

NATIONAL IMPERATIVE

As India moves rapidly toward expanding its nuclear energy capacity to meet growing energy demands and climate commitments, the need for a comprehensive, modern, and robust legal framework for nuclear safety has become more urgent than ever. While India has made significant strides in developing nuclear infrastructure and expertise, the legislative and regulatory architecture must keep pace with evolving technologies, international norms, and public expectations for transparency and accountability.

Currently, nuclear safety in India is governed under the Atomic Energy Act, 1962, which, though visionary for its time, is now outdated in its ability to address modern challenges. The Act vests overwhelming authority in the Department of Atomic Energy (DAE), with regulatory functions carried out by the Atomic Energy Regulatory Board (AERB). However, the AERB derives its powers not from a statute, but through an executive notification, leading to concerns about its independence, authority, and operational autonomy.

Several expert committees, including the Comptroller and Auditor General (CAG) and international nuclear watchdogs like the International Atomic Energy Agency (IAEA), have underscored the need for a legally-empowered, independent regulator to ensure credible oversight. The Fukushima disaster in Japan (2011) served as a grim reminder that even technologically advanced nations are not immune to catastrophic failure, and that a strong safety culture backed by enforceable laws is non-negotiable.

In 2011, the government introduced the Nuclear Safety Regulatory Authority (NSRA) Bill, which aimed to replace the AERB with a truly autonomous, statutory body. While the bill was a step in the right direction, it lapsed without being enacted. The reasons ranged from political hurdles to bureaucratic inertia and industry apprehension. Today, nearly a decade and a half later, the need to revisit and pass a revamped version of the NSRA Bill is critical.

First, statutory autonomy of the regulator is paramount. The new law must create an independent body with clearly defined powers, insulated from administrative interference. It must report directly to Parliament to ensure transparency, oversight, and public accountability.

Second, the legislation must codify safety standards, operational protocols, emergency response systems, and accountability mechanisms in alignment with global best practices. This includes mandatory peer reviews, third-party audits, and public disclosure of safety assessments.

Third, there must be an emphasis on stakeholder participation and public engagement. Communities living near nuclear plants deserve a voice in how safety is managed. The law must mandate public hearings, risk communication mechanisms, and clear guidelines for compensation and rehabilitation in case of accidents.

Fourth, the regulator must be empowered to oversee not just civilian reactors but also emerging sectors such as small modular reactors (SMRs), nuclear medicine, and radioactive waste management. As India diversifies its nuclear portfolio, safety governance must also evolve to cover new domains. Fifth, the law must provide legal protection to whistleblowers and scientists who raise genuine concerns about safety lapses. A culture of silence or fear undermines safety in a sector where transparency is vital. Finally, the law must be future-ready-equipped to handle cybersecurity threats, climate risks, natural disasters, and terrorism, which pose new challenges to nuclear facilities. Legal preparedness must go hand in hand with technological vigilance. India's ambitions to become a global leader in clean energy, science, and innovation must rest on a foundation of strong, modern, and democratic institutions. Enacting a new law for nuclear safety is not just about avoiding accidents-it is about building a culture of responsibility, where safety is not an obligation imposed from above, but an ethic embraced at every level of the system. The time to act is now. A new nuclear safety law must not remain a policy aspiration-it must become a legislative reality.

Parthenium: Impacts and Coping Strategies in J&K

■ DR. BANARSI LAL

Every year parthenium awareness week is organized from 16-22 August throughout the country by the National Research Centre for Weed Science, Jabalpur (M.P.) in collaboration with the Krishi Vigyan Kendras (KVKs) of State Agricultural Universities (SAUs), institutes under the Indian Council of Agricultural Research (ICAR), environmental agencies, NGOs etc. The schools, farmers, colony residents, municipalities etc. are also involved in the campaign. Various posters, technical bulletins, books etc. are distributed to the people to create awareness on parthenium management. Various awareness camps and demonstrations are organised to guide the people to eradicate this obnoxious weed by manual, biological and chemical methods. Parthenium hysterophorus (Congress grass) is commonly known as carrot weed as its plant appears like carrot plant. It is herbaceous, an annual plant belonging to subfamily Heliantheae and family Asteraceae (Compositae). Its vernacular names are as gajar ghas, rag-weed, white cap or top, gajari, chatak candani, nakshtra gida, safed topi etc. This weed has been rapidly spreading from the last two decades across the J&K and now this weed has attained the status of "Worst Weed" because of its allelopathic effects on different crops and harmful effects on human beings and animals. It has been observed that its infestation causes crops yield losses up to 40 per cent in several crops and reduces fodder production up to 90 per cent. It is an aggressive annual herbaceous plant which has been widely dispersed across J&K. This weed rapidly covers the new surroundings and poses a serious threat to the environment and biodiversity of J&K.

Union Territory of Jammu and Kashmir is situated in the Northern most part of India and its major part is situated in the Himalayan region. This UT is blessed with immense natural beauty and is considered as the heaven on the Earth. Most of its land is under orchards, pastures, grasslands, forests and wasteland ecosystems. As most of these lands are not used for frequent cultivation, the obnoxious weed like Parthenium hysterophorus (Congress grass) has invaded most of these lands. Parthenium weed is regarded as the worst weed because of its invasiveness, potential for spread and economic and environmental hazards. This invasive weed is presently almost found in all the parts of J&K causing a serious threat to the biodiversity of this beautiful part on the Earth. This weed is considered as the dominant weed in J&K as it has covered almost all the fellow lands, river beds wastelands, pasture lands, grasslands etc. It is a noxious weed because it is highly adaptable to almost all types of environ-



mental conditions and can invade all types of lands, causes high losses in the yield of crops. This weed forms dense, impenetrable thickets and reduces the productivity of crops, pastures, orchards and forestry plantations by its competition for resources and allelopathic effects. The low crops production and productivity due to this weed leads to scarcity of food, fuel wood, fodder, fruits, increase in monkey menace and migration of rural people to urban areas in search of employment after leaving the land fallow.

About 80 per cent of population of J&K directly or indirectly depends on agriculture. People of J&K fulfill their subsistence needs from cultivated, uncultivated and degraded lands. Crops production and productivity can be enhanced in J&K by the management of this problematic weed with the effective technologies. There is need to understand the biology of this obnoxious weed, its ecological impacts and management techniques. This troublesome weed has high rate of dispersal and adaptation to adverse conditions. About 30 per cent of the land of J&K is under cultivation. This weed is now spreading rapidly its tentacles in agricultural lands, forests and pastures. It is spreading at an alarming rate in the J&K and is found in almost all the districts of J&K. This weed is inversely affecting the biodiversity and ecological system of the J&K. It is said that it was introduced in Jammu and Kashmir in 1963 from Madhopur in Punjab across the Ravi River all along the national highway. After that it has been dispersed in all over the state. Presently its infestation is alarming as it has covered large area in J&K. It has been observed that this weed has reduced different crops yields and has also affected biodiversity in J&K. It can be seen on roadside, railway tracts, vacant lands, wastelands, agricultural, horticultural

and plantation crops, industrial areas, irrigation canals etc. in almost every district of J&K.

This dangerous weed has been categorised as "Cosmopolitan weed", "National culprit" and "National health hazard" due to its serious environmental threats. Parthenium origin is considered to be Mexico. In India, its occurrence was first noticed in Pune (Maharashtra) in 1955 and now it has covered almost all parts of the country. It is supposed to be introduced in India from the United States of America along with wheat and other cereals import. By 1972, it had dispersed into the majority of the Western states/UTs from Kashmir in the North to Kerala in the South. It has widely spread in India from Kargil region of Jammu and Kashmir to Port Blair in Andaman and Nicobar. This weed grows at a faster rate due to its aggressiveness, high vitality of seeds, easily dispersal, innate dormancy and prolific seed producing nature. Any part of the plant (even root) can cause the subsequent risk of allergic reactions. In humans it causes health hazards like skin allergy (dermatitis), hay fever, asthma and bronchitis with flowers, seeds and even hair on leaves. The skin becomes photosensitive making it hard for the patient to face the sunlight. Bare parts of the body, soft tissues around the eyes and under joints are more likely to be effected by the contact dermatitis. Allergic papules are observed in school boys when they volunteered for uprooting parthenium. Animals are equally prone to the harmful effect of the weed. During summer seasons, when the animals do not get palatable species in grazing lands, they are forced to feed on parthenium. As a result milk taste becomes bitter and they suffer with ulcers in mouth and intestine. Whenever animals walk or graze through parthenium, their udders are inflamed and

they suffer with fever and rashes. Histopathology of the kidney and liver revealed degenerative changes and necrosis. Being toxic to livestock ,causing both acute and chronic toxicity, a noticeable reduction in milk yield, tainting of milk with parthenin, depigmentation of skin, tainting in mutton and bitter taste of milk have been observed. The milk consumption of the animals grazing around parthenium invaded fields is hazardous to man. Some animals feeding on parthenium die due to acute dysentery, itching, erythematous, development of oedema around eyelids, dorsum of tongue, loss of hair etc. Parthenin is the chief chemical (0.3%) found in the weed.

Community efforts involving all sections of the society are needed to manage the parthenium. Uprooting the weed manually when the soil is wet and slashing with word, collecting and burning the weed before flowering are some of the means of its manual control. Spraying of a solution of common salt (Sodium Chloride) at 15-20 per cent concentration has been found very effective. Applications of herbicides like glyphosate (1-1.5%) for total vegetation control or metribuzin (0.3-0.5%) if grasses are to be saved in non-agricultural land are considered effective in preventing this weed spread. It can also be controlled by the use of bio agent Mexican beetle (Zygogramma bicolorata) as it is natural, self sustaining, inexpensive and is ideally suited to non-crop situations and wastelands. This bio agent remains most active during rainy season and it completely controls the weed. The plant species like Cassia tara, Cassia sericea, Amaranthus asper, Malva pustulata etc. have capability to replace parthenium. The other way to manage parthenium is by uprooting it before flowering and make vermicompost by pit method. Vermicompost can be applied in different crops to mitigate the nutrients problems. It can also be used in papermaking, an antifedant and phagostimulants. National Research Centre for Weed Science, Jabalpur (M.P.) organises many awareness programmes on Parthenium eradication throughout the country by involving Krishi Vigyan Kendras, institutes under ICAR, environmental agencies, NGOs etc. Various posters, folders, technical bulletins, books. Parthenium eradication has become a challenge in J&K because of its epidemic proliferation and strong reproductive potential. This weed is spreading at an alarming rate in J&K and some strenuous efforts and strategies are needed to eradicate this menace so as to improve the production and productivity of different crops. Both public and private organizations need to work together to manage this obnoxious weed.

The writer is Chief Scientist & Head of KVK Reasi, (SKUAST-J).

Havoc of cloudbursts in Jammu and Kashmir: A growing threat with historical roots

■ MOHAMMAD HANIEF



The mountains of Jammu and Kashmir, known for their scenic splendour, have also long been vulnerable to one of nature's most destructive weather phenomena: the cloudburst. Over the years, sudden bursts of intense rainfall have repeatedly turned tranquil valleys into corridors of chaos, claiming lives, destroying property, and leaving lasting scars on communities. While such incidents are not new to the Himalayan region, their frequency and impact have been magnified in recent decades, making them one of the most pressing environmental challenges for the Union Territory.

A cloudburst is an extreme rainfall event concentrated over a small area in a very short span of time. In simple terms, it is the sudden unloading of massive amounts of water from a cloud, sometimes exceeding 100 millimetres of rain within an hour. The unique geography of Jammu and Kashmir makes it especially prone to these events. The interaction of monsoon moisture with western disturbances and the steep slopes of the Himalayas creates the perfect conditions for convective clouds to develop and burst.

Unlike widespread monsoon rains, cloudbursts are highly localised. One village may be devastated while another, only a few kilometres away, remains dry. Their unpredictability and the speed with which torrents of water rush down narrow valleys and gorges leave little time for preparation, often resulting in catastrophic consequences.

The history of Jammu and Kashmir is punctuated with episodes of cloudbursts that have caused large-scale devastation. In many districts of both Jammu and the Valley, elders still recount stories of nights when skies suddenly tore open and villages were swept away. Records may be incomplete, but the collective memory of the people has preserved these tragedies as grim reminders of the mountains' fury.

In the Valley, cloudbursts have frequently struck pilgrimage routes and remote high-altitude areas. These regions, often crowded with yatrīs, tourists, and service providers during monsoon months, have repeatedly witnessed sudden deluges that claimed lives and disrupted religious and cultural activities. Narrow



gorges and mountain streams that appear harmless on clear days have turned into raging torrents within minutes, washing away tents, ponies, and people alike.

The Jammu division, particularly districts such as Doda, Kishtwar, Poonch, and Rajouri, has its own tragic history. Settlements here are often perched on steep slopes, and traditional houses built of stone and mud crumble easily under the impact of debris flows. Farmers have watched terraced fields destroyed, irrigation channels buried, and entire hamlets flattened. Night-time cloudbursts have been especially lethal, leaving sleeping families little chance to escape.

Over time, these recurring calamities have become embedded in local folklore, reinforcing the understanding that mountains are both protectors and destroyers. Yet, despite the memory of past tragedies, human expansion into vulnerable zones has continued, increasing exposure to fresh dangers.

Several factors have amplified the impact of cloudbursts in recent decades. One of the most significant is land-use change. The construction of roads, tunnels, and other infrastructure projects has destabilised slopes, while unchecked dumping of excavated debris has created loose mounds that readily transform into landslides during intense rainfall.

Climate change has also played a role. Warmer air holds more moisture, and meteorologists have observed an increase in short-duration, high-intensity rainfall events across the

Himalayan belt. This has made the region more susceptible to flash floods and cloudburst impacts, with storms often exceeding historical averages.

At the same time, human exposure has multiplied. Population growth, new settlements, and expanding tourism have brought more people into harm's way. Pilgrimage sites witness heavy seasonal crowds, trekking routes attract large numbers of visitors, and commercial establishments often spring up near streams and riverbanks. As a result, when cloudbursts occur, the toll in terms of lives and property is far greater than in earlier times.

The devastation unleashed by a cloudburst extends far beyond immediate loss of life. Infrastructure, livelihoods, and community well-being all suffer long-lasting setbacks. Transport networks are among the first casualties. Mountain roads depend on delicate retaining walls and culverts, which are easily washed away by surging waters. A single collapse can isolate entire valleys for days, cutting off relief supplies and emergency services. Helicopter sorties, often needed for rescue, are hampered by poor weather.

Rural water supply schemes, which rely on streams and springs, are also badly hit. Intakes are damaged, pipes are buried under debris, and water sources become contaminated. Farmers face the destruction of apple orchards, saffron fields, and paddy lands. Topsoil is eroded, young plants are uprooted, and silt deposition makes fields infertile for seasons.

Livestock losses are common, further crippling rural households.

Health risks emerge quickly in the aftermath. Contaminated water leads to outbreaks of diarrhoeal disease, while stagnant pools become breeding grounds for mosquitoes. With roads blocked, patients requiring regular treatment face life-threatening delays. Schools, often repurposed as relief shelters, lose academic days, leaving students behind in their studies.

The psychological burden on survivors is equally heavy. Families who lose loved ones or see their homes washed away carry the trauma for years, and communities struggle to rebuild their sense of security.

Despite improvements in disaster management, Jammu and Kashmir remains underprepared for the scale of destruction cloudbursts can unleash. Detection is one major gap. Doppler radars and rain gauges provide data, but cloudbursts develop so rapidly that warnings often arrive too late. Remote areas lack dense sensor networks, and patchy mobile connectivity further delays communication.

Hazard mapping is another weakness. Many villages lack clear risk maps identifying historical flood paths or safe zones. In their absence, residents underestimate threats and continue to occupy high-risk areas. Building regulations are poorly enforced, with structures frequently constructed along streambeds or unstable slopes.

The management of tourism and pilgrimages also presents challenges. Pilgrim routes often become overcrowded, and temporary shelters and shops are set up in vulnerable areas. When heavy rain hits, these settlements are quickly overwhelmed.

Reducing the impact of cloudbursts requires a mix of technology, community preparedness, and stricter governance. Installing dense networks of rain gauges in cloudburst-prone valleys, linked with local sirens and offline SMS alerts, can provide crucial minutes of warning. River level sensors upstream can help detect sudden rises and alert downstream communities.

Equally important is restoring natural drainage systems. Streams should be cleared of encroachments, and floodplains must be preserved. Engineering solutions such as debris racks and slope drainage systems can reduce risks, while bioengineering methods using vegetation can help stabilise slopes.

Community preparedness plays a vital role. Villages should conduct evacuation drills before the monsoon, mark safe escape routes, and

educate children and shopkeepers on emergency protocols. During pilgrimages, dynamic crowd management should be enforced, with movement halted immediately when rainfall crosses a critical threshold.

Strengthening homes and public buildings is another priority. Elevated plinths, reinforced walls, and raised storage areas can reduce losses. Primary health centres should be stocked with emergency medical kits and trained staff to respond during disasters.

Finally, systematic data collection is essential. Each cloudburst event should be documented with details of rainfall intensity, damage patterns, and recovery efforts. Over time, this will provide valuable insight for refining policies and infrastructure planning.

Despite repeated tragedies, the resilience of communities in Jammu and Kashmir has been remarkable. Neighbours rescue one another, volunteers set up kitchens, and religious institutions open their doors to survivors. This spirit of solidarity is the backbone of disaster response in the region and should be formally recognised and supported through training and resources.

Equally valuable is the knowledge of elders who remember past events and know which streams can suddenly swell. Their experience, combined with modern technology, can provide a comprehensive understanding of risk and guide safer development.

Cloudbursts are an inevitable part of life in the Himalayas, but their destructive potential can be significantly reduced if lessons from the past are acted upon. Respecting the natural flow of rivers, enforcing land-use regulations, investing in early warning systems, and strengthening community preparedness are all crucial steps.

Jammu and Kashmir stands at a crossroads where climate change and human expansion into fragile zones are colliding. Choices made today-where to build, how to manage pilgrimages, and whether to prioritise resilience over short-term growth-will determine whether the next cloudburst is remembered as yet another tragedy or as a challenge met with foresight.

The mountains will always carry the power to nurture and to destroy. What remains within human control is the wisdom to adapt and prepare. In Jammu and Kashmir, where the memory of past cloudbursts is still vivid, there is no excuse for repeating mistakes. The sky may open without warning, but preparedness and prudence can ensure that communities are not left helpless when it does.

