Disaster-Related Statistics in Pakistan

Understanding Pakistan's Vulnerability

Geographic Diversity & Hazards

- Mountain ranges to coastal plains
- Floods: Monsoons, glacial melts
- Earthquakes: Seismically active zones
- Heatwaves: Rising temperatures
- Droughts: Water scarcity
- Pandemics: COVID-19 experience

Recent Major Disasters

2022 Floods:

- 33M affected, $30B+ damages
- 1,739 deaths

2024-2025 Floods:

- 1,037 deaths, 1,067 injuries
- 229,763 houses damaged
- Rs 744B economic loss

Climate change amplifying disaster frequency - 70 districts affected in 2025

Census 2023: Vulnerability Indicators

Total Population
241.5M

50% under age 20

Rural Population
61.1%

Limited early warning access

Housing Vulnerability
62% Kacha/Semi-Pakka

Flood & earthquake prone

Out of School (5-16)
35.6%

22.8M children at risk

Firewood for Cooking
52.7%

Indoor pollution + deforestation

Avg Household Size
6.3 persons

Overcrowding increases risk

Source: 7th Population & Housing Census 2023 (Digital Census) - First ever digital census of Pakistan

National Policy Framework & PBS Role

Key Policy Documents

- National Disaster Management Plan
- Climate Risk Screening Handbook (2025)
- Sendai Framework & SDG 1, 11, 13

Climate Risk Screening

- CHIRA: Initial Risk Assessment
- CARA: Adaptation & Resilience
- CMA: Mitigation Assessment

1. Pre-Disaster

Risk assessment & vulnerability mapping

2. During Disaster

Rapid damage assessment with GIS

3. Post-Disaster

Recovery monitoring & impact evaluation

4. Mainstreaming

Integration with development planning

Measuring What Matters: Indicators Framework

Human Impact

✓ Deaths & injuries
✓ Missing persons
✓ Displaced population
✓ Affected population (age, sex, disability)

Economic Losses

✓ Housing damage (Kacha vs Pakka)
✓ Agricultural losses
✓ Livestock deaths (22,841 in 2025)
✓ Infrastructure damage

Risk Indicators

✓ Population in hazard zones
✓ Infrastructure exposure
✓ Vulnerability indices

Data Gaps We're Addressing (CIME Framework)

→ Real-time data collection → Geospatial integration → Continuous infrastructure inventories

Case Study 1: 2022 Floods - Breakthrough Innovation

The Challenge

33 million affected • 1,739 deaths • $30+ billion damages

Traditional survey methods too slow - unprecedented scale required new approach

1. Flood Extent Mapping

- Satellite imagery analysis
- Digital flood boundaries
- Ground truthing validation
- Remote sensing integration

2. Geospatial Intersection

- Overlaid with census enumeration areas
- Precise affected area ID
- Population estimation accuracy
- 120,000 tablets deployed

Assessment time reduced from MONTHS to WEEKS

2022 Floods: Comprehensive Damage Assessment

Data Collection Innovations

Mobile tablet surveys • Real-time transmission • Georeferenced data • GIS integration

✓ Affected Population

Disaggregated by age/sex

✓ Housing Damage

Kacha vs Pakka structures

✓ Livestock Losses

Cattle, goats, poultry

✓ Livelihood Impacts

By occupation type

✓ Source of Income

Agricultural workers, daily wage

✓ Critical Infrastructure

Schools, health facilities

Dashboard Features

Interactive maps • District/Tehsil/EA disaggregation • Temporal analysis • Relief distribution tracking

Case Study 2: 2024-2025 Floods - Enhanced Capabilities

2024-2025 Flood Impact

1,037 deaths | 1,067 injuries

229,763 houses damaged

Rs 744 billion economic loss

70 districts affected across Pakistan

Enhanced Capabilities

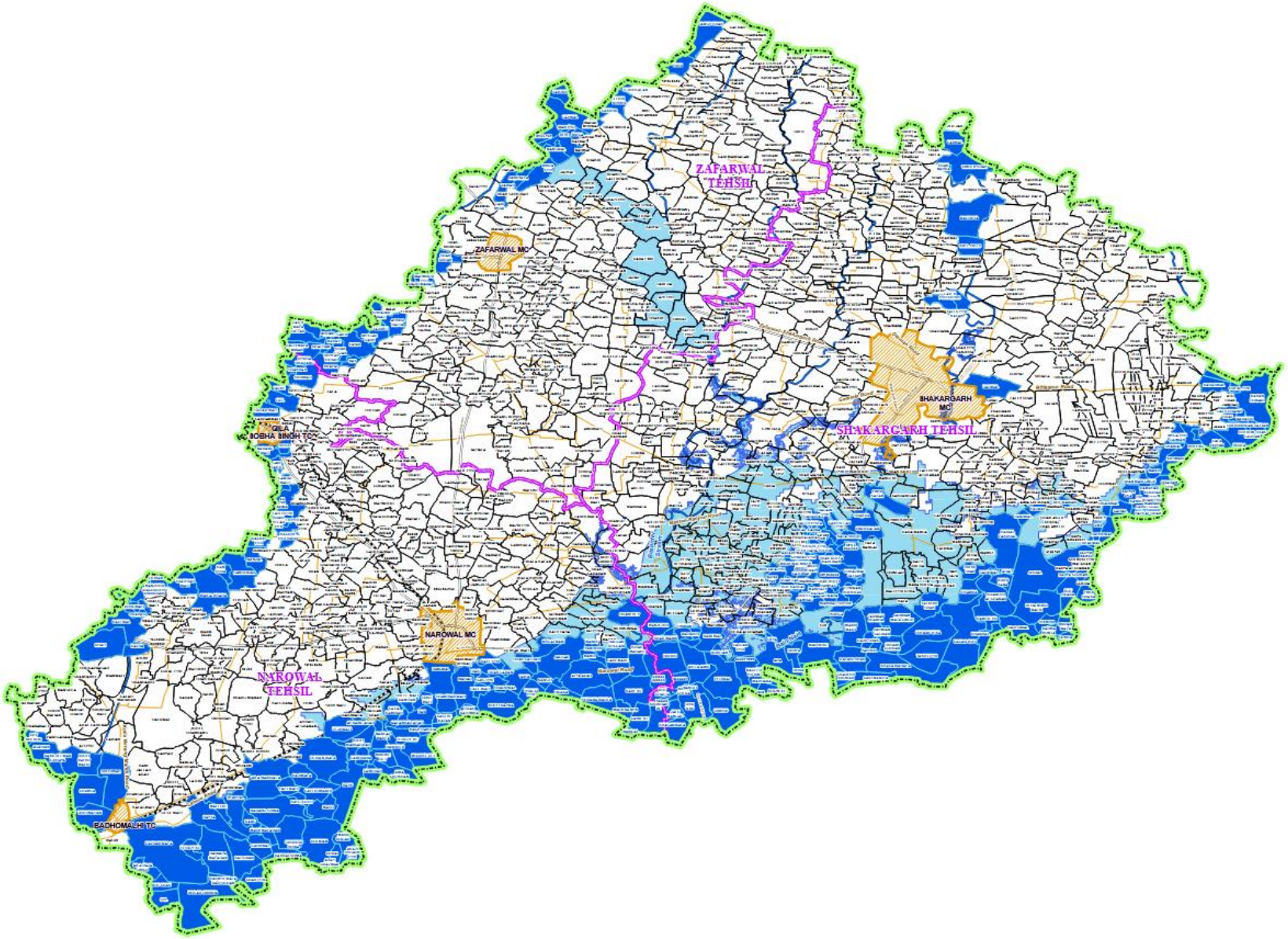
✓ Automated reporting systems

✓ Real-time decision-maker updates

Provincial Distribution of Losses (Rs 744B Total)

- **Punjab: Rs 632B (84.9%)**
- **KP: Rs 51B (6.9%)**
- **Sindh: Rs 32B (4.3%)**
- **GB: Rs 13B (1.7%)**
- **AJK: Rs 9B (1.2%)**
- **Balochistan: Rs 7B (0.9%)**

GIS-based methodology now STANDARD PRACTICE for PBS disaster response


ZAFARWAL TEHSIL
ZAFARWAL MC
SHAKARGARH MC
SHAKARGARH TEHSIL
SOBHA SINGH TC
NAROWAL MC
NAROWAL TEHSIL
RADHOMALHI TC

Advanced GIS: Predictive Risk Assessment

NatCat Model & Return Period Analysis

- 50-year return period flood mapping
- Riverine & urban flood risk combined
- Heatwave extreme temperature risk
- Areas with 60% of Pakistan's GDP at highest risk

Top 10 Most Vulnerable Districts

1. Muzaffargarh (Punjab)
2. Multan (Punjab)
3. Bhakkar (Punjab)
4. Dadu (Sindh)
5. Bahawalpur (Punjab)

Critical Infrastructure Exposed to Riverine Flooding

Health Facilities

Most exposed:
130 in Multan district
Top 10 districts: 413 facilities

Educational Institutes

Most exposed:
1,394 in Naushahro Feroze
Top 10 districts: 8,717 institutes

Road Networks

Most exposed:
1,018 km in Multan

Top 10 districts: 5,366 km

Census 2023 Data: Housing Vulnerability in Flood Zones

- 62% Kacha/Semi-Pakka houses in vulnerable districts (mud, thatch construction)
- 6.3 persons per household = high congestion during evacuations
- 35.6% children out of school = reduced disaster preparedness knowledge

Case Study 3: COVID-19 Pandemic Response

The Challenge: Track disease spread • Identify hotspots • Support resource allocation (hospitals, testing, vaccination)

1. Patient Geocoding

- Geocoded patient addresses
- Aggregated to enumeration areas
- Privacy protected through aggregation

2. Choropleth Mapping

- Visualized case density
- Identified emerging hotspots
- Tracked temporal trends daily

3. Population Integration

- Calculated infection rates
- Identified vulnerable populations
- Supported targeted interventions

Impact on Public Health Response

✓ Enabled targeted lockdowns ✓ Optimized testing drives ✓ Guided vaccination campaigns ✓ Shared with provincial governments

Climate Risk Screening: Mainstreaming at PBS

Pakistan's Climate Risk Screening Handbook (2025)

Planning Commission's standardized framework for all PSDP projects - PBS now applies to all disaster assessments

CHIRA

Climate & Hazard Initial Risk Assessment

- High-level screening
- Risk scoring (0-20 scale)
- For ALL projects
- PCN & PC-I stage

CARA

Climate Adaptation & Resilience Assessment

- Medium/High risk projects
- Vulnerability assessment
- Adaptation options
- PC-II stage

CMA

Climate Mitigation Assessment

- GHG emissions tracking
- Baseline vs project scenario
- Mitigation planning
- Carbon accounting

CIME: Climate Indicators for M&E

PBS now tracks climate indicators at output, outcome & impact levels for all disaster-related projects

Building a Disaster Data Ecosystem

Primary Data Sources

- Population & Housing Census 2023 (241.5M population, 38.3M households)
- Administrative records (NDMA, PDMAs)
- Field surveys & rapid assessments
- Satellite imagery (SUPARCO)

Key Partnerships

National:
NDMA, PDMAs, Climate Change Ministry, Finance Ministry, Planning Commission

Technical:
SUPARCO, NADRA, Universities,

International:
UN agencies, World Bank, ADB, Development partners

Integration Achievements

Census 2023 Integration

Enumeration areas = geographic framework for all disaster data

Real-time Systems

120,000 tablets, digital data collection, live dashboards

Predictive Modeling

50-year return period analysis, vulnerability mapping

Open Data

API access for government agencies, public data portal

No single agency can handle disaster data alone - partnerships are essential

Overcoming Barriers to Quality Disaster Statistics

Evolution of PBS Disaster Statistics Capabilities

Challenge	Solution Implemented	Remaining Gaps
Timeliness	Mobile data, GIS automation, 120K tablets	Need real-time sensor networks
Coordination	Data sharing protocols, PBS as hub	Formalize legal framework
Disaggregation	survey design, census linkage	Better disability data collection
Capacity	Training programs, university partnerships	Staff retention, continuous learning
Resources	Leveraged census infrastructure	Sustainable funding for disaster stats
Prediction	NatCat Model, return period analysis	Expand to all hazard types

Census enumeration areas + GIS technology = Foundation for modern disaster statistics

Key Insights from Pakistan's Experience

✓ What Worked

1. Leverage census infrastructure
   (38.3M households, enumeration areas)
2. Start small, scale up
   (2022 pilot → 2024-25 full deployment)
3. Technology as enabler
   (120K tablets, real-time dashboards)
4. Partnerships essential
   (NDMA, SUPARCO, provinces)
5. User-driven approach
   (Meeting policymaker needs)

⚠ What We'd Do Differently

- Start capacity building earlier
  (GIS training takes time)
- Formal data sharing agreements upfront (Legal framework for inter-agency data)
- More investment in documentation
  (Methodology, metadata standards)
- Build system redundancy
  (Backup servers, alternative staff)
- Better disability data collection
  (Vulnerable population assessment)

Critical Success Factors

✓ Leadership commitment at PBS
✓ Support from disaster authorities
✓ Technical assistance from partners
✓ Willingness to innovate & learn
✓ Digital Census 2023 infrastructure
✓ Climate Risk Screening framework
✓ 241.5M population baseline data
✓ Real-time monitoring systems

Don't wait for the perfect system - start with what you have and improve iteratively!

Recommendations for NSOs Starting This Journey

Getting Started

1. Assess current capabilities & infrastructure
2. Identify key users & their data needs
3. Start with one disaster type (floods/droughts)
4. Establish partnerships early (disaster agencies)

Building Capacity

5. Invest in GIS training for staff
6. Use open-source tools (QGIS, R, Python)
7. Document everything (methods, metadata)
8. Learn from peers regionally

Ensuring Sustainability

9. Mainstream into regular budget
10. Create SOPs for rapid deployment
11. Engage with international frameworks
12. Adopt climate risk screening (CHIRA/CARA)

Recommended Tools (Open Source)

QGIS (GIS) • R/Python (analysis) • ODK/KoboToolbox (mobile data) • Apache Superset (dashboards)

Pakistan Bureau of Statistics welcomes knowledge exchange and collaboration

PBS Vision for Disaster Statistics 2025-2030

2025-2026
Short-term

✓ Expand GIS to all hazard types

✓ Climate risk screening for all PSDP projects

✓ Complete district vulnerability mapping

✓ Real-time early warning integration

2027-2028
Medium-term

✓ Integrated disaster data warehouse

✓ Predictive analytics for compound hazards

✓ PM's Climate Resilience framework alignment

2029-2030
Long-term

✓ Full Sendai Framework reporting

✓ Machine learning for risk prediction

✓ Regional expertise hub for Asia-Pacific

🎯 Strategic Priorities

Technical:

- Advanced geospatial analytics
- Machine learning for disaster prediction
- Climate model integration

Institutional:

- Formalize inter-agency coordination
- Build provincial capacity
- Strengthen regional networks

Key Takeaways: Pakistan's Disaster Statistics Journey

From →

- Traditional paper surveys
- Delayed reporting (months)
- Siloed data systems
- Disaster response only
- Aggregate statistics
- Limited spatial analysis
- Manual data processing

To ✓

- Digital Census 2023 (120K tablets)
- Real-time dashboards (weeks)
- Integrated systems (NDMA, SUPARCO)
- Risk-informed development
- Advanced GIS & predictive modeling
- Automated analytics

Core Message

Disaster statistics are not just numbers - they represent lives, livelihoods, and the path to resilience.

NSOs have a critical role in transforming data into actionable intelligence for disaster risk reduction.

Our Commitment

Pakistan Bureau of Statistics is committed to continuous improvement and regional cooperation in advancing disaster-related statistics for sustainable development.

Thank You

www.pbs.gov.pk

Special thanks to SIAP, IMF, and Statistics Korea