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POLICY BRIEF

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Tackling Lightning Hazards in Bangladesh: Towards a Comprehensive Protection Strategy

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Abstract: Lightning has emerged as an acute, high-mortality climate threat in Bangladesh, causing over 300 annual fatalities since its formal designation as a natural disaster in 2016. This escalating crisis is driven by a convergence of factors: climate change-induced atmospheric instability and widespread landscape changes. Nearly 80 per cent of victims are from farming and fishing communities, so lightning strikes often worsen poverty, as households that lose their primary breadwinner are pushed to sell assets under duress. Current government efforts, including the planting of palm trees to reduce lightning strikes, the installation of static arresters, and the expansion of early warning services, have created an important foundation, nevertheless they can be strengthened to deliver faster and more reliable protection for vulnerable communities. This policy brief argues for building on these initiatives by moving towards a more integrated, human-centred mitigation approach, focusing on the activation of Cell Broadcast early warning alerts, the placement of small concrete shelters in high-risk agricultural areas, and the introduction of affordable micro-insurance products that help rural households avoid distress asset sales and maintain their livelihoods.

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Tackling Lightning Hazards in Bangladesh: Towards a Comprehensive Protection Strategy Strategic Mitigation

I. Introduction: The Emergence of a New Climate Threat

In Bangladesh, where cyclones, floods and river erosion usually dominate public and policy conversations on climate risk, lightning was historically regarded as a dispersed pattern of localised tragedies rather than a matter for national disaster governance. This perspective changed when an exceptionally deadly spell in 2016 brought the lightning hazard into focus, with at least 81 lightning-related deaths reported over just two days on 12 and 13 May in the same year (Biswas et al., 2016; Holle & Islam, 2017). In the period that followed, the Government of Bangladesh formally designated lightning as a natural disaster, and lightning-related injuries and fatalities were added to the official disaster list alongside cyclones, floods and droughts (Ahmed et al., 2024; Islam, 2016). This reclassification has since been reflected in the broader institutional architecture for disaster management, with lightning now acknowledged as a distinct hazard in core strategic documents, including the National Disaster Management Plan 2021–2025 (MoDMR, 2020).

Satellite and ground-based observations reveal a steady upward trajectory in lightning frequency since the early 1980s. Mortality data mirrors this trend, shifting from mere dozens of annual deaths in the 1990s to a consistent pattern exceeding 300 in recent years (Voiland, 2022). According to the Bangladesh Meteorological Department, 62 per cent of these strikes occur during the pre-monsoon season, creating a concentrated window of risk that overlaps dangerously with the agricultural calendar (Ahmed et al., 2024).

The escalation in lightning lethality in Bangladesh is driven by a potent convergence of atmospheric instability and anthropogenic climate change. Rising global temperatures are intensifying evaporation and convective cloud formation, creating the thermodynamic conditions necessary for frequent and violent thunderstorms (Ahmed et al., 2024). Beyond atmospheric drivers, the crisis is exacerbated by profound shifts in land use and ecosystem degradation. In the vast, low-lying Haor basins, the systematic removal of tall trees to facilitate agricultural expansion has eliminated the natural conductors that historically grounded electrical discharges (Siddique, 2024). This ecological stripping has left farmers, fishers, and outdoor workers as the tallest objects in the landscape. With tree canopies no longer providing a kind of natural shield, people working in rural areas are now far more exposed to lightning, and this has been linked in several reports to rising fatalities associated with deforestation and unplanned changes in land use (Daily Sabah, 2017). The burden of lightning falls squarely on the agrarian economy, with casualties peaking during labour-intensive periods like the Boro rice harvest. Against this backdrop, this policy brief provides a summary of the geographical

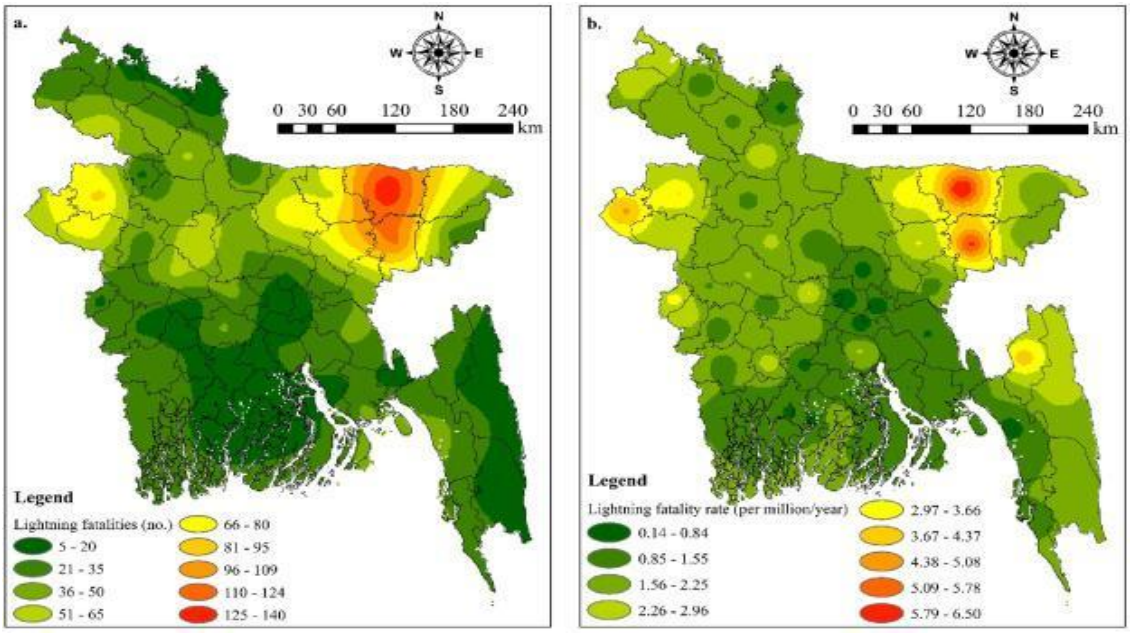
trends, drivers of escalating risks, and socioeconomic impacts of lightning strikes followed by some recommendations for a more comprehensive, resilient, data-driven mitigation strategy.

II. Trends and Geography of Vulnerability

According to the Department of Disaster Management (DDM), lightning strikes caused at least 3,485 deaths between 2015 and 2024, with annual fatalities varying from 226 in 2015 to a peak of 427 in 2020. Although reported lightning deaths fell to 322 in 2023 and to 271 by mid-2024, the pattern in 2025 has again been severe, with 23 deaths recorded on a single day in 28 April, including 19 farmers, while in Kishoreganj District ten people were killed over just 16 days between late April and early May, and other districts repeatedly identified as high risk include Rangpur, Dinajpur, Nilphamari, Kurigram and Dhaka (Dhaka Tribune, 2025). At the same time, NGO-based monitoring, such as data compiled by the Foundation for Disaster Forum, reports 3,273 lightning deaths between 2010 and 2021, which, although based on a different time frame, points to consistently higher cumulative totals than official figures and suggests that administrative statistics may not fully capture the true scale of mortality (Siddique, 2024).

While lightning strikes occur across Bangladesh, vulnerability is spatially concentrated with the northeastern Haor districts (Sunamganj, Kishoreganj, Netrokona) and northwestern districts such as Dinajpur and Chapainawabganj being identified as high-risk areas (Ahmed et al., 2024) as shown in Figure 1.

Figure 1: Spatial distribution of lightning fatalities



Source: Adapted from Ahmed et al (2024).

In the period of 2015-2022, Chattogram district records the highest absolute number of deaths (41) among the listed districts but, due to its large population, maintains a comparatively low fatality rate

(0.056 per 100,000) (Ahmed et al., 2024). Conversely, small, largely rural districts like Jhalokati and Barguna have the highest acute risk rates (0.227 and 0.223 per 100,000, respectively) (Ahmed et al., 2024).

III. Drivers of Escalating Risks

The surge in lightning lethality in Bangladesh is not merely a statistical anomaly but the result of a convergence between atmospheric instability, anthropogenic landscape regression, and regional pollution trends.

- **Sensitivity of lightning to warming**

The increasing frequency of lightning strikes is fundamentally tethered to global temperature rise. Widely accepted climatological estimates suggest that lightning frequency will increase by approximately 12 per cent for every 1°C rise in global average temperature (Romps et al., 2014). This metric, derived from the correlation between flash rates and Convective Available Potential Energy (CAPE), underscores the severe thermodynamic sensitivity of South Asia's atmosphere.

- **Signals for higher convective energy over the Bay of Bengal**

Regional modeling projects that the country-average CAPE, the primary fuel for intense thunderstorms, will rise by up to 45 per cent during the highly vulnerable pre-monsoon season in Bangladesh (Jahan et al., 2025). This indicates a future defined not just by more frequent storms, but by higher intensity events driven by the collision of warm, moist air from the Bay of Bengal with cooler northern air masses (Voiland, 2022). High values of cloud water mixing ratios in the northeast (Sylhet) already correlate directly with severe lightning occurrences, confirming that the atmosphere is becoming increasingly primed for lethal discharge (Voiland, 2022).

- **Landscape change: loss of tall trees and open field exposure**

As previously noted, the removal of natural protective barriers is a primary driver of rising vulnerability. The increasing trend of lightning fatalities is strongly linked to the wholesale clearance of large trees, particularly in the extensive wetlands of the Haor Basin. Farmers, driven by the economic imperative to maximise arable land for cash crops like Boro rice, inadvertently maximise their own exposure by removing the natural grounding targets that divert strikes away from them. This dynamic illustrates a detrimental positive feedback loop where necessary agricultural production practices directly escalate disaster risk. The economic pressure to maximise yield through land clearing removes natural protection, thereby increasing human exposure during the critical harvest period. This landscape vulnerability demonstrates that the disaster risk is embedded within current agricultural practice.

- **Links between aerosols or fine particulates and thunderstorm electrical activity**

A distinct, often overlooked driver is the role of atmospheric pollution. Recent studies identify a strong correlation between increased lightning activity and the presence of fine particulate matter (PM 2.5) and aerosols, particularly during the pre-monsoon season (Hasnat, 2025). Transboundary dust and sulfate particles, largely originating from agricultural burning and industrial emissions across the Indo-Gangetic Plain, alter cloud microphysics. These aerosols modify how electrical charges build up and separate within storm clouds, leading to an intensification of lightning flash rates (Hasnat, 2025). Because these pollutants enter Bangladesh via long-range transport, lightning mitigation must be treated not only as a localised safety issue but as a regional challenge of atmospheric security and climate diplomacy.

IV. Socio-economic Impact Assessment

The socio-economic footprint of lightning in Bangladesh is defined by a stark asymmetry: it is almost exclusively a disaster for the agrarian poor. Unlike cyclones or floods that sweep across broad demographics and geographies, lightning functions as a threat to the rural workforce, converting essential economic activities such as harvesting rice, fishing in open waters, and grazing cattle into lethal exposure.

- **Victim profiles and occupational exposure**

Lightning mortality disproportionately affects the most socio-economically vulnerable sectors. The risk profile is intensely rural, with rural populations facing 8.73 times higher risk of being struck than their urban counterparts (Biswas et al., 2016). Furthermore, approximately 80 per cent of all lightning victims are estimated to be farmers and fishermen (Anas, 2019). Specific data from monitoring groups reinforce this, showing that of 228 fatalities recorded by August 2022, 145 were farmers and 29 were fishers (Islam, 2022). Fatalities frequently occur when victims are engaged in essential livelihoods such as harvesting rice, fishing in open water, or tending village pastures. In one tragic instance, 16 people from a single family were killed while sheltering under a metal shed during a storm (Vaidyanathan, 2023). This concentration of risk underscores that lightning is not an indiscriminate killer, but a specific threat to the agricultural labour force.

- **Household shock patterns and financial stressors**

As primary male breadwinners are often the victims of lightning strikes, the economic shock to low-income households is immediate and catastrophic. The death of an earner triggers a financial crisis that forces families to make detrimental coping choices: borrowing extensively at high interest, exhausting limited savings, and, most critically, liquidating productive assets (Vaidyanathan, 2023). This distress selling of land or livestock to cover funeral costs or debt repayment compromises long-term food security, housing quality, and children's education. Since poverty reduction relies on the accumulation of assets, a lightning shock effectively traps the family in a vicious cycle of poverty from which recovery is often impossible. While the government pledged compensation mechanisms in 2016, the persistent necessity for families to liquidate assets suggests that current support is too slow or insufficient to stabilise households during the immediate post-disaster crisis.

- **Livestock and asset loss**

Beyond the human toll, lightning strikes inflict significant economic damage by killing livestock, destroying traditional homes, and sparking fires. However, a critical gap exists in national disaster accounting: there is currently no robust, publicly available data quantifying livestock loss (cattle, goats, poultry). For the rural poor, livestock often represents the primary form of liquid wealth, collateral, and productive capital. The loss of it could imply the destruction of a household's savings account. Without data to quantify this loss, the full economic burden of lightning hazards remains undercounted, and mitigation strategies fail to address the need for protection of livestock and other relevant assets.

V. Policy Recommendations

The lightning crisis in Bangladesh is driven by climate-induced hazard intensification and preventable socio-economic exposure. Current governmental responses, namely the Early Warning System sensor network, planting palm trees, and installing lightning arresters sets up a decent foundation to tackle the lighting hazard (Rahman, 2023). The recommendations that follow are intended to complement and strengthen these efforts, with the pathway to more effective mitigation resting on a careful sequencing of investment that places immediate, scalable human protection ahead of purely static infrastructure.

Refocus institutions and budgets on lightning risk. The Department of Disaster Management and the Bangladesh Meteorological Department should be given an explicit lightning mandate, with dedicated budget lines for detection, forecasting and warning, so that resources are not continually diverted to other hazards. Non-governmental and community-based organisations can also support these measures through local awareness activities, training and maintenance of protection systems. Priority investment areas include a national lightning detection network, upgraded radar, and operational research partnerships with agencies such as NASA and regional centres to improve nowcasting. At the same time, capital spending on standalone arresters needs to be reviewed against more protective options, with funds steered towards certified Lightning Protection Systems on schools, health centres and community buildings in high risk rural areas, and towards a tree planting programme that is fully financed through to sapling maturity rather than only at the planting stage (Rahman, 2023; Siddique, 2024).

Embed lightning in disaster and climate planning with targets. Lightning risk reduction should be fully woven into disaster risk reduction and climate adaptation plans, building on its inclusion in the official disaster list and the National Adaptation Plan, but moving from mention to measurable commitments. National strategies ought to set clear outcome targets, for example a specified reduction in annual deaths over a five-year period, and attach ring fenced budgets for prevention and preparedness activities. Disaster management guidelines should be revised so that simple, context specific lightning safety procedures for schools, farms, small workshops and industrial sites are placed alongside existing flood and cyclone protocols, and these procedures should then be picked up within sector plans for agriculture, education and labour.

Make early warning reach the last mile. Policy attention now needs to close the gap between forecasts issued in Dhaka and decisions taken in fields, boats and construction sites in high-risk districts (Vaidyanathan, 2023). A practical step would be full activation of the Cell Broadcast system in these districts, with government bearing part of the technical and financial costs so that BMD and mobile operators can send rapid, location specific alerts over existing networks at no charge to users (Rahman, 2023).[2] This should be backed by a simple framework for local dissemination in which village committees or nominated volunteers are tasked with relaying warnings through mosque loudspeakers, union parishad announcements, megaphones and local radio, using very short messages in local dialects, and by integrating lightning alerts into the established cyclone warning channels and the Cyclone Preparedness Programme volunteer network (Dhaka Tribune, 2025; Siddique, 2024).

Link infrastructure, behaviour change and financial protection. New protective structures will only work if they are reachable in time and built to proper standards, so funding for multipurpose shelters, including the planned one-kilometre spaced shelters in Haor areas, should be conditional on a tested link to the local early warning system and on clear operating protocols for opening and use during storms. The National Building Code should be updated so that certified Lightning Protection Systems are a legal requirement for all public buildings and new tall structures, with simple compliance checks built into existing inspection routines (Siddique, 2024). Alongside this, one standard safety message such as “When thunder roars, go indoors” can be used nationwide, pushed through schools, religious institutions, media and local government in the pre monsoon months, with tailored guidance for high-risk occupations such as farming, fishing and construction on when to stop work and where to shelter. Finally, lightning needs to be treated as a source of household level financial shock, which implies the creation of subsidised micro insurance or a dedicated social protection window for registered rural workers, designed to pay out quickly enough to prevent distress sales of land and livestock, while regional diplomacy on climate and air quality begins to factor in how transboundary aerosol transport may be amplifying local lightning risk.

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