# 8. Safer Building Code-Geography

The debate surrounding India's updated earthquake safety codes highlights a critical tension between scientific necessity and economic feasibility. While a decade of research suggests that India's current building standards are outdated, the withdrawal of revised norms by the Bureau of Indian Standards (BIS) due to cost concerns poses a significant challenge to national disaster resilience.

## 1. Background and Definitions

### Seismology and Structural Design

**Seismic Hazard Assessment-** The study of the potential for earthquake-related ground shaking in a specific area.

**Seismic Zoning-** The process of dividing a country into regions with similar levels of expected ground shaking to guide construction standards.

**The IS 1893 Standard-** Titled *"Criteria for Earthquake Resistant Design of Structures,"* this is the mandatory five-part code published by the BIS. It dictates how buildings, bridges, and dams must be designed to withstand tectonic movements.

### Key Scientific Metric- Peak Ground Acceleration (PGA)

PGA measures the maximum ground shaking that occurs during an earthquake at a specific location.

**Unit of Measurement-** Expressed as a fraction of g (the acceleration due to gravity, 9.81 m/s^2).

**Scale-** Low-risk areas typically have PGA values under $0.10g$, while high-risk zones can exceed 0.30g. Extreme seismic events in countries like Japan can see PGA values over 1.0g

## 2. Gaps in India's Existing Seismic Framework

Historically, India's earthquake zoning has been criticized for being "reactive" rather than "proactive." The following gaps have been identified-

**Retrospective Zoning-** Areas were often upgraded to high-risk (Zone IV or V) only *after* a devastating earthquake occurred, failing to prevent loss in the first place.

**Seismic Gap Neglect-** Regions that have not experienced an earthquake in a long time but sit on high-stress tectonic fault lines were wrongly classified as low-risk.

**Soil Amplification Ignored-** The existing framework does not adequately account for how local soil types (like soft alluvial soil) can amplify shaking, leading to more structural damage than expected.

**Data Underutilization-** Modern data from the 168 monitoring stations of the National Centre for Seismology has not been fully integrated into the older maps.

**Methodological Lag-** Current maps lack the use of Probabilistic Seismic Hazard Assessment (PSHA), a global standard that estimates the likelihood of various levels of earthquake ground motion.

## 3. Comparison- Existing vs. Proposed Seismic Standards

The proposed (but currently withdrawn) standards aimed to bring India closer to global safety benchmarks.

| Feature | Existing Standards (Current) | Proposed Standards (Withdrawn) |
|---|---|---|
| Number of Zones | Four (Zones II, III, IV, V). | Five (Introduces Zone VI). |
| Max PGA Estimate | Significantly lower/conservative. | High (up to 0.75g). |
| Database Range | Limited historical records. | 69,000+ earthquakes (2600 BC–2019). |
| Methodology | Deterministic/Reactive. | Advanced Probabilistic (PSHA). |
| Global Alignment | Below US/Japan standards. | Aligns with ~1g design practices. |
| Zone VI Criteria | N/A | For areas where PGA exceeds 0.6g. |

## 4. Highlights of the New Scientific Findings

The research backing the withdrawn standards emphasized that India's risk profile is much higher than previously documented-

**Massive Population Exposure-** Approximately 79% of India's population resides in regions prone to moderate or severe seismic activity.

**Introduction of Zone VI-** This new zone was proposed specifically for the Himalayas and Northeast India, where tectonic strain is at its peak.
**Doubling Hazard Estimates-** In several high-risk areas, the revised hazard maps nearly doubled the previous estimates for ground acceleration, suggesting that existing buildings might not be strong enough.
**Predictive Accuracy-** By using a dataset spanning over 4,600 years, the new map identifies potential "seismic gaps" where a major earthquake is overdue.

## 5. The Policy Dilemma- Safety vs. Cost

The withdrawal of these standards by the Cabinet Secretariat stems from a "classic policy dilemma"-
**Project Cost Inflation-** Stricter codes require more steel, specialized concrete, and advanced engineering, which would significantly increase the cost of residential and commercial projects.
**Infrastructure Delays-** Retrofitting or redesigning ongoing massive projects—such as Metro Rail networks, bridges, and dams—to meet new PGA values would lead to massive budget overruns and timeline delays.
**Feasibility of Enforcement-** Implementing high-tech standards in a country with a vast, unregulated construction sector poses a major governance challenge.

## 6. Conclusion and Way Forward

The current situation leaves a "protection gap." While the revised seismic map is scientifically robust and reflects the reality of India's tectonic vulnerability, the economic burden of implementation remains a hurdle.
Moving forward, India needs a phased implementation approach-
**Critical Infrastructure First-** Mandatory adoption of new codes for dams, nuclear plants, and hospitals.
**Public Awareness-** Educating developers on the long-term "cost of failure" versus the "cost of safety."
**Incentivized Retrofitting-** Providing tax breaks or subsidies for residential societies to strengthen older buildings against seismic threats.
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