract for the items which are not available with the State Government and required in bulk. This will ensure the timely availability of relief items.

6. **Evacuation Plan:** Based on the vulnerability assessment, whether evacuation plan for the persons residing in the low lying areas has been drawn up. These include identification of places, means of transportation, evacuation route.

7. **Dissemination of forecasting/ warning Plan:** Based on the forecasting agencies, whether dissemination of these forecasting / warning etc. plans for the persons residing in the I areas likely to be affected has been drawn up. These include identification of forecasting agencies, means of dissemination of warning to the end users etc.

8. **Plan to Regulate flow of people:** Based on the forecasting agencies, whether any plan have been drawn up to regulating the pilgrims/ tourist in the wake of any eventuality in the religious / tourist places for the persons residing/ visiting in the areas. These include identification of regulating agencies, evacuation/ alternative route etc..

9. **Activating of Control Rooms:** Whether Control Rooms at vulnerable districts and State Headquarters have been activated with adequate number of trained personnel and equipment.

10. **Search and Rescue Teams:** How many search and rescue teams in the State have been trained and equipped for cyclonic storm/ floods/heavy rains. Whether the procedure for their deputation at short notice has been finalized. Whether Search & Rescue Reams of your State can be deputed to the neighboring State, during crisis period?

11. **Transparency in Relief Operations:** The Ministry of Home Affairs has been requesting the State Governments that a list giving the details of the beneficiaries with their name and address along with quantity/ volume and quality of relief distributed may be prepared and made available to the local representatives of the public in Panchayats and Municipalities. The consolidated list should also be maintained and displayed at the block level/ Taluka levels and made available to general public on demand on nominal charges of Rs.10/-. The State Governments are requested to indicate the action taken in the matter.

12. **Identification of Nodal Officers:** Whether a list of nodal officers in various concerned Departments of the State Governments and Government of India located in that State has been made. These list of required to made activity/ sub-activity wise. The Name, Designation, Telephone Nos., Fax No. and E-mail address of identified nodal officer is to be prepared, printed and circulated to all concerned.

13. **Preparedness Drills:** The State Governments are required to organize preparedness drills and to carry out mock exercises. Whether such exercises have been carried out by the State Governments during current year based on the field experience and lesson learnt from previous disaster.

14. **Progress of utilization of Capacity Building Grant awarded by 13th Finance Commission:** The State Governments are requested to furnish updates on this and highlight issues, if any.

Check list of activities requiring immediate attention

1. Preparedness Phase

- Identifying the vulnerable areas using simulation techniques
- Identifying local resources (Updating the details on annual basis)
- Defining the catchments for each of the shelter (allocate vulnerable population Shelter-wise)
- Forming medical teams and providing list of shelters entrusted to them
- Estimating resource requirements and preparing a list of shortfalls (Standards need to be developed for estimating resource requirement) including power back ups for water supply systems, petrol and diesel out lets, DEOCs
- All service providers need to be requested to prepare themselves with required power back up, to ensure the communication links immediately after the event.
- Each department has to identify vulnerable areas like possible breach locations to roads, tanks etc and try to attend them prior to the alert phase itself

1. On Getting Alert / Forecasted Maps showing Likely affected areas

- Prioritizing the affected areas based on forecasted degree of vulnerability
- Moving the action teams to the likely affected areas to commence evacuation process
- Making arrangements for essential commodities water, milk and food at shelters and also to affected populations not coming to the shelters.
- Providing accurate information to the people about the oncoming event and encourage those who can prepare themselves to procure requirements for next 3 to 4 days.
- Rushing the civil supplies to the identified shelters before people reaching the shelters.
- Rushing medical teams with medicines to a central locations close to the shelters entrusted to them.
- Each department has to identify resources like sand bags required to close the breaches, diesel storage, for immediate restoration of power and telecom services
- Start procuring water packet, packaged food packets like bread
- Rush spare stocks like electrical poles and other spares required to restore power immediately after the event.

- Provide information related to likely affected areas to transport departments (both rail and road authorities) detailing about the time to stop the services.
- Diesel Generators to each of the water supply schemes

3. During the event

- Providing regular information to people regarding current status of the event, details about the nearest help lines
- Provide details of centralized operating center to report damages, requests for help etc.
- Establish fool proof communication link like satellite based communication systems to all the disaster managers

4. Immediately after the event

- Prioritize the affected areas based on the satellite imageries, spatial datasets, data from observational network and information reported from citizens to take up restoration works.
- Establish a communication link to places outside the affected areas to execute relief more efficiently
- Restore essential services like power, water supply and major road and rail network.
- Open control points for receiving and channelizing properly the aid received from outside the affected areas. These control units may be used to provide information about the real requirements within the affected areas so that the resource help from outside matches the requirements.

Cyclone Awareness

Do's (✓)

i) Before the Cyclone season:

- Check the house; secure loose tiles and carry out repairs of doors and windows
- Remove dead branches or dying trees close to the house; anchor removable objects such as lumber piles, loose tin sheets, loose bricks, garbage cans, sign-boards etc. which can fly in strong winds
- Keep some wooden boards ready so that glass windows can be boarded if needed
- Keep a lantern filled with kerosene, battery operated torches and enough dry cells
- Demolish condemned buildings
- Keep some extra batteries for transistors
- Keep some dry non-perishable food always ready for use in emergency
- Identify potential hazards and know how to secure or protect them before the cyclone strikes.
- Check your house; secure loose tiles, fasten your thatch roof to the framed structure and carry out repairs of doors & windows
- Integrate your community's emergency plans, warning signals, evacuation routes, and locations of emergency shelters.
- Communicate emergency phone numbers to all members of the community.
- Consider building a safe room.
- Inform local authorities about any special needs, i.e., elderly or bedridden people, or anyone with a disability.

ii) When the Cyclone starts

- Listen to the radio (All India Radio stations give weather warnings) and T.V.
- Keep monitoring the warnings. This will help you prepare for a cyclone emergency.
- Pass the information to others.
- Believe in the official information
- When a cyclone alert is on for your area continue normal working but stay alert to the radio/T.V. warnings.
- Stay alert for the next 48 hours as a cyclone alert means that the danger is within 48 hours.
- Make preparation for possible evacuation and take precautionary measures like arranging dry food, lantern, drinking water, emergency repairing of houses including doors, windows and roofs like thatched roofs etc.

iii) When your area is under cyclone warning

- Get away from low-lying beaches or other low-lying areas close to the coast
- Leave early before your way to high ground or shelter gets flooded
- If your house is securely built on high ground take shelter in the safe part of the house. However, if asked to evacuate do not hesitate to leave the place.
- Board up glass windows or put storm shutters in place.
- Provide strong suitable support for outside doors.
- If you do not have wooden boards handy, paste paper strips on glasses to prevent splinters. However, this may not avoid breaking windows.
- Get extra food, which can be eaten without cooking. Store extra drinking water in suitably covered vessels.
- If you have to evacuate the house move your valuable articles to upper floors to minimize flood damage.
- Ensure that your hurricane lantern, torches or other emergency lights are in working condition and keep them handy.
- Small and loose things, which can fly in strong winds, should be stored safely in a room.
- Be sure that a window and door can be opened only on the side opposite to the one facing the wind.
- Make provision for women, children and adults requiring special diet.
- If the centre of the cyclone is passing directly over your house there will be a lull in the wind and rain lasting for half an hour or so. During this time do not go out; because immediately after that, very strong winds will blow from the opposite direction.
- Switch off the electrical mains in your house.
- Remain calm.
- Listen to cyclone warning by radio or other means.

iv) When Evacuation is instructed

- Be sure to follow official instructions
- Pack essentials for yourself and your family to last a few days. These should include medicines, special food for babies and children or elders.
- Turn off electrical mains and Gas connections before evacuating your house.
- You can carry the live stocks to animal shelters.
- You can carry your valuable and keep your house under lock and key. Don't worry about the house as it would be taken care of by the Police.
- Head for the proper shelter or evacuation points indicated for your area.
- At the shelter follow instructions of the person in charge.
- Remain in the shelter until you are informed to leave
- If you are unable to evacuate, go to your wind-safe room. If you do not have one, follow these guidelines:
 - i. Stay indoors during the cyclone and away from windows and glass doors.
 - ii. Close all interior doors – secure and brace external doors.
 - iii. Keep windows, curtains, and blinds closed. Do not be fooled if there is a lull; it could be the eye of the storm – winds could pick up again.

- iv. Take refuge in a small interior room, closet, or hallway on the lowest level.

v) Post-cyclone measures

- You should remain in the shelter until informed that you can return to your home.
- You must get inoculated against diseases immediately.
- Strictly avoid any loose and dangling wires from lamp posts.
- If you have to drive, do drive carefully.
- Clear debris from your premises immediately.
- Help in rescue operation if you are trained for the job.
- Report the correct losses to appropriate authorities.
- Listen to the Tele Vision or radio for information.
- If you are told to return to your home, do so using the recommended routes only.
- Do not go sightseeing or driving through flood water.
- Keep children away from flood water.
- Stay away from damaged power lines, fallen trees and flood water.
- If the water supply system has been flooded, you must assume it is contaminated.
- Boil or purify your water until supplies are declared safe.
- On entering your house watch for insects, loose floor boards, holes in the floor, protruding nails, and sagging ceiling areas that may be ready to fall.
- If your home has become uninhabitable due to cyclone damage, contact your local council to identify where you can seek further assistance

Don'ts (X)

- Avoid being misled by rumours and do not spread them; this will help to avoid panic situations.
- Do not insist for staying in your houses, which are vulnerable and run the risk of being marooned/destroyed
- Do not leave the safer places during lull period during the cyclone
- Don't touch the loose and dangling wire from lamp post, it may have electric current.

SUGGESTED INPUTS FOR BLUE BOOK : HQ IDS**DTE OF OPS (T&H)****(Only critical points have been addressed)**

1. **Helipad Dimensions:-** The surface of helipad must be level, hard and free of dust. The minimum helipad dimensions for safe operations of helicopters at various altitudes above sea level are given below:-

Elevation of helipad	Minimum size of helipad in meters	
	MLH	CTK/GTH
Upto 1 km	75 x 35	25 x 15
Between 1 and 2.5 km	100 x 35	25 x 15
Between 2.5 km and operating	150x 35	25 x 15

- (c) **Vertical T/O With 15 M High Obstacles at Boundaries.** These limits are extreme cases and applicable for T/O under conditions of adequate reserve of power available (AUW limitations) at hover. For regular T/O and App clearances guidelines mentioned in Para 5 (c) are to be resorted to:-

Altitude	Helipad size	T/O Angle after utilisation of full length of helipad
At Sea Level	130 x 50M	9 deg
At 500 M	170 x 50M	6 deg
At 1.5 KM	240 x 50M	4 deg
At 2 KM	270x 50 M	3.5 deg
At 3 KM	340x50 M	2.7 deg

2. **No Obstruction Higher Than helipad Limit:-**

(a) **For Twin Engine Helptrs.** No object/ obstruction higher than the height of the helipad in T/O and landing direction, with in a distance of 30 mts from the edges of the helipad. it is desirable to have a similar clearance on sides also. It needs to be ensured that clearance on the sides is adequate for safe conduct of operations from the helipad.

(b) **For Chetak/Cheetah.** No obstruction higher than the helipad with in a distance of 75 ft in takeoff and landing direction. it will be desirable to have a similar clearance on sides also. It needs to be ensured is that clearance on the sides is adequate for safe conduct of operations from the helipad.

For two and three heptr ops by Mi-8/17/17-IV, min helipad sizes are as follows:-

	Two heptrs	Three heptrs
(i) Up-to 1000m	100 m x 60m	100m x 100m
(ii) 1000m to 2500m	135m x 70m	170m x105 m
(iii) Above 2500m	185m x 70m	220m x 105m

(c) For two or more Chetak/Cheetah ops from a helipad additional parking space of dimension 15m x 15m for each additional Chetak/ Cheetah helicopter is to be made available. Also sufficient place is to be available for taxiing to stay clear of other parked helicopter(s) and natural/manmade obstructions near the parking area.

3. **Approach and Take Off Obstacle Clearance.** An area covered by lines fanning out at 15 degrees from the edges of the no obstruction higher than helipad limit in the takeoff and landing direction up to a distance of 500 m is designated as approach and takeoff funnel for helicopters (Refer Diagram). Heptrs, while making app or during T/O should have a min obstruction clearance of at-least 20 M (for twin engine heptrs) and 50 feet (for single engine heptrs) in the app and T/O funnel. The permitted app and takeoff angles for various heptrs are as given below:-

(a) **For Chetak/Cheetah**

Density Altitude	App &T/O angle
0- 3000 ft	9 deg max (Steep App)
0- 8000 ft	6°
Above 8000 ft	3°

(b) **For Mi-8/Mi-17/Mi-17-IV**

0 – 1500M	6°max Steep App
0 to maximum	3°

4. **Parking Area for Additional Helicopter.** For operating more than one helicopter at a time from any helipad, a parking area clear off the approach/take off path of the helipad is mandatory. Dimensions of additional parking area are given below:-

(a) For Mi-8/Mi-17/1-V/Mi25/35	25M x 30M
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3

(b) For Chetak/Cheetah

15M x 15M

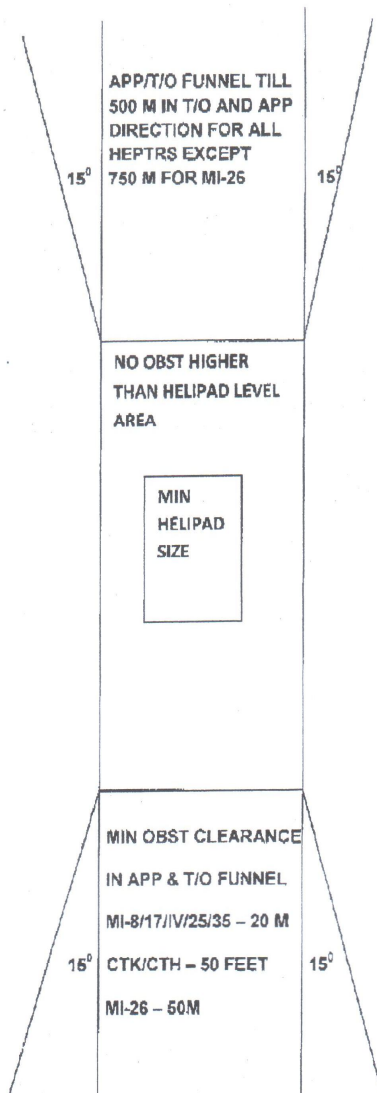
5. **DZ Dimensions.** The standard DZ size will be of 200 X 100 M. For free/para drops safe obstacle clearance in approach and overshoot above the drop height and adequate turning area for repeat drops is must.

(a) **Safety Zone.** There should be a safety zone around the DZ. This Zone extends up to 100 M on either side and up to 150 M on approach and overshoot direction .However when there is only one way approach , the safety zone towards approach can be 100 M. The safety zone need not be a prepared area.

(b) **Danger Zone.** The Danger Zone comprises the DZ and the safety zone. Thus its overall dimension will be 450 X 300 M. This zone must be free of habitation and movement of personnel and live stock etc.

LP

APPROACH AND T/O FUNNEL



MI-26 OPERATIONS

6. **Helipad dimensions.** The minimum helipad size requirements are as follows:-

(a) **IGE Operations**

Elevation of the helipad	Minimum helipad size
Up to 1KM	80M x 40 M
Between 1 and 2.5 KM	100M x 50 M
2.5 KM and above	150 M x 50 M

(b) Mi-26 will not be able to operate in any helipad size less than 80 m x 80 m even in extreme emergency.. This implies that minimum helipad size to carry out under-slung ops will be 80 m x 80 m.

(c) **No obstruction higher than helipad height.** There should be no obstruction higher than the level of the helipad with in 75 M from the edge of the helipad in T/O and approach direction and 50 M sideways. Also with in 100 M of the helipad edge there should not be any obstruction of semi-permanent nature which can fly off due to down wash of the heptr.

(d) **Approach Angle, Approach Funnel and Obstacle Clearance.** The approach angle for Mi-26 is 3 deg. An area covered by lines fanning out at 15 deg angle, from the edge of the no obstruction higher than helipad limit, in take off and approach direction up to a distance of 750 m is termed approach funnel for Mi-26. While making approach or during takeoff, minimum vertical obstacle clearance in the approach funnel should be 50 m.

7. **Selection of LZ/Helipad.** Following safety aspects are to be ensured while deciding the number of helicopters that can be cleared for simultaneous operations from any particular LZ/helipad.

(a) Parking and maneuvering place for all helicopters is away from the landing and takeoff area.

(b) Each helicopter when parked is to have at-least two rotor diameters separation.

(c) There should be no vertical projection higher than helipad in T/O/ App directions (poles, fire fighting sheds etc) within 30 meters from edge of the helipad in case of twin engines heptrs and within 75 feet in case of single engine heptrs. Similar clearance is desirable on sides also for safe conduct of operations from the helipad.

9. **Precautions.** While selecting LZ/helipad for simultaneous operation of two or more helicopters following points should be borne in mind:-

(a) Surface is satisfactory.

(b) Entire LZ/helipad has adequate approach/take off funnel. Adequate parking place is available adjacent to LZ/helipad.

(c) LZ/helipad and particular area size is such that sufficient space is available to maintain separation as per laid down orders/instructions.

10. **Layout Dimensions MI-8/ 17/17-IV for Night operations:-**

(a) **Helipad.** The helipad to be lit will be of 75 x 50 M dimension.

(b) **Lay out for Chetak/Cheetahs.** The Chetak/Cheetah helipad should be lit with dimension 50 x 25 M. In case of common helipad requirement, the helipad lay-out will be for Mi-8/17/25/35s and Chetak/Cheetahs can also operate on this.

(d) **Number of Goose Necks/Glim Lamps.** The four corners of the helipad are to be lit with four goose neck at each corner with their wick joined together to give a stronger flame. The centre of the helipad should be marked with four glim lamps placed at each side. **For NVG operations, lights would be NVG compatible.**

11. **Additional Requirements for Helicopter Operations**

(a) **Refueling facilities.**

Helicopters of IAF on the average would have a use full endurance of 1h 45 min, which would translate to a 180 KM one way. It is prudent that disaster relief be centered around a refueling hub. This would enable disaster relief operations to continue unhindered in day light hours. MLH helicopters would require 800 litres of fuel for an hour of flying whereas the consumption of ALH would require 350 litres. Smaller helicopters like CTK/CTH would require 220l for an hour of flight. Operations involving Mi-26 helicopter would require 6000 Kgs a day considering operations of two sorties a day. Planning of refueling and admin arrangements as envisaged in Para 3 (a) would contribute to safe HADR operations.

7
(b) **Wind Indicators**

It would be desirable to have provision of installation of windsocks/wind indicators in all helipads earmarked for use in disaster management. This would ensure safe helicopter operations aiding the operators during HADR missions from disaster management hubs.

(c) **Fire Fighting**

It is mandatory to maintain basic aviation fire fighting facilities in all planned disaster management hubs. Operations close to ground especially takeoffs/approaches are critical phases in helicopter operations.

(d) **Communication and Internet facilities**

Redundant Communication facilities form the backbone of efficient HADR operations. The same would enhance the effectiveness and safety of disaster management operations. Internet facilities in the communication centre would help in effective planning of HADR operations with inputs on weather, sat picture and help in de conflict traffic. There should be facilities for online briefing /debriefing of missions with video conferencing facilities.

(e) **Security, FOD, Vehicular Movement**

It should be ensured that the helicopter is parked in a dust free area with adequate control of vehicular and personnel movement around the helipad. Crowd control assumes paramount importance in HADR operations and will immensely help safe emplaning and deplaning of personnel.