March 11 this year, an earthquake of magnitude 9.0 on the Richter scale, followed by a 14-metre tsunami caused incalculable damage in Japan. According to Japan’s National Police Agency, as on 3 April, 12,341 persons were dead and more than 15,000 missing. The economic losses are pegged at $239 billion, about 4% of the Gross Domestic Product.

The rarest of the rare, simultaneous occurrence of two natural phenomena, a powerful earthquake and a devastating tsunami, led to a serious situation at the Fukushima Atomic Power Station (Fukushima Daiichi). The staff of the Tokyo Electric Power Company (TEPCO) ably aided by other Japanese personnel are trying to mitigate the effects of the accident.

Japan operates 54 nuclear power reactors that generate 30% of the total electric power in the country. The accident is likely to cause a huge setback to the nuclear industry in Japan and to some countries elsewhere, but not to all as envisaged in the Fukushima Daiichi. Nuclear power reactors are equipped with earthquake sensors. If the ground acceleration at the location reaches above a preset value (90% of the design value), the reactor will automatically shut down.

The full facts on what happened in Fukushima are not known. During 20 to 24 June 2011, the International Atomic Energy Agency (IAEA) will organize a High-Level Ministerial Conference on Nuclear Safety to “learn the right lessons from what happened on 11 March and afterwards” at the Fukushima Daiichi nuclear power plant and “to strengthen nuclear safety throughout the world”. The Conference “should provide an initial assessment of the Fukushima accident, its impact and consequences; consider the lessons that need to be learned; launch the process of strengthening nuclear safety, and strengthen the response to nuclear accidents and emergencies.”

The Fukushima reactor site suffered immensely. Hydrogen explosions, fires, radioactive releases to the outside...
environment, contaminated water in the reactor building, increased in radiation levels of the site, among other events. One worker died in a crane accident at Fukushima Daini. It was also reported that the dead bodies of two missing persons were located in the turbine building of Unit 4. Many workers are attending to the mitigation of the accident with stringent dose control procedures in place. None of them will receive doses more than the limits prescribed by the regulatory authority.

Fukushima Daiichi plant has six Boiling Water Reactors (BWRs), Unit 1 of 460 MW capacity; units 2, 3, 4, 5 are of 784 MW capacity and unit 6 has 1100 MW capacity. When the earthquake hit, the reactors 4, 5 & 6 were in shutdown stage for planned maintenance. The remaining reactors were shut down automatically during the earthquake. But then, a tsunami of 14 metres caused by the earthquake flooded the plant.

When a reactor is shut down, power level due to fission reactions drops. But the fuel contains fission products and activation products. These decay at different rates. The energy released during decay will continue to heat up the fuel producing substantial quantities of decay heat. Just prior to shut down, the decay heat may be as high as 2%. It reduces exponentially to about 2% in the first hour, 1% after the first 11 hours. The decay heat is used to heat the fuel, leading to its more rapid fission and increasing levels. These two effects, coupled with the movement of the fuel rods, can lead to fuel damage.

When the accident hit, the reactors were not in power generation mode. The sodium coolant in sodium-cooled reactors like in the units 1 & 2, became superheated and pressurized. This resulted in a steam explosion that caused the reactor vessel to rupture. The steam explosion also caused the loss of containment, leading to the release of radioactive materials into the environment.

The reactor core isolation cooling (RCIC) pumps, which operate on steam from the reactor, were used to replace reactor core inventory; however, these pumps have their valves driven by batteries. At Fukushima, the battery-supplied control valves could not function for long.

One of the essential safety requirements in the case of nuclear power reactors is that the reactor core where the heat is generated must remain immersed in water all the time. There was some evidence that due to lack of cooling, core meltdown occurred partially in reactors 1, 2 & 3. During the early hours, the pressure in the reactor pressure vessel of Unit 1 increased because of insufficient cooling. Normally the steam generated will get released through the suppression pool. In this case, the pressure increased because of the lack of cooling. The non-condensable gases and steam released caused a pressure increase.
Since suppression pool recirculation pumps, which are part of the emergency cooling system, were damaged by the tsunami waves, they were not available. This compromised the heat removal efficiency of the suppression pool; its temperature increased. Hydrogen, released from the primary containment, leaked to the secondary containment, reached the explosive limit, and exploded, blowing off the roof. Whether the operators vented the containment to reduce pressure is not clear.

Hydrogen explosions occurring at different times destroyed the upper portions of the buildings that housed reactors 1, 3 & 4. An explosion damaged the ... Multiple fires broke out at reactor 4. The fires died out subsequently. Radioactive releases occurred with the explosions.

Since the temperature of the coolant water in the reactors was found to increase, the operators tried to pump seawater through the affected reactors. Apprehending that seawater may lead to clogging in the reactor internals and salt deposit may inhibit cooling of the fuel rods, the rescuers pumped light water instead at quantities of 7 to 8 cubic metres per hour. This process is continuing.

Present Status at Fukushima
As on 5th April, the IAEA daily update continues to state that the situation remains very serious at the Fukushima Daiichi ... supply to pump water through the Reactor Pressure Vessels (RPV) of Units 1, 2 and 3. Also lighting in a part of Units 1-4 Turbine Building was restored on 2 April.

Water containing high levels of radioactivity was seen in the containment Units of 1, 2 and 3 and in the drainage pits of Units 5 and 6.

Regulatory authority has allowed the company to transfer 23,000 tonnes of water containing low level of activity from different locations of the plant to sea. The volume thus freed may be used to store highly contaminated water from the turbine buildings of the stricken reactors.

After several unsuccessful efforts with different techniques, the TEPCO staff managed to stop flow of highly contaminated water from Unit 2 to sea by injecting coagulation agents (liquid glass).

Spent Fuel Pools
Spent or used fuel rods contain fission products and activation products such as plutonium. Once removed from the reactor, they remain in a specially constructed pool of water over 40 feet deep for one to three years. Water...
The earthquake moved the island 4 metre east and apparently subsidised the nearby coastline by half a metre.

The spent fuel pool of Unit 4 suffered a hydrogen explosion and fire. We do not know to what extent fuel rods in the pool are exposed.

Radiation Monitoring in Japan

Japanese authorities started measurement of environmental radiation levels and concentration of radioactivity in foodstuffs right from the early days of the accident. They concentrated on the measurement of Iodine-131 and Cesium-134/137 in various food items. Iodine-131 was implicated in childhood thyroid cancers in Chernobyl.

On March 12, the Japanese authorities started evacuation of 170,000 persons from a zone of radius 20 km around Fukushima Daiichi and 30,000 from a zone of radius 10 km around Fukushima Daini. At the evacuation centres they distributed 230,000 doses of stable iodine. Flooding thyroid with stable iodine is a well-proven prophylactic method to prevent entry of radioiodine to the thyroid. It is very effective if used just ahead of any radioiodine entering the body.

Various agencies were keeping track of radioactivity levels in different foodstuffs for the past several weeks. Initially high values were observed. As of 4 April, Iodine-131 and Cesium-134/137 were detectable in drinking water in a few prefectures. All values were far below levels that would trigger recommendations for restrictions of drinking water. As of 6 April, one restriction for infants related to I-131 (100 Bq/l) remains in place as a precautionary measure in only one village of the Fukushima prefecture. A Bq is a unit of radioactivity. In a Bq one disintegration occurs every second.

Since 23 March, gamma dose rates in the 45 prefectures have decreased. IAEA noted that values of dose rate for 6 April showed no significant changes. Gamma dose rates were reported for 45 prefectures to be between 0.02 to 0.1 microsievert per hour. These values are taken on April 5th above the natural background.

Background radiation at any location depends on the contribution from natural radioactive materials in soil and rocks as well as contributions from airborne radionuclides and cosmic radiation. Cosmic ray contribution will depend on the latitude and to a greater extent on the altitude of the location.

One notable feature of these results is the wide variation in the levels across various locations. The highest levels recorded are in Manvalakurichi. This is due to the higher concentrations of thorium in that area.

Radiation Doses to Workers at Fukushima

Unlike in Chernobyl, no worker in Fukushima died of radiation exposure. The media characterized rescuers as “suicide heroes”.

The Fukushima incident has been elevated to level 7 on the International Nuclear Events Scale.
Earthquakes, Tsunamis and Floods in India

The recent events with the temples of earthquakes, tsunamis and floods in recent installations. The nuclear power industry of India has been operating for decades. The incident at the Dharhan nuclear power plant in 1973, the Bhopal disaster in 1984, and the nuclear accident at Fukushima in 2011 have been classified as significant events. The International Nuclear Events Scale (INES) is a useful tool to classify the significance of such events. We have some experience with the impact of earthquakes, tsunamis and floods in India.

The Chernobyl disaster was rated 7 in the INES scheme for its impact on nuclear installations. The nuclear power plants at Dharhan, Bhopal and the Bhopal disaster in 1984 have been rated 5. The Bhopal disaster was the result of an accident at the Union Carbide Corporation plant in 1984. The accident released large quantities of toxic gas, causing thousands of deaths and injuries.

The scale is designed so that the scale is designed so that the impact of each increase in level on the INES is greater for each increase in level on the INES. Events without safety significance have been classified as levels 0 to 3. Levels 4 to 7 are classified as “accidents”. These levels have been designed to consider three areas of impact: people and the environment, radiological barriers, and the nuclear installations.

The INES scheme classifies events at seven levels: Levels 1–3 are “incidents” and Levels 4–7 “accidents”. These levels are designed to consider the severity of the event, the number of people affected, and the environmental impact.

Lessons from the Accident

The Dharhan nuclear power plant accident in 1973 is an example of an accident that occurred due to a failure in the design of the reactor. The accident resulted in the release of radioactive material into the environment.

The Nuclear Power Corporation of India (NPCIL) has been operating nuclear power plants in India since 1975. The NPCIL has installed seismic sensors at all plants to monitor seismic activity. The NPCIL has also installed protective gear, such as radiation detection equipment, at all plants. The NPCIL has also implemented several significant safety short-term and long-term recommendations to improve safety.

The scale is designed so that the impact of each increase in level on the INES is greater for each increase in level on the INES. Events without safety significance have been classified as levels 0 to 3. Levels 4 to 7 are classified as “accidents”. These levels have been designed to consider three areas of impact: people and the environment, radiological barriers, and the nuclear installations.

The INES scheme classifies events at seven levels: Levels 1–3 are “incidents” and Levels 4–7 “accidents”. These levels are designed to consider the severity of the event, the number of people affected, and the environmental impact.

Lessons from the Accident

The Dharhan nuclear power plant accident in 1973 is an example of an accident that occurred due to a failure in the design of the reactor. The accident resulted in the release of radioactive material into the environment.

The Nuclear Power Corporation of India (NPCIL) has been operating nuclear power plants in India since 1975. The NPCIL has installed seismic sensors at all plants to monitor seismic activity. The NPCIL has also installed protective gear, such as radiation detection equipment, at all plants. The NPCIL has also implemented several significant safety short-term and long-term recommendations to improve safety.

The scale is designed so that the impact of each increase in level on the INES is greater for each increase in level on the INES. Events without safety significance have been classified as levels 0 to 3. Levels 4 to 7 are classified as “accidents”. These levels have been designed to consider three areas of impact: people and the environment, radiological barriers, and the nuclear installations.

The INES scheme classifies events at seven levels: Levels 1–3 are “incidents” and Levels 4–7 “accidents”. These levels are designed to consider the severity of the event, the number of people affected, and the environmental impact.

Lessons from the Accident

The Dharhan nuclear power plant accident in 1973 is an example of an accident that occurred due to a failure in the design of the reactor. The accident resulted in the release of radioactive material into the environment.

The Nuclear Power Corporation of India (NPCIL) has been operating nuclear power plants in India since 1975. The NPCIL has installed seismic sensors at all plants to monitor seismic activity. The NPCIL has also installed protective gear, such as radiation detection equipment, at all plants. The NPCIL has also implemented several significant safety short-term and long-term recommendations to improve safety.

The scale is designed so that the impact of each increase in level on the INES is greater for each increase in level on the INES. Events without safety significance have been classified as levels 0 to 3. Levels 4 to 7 are classified as “accidents”. These levels have been designed to consider three areas of impact: people and the environment, radiological barriers, and the nuclear installations.

The INES scheme classifies events at seven levels: Levels 1–3 are “incidents” and Levels 4–7 “accidents”. These levels are designed to consider the severity of the event, the number of people affected, and the environmental impact.

Lessons from the Accident

The Dharhan nuclear power plant accident in 1973 is an example of an accident that occurred due to a failure in the design of the reactor. The accident resulted in the release of radioactive material into the environment.

The Nuclear Power Corporation of India (NPCIL) has been operating nuclear power plants in India since 1975. The NPCIL has installed seismic sensors at all plants to monitor seismic activity. The NPCIL has also installed protective gear, such as radiation detection equipment, at all plants. The NPCIL has also implemented several significant safety short-term and long-term recommendations to improve safety.

The scale is designed so that the impact of each increase in level on the INES is greater for each increase in level on the INES. Events without safety significance have been classified as levels 0 to 3. Levels 4 to 7 are classified as “accidents”. These levels have been designed to consider three areas of impact: people and the environment, radiological barriers, and the nuclear installations.

The INES scheme classifies events at seven levels: Levels 1–3 are “incidents” and Levels 4–7 “accidents”. These levels are designed to consider the severity of the event, the number of people affected, and the environmental impact.

Lessons from the Accident

The Dharhan nuclear power plant accident in 1973 is an example of an accident that occurred due to a failure in the design of the reactor. The accident resulted in the release of radioactive material into the environment.

The Nuclear Power Corporation of India (NPCIL) has been operating nuclear power plants in India since 1975. The NPCIL has installed seismic sensors at all plants to monitor seismic activity. The NPCIL has also installed protective gear, such as radiation detection equipment, at all plants. The NPCIL has also implemented several significant safety short-term and long-term recommendations to improve safety.

The scale is designed so that the impact of each increase in level on the INES is greater for each increase in level on the INES. Events without safety significance have been classified as levels 0 to 3. Levels 4 to 7 are classified as “accidents”. These levels have been designed to consider three areas of impact: people and the environment, radiological barriers, and the nuclear installations.

The INES scheme classifies events at seven levels: Levels 1–3 are “incidents” and Levels 4–7 “accidents”. These levels are designed to consider the severity of the event, the number of people affected, and the environmental impact.

Lessons from the Accident

The Dharhan nuclear power plant accident in 1973 is an example of an accident that occurred due to a failure in the design of the reactor. The accident resulted in the release of radioactive material into the environment.

The Nuclear Power Corporation of India (NPCIL) has been operating nuclear power plants in India since 1975. The NPCIL has installed seismic sensors at all plants to monitor seismic activity. The NPCIL has also installed protective gear, such as radiation detection equipment, at all plants. The NPCIL has also implemented several significant safety short-term and long-term recommendations to improve safety.

The scale is designed so that the impact of each increase in level on the INES is greater for each increase in level on the INES. Events without safety significance have been classified as levels 0 to 3. Levels 4 to 7 are classified as “accidents”. These levels have been designed to consider three areas of impact: people and the environment, radiological barriers, and the nuclear installations.

The INES scheme classifies events at seven levels: Levels 1–3 are “incidents” and Levels 4–7 “accidents”. These levels are designed to consider the severity of the event, the number of people affected, and the environmental impact.

Lessons from the Accident

The Dharhan nuclear power plant accident in 1973 is an example of an accident that occurred due to a failure in the design of the reactor. The accident resulted in the release of radioactive material into the environment.

The Nuclear Power Corporation of India (NPCIL) has been operating nuclear power plants in India since 1975. The NPCIL has installed seismic sensors at all plants to monitor seismic activity. The NPCIL has also installed protective gear, such as radiation detection equipment, at all plants. The NPCIL has also implemented several significant safety short-term and long-term recommendations to improve safety.

The scale is designed so that the impact of each increase in level on the INES is greater for each increase in level on the INES. Events without safety significance have been classified as levels 0 to 3. Levels 4 to 7 are classified as “accidents”. These levels have been designed to consider three areas of impact: people and the environment, radiological barriers, and the nuclear installations.

The INES scheme classifies events at seven levels: Levels 1–3 are “incidents” and Levels 4–7 “accidents”. These levels are designed to consider the severity of the event, the number of people affected, and the environmental impact.

Lessons from the Accident

The Dharhan nuclear power plant accident in 1973 is an example of an accident that occurred due to a failure in the design of the reactor. The accident resulted in the release of radioactive material into the environment.

The Nuclear Power Corporation of India (NPCIL) has been operating nuclear power plants in India since 1975. The NPCIL has installed seismic sensors at all plants to monitor seismic activity. The NPCIL has also installed protective gear, such as radiation detection equipment, at all plants. The NPCIL has also implemented several significant safety short-term and long-term recommendations to improve safety.

The scale is designed so that the impact of each increase in level on the INES is greater for each increase in level on the INES. Events without safety significance have been classified as levels 0 to 3. Levels 4 to 7 are classified as “accidents”. These levels have been designed to consider three areas of impact: people and the environment, radiological barriers, and the nuclear installations.

The INES scheme classifies events at seven levels: Levels 1–3 are “incidents” and Levels 4–7 “accidents”. These levels are designed to consider the severity of the event, the number of people affected, and the environmental impact.

Lessons from the Accident

The Dharhan nuclear power plant accident in 1973 is an example of an accident that occurred due to a failure in the design of the reactor. The accident resulted in the release of radioactive material into the environment.

The Nuclear Power Corporation of India (NPCIL) has been operating nuclear power plants in India since 1975. The NPCIL has installed seismic sensors at all plants to monitor seismic activity. The NPCIL has also installed protective gear, such as radiation detection equipment, at all plants. The NPCIL has also implemented several significant safety short-term and long-term recommendations to improve safety.
Japan operates 54 nuclear power reactors that generate 30% of the total electric power in the country.

We accept different values of doses as safe and acceptable, depending on circumstances. One need not lose sleep over receiving a few tens of mSv, if the occasion demands it. Exposing oneself to a few tens of millisievert in a normal day is not an unusual experience for many people in this country. We are exposed to these doses as a result of medical procedures, natural background radiation, and various occupational exposures. It is important to remember that the effects of radiation are cumulative, and excessive exposure to radiation can lead to serious health problems.

### What is a Safe Radiation Dose?

The International Commission on Radiological Protection (ICRP) recommends a maximum limit of 1 mSv per year for the general public. This limit is based on the assumption that the average person is exposed to about 2.5 mSv of natural background radiation per year. The ICRP also recommends a limit of 100 mSv per year for members of the public who are occupationally exposed to radiation.

#### What are the Doses for Different Groups?

- **For Members of the Public:**
  - General public: 1 mSv per year
  - Children: 5 mSv per year
  - Pregnant women: 5 mSv per year

- **For Workers:**
  - 25 mSv per year
  - 100 mSv per year for members of the public who are occupationally exposed to radiation

- **For Animals:**
  - 2 mSv per year

- **For Plants:**
  - 0.1 mSv per year

### Dose Limits for Different Occupations

- **Medical Procedures:**
  - Cardiac CT scan: 12 mSv
  - Angioplasty: 40 mSv
  - Radiation treatment: 60,000 mSv for part of the body

- **Nuclear Power Plant Design:**
  - The designers estimate the seismic parameters for nuclear power plants conservatively. The elevation of the reactor buildings is designed to withstand a seismic event that is 1.5 times more severe than the expected ground acceleration.

- **Emergency Response:**
  - Twenty recovery workers in the Fukushima accident received less than 200 mSv.
  - The maximum dose limit decided by the Japanese regulatory agency was 250 mSv.

- **Radon Exposure:**
  - The average natural background radiation dose is 2.4 mSv annually. In England and Wales, residents of over 100,000 to 200,000 homes are exposed to more than 10 mSv annually from radon, a radioactive gas found in nature.

### Seismic Design of Nuclear Power Plants

- **Kudankulam Reactors:**
  - The reactors are located in seismic Zone III, and the peak ground acceleration is assumed to be 0.3 g. The maximum design earthquake is assumed to be 0.5 g.

- **Narora Reactors:**
  - The reactors are located in seismic Zone IV, and the peak ground acceleration is assumed to be 0.6 g. The maximum design earthquake is assumed to be 0.8 g.

- **Jaitapur Reactors:**
  - The reactors are located in seismic Zone IV, and the peak ground acceleration is assumed to be 0.7 g. The maximum design earthquake is assumed to be 1.1 g.

### Recovery from the Tsunami

- **Kudankulam:**
  - The tsunami damaged only the seawater pumps located in the area above Zone IV. The remaining structures were unaffected.

- **Narora:**
  - The tsunami flooded the reactor building and turbine building. The resulting water level was about 25 metres above mean sea level.

- **Jaitapur:**
  - The tsunami flooded the reactor building and turbine building. The resulting water level was about 16 metres above mean sea level.

### Radiation Levels

- **Fukushima:**
  - Radiation levels in and around the plant remained normal.

- **Kudankulam:**
  - Radiation levels were found to be normal.

### Lessons Learned

- **Emergency Preparedness:**
  - The designers of Indian nuclear power plants have learned from the Fukushima accident and have made significant improvements in emergency preparedness.

- **Safety Culture:**
  - The nuclear power plants in India have implemented rigorous safety procedures to prevent accidents and to ensure the safety of the public.

- **Regulatory Oversight:**
  - The Atomic Energy Regulatory Board (AERB) has implemented strict regulatory oversight to ensure the safety of nuclear power plants.

### Conclusion

We must continue to learn from the lessons of the past and to improve our safety procedures to prevent accidents and to ensure the safety of the public.
the public domain. The responsibility of deciding and implementing the appropriate protective actions for the public during a radiological emergency rests with the appropriate officials, usually at the state or local level, or in the case of a nuclear power plant, the Nuclear Regulatory Commission (NRC), which is responsible for enforcing the rules and regulations that protect the public from radiation exposure.

State and local officials base their decisions on the best available scientific data provided by the US federal government. This data is gathered and analyzed by the Environmental Protection Agency (EPA), the Department of Energy (DOE), and other agencies. The EPA's State and Local Radiological Surveillance Branches (SLSs) are located at each site. They monitor the environment around the nuclear power plant to ensure the inadvertent release of harmful substances does not occur.

Moreover, on a routine basis, the DOE evaluates the performance of the National Nuclear Security Administration's (NNSA) Environmental Laboratory (ESLs) to ensure the facilities are effectively monitoring the environment around the nuclear power plant to prevent radiation leaks.

In case of radioactivity leakage, the radiological consequences are managed by government agencies and other stakeholders based on the general principles of protection and preparedness outlined by the Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA).

**Potential Consequences:**

The potential consequences of a radiological emergency are managed by government agencies and other stakeholders. The NRC and the EPA are responsible for ensuring that the nuclear power plant is designed and operated in a manner that minimizes the risk of radiation exposure to the public. In the event of a radiological emergency, the NRC and the EPA work closely with state and local officials to ensure that the public is protected.

**Implications for Public Health:**

The potential consequences of a radiological emergency are managed by government agencies and other stakeholders. The NRC and the EPA are responsible for ensuring that the nuclear power plant is designed and operated in a manner that minimizes the risk of radiation exposure to the public. In the event of a radiological emergency, the NRC and the EPA work closely with state and local officials to ensure that the public is protected.
The Indian Environmental Monitoring (IERMON) network collects data from 85 locations in different parts of the country and transmits them to a central unit in BARC. Background radiation levels at different locations are published by AERB, DAE and NPCIL in their website. These radiation monitors have not recorded any detectable increases in background radiation levels.

Doses are shown in nanogray per hour in AERB website. This unit is equal to nanosievert per hr. BARC scientists detected radioiodine released from the accident (26 April 1986) at the Chernobyl nuclear power station by measuring the radionuclide in... Goats’ thyroid will concentrate iodine 131. The activity concentration in goats’ thyroid gives an idea about iodine-131. Radioiodine appeared in goats’ thyroid samples at various power stations on or around May 14. The concentrations increased steadily reaching the highest value of 26.7 Bq per gm on May 27 at Rawatbhata. The radioiodine content in goats’ thyroid decreased due to washout from the body. We are able to detect extremely small amounts of radioactivity as our measuring techniques and instruments are very sensitive. It does not mean that these radiation levels are harmful.

Public awareness/monitoring
The media has been doing an excellent job in putting radiation effects into perspective. When the dust settles down, public will be more concerned about food contamination and will continue to monitor the situation. India is likely to follow the same path.

An AERB monograph lists the major earthquakes in India. All earthquakes magnitude 7 and above occurred in Zone V.

The Nuclear Path
Fukushima is a serious accident caused by the highly improbable simultaneous occurrence of a very severe earthquake and a devastating tsunami that left 12341 persons dead and over 15,000 missing. Unlike Chernobyl, Fukushima did not kill anyone due to radiation exposure. Because of prompt administration of stable iodine (potassium iodide) there may not be any thyroid cancer among children. In spite of the fact that six reactors and seven spent fuel pools were involved, the radiological impact will be localized.

Of the six reactors, three with partially melted core may have to be decommissioned. Handling the partially exposed fuel rods in dry spent fuel is a unique problem. Scrubbing the place clean (if they attempt) may take decades and may cost billions of dollars.

The media has been doing an excellent job in putting radiation effects into perspective. When the dust settles down, public will be more concerned about food contamination and will continue to monitor the situation. India is likely to follow the same path.