

What may Iraq face beyond bombing nuclear reactors of Iran?!

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Abstract

Iraq faces significant risks if nuclear reactors in Iran were to explode, due to its geographical proximity and shared environmental systems. These risks would largely stem from the release of radioactive materials and could have severe consequences across various sectors. In the following, a brief overview on the radiation hazards those may be seen by Iraqis due to bombing of three nuclear reactors in Iran, Fordow, Natanz, and Isfahan, on Sunday 22nd June 2025.

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1. Introduction

When a nuclear reactor meltdown, whether due to an accident or an attack, it releases enormous quantities of radioactive materials into the environment. This causes severe radiation damage that affects human health and the environment in both the short and long term. Here are the most significant of these damages:

1.1 Direct Health Damages (Short-Term)

Acute Radiation Syndrome (ARS): This occurs when exposed to very high doses of radiation in a short period, rapidly destroying body cells, especially fast-dividing cells like those in bone marrow and the gastrointestinal lining. Symptoms include nausea, vomiting, diarrhea, headaches, fatigue, hair loss, and internal bleeding, and it can lead to death within days or weeks. Radiation burns as very high doses of radiation can cause severe burns to the skin and tissues. The vital organs such as the central nervous system, respiratory system, circulatory system, and digestive system can be directly affected, leading to functional failure. In areas very close to the explosion's epicenter, radiation doses may be so high as to cause immediate death.

1.2 Long-Term Health Damages

Cancer is one of the most dangerous long-term effects of radiation exposure. Radiation increases the risk of developing various types of cancer, such as thyroid cancer (as widely seen after the Chernobyl disaster), leukemia, bone cancer, lung cancer, and others. These cancers can appear years or even decades after exposure. Radiation can affect the DNA in reproductive cells, increasing the risk of genetic mutations that can be passed down to future generations, causing genetic deformities and birth

defects. Children and infants are more sensitive to radiation because their cells are rapidly growing and dividing. The immune system may be weakened, making the body more susceptible to diseases. It can affect neurological development in children and neurological functions in adults. Eye diseases, mainly, risk of developing cataracts may increase. Nuclear disasters can cause long-term psychological trauma, anxiety, and depression in those affected and survivors.

1.3 Environmental and Food-Related Damages

With respect to widespread radioactive contamination, radioactive materials spread into the atmosphere and settle on soil, water, and vegetation over very long distances. The extent of dispersion depends on factors such as the type and quantity of radioactive materials, and wind speed and direction. This contamination can persist for decades or even centuries, especially with long-lived radioactive materials like plutonium and uranium.

For food chain contamination, radioactive materials transfer to plants through contaminated soil and water, then to animals that feed on these plants, and finally to humans through animal products (meat, milk).

For ecosystem degradation, high levels of radiation lead to the destruction of forests and vegetation and the death of animals, significantly impacting biodiversity.

For water source contamination, groundwater and surface water sources, including coastal desalination plants, become contaminated, rendering them unfit for human consumption and agriculture.

For exclusion zones, areas surrounding the damaged reactor become uninhabitable for humans for decades or even centuries, requiring widespread evacuation of populations.

A nuclear reactor meltdown represents an enormous environmental and humanitarian catastrophe. Its effects extend beyond the short term, impacting future generations and the natural environment in ways that could last for thousands of years.

2. Spread of Radioactive Effects

The speed of spread of radioactive effects from a nuclear reactor explosion depends on several factors, making it difficult to pinpoint a single speed. However, we can understand how they spread:

2.1 Immediate Aftermath of the Explosion (First Seconds to Minutes)

As an initial radiation, an immediate release of large quantities of radiation (gamma rays and neutrons) occurs at the moment of the explosion. This radiation travels at the speed of light. Also, thermal pulse and shockwave occur as these cause severe burns and widespread destruction within a few seconds. Finally, the explosion cloud (mushroom cloud) appears and forms rapidly and ascends into the atmosphere, carrying radioactive materials with it.

2.2 Radioactive Fallout (Minutes to Hours)

After the explosion, radioactive particles (atomic dust) are formed from fissionable materials and materials that absorbed radiation. These particles drift with the wind and fall to the ground. Fallout usually takes more than 15 minutes to reach ground level for areas outside the immediate damage zones. Closer areas are affected more quickly. The fallout produced during the first few hours is the most dangerous and can extend its effects for tens of kilometers from the explosion site.

2.3 Long-Term Spread (Days to Years)

With respect to weather factors, wind speed and direction play a crucial role in determining the extent and speed of radioactive material dispersion. Winds can carry particles over very long distances, causing widespread contamination. These factors include the following:

- Environmental Medium: The spread of radioactive contamination varies depending on the medium.
- Air: Airborne radioactive particles disperse according to wind patterns.
- Water: If radiation leaks into rivers or groundwater, its effects can extend for tens or even hundreds of kilometers, impacting agriculture and drinking water.
- Soil: Radioactive materials can accumulate in the soil, affecting plants, animals, and humans in the long term.

2.4 Key Factors Affecting the Speed and Extent of Radioactive Effects

Explosion yield is the main factor that affects the speed and extent of radioactive effects. The greater the

explosion's power, the larger the quantity of radioactive materials dispersed and the wider their spread. As well, the type of explosion certainly has a reasonable effect as airbursts spread radioactive debris more widely than underwater or near-surface explosions.

Weather conditions have strong role too on the speed and extent of radioactive effects. The first condition is the wind speed and direction as the most important factor in determining the path of the radiation cloud. Precipitation is the second condition as rain can accelerate the deposition of radioactive materials onto the ground (black rain). Temperature and atmospheric pressure affect air movement and particle dispersion. The type of radioactive materials should be considered as well as radioactive isotopes differ in their half-life (the time required for half of the radioactive material to decay) and energy, which affects their danger and persistence in the environment. Finally, terrain and environment, such as mountains, valleys, and bodies of water can influence contamination spread patterns.

Radioactive effects can spread very quickly in the initial stages (seconds and minutes), then continue to spread more slowly and over wider ranges during days, weeks, and even years, influenced by weather and environmental factors.

3. So, what can I do in this situation?

Here are the most important measures to take to avoid exposure to radiation damage from a nuclear reactor explosion:

3.1 Immediate Shelter-in-Place

Stay Indoors: In the event of a nuclear explosion or a significant radioactive leak, the first and most crucial step is to immediately seek sturdy, airtight indoor shelter.

Seek Strongest Location: Head to building basements or interior rooms with thick concrete or brick walls, away from windows and doors. These materials provide better protection against radiation.

Seal Windows and Doors: Tightly close all windows, doors, and ventilation openings to prevent airborne radioactive particles from entering.

Turn Off Ventilation Systems: Shut down air conditioners, heating systems, fans, and any ventilation systems that draw air from outside.

3.2 Fallout Protection

Stay Sheltered for Long Enough: Radioactive fallout is most dangerous in the first hours and days after an explosion. You should remain in shelter for at least 24 to 48 hours, or as directed by authorities.

Clean Body and Clothes: If you were outside at the time of the explosion, remove all outer clothing immediately upon entering shelter and place it in a sealed plastic bag away from people. Then, shower thoroughly with soap and water to wash off any radioactive particles from your skin and hair.

Cover Nose and Mouth: Use a mask or a damp cloth to cover your nose and mouth if you need to briefly leave shelter or when handling potentially contaminated materials.

3.3 Essential Supplies

Store Water and Food: You should have an adequate supply of bottled water and non-perishable canned or dry food for at least several days, as water and power supplies may be affected.

Communication Tools: Have a battery-powered radio to listen for official emergency instructions, and a fully charged mobile phone.

First Aid: Keep a comprehensive first-aid kit with essential medications for family members.

3.4 Potassium Iodide (KI)

Understand Its Function: Potassium iodide tablets only protect the thyroid gland from absorbing radioactive iodine; they do not protect against other types of radiation or other radioactive materials.

Use as Directed: Take them only when instructed by health authorities, and at the specified dose. Do not take them as a preventive measure without instructions, as they have potential side effects.

3.5 Stay Away from Contaminated Areas

Avoid Hot Zones: If radioactive contaminated areas are announced, you must avoid them completely and stay as far away as possible.

Do Not Consume Contaminated Food or Drink: Avoid eating any food or drinking any water that may be contaminated with radiation (such as vegetables grown outdoors or rainwater).

3.6 Stay Informed and Comply with Directives

Follow Official News: Rely on official sources (government, civil defense, health organizations) for reliable information and guidance.

Do Not Spread Rumors: Avoid spreading or believing rumors that could cause panic.

Be Ready for Evacuation: If evacuation orders are issued, comply with them quickly and calmly, following specified routes and instructions.

3.7 Prior Preparation

Develop a Family Emergency Plan: Determine a meeting place, assign tasks, and ensure everyone knows the emergency plan.

Emergency Kit: Prepare a kit containing important documents, cash, medications, and essential supplies.

Remember, prevention is better than cure, and prior preparation and knowledge of the correct procedures can make a significant difference in reducing potential risks.

4. What is the situation in Iraq?

Iraq faces significant risks if nuclear reactors in Iran were to explode, due to its geographical proximity and shared environmental systems. These risks would largely stem from the release of radioactive materials and could have severe consequences across various sectors.

4.1 Health Risks:

The primary and most immediate risk is exposure to radioactive fallout. Depending on wind patterns, distance from the explosion, and the severity of the incident, Iraqi citizens could be exposed to dangerous levels of radiation. This can lead to the following:

- Acute Radiation Sickness: In severe cases, causing nausea, vomiting, hair loss, and potentially death.
- Increased Cancer Risk: Long-term exposure, even to lower levels, can significantly increase the risk of various cancers (leukemia, thyroid cancer, etc.).
- Birth Defects and Genetic Mutations: Exposure during pregnancy or to reproductive cells can lead to birth defects and inherited genetic problems in future generations.
- Other Health Problems: Immune system suppression, cataracts, cardiovascular diseases, and psychological impacts due to fear and uncertainty.

4.2 Environmental Contamination:

- Air Pollution: Radioactive particles released into the atmosphere would be carried by prevailing winds, potentially contaminating large areas of Iraq.
- Water Contamination: Fallout can settle on water bodies (rivers, lakes, groundwater), contaminating drinking water supplies and affecting aquatic life. The Tigris and Euphrates rivers, vital to Iraq, could be severely impacted.
- Soil Contamination: Radioactive materials settling on agricultural land would contaminate crops and livestock, making food unsafe for consumption for years or even decades. This would devastate Iraq's agricultural sector.
- Ecosystem Damage: Contamination of air, water, and soil would disrupt ecosystems, affecting plant and animal life, potentially leading to long-term ecological imbalance.

4.3 Economic and Social Impacts:

- Displacement and Migration: Large-scale population displacement would likely occur from affected areas, straining resources in safer regions and potentially leading to humanitarian crises.
- Agricultural Collapse: Contamination of farmlands would lead to severe food shortages and economic losses for farmers, impacting national food security.
- Fisheries Impact: Contamination of rivers and the Persian Gulf would harm fish stocks, affecting livelihoods and food supply.
- Infrastructure Damage: While direct blast effects would be limited to areas very close to the explosion,

widespread contamination could render essential infrastructure (e.g., water treatment plants, power grids) unusable or highly risky to operate.

- Trade and Tourism Decline: The perception of Iraq as a contaminated zone would severely impact trade relations and deter tourism, further damaging the economy.
- Long-Term Clean-up Costs: Decontamination efforts would be immensely costly and time-consuming, diverting significant national resources.
- Psychological Trauma: The fear and uncertainty associated with radiation exposure and its long-term effects would have profound psychological impacts on the population.

4.4 Regional Instability:

- Humanitarian Crisis: A large-scale nuclear accident would create a massive humanitarian crisis, requiring international aid and coordination.
- Cross-border Tensions: The transboundary nature of radioactive fallout could lead to diplomatic tensions and disputes between Iraq and Iran, as well as other regional countries.

- Security Concerns: The overall instability created by such an event could exacerbate existing security challenges in the region.

Current Situation and Preparedness

It is important to note that recent reports from June 2025 indicate that Iraq's Nuclear Regulatory Authority has stated there is currently no radiation threat from recent strikes on Iranian nuclear sites. Iraqi authorities have activated emergency response teams and technical monitoring systems. However, officials and experts have warned that a direct hit on a facility like Iran's Bushehr Nuclear Power Plant, which hosts thousands of kilograms of nuclear material, could have "catastrophic consequences" and release significant radioactivity across the region, potentially affecting Iraq hundreds of kilometers away.

While Iraq has its own early warning systems and has joined regional taskforces for nuclear emergencies, some experts express concerns about the country's overall resources and public awareness to respond effectively to a major radiological disaster, highlighting the need for international support.