

Emergency management

Key elements of emergency management are **prevention preparedness, response, and recovery**

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Prevention of accidents

All practical efforts must be made to prevent and mitigate nuclear or radiation accidents. The most harmful consequences arising from facilities and activities have come from the loss of control over a nuclear reactor core, nuclear chain reaction, radioactive source or other source of radiation. Consequently, to ensure that the likelihood of an accident having harmful consequences is extremely low, measures have to be taken:

- To prevent the occurrence of failures or abnormal conditions (including breaches of security) that could lead to such a loss of control;
- To prevent the escalation of any such failures or abnormal conditions that do occur;
- To prevent the loss of, or the loss of control over, a radioactive source or other source of radiation.

The primary means of preventing and mitigating the consequences of accidents is ‘defence in depth’. Defence in depth is implemented primarily through the combination of a number of consecutive and independent levels of protection that would have to fail before harmful effects could be caused to people or to the environment. If one level of protection or barrier were to fail, the subsequent level or barrier would be available. When properly implemented, defence in depth ensures that no single technical, human or organizational failure could lead to harmful effects, and that the combinations of failures that could give rise to significant harmful effects are of very low probability. The independent effectiveness of the different levels of defence is a necessary element of defence in depth.

Defence in depth is provided by an appropriate combination of:

- An effective management system with a strong management commitment to safety and a strong safety culture.
- Adequate site selection and the incorporation of good design and engineering features providing safety margins, diversity and redundancy, mainly by the use of:
 - Design, technology and materials of high quality and reliability;
 - Control, limiting and protection systems and surveillance features;
 - An appropriate combination of inherent and engineered safety features.
 - Comprehensive operational procedures and practices as well as accident management procedures.

Accident management procedures must be developed in advance to provide the means for regaining control over a nuclear reactor core, nuclear chain reaction or other source of radiation in the event of a loss of control and for mitigating any harmful consequences.

Emergency preparedness and response

Arrangements must be made for emergency preparedness and response for nuclear or radiation incidents.

The primary goals of preparedness and response for a nuclear or radiation emergency are:

- To ensure that arrangements are in place for an effective response at the scene and, as appropriate, at the local, regional, national and international levels, to a nuclear or radiation emergency;
- To ensure that, for reasonably foreseeable incidents, radiation risks would be minor;
- For any incidents that do occur, to take practical measures to mitigate any consequences for human life and health and the environment.

The licensee, the employer, the regulatory body and appropriate branches of government have to establish, in advance, arrangements for preparedness and response for a nuclear or radiation emergency at the scene, at local, regional and national levels and, where so agreed between States, at the international level.

The scope and extent of arrangements for emergency preparedness and response have to reflect:

- The likelihood and the possible consequences of a nuclear or radiation emergency;
- The characteristics of the radiation risks;
- The nature and location of the facilities and activities.

In developing the emergency response arrangements, consideration has to be given to all reasonably foreseeable events. Emergency plans have to be exercised periodically to ensure the preparedness of the organizations having responsibilities in emergency response.

When urgent protective actions must be taken promptly in an emergency, it may be acceptable for emergency workers to receive, on the basis of informed consent, doses that exceed the occupational dose limits normally applied, but only up to a predetermined level.

Protective actions to reduce existing or unregulated radiation risks must be justified and optimized. Radiation risks may arise in situations other than in facilities and activities that are in compliance with regulatory control. In such situations, if the radiation risks are relatively high, consideration has to be given to whether protective actions can reasonably be taken to reduce radiation exposures and to remediate adverse conditions.

One type of situation concerns radiation of essentially natural origin. Such situations include exposure to radon gas in dwellings and workplaces, for example, for which remedial actions can be taken if necessary. However, in many situations there is little that can practicably be done to reduce exposure to natural sources of radiation.

A second type of situation concerns exposure that arises from human activities conducted in the past that were never subject to regulatory control, or that were subject to an earlier, less rigorous regime of control. An example is situations in which radioactive residues remain from former mining operations.

Recovery

Recovering from a disaster is usually a gradual process. Safety is a primary issue, as are mental and physical well-being. If assistance is available, knowing how to access it makes the process faster and less stressful. This section offers some general advice on steps to take after disaster strikes in order to begin getting your home, your community, and your life back to normal.

Many lessons have been learned from Chernobyl experience in the field of post-crisis administration and rehabilitation. Social-economical recovery is the most significant problem of regions affected by the Chernobyl catastrophe. Lack of reliable information led to mistrust of authorities generally and, in particular, in official statements on radiation levels. This greatly hindered effective

communication with the public, and the recovery process itself. Successful minimization of Chernobyl accident consequences is being possible only with adequate integrated scientific maintenance of all accomplished works. The role of trustful information remains important for territory rehabilitation and providing protection of the population from radiation.

Evacuation and resettlement of more than a hundred thousand people caused psychological stress, however this was justified on the grounds of radiation safety. Later resettlement of people from low contaminated areas was unjustified. This experience has implications for responding to any future accident, nuclear or otherwise.

Anxiety about health consequences of radiation exposure has not abated over time. In affected areas some inhabitants are in a state of helplessness, passivity and are unable to make decisions about their future. Innovative approaches are needed to involve affected populations on measures to improve their living conditions on the contaminated territories. There is a need to present information to certain groups of persons, who can use it and give helpful advice to the affected population, using an integrated approach to healthy lifestyle, not only about radiation dangers.

Economical development and community self-sufficiency is a key to improvement of living conditions. There should be a basic strategy of economic and social rehabilitation of people living in contaminated territories. People and communities should have willing to organize their own future; be economically effective and overcome the psychological and social consequences of the accident.

International recommendation

IAEA and other relevant international organizations that participate in the activities of the Inter-Agency Committee on Response to Nuclear Accidents have developed the [Joint Radiation Emergency Management Plan of the International Organisations](#) (Joint Plan). The Joint Plan describes: the objectives of response; the organizations involved in response, their roles and responsibilities, and the interfaces among them and between them and States; operational concepts; and preparedness arrangements. These practical arrangements are reflected in the various organizations' own emergency plans, e.g. the IAEA's in-house Nuclear and Radiation Event Assistance Plan (NAREAP) and WHO's Radiation Emergency Medical Preparedness and Assistance Network (REMPAN) manual. The Joint Plan does not prescribe arrangements between the participating organizations, but describes a common understanding of how each organization will act during a response and in making preparedness arrangements. All States have obligations under general international law, and States which are neither party to one or other of the two Conventions on Nuclear Safety nor Member States of the IAEA are invited to note that the IAEA is the main co-ordinating body for implementation of the Joint Plan. Those States are invited also to use the arrangements described in the Joint Plan when providing relevant information about nuclear or radiological emergencies, in order to minimize the transnational radiological consequences and to facilitate the prompt provision of information and assistance.