



THE CORE IAS

— India's First Institute Dedicated to Answer Writing —



ZENITH — DISASTER — MANAGEMENT

★ VALUE ENRICHMENT ★

★
CONCEPTS • ANALYSIS • APPLICATION



UNDERSTAND
Disasters Beyond
News Headlines



ANALYSE
Risks, Vulnerabilities
& Frameworks



CONNECT
Disaster Management
with Current Affairs



APPLY
In Answer Writing
Effectively

“ Disasters are not natural,
but their impact is.
Preparedness today, *resilience* tomorrow. ”

★ THINK. QUESTION. CONNECT. SUCCEED. ★

UPSC CIVIL SERVICES EXAMINATION

MAINS · GENERAL STUDIES PAPER III

DISASTER MANAGEMENT

Value Addition Vault

Unit 15 · Mains 2026 Edition

A Basics · DRR · B Specific Disasters · C Multi-Hazard Cascades · D DRR Architecture · E HADR & International · F Technology & EWS

WHAT THIS VAULT GIVES YOU

A table-driven companion to your micro-topics mapping. Every PYQ-derived theme — vulnerability, resilience, Sendai, NDMA guidelines (Earthquake 2007, Tsunami 2010, Drought 2010, Urban Floods 2010, Cloudburst, Landslide 2009, GLOF 2020, Heatwave 2019), urban floods, cloudbursts, tsunami — unpacked into atomic tables.

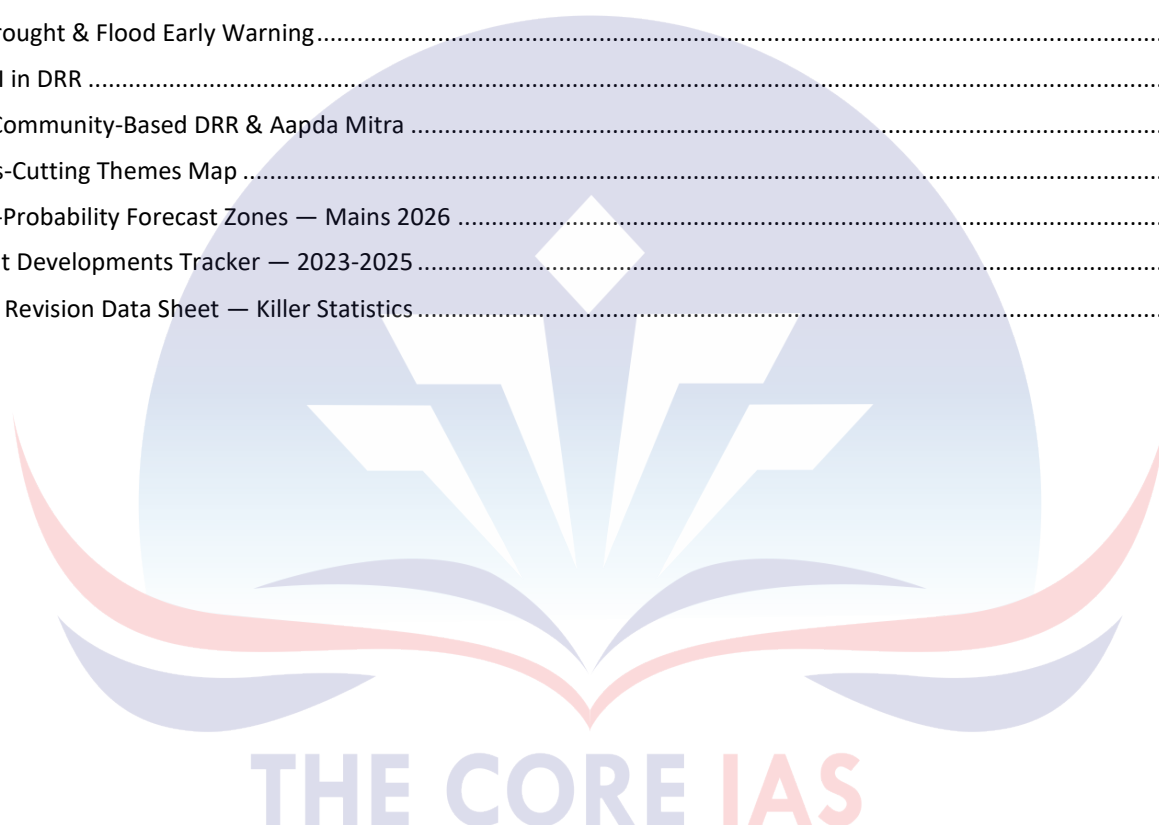
Current to 2025 — Sendai Mid-Term Review 2023, CDRI scaling, Joshimath Jan 2023, South Lhonak GLOF Oct 2023, Wayanad Jul 2024, Tibet Jan 2025, cyclones Biparjoy-Michaung-Remal-Dana, Op Dost Turkey-Syria 2023, Op Karuna Myanmar, DM Amendment Act 2025 in pipeline, 15th FC mitigation funds, parametric insurance, IMD impact-based forecasting.

THE CORE IAS

Table of Contents

Table of Contents.....	2
A. Disaster Basics — Vulnerability, Resilience & DRR Frameworks	4
(i) Disaster Terminology — UNDRR Risk Equation	4
(ii) DM Act 2005 — Architecture & Recent Amendments	4
(iii) Global DRR Architecture — Yokohama → Hyogo → Sendai.....	5
(iv) Sendai Framework — 4 Priorities & 7 Targets	6
(v) Hyogo vs Sendai — Key Differences (2018 PYQ)	7
(vi) Vulnerability — Types (2019 PYQ).....	7
(vii) Resilience — Elements & Frameworks (2024 PYQ)	8
(viii) Reactive → Proactive Doctrinal Shift (2020 PYQ)	8
(ix) Landslide Hazard Zonation (2019 PYQ).....	9
(x) Recent Proactive Measures — India's DRR Doctrine Shift.....	9
(xi) Sendai Framework Mid-Term Review (2023)	10
B. Specific Disasters & NDMA Guidelines	11
(i) Drought — NDMA Guidelines & Types.....	11
(ii) El Niño / La Niña / IOD — Monsoon Impact.....	12
(iii) Earthquake — Indian Seismic Zones & NDMA 2007.....	12
(iv) Recent Earthquakes & Indian Response	13
(v) Urban Floods — Mechanisms & Drivers	14
(vi) Urban Flood Case Studies	15
(vii) Cloudburst — Mechanism & Recent Events	16
(viii) 2004 Indian Ocean Tsunami & ITEWS.....	17
(ix) Cyclones — Biparjoy to Dana & India's Cyclone Model.....	17
(x) Glacial Lake Outburst Flood (GLOF) — NDMA 2020 Guidelines	18
(xi) Heat Action Plans (HAP) — Ahmedabad Model	19
(xii) Industrial / Chemical Disasters	19
(xiii) Biological / Pandemic Disasters — COVID-19 Lessons.....	20
C. Recent Multi-Hazard Cascades (2021-2025).....	21
(i) Chamoli Glacier Disaster (Feb 2021).....	21
(ii) Joshimath Land Subsidence (Jan 2023)	21
(iii) Sikkim South Lhonak GLOF (Oct 2023)	22
(iv) Wayanad Landslide (Jul 2024)	22
(v) Tibet Earthquake (Jan 2025) — Himalayan Spillover.....	23
D. India's DRR Architecture & Financing.....	24
(i) Three-Tier Architecture	24
(ii) NDRF — Specialised Response Force.....	24
(iii) 15th Finance Commission DM Allocations (2021-26).....	25
(iv) Innovative Financing Instruments	25

(v) NDMA Guidelines Stack — Comprehensive Reference	26
E. International Cooperation & HADR Diplomacy.....	28
(i) Coalition for Disaster Resilient Infrastructure (CDRI)	28
(ii) IRIS — Infrastructure for Resilient Island States.....	28
(iii) India's HADR Operations Tracker.....	28
(iv) Mission LiFE × DRR Linkage.....	29
F. Technology & Early Warning Systems.....	31
(i) IMD Impact-Based Forecasting.....	31
(ii) INCOIS — Indian National Centre for Ocean Information Services	31
(iii) ISRO Bhuvan & NDEM.....	32
(iv) CAP-SACHET — Common Alerting Protocol.....	32
(v) Drought & Flood Early Warning.....	32
(vi) AI in DRR	33
(vii) Community-Based DRR & Aapda Mitra	33
G. Cross-Cutting Themes Map	35
H. High-Probability Forecast Zones — Mains 2026	36
I. Recent Developments Tracker — 2023-2025	38
J. Quick Revision Data Sheet — Killer Statistics	40



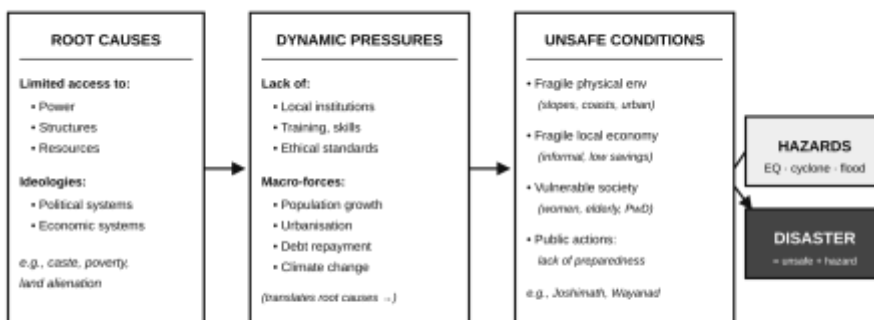
A. Disaster Basics — Vulnerability, Resilience & DRR Frameworks

PYQ density: 6 questions (2013-24) · Anchor topics: vulnerability & risk, Sendai vs Hyogo, resilience, landslide zonation, reactive→proactive shift.

(i) Disaster Terminology — UNDRR Risk Equation

Term	Definition (UNDRR / DM Act 2005)
Hazard	A potentially damaging physical event, phenomenon, or human activity (earthquake, cyclone, flood).
Exposure	People, property, livelihoods, services, infrastructure, ecosystems in hazard-prone areas.
Vulnerability	Conditions making people, communities, assets susceptible to damaging effects (poverty, weak buildings, age).
Capacity	Combination of strengths, attributes, resources to manage and reduce risk (preparedness, response systems).
Risk Equation	$Risk = (Hazard \times Exposure \times Vulnerability) \div Capacity$
Disaster	Serious disruption of a community when realised risk overwhelms its capacity — loss of life, property, environment.
Resilience	Ability of a system to resist, absorb, accommodate, recover from a hazard in timely and efficient manner.
Build Back Better (BBB)	Recovery/reconstruction approach to integrate DRR; Sendai Priority 4.
Disaster Risk Reduction (DRR)	Concept and practice of reducing disaster risks via systematic analysis and management of causal factors.

Pressure-and-Release (PAR) Model — Vulnerability as Social Process



"Vulnerability is the product of social processes — not the hazard itself"

— Wisner, Blaikie, Cannon, Davis (At Risk, 2nd edn., 2003)

Release: targeted action at each stage reduces vulnerability before hazard strikes

(ii) DM Act 2005 — Architecture & Recent Amendments

Body / Provision	Detail
DM Act 2005	Enacted post-2004 tsunami; institutional framework; central, state, district 3-tier; defines disaster as natural or man-made event causing substantial loss.
NDMA (National DM Authority)	Chairperson — PM; HQ New Delhi; up to 9 members; lays down policies, plans, guidelines for DM.
SDMA (State DM Authority)	Chairperson — CM; mirrors NDMA at state level.
DDMA (District DM Authority)	Chairperson — District Magistrate; ground-level coordination.
NIDM	National Institute of Disaster Management, New Delhi; training, capacity-building, research.
NDRF	National Disaster Response Force; 16 battalions (~16,000 personnel); specialised in floods, earthquakes, CBRN, urban search & rescue.
National Plan	NDMP 2016 (first); updated 2019; aligned with Sendai; sets all-hazards framework.
NDRR (Reserve)	National Disaster Response Reserve — pre-positioned equipment/stores at strategic locations.
DM (Amendment) Act 2025 — in pipeline	Proposed to strengthen NDMA powers; statutory backing for SDMP/DDMP; urban DM separately addressed; financing clarity; consultation phase since 2024.

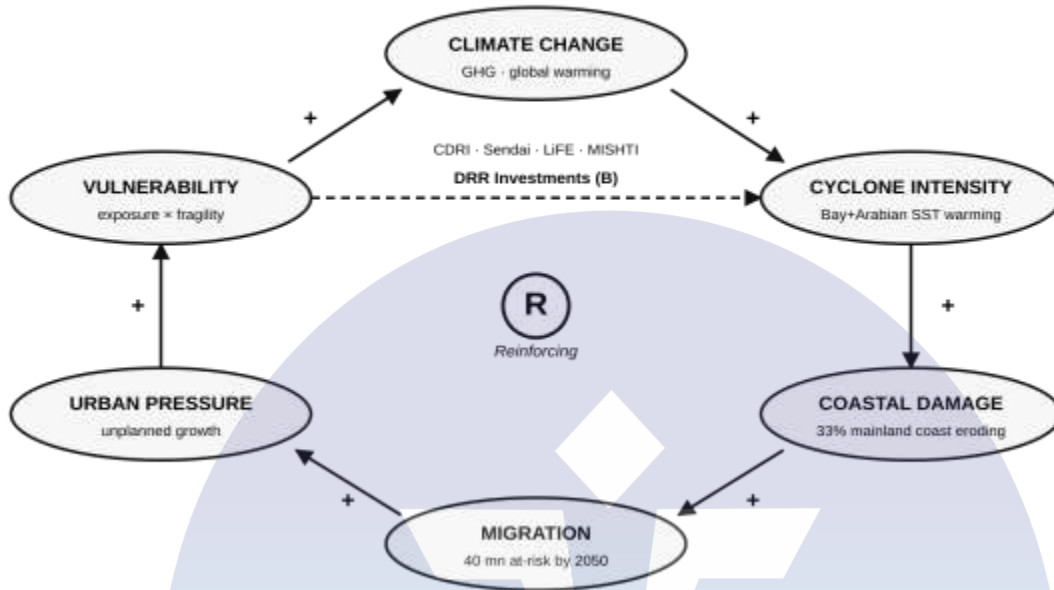
(iii) Global DRR Architecture — Yokohama → Hyogo → Sendai

Framework	Period / Year	Key Features
IDNDR (International Decade for Natural Disaster Reduction)	1990s	UN-declared decade; first global DRR initiative; led to Yokohama 1994.
Yokohama Strategy	1994	First global blueprint; emphasised vulnerability assessment, prevention, preparedness.
Hyogo Framework for Action (HFA)	2005-15	5 priorities — strong DRR institutions, identify risks, build culture of safety, reduce underlying risk factors, strengthen preparedness.
Sendai Framework for DRR (SFDRR)	2015-30	4 priorities, 7 global targets, 38 indicators; voluntary, non-binding; aligned with SDGs + Paris Agreement.
Sendai Mid-Term Review	May 2023	UN High-Level Meeting (HLM); Political Declaration; only 5 of 38 indicators have global data; progress uneven; renewed focus needed.
UNDRR	UN Office for Disaster Risk Reduction	

Framework	Period / Year	Key Features
	(formerly ISDR); custodian of Sendai; HQ Geneva.	

Causal Loop Diagram — Climate × DRR × Vulnerability Feedbacks

R = Reinforcing loop (vicious cycle) · B = Balancing loop (corrective)
 Each "+" arrow = positive feedback; if not interrupted by balancing actions (B), the loop accelerates vulnerability and losses



(iv) Sendai

Framework — 4 Priorities & 7 Targets

Element	Detail
Priority 1	Understanding disaster risk — risk assessment, education, awareness.
Priority 2	Strengthening disaster risk governance — DRR institutions, policies, multi-stakeholder.
Priority 3	Investing in DRR for resilience — public + private investment in structural + non-structural measures.
Priority 4	Enhancing preparedness for effective response and "Build Back Better" in recovery, rehabilitation, reconstruction.
Target (a)	Substantially reduce global disaster mortality by 2030 (vs 2005-15 baseline).
Target (b)	Substantially reduce number of affected people globally by 2030.
Target (c)	Reduce direct economic loss in relation to global GDP by 2030.
Target (d)	Substantially reduce disaster damage to critical infrastructure (hospitals, schools) and basic services.
Target (e)	Substantially increase number of countries with national and local DRR strategies by 2020.

Element	Detail
Target (f)	Substantially enhance international cooperation to developing countries.
Target (g)	Substantially increase availability of and access to multi-hazard early warning systems and disaster risk info by 2030.

(v) Hyogo vs Sendai — Key Differences (2018 PYQ)

Dimension	Hyogo Framework (HFA) 2005-15	Sendai Framework (SFDRR) 2015-30
Focus	Capacity-building & disaster risk management.	Disaster-loss-reduction outcome-oriented; explicit measurable targets.
Scope of Hazards	Primarily natural disasters.	Expanded — biological (pandemics), technological, environmental.
Measurable Targets	5 priorities, no quantitative targets.	7 global targets + 38 indicators.
Stakeholders	State-centric.	Whole-of-society approach — non-state actors, women, youth, PwD.
Build Back Better	Not explicit.	Explicit Priority 4 — recovery as opportunity.
Alignment	Standalone.	Aligned with SDGs (2015-30), Paris Agreement (2015), New Urban Agenda (2016).
Risk Governance	General institutional emphasis.	Explicit emphasis on national-local strategies (Target e).
Early Warning	General preparedness mention.	Target g — multi-hazard early warning + risk information access.
Substance Shift	Risk Management (process-driven).	Risk Reduction (outcome-driven).

(vi) Vulnerability — Types

Type	Characterisation
Physical	Location in hazard-prone area; quality and age of buildings; engineering deficiencies (non-engineered housing ~70% in India).
Social	Poverty, marginalisation, women, elderly, children, PwD, ethnic/religious minorities, migrants; demographic structure.
Economic	Livelihood dependence on single sector (agriculture, fisheries); lack of insurance penetration (~3.7% in India); informal economy.
Environmental	Ecosystem degradation — mangroves lost, wetlands encroached, forests cleared; reduces natural buffer.
Attitudinal / Behavioural	Lack of risk awareness, fatalistic attitudes, denial of risk, inadequate evacuation compliance.
Institutional	Weak governance, gaps in DRR policy, lack of coordination, corruption in

Type	Characterisation
	compliance enforcement.
Cultural	Customs limiting evacuation (e.g., gender-based mobility restrictions), reluctance to leave ancestral homes.
Information	Lack of access to early warning, language barriers, digital divide.

(vii) Resilience — Elements & Frameworks

Framework	Detail
4Rs of Resilience (Bruneau et al.)	Robustness (strength to withstand) · Redundancy (alternative options) · Resourcefulness (capacity to mobilise) · Rapidity (speed to recover).
4As Framework	Anticipation · Absorption · Adaptation · Transformation.
PMI 5Rs of Governance	Reduce risk · Respond rapidly · Restore (recovery) · Rebuild better · Reform institutions.
Engineering Resilience	Return to pre-disaster state.
Ecological Resilience	Persist in face of disturbance, retain function.
Socio-Ecological Resilience	Adapt and transform — emphasises learning, novelty, change.
Critical Infrastructure Resilience	Power, water, telecom, transport, health — Sendai Target d focus; CDRI 2019 anchors.
Community Resilience	Social capital, local knowledge, networks; Aapda Mitra, Yuva Aapda Mitra schemes.

(viii) Reactive → Proactive Doctrinal Shift

Phase	Detail
Pre-2005 — Reactive / Relief-centric	Calamity Relief Fund (CRF, 1990); National Calamity Contingency Fund (NCCF, 2000); focus on post-disaster relief and compensation; ad-hoc response.
DM Act 2005	Foundational institutional shift; NDMA, SDMA, DDMA created; preparedness, mitigation, response, recovery cycle.
SDRF / NDRF (15th FC)	State Disaster Response Fund + National Disaster Response Fund replaced CRF + NCCF; based on hazard vulnerability index of state.
NDMF / SDMF (15th FC 2021-26)	National Disaster Mitigation Fund (₹13,693 cr) + State Disaster Mitigation Fund — first dedicated pre-disaster mitigation funds.
CAP-SACHET	Common Alerting Protocol — multi-channel disaster alerts (SMS, app, radio, TV); operational since 2020.
NDEM-NRSC	National Database for Emergency Management (NRSC ISRO); GIS-based real-time monitoring.

Phase	Detail
Climate-Adapted Frameworks	Heat Action Plans (Ahmedabad model 2013); flood early-warning (CWC); cyclone preparedness (IMD).
CDRI 2019	India-led Coalition for Disaster Resilient Infrastructure; HQ New Delhi.
PM's 10-point DRR Agenda	Articulated at Asian Ministerial Conference on DRR, Delhi 2016; integrate DRR in development.
Aapda Mitra	~1.5 lakh community volunteers trained for first-response; expanded to Yuva Aapda Mitra (NCC/NSS) 2023.

(ix) Landslide Hazard Zonation

Aspect	Detail
Bureau of Indian Standards	IS 14496 (Part 2): 1998 — guidelines for landslide hazard zonation in mountainous terrain.
National Landslide Susceptibility Map (NLSM)	GSI-led; 4 macro-zones — Very High, High, Moderate, Low.
NDMA Guidelines on Landslides	Issued June 2009; identification of vulnerable areas; preparedness measures; community-based DRR.
National Landslide Risk Management Strategy	2019 — integrated approach; sector-wise vulnerability mapping; capacity-building.
Geological Survey of India (GSI)	Nodal agency for landslide hazard mapping; National Landslide Forecasting Centre operational.
Landslide Triggers	Heavy rainfall (75%+ of Indian landslides); earthquakes; anthropogenic — road-cutting, mining, deforestation, hill-slope construction.
Most Vulnerable States	Uttarakhand, Himachal Pradesh, Sikkim, Arunachal Pradesh, Mizoram, Manipur, Meghalaya, Nagaland, Tripura, J&K + Western Ghats (Kerala-Karnataka-Maharashtra-Goa).
Recent Major Events	Kedarnath 2013 (flash flood + landslide cascade); Chamoli 2021; Sikkim 2023; Wayanad Jul 2024 (~430 deaths); Himachal multiple in monsoons 2023-24.
Mitigation Techniques	Engineering — retaining walls, slope stabilisation, drainage; bioengineering — vetiver grass, vegetation; afforestation; building bye-laws restricting construction on slopes >30°.
Early Warning	GSI National Landslide Forecasting Centre — pilot in Darjeeling-Kalimpong + Nilgiris; expansion planned.

(x) Recent Proactive Measures — India's DRR Doctrine Shift

Measure	Detail
PM's 10-Point Agenda on DRR (2016)	Articulated at AMCDRR, New Delhi; (1) integrate DRR in development · (2)

Measure	Detail
	work towards risk coverage · (3) encourage women leadership · (4) global risk mapping · (5) leverage technology · (6) university programmes · (7) media networks · (8) volunteer mobilisation · (9) recovery learning · (10) international cohesion.
Coalition for Disaster Resilient Infrastructure (CDRI)	Launched Sep 2019 UN Climate Action Summit; HQ New Delhi; 40+ member countries; focus — power, transport, telecom, water resilience.
IRIS (Infrastructure for Resilient Island States)	CDRI initiative for SIDS; launched COP26 Glasgow Nov 2021.
National Disaster Management Plan (NDMP) 2019	Aligned with Sendai 4 priorities + 7 targets; revised 2019; specifies roles of all stakeholders.
Heat Action Plans	Ahmedabad 2013 — South Asia's first; replicated in 23+ cities; Telangana, Odisha, Bihar models; reduced heat-mortality 30-40%.
Aapda Mitra	~1.5 lakh community volunteers trained for first response; women-led in many states.
Yuva Aapda Mitra Yojana	Sep 2023 — extends to NCC/NSS volunteers; target 2.5 lakh by 2026.
CAP-SACHET (Common Alerting Protocol)	Multi-channel (SMS, mobile-app, radio, TV, Pradhan PA system); pan-India operational 2023.
IMD Impact-Based Forecasting	Beyond raw weather data — links forecast to expected impact at district-level; pilot expansion.
NDMF / SDMF	15th FC introduced dedicated mitigation funds; ₹13,693 cr NDMF; structural projects (hill-stabilisation, coastal defence, anti-flood works).

(xi) Sendai Framework Mid-Term Review

Aspect	Detail
UN High-Level Meeting (HLM)	New York, May 18-19, 2023; Political Declaration adopted.
Findings	Only 5 of 38 indicators have sufficient global data; mortality target progress uneven; rising losses vs reduction goals.
Renewed Calls	Triple investment in DRR; integrate climate change adaptation with DRR; whole-of-government approach.
India's Showcase	Achievements highlighted — CDRI, Aapda Mitra, cyclone preparedness (Biparjoy 2023 zero-casualty model).
Gap Analysis (India)	Vulnerability mapping for landslides incomplete; ULB-level DRR plans deficient; private-sector engagement nascent.
Post-2030 Agenda	Discussions on successor framework begun; expected to integrate climate-DRR-development triumvirate more tightly.

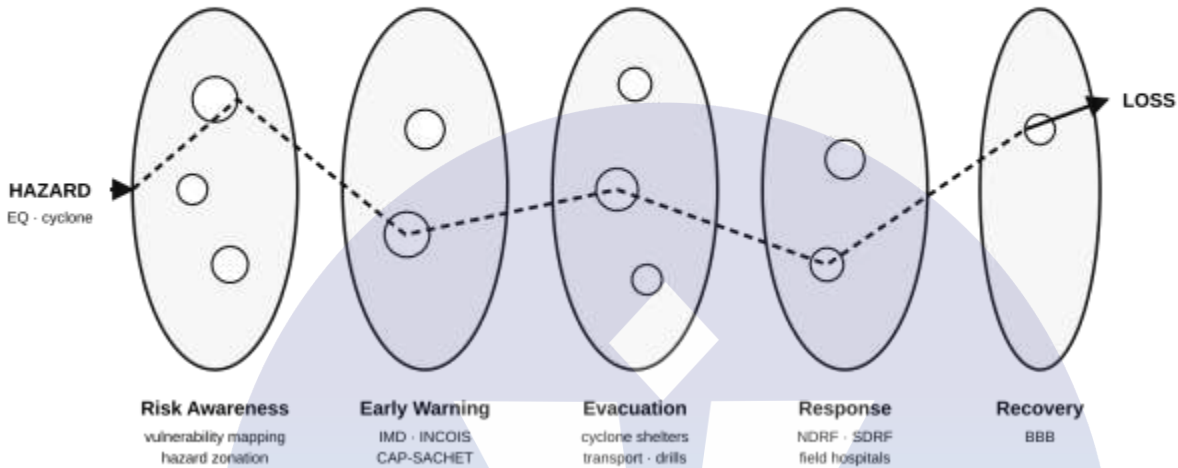
B. Specific Disasters & NDMA Guidelines

PYQ density: 6 questions (2014-22) · Anchor topics: drought (El Niño/La Niña), earthquakes, urban floods, cloudbursts, 2004 tsunami, NDMA guidelines stack.

Swiss Cheese Model — Disaster Defenses (Reason, 1990)

Each defense layer has gaps. When gaps align, hazard penetrates all defenses → loss.

Wayanad Jul 2024 example: WG ESA not notified · cloudburst nowcast gap · pre-dawn = no evacuation · NDRF reached late



(i) Drought — NDMA Guidelines & Types

Aspect	Detail
NDMA Drought Guidelines	September 2010 — phase-wise approach; drought-prone districts categorisation.
Meteorological Drought	Rainfall deficit $\geq 25\%$ from long-term mean for an extended period.
Hydrological Drought	Depletion of surface and ground water resources — reservoirs, aquifers, rivers below long-term levels.
Agricultural Drought	Insufficient soil moisture for crop growth at critical growth stages.
Socio-Economic Drought	Demand exceeds supply due to weather-related shortfall + economic vulnerability.
Ecological Drought	Deficient water for natural ecosystems — wetlands, forests, biodiversity stress.
National Drought Manual (2016)	Agriculture Ministry; trigger criteria, declaration process, relief norms.
MGNREGA as Drought Mitigation	Water-harvesting structures; village ponds; vetiver plantations; convergence with PMKSY.
Drought Mitigation Schemes	PMKSY (Pradhan Mantri Krishi Sinchayee Yojana); Atal Bhujal Yojana;

Aspect	Detail
	Watershed Development; PM-PRANAM 2023.
Insurance	Pradhan Mantri Fasal Bima Yojana (PMFBY 2016 — revamped 2020); Restructured Weather Based Crop Insurance Scheme (RWBCIS).
Drought Atlas of India	Department of Agri & Cooperation; updated periodically; risk maps for districts.

(ii) El Niño / La Niña / IOD — Monsoon Impact

Phenomenon	Detail
ENSO (El Niño-Southern Oscillation)	Coupled atmosphere-ocean phenomenon in tropical Pacific; oscillates between warm (El Niño) and cool (La Niña) phases every 3-7 years.
El Niño	Warming of central-eastern equatorial Pacific; weakens Indian summer monsoon (~60% of El Niño years see drought).
La Niña	Cooling of central-eastern equatorial Pacific; often correlates with above-normal Indian monsoon.
Indian Ocean Dipole (IOD)	Difference in SST between western and eastern tropical Indian Ocean; +IOD favourable for monsoon; can offset El Niño impact.
Major El Niño Years × Indian Monsoon	1965 (-18%), 1972 (-24%), 1987 (-19%), 2002 (-19%), 2009 (-22%), 2014 (-12%), 2015 (-14%), 2023 (-6% mild).
IMD Forecasting Models	Dynamic Monsoon Mission Coupled Forecast System (MMCFS); operational since 2018; outperforms statistical models.
Forecast Lead Times	Long Range Forecast (LRF) — April issued; updated May/June; 5-category scale (deficient to excess).
Triple-Dip La Niña 2020-23	Rare 3-year La Niña; supported above-normal monsoons in 2020, 2021; ended Jan 2023.
2023 El Niño	Started Jun 2023; moderate intensity by Dec 2023; ended Apr 2024; mild Indian impact thanks to +IOD.
2024 Onset of La Niña	IMD confirmed late 2024; expected to support above-normal 2025 monsoon.

(iii) Earthquake — Indian Seismic Zones & NDMA 2007

Zone	Intensity	Areas
Zone V (Very High)	MSK IX+	Northeast India (entire), Kachchh (Gujarat), Andaman-Nicobar, parts of Uttarakhand, parts of HP, northern Bihar.
Zone IV (High)	MSK VIII	Remaining J&K-Ladakh, Delhi-NCR, remaining HP, parts of UP, parts of Bihar, parts of WB, parts of Sikkim.

Zone	Intensity	Areas
Zone III (Moderate)	MSK VII	Most of remaining north India, central India, parts of Maharashtra (Koyna), parts of southern India, parts of NE.
Zone II (Low)	MSK VI	Rest of peninsular India; relatively safe.
NDMA Earthquake Guidelines	Issued April 2007; covers six pillars — earthquake-resistant construction, retrofitting, response, capacity-building, R&D, regulation.	
National Building Code (NBC) 2016	BIS-published revision; mandates seismic compliance; structural integrity for hospitals, schools, lifeline infrastructure.	
Critical Vulnerabilities	~70% housing in India is non-engineered (mason-built without engineer); urban density rising; lifeline infra (hospitals, schools) low-seismic compliance; old retrofitting gaps.	
PMAY Seismic Compliance	PMAY-G + PMAY-U mandate compliance with NBC 2016; structural certification by trained engineers.	
NCSRP	National Centre for Seismology Research Project; expanding broadband seismic network to 200+ stations.	

(iv) Recent Earthquakes & Indian Response

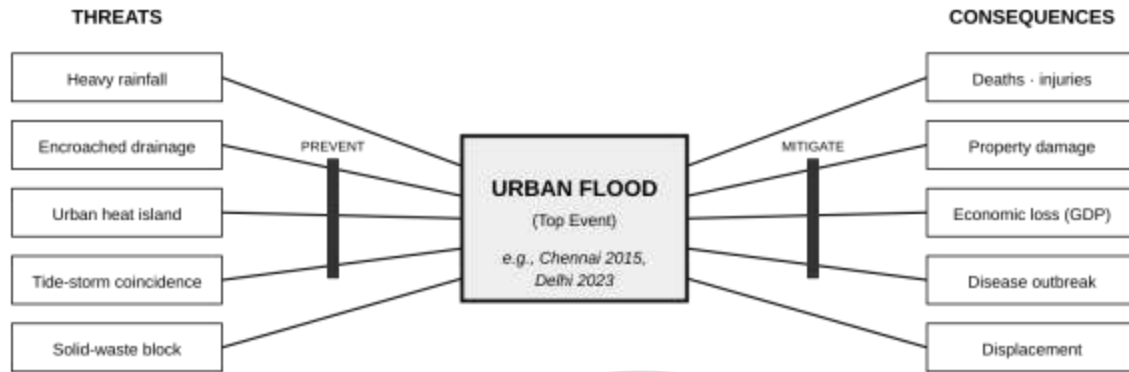
Event	Year / Magnitude	Significance / Response
Bhuj (Gujarat)	2001, M 7.7	~20,000 deaths; ~1.7 lakh injured; led to NDM Act 2005 + GSDMA formation.
Sumatra-Andaman	2004, M 9.1-9.3	Triggered Indian Ocean tsunami; ~2.3 lakh deaths regionally; India ~16,300.
Sikkim	Sep 2011, M 6.9	Epicentre Nepal-Sikkim border; ~111 deaths; landslide cascades.
Nepal-Bihar	Apr-May 2015, M 7.8-7.3	~9,000 deaths in Nepal; ~125 in Bihar; India's Operation Maitri rescue.
Doda-Kishtwar (J&K)	Jun 2023, M 5.4	Minor damage; reminded of J&K seismicity.
Turkey-Syria	Feb 6, 2023, M 7.8 + M 7.5	~60,000 deaths combined; India launched Operation Dost — NDRF + Army + IAF; field hospital deployed Hatay.
Afghanistan-Pakistan	Oct 2023, M 6.3 series	~1,400 deaths Herat; India offered humanitarian assistance.

Event	Year / Magnitude	Significance / Response
Morocco	Sep 2023, M 6.8	Indian condolences; not direct relief deployment.
Tibet	Jan 7, 2025, M 7.1	Epicentre near Shigatse; tremors felt across Nepal, Bhutan, NE India; spurred GLOF risk assessments for Himalayan states.
Lessons / Op Dost (Turkey 2023)	NDRF 5 teams (151 personnel) + 30-bed field hospital + medical experts via IAF C-17; first such overseas deployment of NDRF.	

(v) Urban Floods — Mechanisms & Drivers

Driver	Mechanism
Impervious Surfaces	Concrete + asphalt prevent infiltration; runoff coefficient rises from ~0.1 (natural) to ~0.9 (urban).
Encroachment of Wetlands & Water-Bodies	Mumbai's Mithi River buffer encroached; Chennai's Pallikaranai marsh shrunk 90%; Bengaluru's lake area down from ~280 to ~80.
Drainage System Capacity	Most Indian city drainage designed for 10-15 mm/hour; modern intense events exceed 50-100 mm/hour.
Blocked Drains	Solid waste, plastic, silt accumulation; pre-monsoon de-silting often inadequate.
Climate Change Intensification	Clausius-Clapeyron — 7% more atmospheric moisture per °C of warming; extreme rainfall events rising in frequency.
Urban Heat Island Effect	Cities 3-5°C warmer than surroundings; intensifies local convective rainfall.
Land-Use Change	Loss of green cover; ridgeline drainage altered; topographic alteration.
Storm-Surge in Coastal Cities	Mumbai, Chennai, Kochi — cyclone-coincident floods (Mumbai 2005, Chennai 2015).

Bowtie Diagram — Urban Flood Risk Control



Prevention barriers:

AMRUT 2.0 · Wetland Rules 2017 · CAP-SACHET · Building bye-laws · SWM 2016

Mitigation barriers:

NDRF · PMFBY · health surge · insurance · BBB recovery

Industrial-safety tool adapted for DRR: every threat needs a barrier; every consequence needs a mitigation

(vi) Urban

Flood Case Studies

City	Event	Drivers / Damage / Lessons
Mumbai	Jul 26, 2005	944 mm in 24 hrs (record); ~1,094 deaths; Mithi River encroachment; ₹35,000 cr loss; BMC stormwater overhaul began.
Chennai	Dec 1, 2015	~470 mm in 24 hrs; Adyar-Cooum overflow; ~510 deaths; Pallikaranai marsh loss; airport flooded 4 days.
Mumbai	Aug 29, 2017	~315 mm in 12 hrs; renewed BRIMSTOWAD project push.
Hyderabad	Oct 13-15, 2020	~192 mm in 24 hrs (Krishnaiah Nagar); ~70 deaths; revealed inadequate Musi River + nala maintenance.
Bengaluru	Sep 4-5, 2022	~150 mm + tank cascades; Outer Ring Road flooded; lakes encroached; ₹250+ cr damage; tech sector hit hard.
Delhi	Jul 8-11, 2023	Yamuna 208.66 m record level; ~25,000 evacuated; ITO, Civil Lines, Tilak Marg flooded; Old Yamuna Bridge shut.
Chennai (Michaung)	Dec 4-5, 2023	Cyclone-induced; ~33 deaths; ₹10,000 cr damage; revived Pallikaranai marsh restoration.
Kolkata Bombay floods	recurring	Heritage drainage; recurring water-logging; KMC stormwater modernisation ongoing.
Mitigation	—	AMRUT 2.0 (₹2.99 lakh cr) — water + sewerage + urban drainage; Smart Cities Mission storm-drainage; Sponge City principle (Wuhan model).

City	Event	Drivers / Damage / Lessons
NDMA Urban Flood Guidelines	Sept 2010	First nationwide; Urban Local Body capacity-building; Catchment Management Plans; Drainage Master Plans.
Sponge City Concept	—	Permeable pavements, bioswales, rain gardens, green roofs; absorb 70%+ rainwater; Wuhan, Singapore, NYC models.
Blue-Green Infrastructure	—	"Blue" — water bodies; "Green" — vegetation; integrated planning; lake-restoration, river-rejuvenation core to AMRUT 2.0.

(vii) Cloudburst — Mechanism & Recent Events

Aspect / Event	Date / Year	Detail
Definition (IMD)	—	Localised very heavy rainfall — typically >100 mm/hour over an area <30 sq km.
Causal Mechanism	—	Orographic lift (Himalayas, Western Ghats); convective updrafts trap moisture; sudden release on saturation.
Why Himalayas	—	Steep terrain forces moisture-laden monsoon air upward; rapid cooling → intense rainfall; common in U.K., HP, J&K.
Why Western Ghats	—	Similar orographic mechanism on smaller scale; lateritic soils contribute to landslide cascade.
Climate Change Intensification	—	Clausius-Clapeyron — 7% more atmospheric moisture per °C warming; cloudburst frequency rising.
Detection Challenge	—	Doppler radar coverage incomplete in mountains; sub-grid scale phenomenon escapes most numerical models.
Kedarnath Disaster	Jun 16-17, 2013	Multi-day rainfall + cloudburst + Chorabari Lake breach; ~5,700 deaths; transformed Uttarakhand DM doctrine.
Leh Cloudburst	Aug 6, 2010	~250 deaths in 30 min event; led to NDMA cloudburst working group.
Kashmir Floods	Sep 2014	Cloudburst component; ~277 deaths; Jhelum overflow.
Amarnath Yatra	Jul 8, 2022	~17 deaths near holy cave; cloudburst-triggered flash flood.
Himachal Pradesh	Jul-Aug 2023	Mandi, Kullu, Shimla, Solan multiple events; ~330 deaths; landslide cascades.
Wayanad (Kerala)	Jul 30, 2024	Pre-dawn cloudburst + landslide; ~430 deaths Mundakkai-Chooralmala; Western Ghats ESA failure.

Aspect / Event	Date / Year	Detail
Chamoli	Feb 7, 2021	Rishiganga glacier breach + flash flood; ~200 deaths/missing; cloudburst component debated.

(viii) 2004 Indian Ocean Tsunami & ITEWS

Aspect	Detail
Trigger	Dec 26, 2004 — Sumatra-Andaman earthquake; M 9.1-9.3; third-largest ever recorded.
Affected Countries	14 countries — Indonesia, Sri Lanka, India, Thailand, Maldives, Malaysia, Myanmar, Bangladesh, Tanzania, Somalia, Kenya, Seychelles, South Africa, Madagascar.
Death Toll	~2.3 lakh combined; Indonesia ~1.7 lakh; Sri Lanka ~35,000; India ~16,300; Thailand ~8,000.
India's Toll	Tamil Nadu — 8,000+; AP — 800+; Pondicherry — 600+; Kerala — 175+; Andaman-Nicobar — 7,000+ (incl. missing).
Causes for Indian Devastation	No tsunami early warning system; coastal exposure in absence of mangrove buffer; densely populated coast; lack of evacuation drills.
NDMA Tsunami Guidelines	Issued April 2010 — risk reduction framework; coastal early warning; community preparedness; CRZ + coastal infrastructure norms.
ITEWS (Indian Tsunami Early Warning System)	INCOIS Hyderabad; operational 2007; 17 seismic stations; tide gauges + Deep-sea BPRs; 10-minute warning capability.
ISRO-INSAT Support	Real-time data transmission from ocean buoys; satellite-based warning dissemination.
IOC-UNESCO Coordination	Indian Ocean Tsunami Warning System; regional cooperation; India is a Regional Tsunami Service Provider.
Mock Exercises	Indian Ocean Wave Exercise (IOWave) every 2 years; IOWave23 (Oct 2023); India lead role.
Coastal Bio-Shields Post-2004	Mangrove restoration (Sundarbans, Pichavaram, Bhitarkanika); MISHTI 2023 scaled this; ₹600 cr / 540 sq km.

(ix) Cyclones — Biparjoy to Dana & India's Cyclone Model

Cyclone	Date / Region	Impact / Lesson
Phailin	Oct 2013 — Odisha	Category 5; ~45 deaths only (vs Oct 1999 super-cyclone ~10,000 deaths); birth of Odisha model.
Hudhud	Oct 2014 — AP-Odisha	Vizag flattened; ~124 deaths; ₹21,908 cr damage.
Fani	May 2019 — Odisha-WB	Extreme Severe; ~89 deaths; ₹12,000 cr damage; pre-emptive evacuation 1.2 mn (Odisha model refined).

Cyclone	Date / Region	Impact / Lesson
Amphan	May 2020 — WB-Bangladesh	~133 deaths; ₹1.02 lakh cr damage (Indian Sundarbans + Kolkata + Bangladesh).
Tauktae	May 2021 — West Coast	~150 deaths; Bombay High oil rig casualties; Gujarat hit.
Biparjoy	Jun 2023 — Gujarat (Kutch)	Cat 3; ~180,000 evacuated pre-emptively; ZERO casualty from storm itself (validated IMD-NDMA model).
Michaung	Dec 2023 — TN-AP	Cat 2; ~33 deaths (Chennai urban flooding); ₹10,000 cr damage.
Remal	May 2024 — WB-Bangladesh	Cat 2; Sundarbans mangrove buffer; cross-border impact; ~50 deaths combined.
Dana	Oct 2024 — Odisha-WB	Severe; ~10 deaths; Odisha's zero-casualty target nearly met; 8 lakh pre-emptive evacuation.
IMD-NDMA Model	—	Pre-emptive evacuation; cyclone shelters (NCRMP); colour-coded warnings; community-led drills; Aapda Mitra deployment; communication via CAP-SACHET.
NCRMP (National Cyclone Risk Mitigation Project)	—	World Bank-assisted; Phase I (AP, Odisha) + Phase II (Gujarat, Goa, Karnataka, Kerala, Maharashtra, WB); cyclone shelters, drainage, embankments.

(x) Glacial Lake Outburst Flood (GLOF) — NDMA 2020 Guidelines

Aspect	Detail
Definition	Sudden release of water from a glacial lake — moraine-dammed, ice-dammed, or supraglacial; can be triggered by avalanche, earthquake, ice-melt, or moraine failure.
NDMA GLOF Guidelines	Issued 2020; first comprehensive Indian framework; identification, monitoring, early warning, structural mitigation, community response.
Indian Himalayan GLOF Risk	~7,500 glacial lakes monitored; ~190 identified as potentially dangerous (PGLs); concentrated in Sikkim, Arunachal, HP, U.K.
South Lhonak Lake GLOF	Oct 3-4, 2023 — Sikkim; pre-dawn lake breach; Teesta River + Chungthang dam destroyed; ~100 deaths/missing; ₹25,000 cr damage.
Chamoli Disaster	Feb 7, 2021 — Uttarakhand; rock-ice avalanche → Rishiganga flash flood; ~200 deaths/missing; Tapovan Vishnugad NTPC tunnel disaster.
Tibet Earthquake Jan 7, 2025	M 7.1 near Shigatse; tremors felt in Sikkim, Bhutan, Nepal; spurred immediate GLOF risk re-assessments.
Monitoring Technology	Satellite-based (ISRO Bhuvan + Cartosat); ground-based automated water-level sensors; SnowMet stations; expanding network.

Aspect	Detail
NMSHE	National Mission for Sustaining Himalayan Ecosystem; one of 8 missions under NAPCC; cryosphere studies, GLOF risk.
Mitigation Options	Lake-level lowering (siphoning, controlled spillway — Imja Lake Nepal model); slope stabilisation; downstream early-warning sirens; evacuation routes.
IRDR Joint Programmes	Integrated Research on Disaster Risk; ICIMOD partnerships across Himalayan countries.

(xi) Heat Action Plans (HAP) — Ahmedabad Model

Aspect	Detail
Ahmedabad HAP	South Asia's first Heat Action Plan, launched 2013; response to 2010 heatwave (~1,300 deaths).
Components	4-tier alert system (Yellow/Orange/Red); cooling centres; public health system readiness; outreach via SMS, billboards, school messaging.
Outcomes	~30-40% mortality reduction in subsequent heatwave years (NRDC + IIPH study).
Replicated	23+ cities — Nagpur, Hyderabad, Surat, Bhubaneswar, Jodhpur, Vijayawada, etc.
NDMA Heatwave Guidelines	2019 (updated 2022); definition — 40°C+ plains, 30°C+ hills; severe — 47°C+.
State-level Notified Disaster	Some states have declared heatwave as state-specific disaster (Bihar, Odisha) — enables SDRF use; centre yet to notify nationally.
Recent Heatwaves	2022 — early March-April heatwave; 2023 — Patna 47°C; 2024 — Delhi 52.3°C on May 29 (all-time high disputed by IMD).
Lancet Countdown 2023	India lost \$159 bn/yr in labour productivity to heat stress.
Cool Roofs Mission	AMRUT 2.0 + UN-Habitat advocacy; reflective coatings reduce indoor temperature 3-5°C.
Telangana Heat Action Plan	Comprehensive 2023 plan; outreach in Hyderabad, Warangal slums; mobile cooling centres.

(xii) Industrial / Chemical Disasters

Event	Year / Detail
Bhopal Gas Tragedy	Dec 2-3, 1984 — Union Carbide MIC leak; ~3,500-15,000 deaths; world's worst industrial disaster; ongoing legacy contamination.
Mayapuri Radiation Incident	2010 — Delhi scrap yard; Co-60 source contamination; 1 death; led to AERB tightening.
Vizag LG Polymers	May 7, 2020 — styrene vapour leak during COVID lockdown reopening; ~11

Event	Year / Detail
	deaths, 1,000+ hospitalised; revealed lockdown-restart safety gaps.
Mundra Port Heroin	Sep 2021 — 3,000 kg seizure (₹21,000 cr); cargo-screening gaps.
NDMA Chemical Disaster Guidelines	Issued 2007; covers identification of hazardous substances, prevention, preparedness, response.
Manufacture, Storage & Import of Hazardous Chemical Rules	1989 (amended periodically); MoEFCC.
OISD (Oil Industry Safety Directorate)	Standards for petroleum industry; under MoP&NG.
MARG (Multi-Agency Response Group)	For CBRN (Chemical-Biological-Radiological-Nuclear) emergencies; NDRF has 5 CBRN battalions.
Lessons	Pre-startup safety review (PSSR) mandatory; emergency response plans audited; community right-to-know.

(xiii) Biological / Pandemic Disasters — COVID-19 Lessons

Aspect	Detail
DM Act 2005 Invocation	COVID-19 declared "notified disaster" Mar 14, 2020; first-ever pandemic invocation; central directives binding on states.
Lockdown	Mar 24, 2020 onwards; phased re-opening; world's largest lockdown by population.
Vaccination Programme	World's largest; CoWIN platform; 220+ crore doses by 2024; Covishield + Covaxin + others.
PM CARES Fund	Set up Mar 27, 2020; not audited by CAG; controversies on disclosure; SC matter ongoing.
One Health Approach	WHO + FAO + WOAHA + UNEP collaboration; integrates human + animal + environmental health surveillance.
National Centre for Disease Control (NCDC)	Strengthened post-COVID; integrated disease surveillance; genomic sequencing capacity (INSACOG).
Pandemic Preparedness Plan	WHO IHR 2005 framework; India's National Action Plan (under preparation); pandemic treaty negotiations 2023-24.
Hospital Surge Capacity	PM-ABHIM (PM Atmanirbhar Bharat Health Infrastructure Mission, 2021); ₹64,180 cr; ICU expansion.
Bird Flu / Avian Influenza	H5N1 outbreaks recurring; culling protocols; sentinel surveillance.
Future Pandemic Risks	Disease X concept (WHO); Nipah (Kerala recurring 2018, 2021, 2023); Zika (2017, 2024 cases); Mpox (2022-24).

C. Recent Multi-Hazard Cascades (2021-2025)

Climate-induced cascading disasters reshaping Indian DRR doctrine — value-addition for current-affairs anchoring.

(i) Chamoli Glacier Disaster (Feb 2021)

Aspect	Detail
Date	Feb 7, 2021.
Trigger	Rock-ice avalanche from Ronti peak (~5,600 m) into Rishiganga river basin.
Cascade	Avalanche → flash flood + debris flow → Rishiganga + Dhauliganga → engulfed Tapovan-Vishnugad NTPC tunnel.
Casualties	~200 deaths/missing (mostly NTPC workers trapped in tunnel).
Geology	Anthropogenic exacerbation — tunnel-blasting weakened slope; debate on Joshimath subsidence connection (2 years later).
Lessons	Glacier instability + climate change; hydropower projects in fragile zones; need cryosphere-aware EIA; halt-and-review for tunneling in Himalayan zones.

(ii) Joshimath Land Subsidence (Jan 2023)

Aspect	Detail
Date	Subsidence noticed Jan 2-6, 2023.
Trigger	Combination — geological fragility (paleo-landslide debris foundation); NTPC Tapovan-Vishnugad tunneling; Helang bypass construction; sub-surface drainage; over-construction.
Damage	868+ houses cracked; 145 houses unsafe (red-marked); displaced 4,000+ persons.
ISRO Satellite	Confirmed 5.4 cm subsidence in 12 days (Dec 27, 2022 - Jan 8, 2023); Cartosat-2 + Sentinel-1A InSAR.
MCS Vulnerability	Joshimath is M.C. Mishra Committee 1976 declared sinking town — warning ignored for 47 years.
Response	Joshimath declared land-subsidence-affected area; relief package ₹1,500 cr; halt on Tapovan tunneling.
SC + HC Interventions	Uttarakhand HC ordered restoration; expert committees from CBRI, GSI, NIH, IIRS, IIT.
Atul Sati-led Civil Society	Joshimath Bachao Sangharsh Samiti; sustained local protests; media attention.

(iii) Sikkim South Lhonak GLOF (Oct 2023)

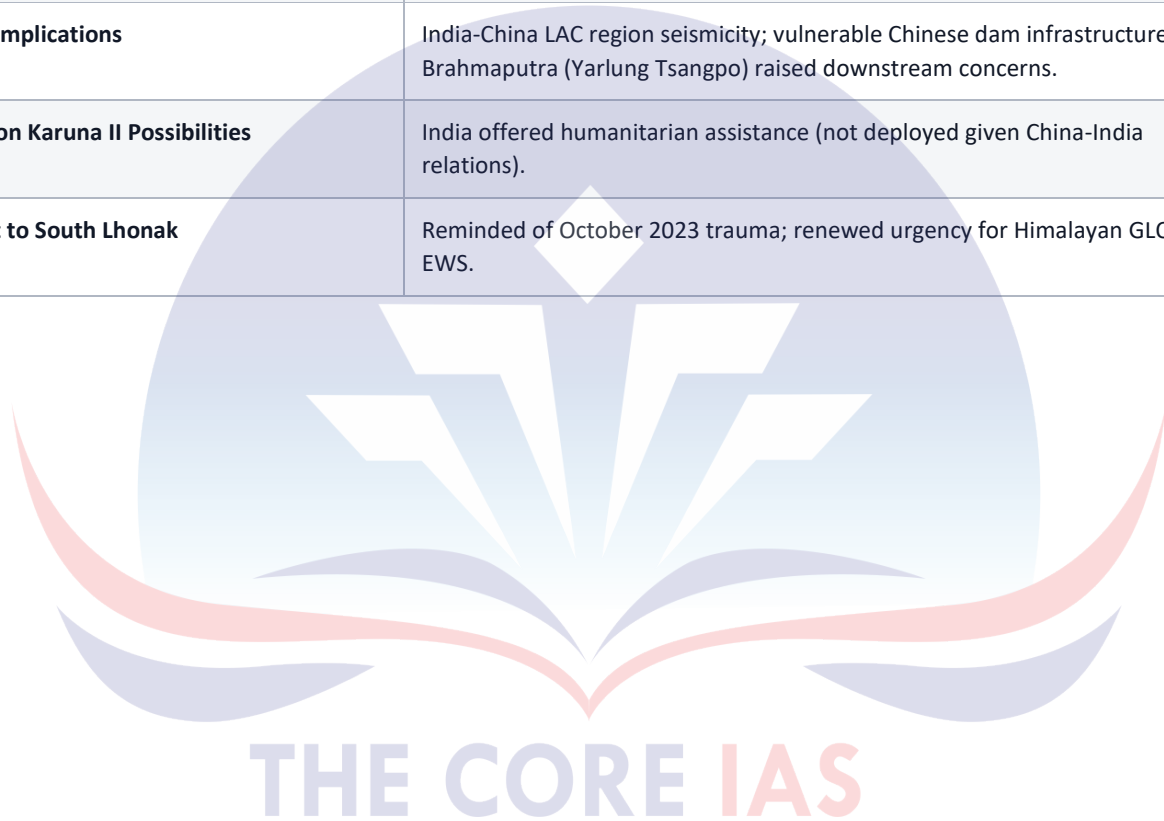
Aspect	Detail
Date	Oct 3-4, 2023 (pre-dawn).
Trigger	South Lhonak glacial lake (Sikkim Himalayas) breached its moraine dam; intense pre-monsoon rainfall + meltwater accumulation suspected.
Cascade	Lake breach → Teesta River flash flood → destroyed Chungthang dam (Teesta-III HEP, 1,200 MW); washed away bridges; flooded valleys downstream.
Casualties	~100 deaths/missing (incl. Army personnel at Chaten); ~25,000 displaced.
Damage	~₹25,000 cr est. (Sikkim govt); Teesta-III dam destroyed; infra damage across Sikkim, downstream WB.
Lessons	GLOF early warning gap; monitoring of glacial lakes deficient; need for lake-level reduction (Imja-style siphoning); cascading dam vulnerability.
NDMA Response	15-member expert committee constituted; review of 56 PGLs in Sikkim; integrated GLOF EWS proposed.
Wider Implication	Himalayan states reviewed glacial-lake inventories; SikkimSDMA + ICIMOD coordination scaled up.

(iv) Wayanad Landslide (Jul 2024)

Aspect	Detail
Date	Jul 30, 2024 (pre-dawn).
Location	Mundakkai-Chooralmala (Vellarimala range), Wayanad district, Kerala (Western Ghats).
Trigger	Pre-dawn cloudburst (~150 mm rainfall in 24 hrs); soil-saturated steep slopes; cascading landslides into Iruvazhinjipuzha river.
Casualties	~430 deaths (largest landslide disaster in Kerala history); ~118 missing.
Damage	~2,000+ houses destroyed; ~10,000 displaced; ₹1,200+ cr damage.
Ecological Context	Western Ghats — Gadgil 2011 → Kasturirangan 2013 ESA reports; Kerala's consistent dilution of ESA recommendations; 2024 disaster cited as ESA-failure exemplar.
Response	NDRF + Army + IAF rescue; Kerala SDMA coordinating; CM Pinarayi Vijayan-led relief.
SC + HC Interventions	Kerala HC suo motu; ESA notification revived; Western Ghats final notification under MoEFCC consultation Jul-Aug 2024.
Broader Lesson	Western Ghats ESZ implementation gap; tipping point in inter-state ESA politics (6 states' resistance to MoEFCC drafts).

(v) Tibet Earthquake (Jan 2025) — Himalayan Spillover

Aspect	Detail
Date	Jan 7, 2025.
Magnitude / Location	M 7.1 epicentre near Shigatse, Tibet (~80 km from Nepal border).
Casualties (Tibet)	~126 deaths (China official figures); ~3,600 houses damaged.
India Impact	Tremors felt across Sikkim, NE India, Bihar; no direct casualties but heightened concern.
GLOF Risk Assessment	Spurred immediate review of 56 PGLs (Sikkim) + 36 PGLs (Uttarakhand); satellite-monitoring intensified.
Critical Implications	India-China LAC region seismicity; vulnerable Chinese dam infrastructure on Brahmaputra (Yarlung Tsangpo) raised downstream concerns.
Operation Karuna II Possibilities	India offered humanitarian assistance (not deployed given China-India relations).
Connect to South Lhonak	Reminded of October 2023 trauma; renewed urgency for Himalayan GLOF EWS.



D. India's DRR Architecture & Financing

Institutional, financial, and operational backbone — examiners reward candidates who can name the right body for the right disaster.

(i) Three-Tier Architecture

Body	Chairperson	Function
NDMA (National DM Authority)	Prime Minister	Policies, plans, guidelines for DM at national level; up to 9 members; secretariat in MHA.
NEC (National Executive Committee)	Home Secretary	Coordinating, implementing arm of NDMA; secretaries of key ministries.
SDMA (State DM Authority)	Chief Minister	State policies, plans, guidelines; mirrors NDMA at state level.
SEC (State Executive Committee)	Chief Secretary	Operational arm of SDMA.
DDMA (District DM Authority)	District Magistrate / Collector	District-level coordination; primary ground response unit.
NIDM (National Institute of DM)	Under MHA	Training, capacity-building, research; New Delhi; partners with NCERT for school curriculum.
State DM Institutes	State-specific	BIPARD (Bihar), HIPA (HP), ATI (multiple states).

(ii) NDRF — Specialised Response Force

Aspect	Detail
Establishment	DM Act 2005 Sec 44; operationalised 2006.
Battalions	16 (target 18); ~16,000 personnel; drawn from CAPF — BSF, CISF, CRPF, ITBP, SSB.
Headquarters	New Delhi; battalions strategically located — Kolkata, Bhubaneswar, Mundali, Vijayawada, Pune, Vadodara, etc.
CBRN Capability	5 of 16 battalions specifically trained for Chemical, Biological, Radiological, Nuclear emergencies.
Deep-Sea Diving	Specialised teams for water-bodies rescue.
International Deployments	Operation Maitri (Nepal 2015 earthquake); Op Megh Rahat (Maldives water 2014); Op Dost (Turkey-Syria 2023, first-ever overseas NDRF deployment); Op Karuna (Myanmar cyclone 2023).
Specialised Equipment	Search-and-rescue, deep-water diving, CBRN protective gear, hazmat suits, drones, medical stations.

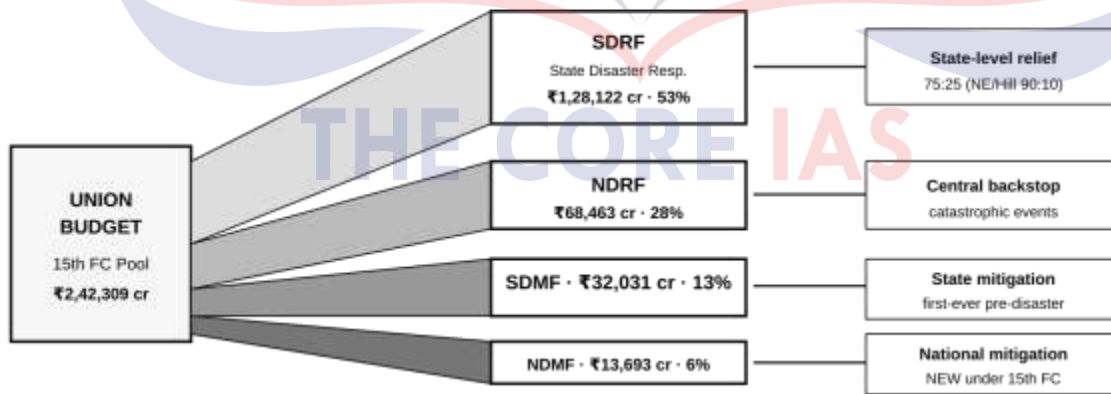
Aspect	Detail
Mock Drills	Annual cycle of state-level + national mock exercises; multi-hazard scenarios.

(iii) 15th Finance Commission DM Allocations (2021-26)

Fund	Allocation	Purpose
NDRF (National Disaster Response Fund)	₹68,463 cr	Central post-disaster response; immediate relief and rehabilitation.
SDRF (State Disaster Response Fund)	₹1,28,122 cr	State-level post-disaster response; ratio 75:25 (Centre:State) for most states; 90:10 for NE+Himalayan states.
Total Response Funds	₹1,96,585 cr	Post-disaster response component.
NDMF (National Disaster Mitigation Fund)	₹13,693 cr	NEW under 15th FC — first dedicated national pre-disaster mitigation fund.
SDMF (State Disaster Mitigation Fund)	₹32,031 cr	NEW under 15th FC — state-level pre-disaster mitigation.
Total Mitigation Funds	₹45,724 cr	Pre-disaster prevention component.
Combined Total	₹2,42,309 cr	For 2021-26 cycle; ~6× of 14th FC allocations.
Recovery & Reconstruction	₹17,500 cr	Additional window for sudden post-disaster needs.
Capacity Building	₹9,500 cr	For NDMA, NIDM, training, equipment modernisation.

15th Finance Commission — Disaster Management Finance Flow (2021-26)

Total ₹2.42 lakh cr · 6× the 14th FC allocation · widths proportional to allocation



DOCTRINAL SHIFT (proven by money):

- Pre-disaster Mitigation = ₹45,724 cr (19% of pool) — was 0% under 14th FC
- NDMF (₹13,693 cr) is INDIA'S FIRST-EVER dedicated national pre-disaster fund
- Validates 'Reactive → Proactive' shift question (PYQ 2020) with quantitative evidence

(iv)

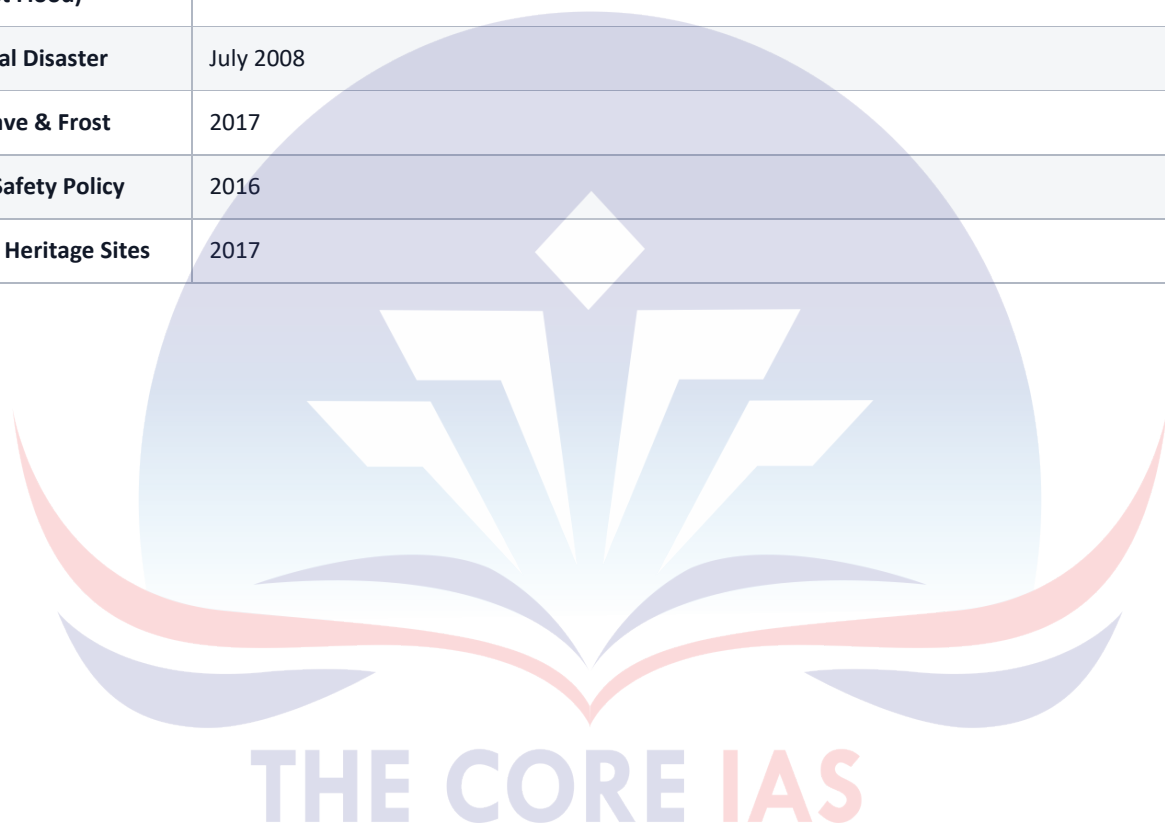
Innovative Financing Instruments

Instrument	Detail
Parametric Insurance	Pay-out based on objective trigger (rainfall, wind speed) not loss assessment; faster disbursement; pilot — Nagaland for cyclone, Punjab for crop.
Sovereign Disaster Risk Pool	Concept; would cover catastrophic losses beyond NDRF/SDRF; explored under DRR financing dialogues.
Cat Bonds (Catastrophe Bonds)	Capital market instruments; sovereign or sub-sovereign risk transfer to investors; pilot stage.
CDRI Resilience Fund	Concept under CDRI for infrastructure resilience financing.
Pradhan Mantri Fasal Bima Yojana (PMFBY)	Crop insurance; weather-based loss compensation; ₹1.5 lakh cr cumulative disbursed since 2016.
Pradhan Mantri Garib Kalyan Yojana	COVID-19 era — direct income support to vulnerable.
Disaster Risk Insurance (Poor + Farmers)	Mission LIFE × DRR push; mass-insurance protocols under examination.
PM CARES Fund	Established Mar 27, 2020; opaque accounting; SC + RTI matter ongoing; recipient of ~₹13,000 cr donations cumulatively (estimates).

(v) NDMA Guidelines Stack — Comprehensive Reference

Guideline	Year
Earthquake Management	April 2007
Chemical Disasters	April 2007
CBRN Emergencies	2009
Floods	January 2008
Cyclones	April 2008
Landslides & Snow Avalanches	June 2009
Urban Floods	September 2010
Drought	September 2010
Tsunami	April 2010
Nuclear & Radiological Emergencies	2009
Mass Casualty Management	2011
Strengthening of Safety	2010

Guideline	Year
& Security for Transportation of POL Tankers	
Industrial Disaster Management	2007 (Chemical)
Boat Capsize Disaster	2010
Heatwave	2019 (updated 2022)
GLOF (Glacial Lake Outburst Flood)	2020
Biological Disaster	July 2008
Cold Wave & Frost	2017
School Safety Policy	2016
Cultural Heritage Sites	2017



E. International Cooperation & HADR Diplomacy

India's growing role as a "Net Security Provider" in the Indo-Pacific via Humanitarian Assistance & Disaster Relief.

(i) Coalition for Disaster Resilient Infrastructure (CDRI)

Aspect	Detail
Launch	Sep 23, 2019 — UN Climate Action Summit, New York; announced by PM Modi.
HQ	New Delhi (CDRI Secretariat).
Membership	40+ countries (2024) + 7 international organisations.
Founding Members	India, Australia, Bhutan, Fiji, Italy, Maldives, Mauritius, Mexico, Mongolia, Sri Lanka, UK + UNDR + ADB + World Bank.
Focus Sectors	Power, transport, telecom, water, urban infrastructure resilience.
Flagship Programmes	IRIS (Infrastructure for Resilient Island States, COP26 2021); CDRI Resilience Fund; Global Infrastructure Resilience Assessment.
Annual Conference	International Conference on Disaster Resilient Infrastructure (ICDRI); 2024 New Delhi.
India's Anchor Position	Hosts secretariat; provides ~\$70 mn over 5 years; key voice in design.
UN Recognition	CDRI recognised as international organisation by UNGA 2022.

(ii) IRIS — Infrastructure for Resilient Island States

Aspect	Detail
Launch	COP26 Glasgow, Nov 2, 2021; launched by PM Modi + PM Johnson (UK) + leaders of Australia, Fiji, Jamaica, Mauritius.
Mandate	Build resilient infrastructure in Small Island Developing States (SIDS); 58 SIDS face existential climate threat.
Initial Funding	\$10 mn from India; UK match \$11 mn; subsequent multi-donor scaling.
Focus Areas	Power systems, transport (ports, airports), telecom, water, urban infrastructure tailored for SIDS vulnerability.
Demonstration Projects	Pacific Island Countries (PICs) + Caribbean + AIS (Africa-Indian Ocean-South China Sea) island groups.
Strategic Value	India's soft-power projection; Indo-Pacific identity; partner of choice for SIDS.

(iii) India's HADR Operations Tracker

Operation	Year / Country	Detail
Operation Castor	Oct 1987 — Maldives	IAF + Army; foiled coup attempt against President Gayoom; foundational HADR doctrine event.
Op Sahayata	Aug 2005 — USA (Hurricane Katrina)	India sent relief supplies.
Op Maitri	Apr 2015 — Nepal earthquake	IAF + NDRF; 16 IAF aircraft, 800+ NDRF; rescued 5,000+ Indians + foreigners.
Op Madad	Dec 2015 — Chennai floods	Domestic; Indian Navy + Coast Guard + Army; relief and rescue operations.
Op Insaniyat	2017 — Bangladesh	Relief for Rohingya refugees in Cox's Bazar.
Op Samudra Setu	May-Jul 2020 — Indian Ocean / COVID	Indian Navy evacuated 4,000+ Indians from Maldives, Sri Lanka, Iran.
Op Devi Shakti	Aug 2021 — Afghanistan	Post-Taliban takeover; evacuated 700+ from Kabul; IAF C-17.
Op Ganga	Feb-Mar 2022 — Ukraine	Evacuated 22,500+ Indians from war-zone via Romania, Hungary, Poland, Slovakia.
Op Kaveri	Apr-May 2023 — Sudan	Civil war evacuation; ~3,800 Indians via INS Sumedha + IAF C-17.
Op Dost	Feb 2023 — Turkey-Syria earthquake	First-ever overseas NDRF deployment; 5 teams (151 personnel) + 30-bed field hospital; lasted 12 days; ~250 rescued; widely lauded.
Op Karuna	May 2023 — Myanmar Cyclone Mocha	Indian Navy ships HADR; 40 tonnes supplies; coordinated with Bangladesh.
Op Sankalp	Ongoing — Gulf of Aden	Indian Navy anti-piracy + maritime security in Red Sea-Arabian Sea; rescued multiple merchant vessels 2024.
Op Ajay	Oct 2023 — Israel	Indians evacuated from Israel during Hamas-Israel conflict.
Op Chakra	Mar 2024 — earthquake assistance	Coordinated multilateral HADR drills.

(iv) Mission LiFE × DRR Linkage

Aspect	Detail
Mission LiFE	Launched at COP26 Nov 2021; operational at Kevadia Oct 2022 (UN SG attended); P20 at G20 India 2023.
DRR Linkage	7 LiFE mantras → resource-efficient lifestyles → reduced ecological vulnerability → lower disaster risk (especially climate-induced).
Behavioural Change Frame	Voluntary; community + individual; vs structural/legislative DRR measures.
Disaster Risk Insurance Push	LiFE + DRR — make insurance accessible to poor and farmers; bottom-of-pyramid coverage.

Aspect	Detail
Multi-Hazard Early Warning	CAP-SACHET — common alerting protocol; multi-channel; available in regional languages.



F. Technology & Early Warning Systems

India's tech-stack for disaster forecasting and response — every Mains answer benefits from naming the specific tool.

(i) IMD Impact-Based Forecasting

Aspect	Detail
Concept	Move from raw weather data ("100 mm rain expected") to predicting expected impact ("100 mm rain may cause urban flooding in low-lying areas, water-logging on these specific arterial roads").
Lead Times	Cyclone forecasts now 120-hour (vs 36-hour earlier); thunderstorm now 3-hour nowcast.
Doppler Weather Radars	~37 DWRs operational (2024); target 87 by 2030; recent installation Leh, Mukteshwar, Bhuj.
IMD Mausam App	~50 mn downloads; real-time weather + warnings in 12 Indian languages.
NCMRWF	National Centre for Medium Range Weather Forecasting; operational ensemble forecasting; 7-15 day outlook.
Bhuvan Disaster Module	ISRO geo-platform; layered hazard maps; available to public.
INSAT-3DR	Geostationary weather satellite; thermal imaging; rapid scan during cyclones.
Cyclone Hazard Map	Each Indian district has been mapped for cyclone hazard intensity (low/medium/high/very high).

(ii) INCOIS — Indian National Centre for Ocean Information Services

Aspect	Detail
Establishment	1999, Hyderabad; under MoES.
ITEWS	Indian Tsunami Early Warning System; operational 2007; 10-min warning capability.
Storm Surge Forecasting	For cyclones; integrated with IMD cyclone forecasts.
Ocean State Forecast	Wave height, sea surface temperature, currents for fisheries + maritime safety.
Tsunami Buoys	Deep-sea Bottom Pressure Recorders (BPRs); ~17 ITEWS seismic stations; real-time data.
IOWave Exercises	Indian Ocean tsunami mock drills every 2 years; IOWave23 (Oct 2023) — 24 countries participated.
SARAT (Search and Rescue Aid Tool)	Operational; uses ocean currents for narrowing search areas.

Aspect	Detail
Marine Heatwave Monitoring	Newer service; tracks SST anomalies critical for cyclone intensification.

(iii) ISRO Bhuvan & NDEM

Aspect	Detail
Bhuvan Platform	ISRO geoportal; layered map services; disaster management module.
NDEM	National Database for Emergency Management; NRSC (ISRO); GIS-based real-time information.
Cartosat Series	High-resolution mapping satellites; used for damage assessment post-disaster.
RISAT (Radar Imaging Satellite)	All-weather monitoring; cloud-penetrating; cyclone tracking + flood mapping.
INSAT Series	Geostationary; weather monitoring; communication for HADR.
Forest Fire Alerts	FSI + ISRO collaboration; SMS/email to forest officials.
Drought Monitoring	NRSC produces monthly Drought Monitor; uses satellite vegetation indices.
Flood Hazard Atlas	NRSC; combines historical inundation + current monsoon mapping.

(iv) CAP-SACHET — Common Alerting Protocol

Aspect	Detail
What is CAP	Common Alerting Protocol — international standard for emergency alert messaging.
SACHET	Indian system implementing CAP — System for Alerts to Civilians during Hazard Emergency & Tracking.
Multi-Channel	SMS, mobile app, FM radio, television, panchayat PA systems, public sirens.
Languages	All 22 scheduled languages + many local dialects.
Channels	IMD + INCOIS + CWC + GSI + Forest dept + state SDMAs feed into SACHET.
Operationalisation	2020 onwards; pan-India by 2023.
Mobile-Based Public Warning System (MB-PWS)	Cell-broadcast tech; mass alerts pushed to all phones in geographic area regardless of network.
Aapda Mitra App	Volunteer registration + community alert + first-response coordination.

(v) Drought & Flood Early Warning

System	Detail
--------	--------

System	Detail
NIDM Drought Early Warning	Integrates IMD rainfall + NRSC vegetation + soil moisture; district-level drought outlook.
Central Water Commission (CWC)	Flood forecasting; 226 forecasting stations; ~7-day lead time for river floods.
Flood Early Warning System (FFEWS)	CWC + IMD + NRSC integration; pilot Brahmaputra basin; expanding.
Reservoir-Level Telemetry	Real-time dam-level monitoring; helps in pre-emptive water release.
Imja-style GLOF EWS	Automated sensors; siren-based alerts; pilot Sikkim South Lhonak post-Oct 2023; Uttarakhand.
Doppler Radar Network	Rapid-scan rainfall mapping; cloudburst detection improving but still limited in mountains.
Mobile-First Era	WhatsApp alerts; weather apps; democratisation of forecasts.

(vi) AI in DRR

Application	Detail
Predictive Analytics	ML models predict flood inundation, cyclone tracks, drought onset; IMD + NCMRWF + IIT Delhi collaborations.
Damage Assessment	Post-disaster satellite imagery + AI = rapid damage classification (Wayanad 2024 application).
Social Media Monitoring	NLP-based sentiment analysis during disasters; identify isolated communities; resource needs prioritisation.
Drone Surveillance	Real-time aerial imagery; thermal sensing for trapped persons; payload delivery in remote zones.
Resource Allocation	AI-optimised dispatch of NDRF, supplies, vehicles based on dynamic disaster mapping.
Risk Mapping	AI-aided composite vulnerability scoring; e.g., Mumbai Climate Action Plan.
Early Warning Refinement	Lead-time extension; reducing false alarms; better targeting of warnings.
Ethical Concerns	Bias in training data; privacy in social-media monitoring; over-reliance vs ground intelligence.

(vii) Community-Based DRR & Aapda Mitra

Initiative	Detail
Aapda Mitra	~1.5 lakh community volunteers trained for first response; 30 districts initial; pan-India scaling.
Yuva Aapda Mitra	Sep 2023 launch; extends to NCC/NSS volunteers; target 2.5 lakh by 2026.

Initiative	Detail
Skill Areas	First-aid, search-and-rescue basics, fire safety, swimming, communications.
Women-Led Initiatives	SHG networks as DRR backbone; Kudumbashree (Kerala), Mission Shakti (Odisha).
School Safety Programme	Mandatory mock drills; School Safety Officer in every school; NDMA-NCERT collaboration.
Disaster-Resilient Schools	Earthquake-resistant retrofitting; safety audits; PMAY-G village construction guidelines.
Local Community DRR	Gram panchayat plans (DDMP); ward-level urban plans (ULB); convergence with SDG framework.
Indigenous Knowledge	Coastal communities — pre-tsunami signs; Himalayan communities — landslide indicators; valuable supplements to scientific systems.



G. Cross-Cutting Themes Map

Themes that recur across A-F — high integrative value for 15-mark Mains questions.

Cross-cutting Theme	Spans Sections	Hooks & Keywords
Climate Change × Disasters	A + B + C	Cyclones (Biparjoy-Michaung-Remal-Dana); GLOFs (South Lhonak Oct 2023); SLR; heatwaves (Delhi 52.3°C May 2024); Wayanad Jul 2024.
NDMA Guidelines Stack	A + B + D	Earthquake 2007, Tsunami 2010, Drought 2010, Urban Floods 2010, Cloudburst, Landslide 2009, GLOF 2020, Heatwave 2019, Chemical 2007, CBRN 2009.
Global DRR Architecture	A + E	Hyogo → Sendai; CDRI 2019; IRIS COP26; Sendai Mid-Term Review May 2023; Mission LiFE × DRR.
Vulnerability Mapping & GIS	A + B + F	Bhuvan; NDEM (NRSC); ITEWS (INCOIS); FFEWS (CWC); GSI-NLSM; National Landslide Forecasting Centre.
Build Back Better & Resilient Infra	A + B + E	CDRI 2019; IRIS COP26; PMAY-G compliance; Cool Roofs Mission; AMRUT 2.0.
Heat-Action Plans	A + B	Ahmedabad 2013 model; Odisha; Telangana; Bihar (state-notified disaster); NDMA 2019 Heatwave Guidelines.
Multi-Hazard Risk Cascades	B + C	Joshimath Jan 2023 → South Lhonak Oct 2023 → Wayanad Jul 2024 → Tibet Jan 2025; Himalayan-Western Ghats vulnerability.
Technology & EWS	B + F	CAP-SACHET; Common Alert Protocol; IMD Impact-Based Forecasting; INCOIS Tsunami; ISRO Bhuvan; NCMRWF; AI integration.
Federal Coordination & Financing	A + D	NDMA-SDMA-DDMA; NDRF-SDRF; NDMF-SDMF (15th FC ₹45,724 cr mitigation); parametric insurance pilots.
Community-Based DRR	A + B + F	Aapda Mitra (~1.5 lakh volunteers); Yuva Aapda Mitra 2023; women-led SHGs; school safety; indigenous knowledge.
HADR Diplomacy	C + E	Op Dost Turkey-Syria 2023 (first NDRF overseas); Op Karuna Myanmar 2023; Op Ganga Ukraine 2022; Op Kaveri Sudan 2023; Op Sankalp Red Sea.
Climate Finance × DRR	A + E	Sendai Target c (economic loss/GDP); Loss & Damage Fund COP27→28; NCQG COP29 Baku \$300 bn/yr; CDRI Resilience Fund.

H. High-Probability Forecast Zones — Mains 2026

Distilled from PYQ density 2020-25 + current happenings: Sendai Mid-Term 2023, CDRI scaling, cascading Himalayan disasters, DM Amendment Act 2025 pipeline.

#	Forecast Zone
1	Sendai Framework Mid-Term Review 2023 — India's progress on 7 global targets; renewed call to triple investment in DRR; post-2030 successor framework debate.
2	Coalition for Disaster Resilient Infrastructure (CDRI 2019) — 40+ members; ICDRI 2024 Delhi; IRIS for SIDS; India's anchor role; UN recognition 2022.
3	Multi-Hazard Cascades — Joshimath Jan 2023; South Lhonak GLOF Oct 2023; Wayanad Jul 2024; Tibet Earthquake Jan 2025; Himalayan + Western Ghats vulnerability.
4	GLOF Management — NDMA 2020 Guidelines; ~190 PGLs monitored; Imja-style lake-lowering; Sikkim post-Lhonak audit; Uttarakhand 36 PGLs review.
5	India's HADR Diplomacy — Op Dost Turkey-Syria 2023 (first NDRF overseas); Op Karuna Myanmar 2023; Op Kaveri Sudan 2023; Net Security Provider doctrine.
6	Cyclone Preparedness — Biparjoy 2023 → Dana 2024; IMD-NDMA zero-casualty model; NCRMP shelters; CAP-SACHET; replicating Odisha model.
7	Heatwave as Notified Disaster — Bihar precedent; NDMA Heatwave Guidelines 2019; Ahmedabad HAP replicated; Delhi 52.3°C May 2024.
8	Urban Floods Governance — Mumbai 2005 → Chennai 2015 → Hyderabad 2020 → Bengaluru 2022 → Delhi 2023; AMRUT 2.0; Sponge City principle; Blue-Green Infrastructure.
9	Pandemic Preparedness — COVID-19 lessons; One Health approach; National Pandemic Plan; INSACOG genomic surveillance; WHO Pandemic Treaty 2024-25.
10	Industrial/Chemical Disasters — Bhopal 1984 legacy; LG Polymers Vizag May 2020; MARG protocol; NDRF CBRN battalions; OISD norms.
11	Disaster Finance — 15th FC NDMF ₹13,693 cr + SDMF ₹32,031 cr; parametric insurance pilots (Nagaland cyclone, Punjab crop); cat bonds concept.
12	PM CARES Fund — accountability + audit + RTI debates; SC proceedings; usage transparency questions.
13	DM (Amendment) Act 2025 in Pipeline — proposed NDMA powers; SDMP/DDMP statutory backing; urban DM separately; financing clarity.
14	Mission LiFE × DRR — Disaster Risk Insurance for poor + farmers; behavioural change; Aapda Mitra scaling (~1.5 lakh volunteers, Yuva extension 2023).
15	Technology & EWS — CAP-SACHET; INCOIS storm-surge + tsunami; ISRO Bhuvan-NDEM; IMD Doppler radar 37→87 by 2030; AI in DRR.
16	Western Ghats ESA Notification — Gadgil-Kasturirangan; 6 states' resistance; Wayanad Jul 2024 as ESA-failure

#	Forecast Zone
	exemplar; MoEFCC consultation 2024-25.
17	CRZ-Cyclone Linkage — coastal mangrove restoration MISHTI 2023; ICZM Phase II; sea-walls vs nature-based solutions; coastal hazard line.
18	School Safety Policy — NDMA 2016; mandatory drills; NDMA-NCERT curriculum integration; PMAY-G earthquake retrofit.
19	Climate-DRR-Adaptation Triumvirate — Loss & Damage Fund COP28 operational; NCQG COP29 \$300 bn/yr by 2035; adaptation finance gap.
20	Indigenous Knowledge in DRR — coastal community tsunami signs; Himalayan landslide indicators; valuable supplements to scientific systems.

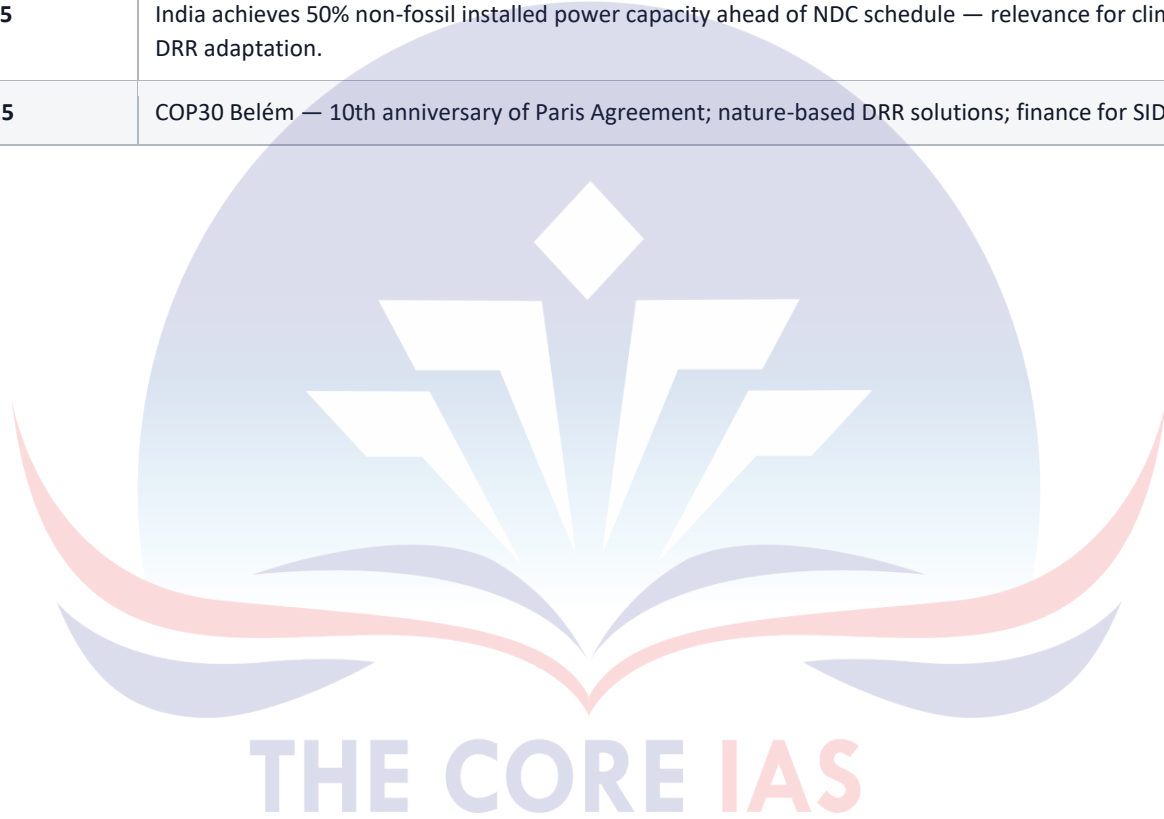


I. Recent Developments Tracker — 2023-2025

Dated, citable events for Mains answers — anchor your argument with specific dates and numbers.

Date	Event / Development
Jan 2023	Joshimath subsidence (Uttarakhand) — 868+ houses cracked; ISRO confirms 5.4 cm subsidence in 12 days; halt to NTPC Tapovan-Vishnugad tunneling.
Feb 2023	Operation Dost — Turkey-Syria earthquake; first overseas NDRF deployment (5 teams + 30-bed field hospital + IAF C-17).
Feb 2023	Cyclone tracking improvements — IMD revised cyclone hazard map; 120-hour forecast lead time.
May 2023	Cyclone Mocha — Bangladesh, Myanmar; Op Karuna by Indian Navy; 40 tonnes relief.
May 2023	Sendai Mid-Term Review High-Level Meeting at UN; Political Declaration; India's achievements showcased.
Jun 2023	Cyclone Biparjoy — Gujarat Kutch; Cat 3; ~1,80,000 evacuated; ZERO casualty from storm; IMD-NDMA model validated.
Sep 2023	Yuva Aapda Mitra launched — NCC/NSS extension of Aapda Mitra; target 2.5 lakh volunteers by 2026.
Sep 2023	P20 (People-20) at G20 New Delhi — Mission LiFE in Leaders' Declaration; DRR component highlighted.
Oct 2023	Sikkim South Lhonak GLOF — pre-dawn breach; Teesta-III dam destroyed; ~100 deaths/missing; ₹25,000 cr damage.
Oct 2023	IOWave23 — Indian Ocean tsunami mock drill; 24 countries; INCOIS-led.
Dec 2023	Cyclone Michaung — TN-AP; Chennai urban flooding; ~33 deaths; ₹10,000 cr damage.
Mar 2024	NDMA 15-member expert committee report on Sikkim GLOF — 56 PGLs in Sikkim to be monitored; revised GLOF EWS proposed.
May 2024	Delhi all-time high temp 52.3°C (May 29) — disputed by IMD; heatwave-related deaths rising.
May 2024	Cyclone Remal — WB-Bangladesh; ~50 deaths combined; Sundarbans mangrove buffer documented.
Jul 30, 2024	Wayanad landslide (Kerala) — Mundakkai-Chooralmala; ~430 deaths; cited as Western Ghats ESA failure.
Aug 2024	SC ruling on Forest Conservation Amendment Act 2023 — upheld but extended Godavarman dictionary-meaning of "forest" until states notify lists.
Sep 2024	Cyclone Asna — rare Arabian Sea September cyclone; Gujarat-Pakistan coast; demonstrated Arabian Sea intensification.
Oct 2024	Cyclone Dana — Odisha-WB; ~10 deaths; 8 lakh pre-emptive evacuation; Odisha's near-zero-casualty target.
Nov 2024	COP29 Baku NCQG agreed — \$300 bn/yr by 2035; G77+China demanded \$1.3 trillion; criticised as

Date	Event / Development
	inadequate.
Nov 2024	NMNF (National Mission on Natural Farming) approved — ₹2,481 cr; convergence with DRR for climate-resilient agri.
Jan 7, 2025	Tibet earthquake M 7.1 near Shigatse; tremors across NE India, Sikkim, Bhutan; ~126 deaths in Tibet; GLOF risk re-assessment for Himalayan states.
Mar 2025	DM (Amendment) Act 2025 — consultation phase; proposed NDMA powers strengthening; SDMP/DDMP statutory backing.
Apr 2025	India achieves cyclone preparedness benchmark — IMD-NDMA model recognised by UNDRR.
Aug 2025	India achieves 50% non-fossil installed power capacity ahead of NDC schedule — relevance for climate-DRR adaptation.
Nov 2025	COP30 Belém — 10th anniversary of Paris Agreement; nature-based DRR solutions; finance for SIDS.

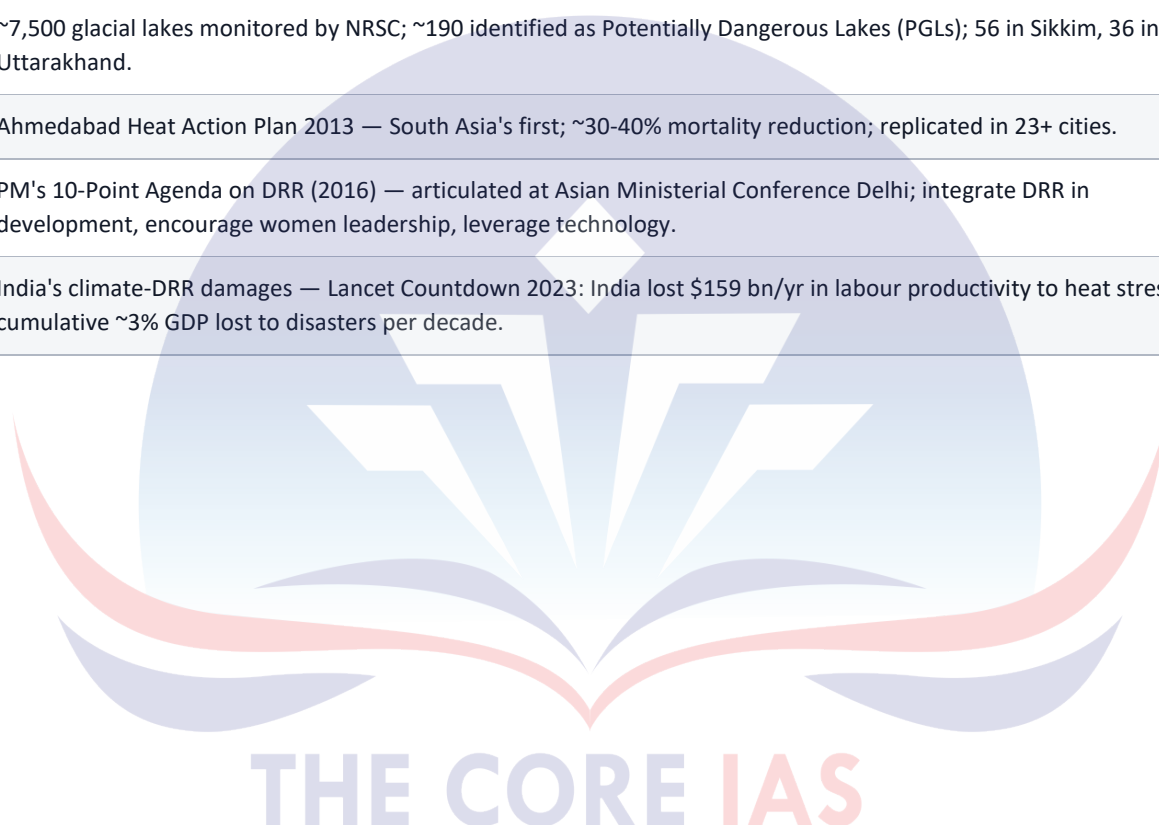


J. Quick Revision Data Sheet — Killer Statistics

25 headline statistics from NDMA, MHA, 15th FC, IPCC, UNDRR — anchor your 250-word Mains answers with specific numbers.

#	Statistic
1	India is the world's 3rd most disaster-prone country; ~58% of land mass vulnerable to earthquakes (Zones III-V), ~12% to floods, ~70% of coast to cyclones, ~68% to drought.
2	DM Act 2005 — first comprehensive Indian DM law; created NDMA (PM), SDMAs (CMs), DDMA (DMs); 16 NDRF battalions (~16,000 personnel).
3	NDRF 16 battalions; 5 CBRN-capable; deployed in Op Dost (Turkey 2023 — first overseas), Op Karuna (Myanmar 2023), Op Maitri (Nepal 2015), Op Ganga (Ukraine 2022), Op Kaveri (Sudan 2023).
4	Sendai Framework (2015-30) — 4 priorities, 7 global targets, 38 indicators; mid-term review May 2023 — only 5 of 38 indicators have sufficient global data.
5	15th Finance Commission DM allocations (2021-26) — NDRF ₹68,463 cr + SDRF ₹1,28,122 cr + NDMF ₹13,693 cr + SDMF ₹32,031 cr = ₹2.42 lakh cr total.
6	NDMF + SDMF (₹45,724 cr) — first-ever dedicated pre-disaster mitigation funds under 15th FC; 6× larger than 14th FC allocations.
7	CDRI (Coalition for Disaster Resilient Infrastructure) — launched Sep 2019 by India at UN; HQ New Delhi; 40+ members; UN-recognised 2022.
8	IRIS (Infrastructure for Resilient Island States) — launched COP26 Nov 2021 for 58 SIDS; India committed \$10 mn initial.
9	Bhuj 2001 earthquake — ~20,000 deaths; led to DM Act 2005 + GSDMA formation.
10	Dec 26, 2004 Sumatra-Andaman tsunami — M 9.1-9.3; ~2.3 lakh deaths across 14 countries; India ~16,300 deaths.
11	Kedarnath disaster Jun 16-17, 2013 — ~5,700 deaths from cloudburst + Chorabari Lake breach; transformed Uttarakhand DM doctrine.
12	Cyclone Biparjoy Jun 2023 — Cat 3 in Gujarat; ~1,80,000 pre-emptive evacuation; ZERO casualty from storm itself; validated IMD-NDMA model.
13	South Lhonak GLOF Oct 2023 — pre-dawn lake breach in Sikkim; Teesta-III dam destroyed; ~100 deaths/missing; ₹25,000 cr damage.
14	Wayanad landslide Jul 30, 2024 — Mundakkai-Chooralmala (Kerala); ~430 deaths; cited as Western Ghats ESA failure.
15	Joshimath subsidence Jan 2023 — 868+ houses cracked; ISRO satellite confirms 5.4 cm subsidence in 12 days; ₹1,500 cr relief.
16	Tibet earthquake Jan 7, 2025 — M 7.1 near Shigatse; tremors across NE India; ~126 deaths in Tibet; spurred GLOF risk re-assessments.
17	Aapda Mitra — ~1.5 lakh community volunteers trained; Yuva Aapda Mitra (Sep 2023) target 2.5 lakh by 2026 via

#	Statistic
	NCC/NSS.
18	IMD Doppler Weather Radars — ~37 operational (2024); target 87 by 2030; 120-hour cyclone forecast lead time.
19	NDMA Guidelines stack — Earthquake 2007, Tsunami 2010, Drought 2010, Urban Floods 2010, Landslide 2009, GLOF 2020, Heatwave 2019, Chemical 2007, CBRN 2009.
20	CAP-SACHET — Common Alerting Protocol multi-channel (SMS, app, radio, TV); 22 scheduled languages; operational pan-India 2023.
21	INCOIS ITEWS — operational 2007; 17 seismic stations; tsunami warning capability 10 minutes; IOWave23 mock drill 24 countries.
22	~7,500 glacial lakes monitored by NRSC; ~190 identified as Potentially Dangerous Lakes (PGLs); 56 in Sikkim, 36 in Uttarakhand.
23	Ahmedabad Heat Action Plan 2013 — South Asia's first; ~30-40% mortality reduction; replicated in 23+ cities.
24	PM's 10-Point Agenda on DRR (2016) — articulated at Asian Ministerial Conference Delhi; integrate DRR in development, encourage women leadership, leverage technology.
25	India's climate-DRR damages — Lancet Countdown 2023: India lost \$159 bn/yr in labour productivity to heat stress; cumulative ~3% GDP lost to disasters per decade.



Congratulations

to all Successful Candidates

OUR CLASSROOM RESULT



AIR 34

ABHI JAIN



AIR 118

GARIMA JAIN
First-Attempt



AIR 228

Devanshu Mohan Dwivedi



AIR 272

ESHA JAIN



AIR 539

SWATI JAIN
हिन्दी माध्यम



AIR 296

Vishal Dubey



AIR 515

Rajat Tripathi



AIR 618

Divyanshu Pal Nagar
हिन्दी माध्यम



AIR 842

Komal



AIR 976

Shравan Deshmukh



AIR 91

JATIN JAIN



AIR 165

SHRUTI



AIR 435

DAMINI DIWAKAR



AIR 152

NEHA JAIN



AIR 67

VASU JAIN



AIR 94

AKASH SHRISHRIMAL



AIR 138

DARSHAN



AIR 269

SHREYANSH SURANA



AIR 279

ARPIT JAIN



AIR 329

SANDHI JAIN



AIR 394

RAJAT KUMAR PAL



UPPSC 2

SANGEETA RAGHAV



UPPSC 36th

ABHISHEK KUMAR



AIR 495

PUKIT BAJAJ



Scan here for video Testimonial

89 shop, Bada Bazar Rd, behind Safal shop, ORN, Delhi, 110005||
630, Banda Bahadur Marg, Mukherjee Nagar, Delhi, 110009||
PRAYAGRAJ

☎ 9873833547, 8800141518