

MAINS MASTERY 2026 · GS PAPER III · QUESTION 7 · STUDENT EDITION

Infrastructure and Disaster Risk in Fragile Landscapes

THE QUESTION, AS SET IN UPSC CSE MAINS 2026

Discuss how the contradiction between 'rapid infrastructure development' and 'disaster-risk reduction' in ecologically-sensitive areas of India can be managed, with suitable examples.

Directive: Discuss how | 10 marks | 150 words

Disaster management: DRR and infrastructure

1 **PYQ Deep Decode**
Demand, hidden demand, structure, form

2 **PYQ Intelligence**
2013 to 2026: hazards, Sendai, fragile regions

3 **Additional information**
Six cases, the tools, a decision flow

4 **Pitfalls and variations**
Corrections and changed directives

5 **The model answer**
Case lines, a flow, matched points

6 **Other ways to write it**
Outlines, and when each works

7 **Quick recall**
Sixteen facts for Mains and Prelims

8 **Write it yourself**
A seven-point self-check

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Discuss how the contradiction between 'rapid infrastructure development' and 'disaster-risk reduction' in ecologically-sensitive areas of India can be managed, with suitable examples.

1 PYQ Deep Decode

Read the question the way the examiner set it: the demand, the hidden demand, the structure that follows from both, and how the answer should be presented, opened and closed.

1.1 The demand

The question takes a **contradiction as given**: India needs roads, tunnels, dams and towns in its mountains and forests, and the same places are where building can create or magnify disaster risk. It asks you to **discuss how that contradiction can be managed**. So the answer shows the tension briefly, with real cases, and then spends most of its words on **the means of managing it**: where to build, how much, how to design, how to warn, and who must be involved. **"With suitable examples"** applies to both parts.

Words in the question	What they ask you to do	What goes wrong if you miss them
Discuss how … can be managed	Explain the methods of management with reasons and evidence; the "how" is the core, not a closing line.	Writing a long essay on disasters with two lines of solutions.
the contradiction	Show briefly why the two goals pull apart: cutting, blasting, impounding and crowding on fragile terrain raise hazard and exposure.	Treating it as "development versus environment" in general.
rapid infrastructure development	Roads (Char Dham), tunnels (Silkyara), hydropower (Teesta III), four-laning (Himachal), urban growth (Joshimath). "Rapid" hints at speed outrunning study.	Ignoring that infrastructure is also needed for security, livelihoods and disaster response.
disaster-risk reduction	Use the Sendai vocabulary: reduce hazard, exposure and vulnerability; prevent new risk, not only respond.	Writing only about relief and rescue.
ecologically-sensitive areas of India	Himalaya and Western Ghats chiefly; also coasts and islands. Name the legal tools: ESAs, ESZs, EIA.	Using examples from plains cities that miss "ecologically-sensitive".
with suitable examples	Indian cases with year and place, each proving the point it sits beside.	Generic phrases such as "many projects have failed".

THE DEMAND IN ONE LINE

Show, with recent Indian cases, why fast building in fragile landscapes creates risk, then explain the planning, appraisal, design, warning and governance tools that let India build there without building disasters.

1.2 The hidden demand

The word "contradiction" is a test. A strong answer shows that the contradiction is **not absolute**: well-sited, well-designed infrastructure is itself disaster-risk reduction, because roads, bridges and power are lifelines during a disaster. The Sendai Framework's target (d) asks countries to **reduce damage to critical infrastructure**, not to stop building it. The real fault line is **governance**: warnings ignored (Joshimath since

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1976), projects judged one at a time rather than together, and communities left out. So the small final part on **governance and communities** is where the hidden demand is answered.

Each point should name the tool, the case that shows why it is needed, and what it changes. The last column is where the hidden demand begins.

Tool	The case that calls for it	What it changes
Risk-informed siting	Teesta III, downstream of a glacial lake long flagged as hazardous.	Hazard maps decide where, before money is spent.
Safer design norms	Vertical hill cuts on the Parwanoo-Solan four-lane failed in the 2023 monsoon.	Benching, drainage and slope protection become rules.
Independent oversight	Char Dham: the Supreme Court allowed wider roads but set an oversight committee (2021).	Safeguards are implemented, not only promised.

WEAK

Development is necessary but disasters are increasing in the Himalayas. Therefore a balance should be maintained between development and environment.

STRONG

After the Parwanoo-Solan four-lane's vertically cut slopes failed in 2023, MoRTH's later norms required bench cutting, drainage and slope protection in the detailed project report: risk is managed when it is written into design before construction begins.

1.3 The structure

The question has **one explicit demand**, how to manage the contradiction, which needs the contradiction itself stated first. The hidden demand, governance and communities, becomes a **small final part**. The shares are of the body between the introduction and the conclusion; they are a teaching guide, not a UPSC rule.

Introduction | **1. The contradiction** about one-quarter | **2. How to manage it** about three-fifths | **3. Governance, communities** about one-sixth | **Conclusion**

Part 1 **The contradiction** about one-quarter

Joshimath	Subsidence, January 2023; warned against heavy construction since 1976.
Silkyara	Char Dham tunnel collapse, 12 November 2023; 41 workers trapped.
Teesta III	South Lhonak GLOF destroyed the 1,200 MW dam, 4 October 2023.
Himachal	2023 monsoon; vertically cut four-lane slopes failed.

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Parts 2 and 3 **Managing it, and who governs it** about three-quarters

Locate and limit	Hazard zonation; carrying capacity; ESAs (Gadgil, Kasturirangan).
Appraise and design	Cumulative EIA; bench cuts, drainage, escape tunnels.
Warn and restore	Glacial-lake monitoring; nature-based slope protection.
Govern	Sendai, the 10-point agenda, CDRI; panchayats and local monitors.

1.4 How to present it

The form follows the question. "How can it be managed" is a **sequence of decisions**, from choosing a site to warning people, so a short **four-step flow** (locate, limit, design, warn) carries Part 2 at a glance, and **headed points** beneath it attach an example to each step. Part 1 needs only **one compact line naming four cases**; each must show the contradiction, not merely a disaster.

Form	Fit here	Reason
Case lines, a flow, headed points	**Best**	The tension proved quickly; the management shown as a sequence with examples.
Risk-versus-intervention table	Good	Matches each hazard to its remedy; slightly heavier in 150 words.
Paragraphs on "balance"	Weak	No mechanism, no examples, no view.

1.5 The introduction and the conclusion

The introduction serves the whole question. It states both sides of the contradiction in one breath: why these regions need infrastructure, and how careless building there turns hazards into disasters.

The conclusion settles the demand. It gives the answer to "how": let risk decide where, how much and how to build, so that infrastructure becomes part of disaster-risk reduction.

2 PYQ Intelligence 2013 to 2026

The question's context in 2026, its place in a line of questions on disaster risk in fragile regions, and what to prepare next.

2.1 Why the subject was topical in 2026

Between 2021 and 2025, India's mountain regions saw a run of disasters that involved infrastructure directly: a hydropower site swept away at Chamoli, a town subsiding at Joshimath, a tunnel collapsing at Silkyara, a dam destroyed by a glacial flood in Sikkim, and highways failing in Himachal Pradesh. Courts, ministries and the NDMA responded with new norms and programmes. GS Paper III was held on 23 August 2026. UPSC never states why it sets a question, so treat this as **context, not cause**. Everything in this table predates the examination.

When	What happened	Why it matters for this question
7 February 2021	A rock and ice avalanche in Chamoli, Uttarakhand, triggers a flood that destroys the Rishiganga	Hydropower sited in a high-hazard valley.

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When	What happened	Why it matters for this question
	project and damages NTPC's Tapovan-Vishnugad project.	
14 December 2021	In **Citizens for Green Doon v. Union of India**, the Supreme Court allows double-lane roads with paved shoulders on three Char Dham feeder roads, citing defence needs, and sets up an **Oversight Committee** under Justice A.K. Sikri to ensure the High-Powered Committee's safeguards are implemented.	The template for managing, not choosing between, the two goals.
January 2023	**Joshimath** subsides; a preliminary NRSC satellite analysis reports 5.4 cm of sinking in 12 days (27 December 2022 to 8 January 2023). By the end of January more than 860 buildings are declared disaster-affected, and construction by NTPC, the BRO and others is halted.	The cost of ignoring the 1976 Mishra Committee.
March 2023	NRSC (ISRO) makes public the **Landslide Atlas of India**: about 80,000 landslides mapped (1998 to 2022) in 17 States and two Union Territories, and a ranking of 147 districts by landslide risk exposure; Rudraprayag and Tehri Garhwal rank highest.	The base map for risk-informed siting.
July to September 2023	Himachal Pradesh's monsoon: the State government estimates losses of about ₹12,000 crore. Experts blame **vertical hill cutting** for damage to the Parwanoo-Solan four-lane highway.	Design, not only rain, decides damage.
August to September 2023	In **Ashok Kumar Raghav v. Union of India**, the Environment Ministry proposes to the Supreme Court that all 13 Himalayan States assess their **carrying capacity**, under G.B. Pant Institute guidelines first circulated on 30 January 2020.	"How much" becomes a legal question.
4 October 2023	A landslide into **South Lhonak** lake collapses its lateral moraine and triggers an outburst flood that destroys the 1,200 MW **Teesta III** dam at Chungthang, and washes away bridges and stretches of NH 10.	Infrastructure in a GLOF path.
12 to 28 November 2023	The **Silkyara-Barkot** tunnel (Char Dham) collapses; 41 workers are rescued after 17 days. On 22 November NHAI announces a safety audit of all 29 tunnels under construction.	Geology and escape routes in tunnel design.
30 November 2023	A High-Level Committee approves a **₹1,658.17 crore** recovery and reconstruction plan for Joshimath, on Build Back Better principles.	Recovery that must not repeat the risk.
30 to 31 July 2024	**Wayanad** landslides (Mundakkai, Chooralmala, Punchirimattom). A day later the Environment Ministry issues the **sixth draft notification** declaring about 56,800 sq km of the Western Ghats ecologically sensitive, including 13 villages	ESAs as a disaster tool, not only a biodiversity tool.

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When	What happened	Why it matters for this question
	in Wayanad, proposing a ban on mining and quarrying.	
August 2024	Approval of the **₹150 crore National GLOF Risk Mitigation Programme** for Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh is reported (21 August); separately, NDMA has identified **189 high-risk glacial lakes** needing mitigation, out of nearly 7,500 in the Indian Himalaya.	Early warning and lake lowering.
25 to 27 March 2025	The **Disaster Management (Amendment) Bill, 2024**, passed by the Lok Sabha on 12 December 2024, is passed by the Rajya Sabha with amendments on 25 March 2025; the Lok Sabha agrees to those amendments on 27 March, and the Bill is subsequently enacted as the Disaster Management (Amendment) Act, 2025: disaster risk reduction written into the definition of disaster management, national and State disaster databases, NDMA and SDMAs to prepare plans, urban disaster management authorities.	The governance layer.
28 July 2025	The Supreme Court (Justices J.B. Pardiwala and R. Mahadevan) directs its Registry to register a writ petition in public interest on Himachal Pradesh's ecology, citing hydropower projects, four-lane roads, deforestation and multi-storey buildings among the reported causes of its crisis.	Cumulative impact, judicially recognised.
December 2025 (reported)	MoRTH's revised hill-road guidelines replace vertical cutting with **benched slopes**, require slope protection and drainage in detailed project reports, and recommend monitoring and early warning in landslide-prone stretches.	Lessons turned into norms.
27 July 2026	The Environment Ministry issues the **seventh draft notification** on the Western Ghats ESA (S.O. 4106(E)): 56,825.7 sq km in six States, proposing a complete ban on mining, quarrying and sand mining; 60 days for public comment.	The latest pre-exam position: still a draft.

2.2 The skill UPSC keeps testing

UPSC's disaster questions move from pre-disaster risk assessment (2013), through hazard-specific mitigation (2016, 2019, 2021, 2022) and DRR frameworks and resilience (2018, 2020, 2024), to infrastructure failure (2023) and now the **development-risk trade-off** and community participation (2026). Questions are verbatim from the official papers, with question numbers.

Year	The question as UPSC set it	What it asked of you	What changed in 2026
2013 GS III, Q18	How important are vulnerability and risk assessment for pre-disaster management ? As an administrator, what are key areas that you would focus on in a Disaster Management System.	Risk assessment before a disaster.	The case for screening infrastructure before approval.

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Year	The question as UPSC set it	What it asked of you	What changed in 2026
2016 GS III, Q16	With reference to National Disaster Management Authority (NDMA) guidelines, discuss the measures to be adopted to mitigate the impact of the recent incidents of cloudbursts in many places of Uttarakhand.	NDMA measures for one hazard.	From one hazard to the projects that magnify all hazards.
2018 GS III, Q18	Describe various measures taken in India for Disaster Risk Reduction (DRR) before and after signing 'Sendai Framework for DRR (2015–2030)'. How is this framework different from 'Hyogo Framework for Action, 2005'?	DRR policy and the Sendai shift.	Sendai now applied to infrastructure decisions.
2019 GS III, Q18	Disaster preparedness is the first step in any disaster management process. Explain how hazard zonation mapping will help disaster mitigation in the case of landslides.	Hazard zonation as a tool.	Zonation as the first gate for siting projects.
2020 GS III, Q18	Discuss the recent measures initiated in disaster management by the Government of India departing from the earlier reactive approach.	From reactive to preventive management.	Prevention applied to infrastructure decisions.
2021 GS III, Q18	Describe the various causes and the effects of landslides. Mention the important components of the National Landslide Risk Management Strategy.	Causes and the 2019 strategy.	Human causes, road cuts and tunnels, at the centre.
2022 GS III, Q8	Explain the mechanism and occurrence of cloudburst in the context of the Indian subcontinent. Discuss two recent examples.	Hazard mechanism, two recent cases.	Designing for extreme rain and cascading hazards.
2023 GS III, Q7	Dam failures are always catastrophic, especially on the downstream side, resulting in a colossal loss of life and property. Analyze the various causes of dam failures. Give two examples of large dam failures.	Infrastructure failure as disaster.	Teesta III (2023) becomes the example.
2024 GS III, Q17	What is disaster resilience? How is it determined? Describe various elements of a resilience framework. Also mention the global targets of Sendai Framework for Disaster Risk Reduction (2015-2030).	Resilience and Sendai targets.	Target (d), critical infrastructure, in practice.
2026 GS III, Q18	"Community participation is the cornerstone of effective disaster management". Analyse this statement with suitable examples from India. Also discuss the challenges to community participation and measures to strengthen it.	Communities in disaster management.	The same paper's companion to Part 3 here.

Also related, verbatim: 2016 GS I, Q14: "“The Himalayas are highly prone to landslides.” Discuss the causes and suggest suitable measures of mitigation." 2024 GS III, Q8: "What role do environmental NGOs and activists play in influencing Environmental Impact Assessment (EIA) outcomes for major projects in India? Cite four examples with all important

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details." 2026 GS I, Q17: "Analyze the major drivers of human-induced land-use changes in India and their geographical consequences."

CARRY THIS METHOD TO ANY "MANAGE A TRADE-OFF" QUESTION

1. **State** both goals and why they collide, with cases.
2. **Deny** that the collision is total: show where they converge.
3. **Sequence** the tools: where, how much, how, warn.
4. **Prove** each tool with an Indian example.
5. **End with** who governs it and who takes part.

2.3 What to prepare next

FRAMEWORKS AND LAWS

Disaster Management Act, 2005	NDMA, SDMAs, DDMAs; amended in 2025 to add disaster databases and urban authorities.
EIA Notification, 2006	Project-by-project clearance; the debate on cumulative and basin-level assessment.
NDMA guidelines	Landslide strategy (September 2019); GLOF guidelines (October 2020).
Western Ghats ESA drafts	Drafts since 2014 (first, S.O. 733(E), 10 March 2014); sixth, S.O. 3060(E), 31 July 2024; seventh, S.O. 4106(E), 27 July 2026, proposing 56,825.7 sq km in six States. Expert committee's tenure extended to July 2027; no final notification.

IDEAS

Risk: hazard, exposure, vulnerability, capacity	"Risk ≈ hazard × exposure × vulnerability" is a teaching aid, not an equation; coping capacity lowers risk. Badly planned infrastructure raises exposure and vulnerability, and where it cuts slopes or alters drainage it can intensify the hazard itself.
Carrying capacity	How much load a town or valley can bear safely.
Cumulative impact	Many small projects, one big risk.
Build Back Better	Sendai's fourth priority: recovery that lowers risk.

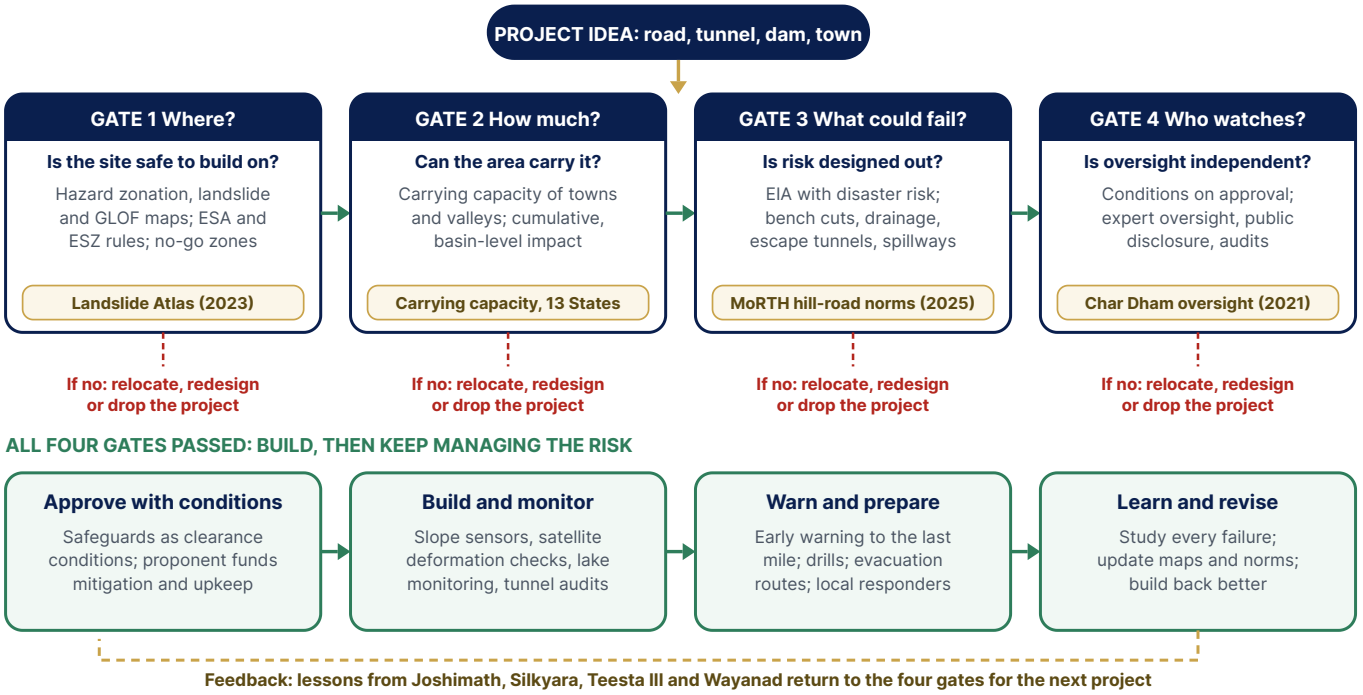
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3 Additional information

Everything needed to answer this question well. Tier 1 holds what the demand needs; Tier 2 places it within the wider debate on development in fragile regions.

TIER 1 · ESSENTIAL: THE CONTRADICTION, THE TOOLS AND THE EXAMPLES

From project idea to risk-informed approval



A teaching diagram of how a risk-informed approval could work, drawn from the Sendai Framework, NDMA guidance, MoRTH's hill-road norms and the Supreme Court's Char Dham judgment. It is not an official procedure; Indian clearances today follow the EIA Notification, 2006, and sectoral rules.

Case	What happened, with evidence	What it shows about the contradiction
THE CONTRADICTION, IN SIX CASES		
Joshimath, 2023	A town built on old landslide debris began to sink. NRSC's preliminary satellite analysis reported 5.4 cm in 12 days (27 December 2022 to 8 January 2023), against 8.9 cm in April to November 2022. More than 860 buildings were declared disaster-affected and 181 unsafe. As early as **1976**, the **Mishra Committee** had recommended banning heavy construction and tree-felling in sliding zones and protecting the toe of the slope. Construction by NTPC, the BRO and others was halted in January 2023.	Warnings existed for nearly 50 years; growth outran them.
Silkyara, 2023	On 12 November 2023 part of the Silkyara-Barkot tunnel (about 4.5 km, Char Dham project) collapsed; **41 workers** were rescued on 28 November after 17 days. The site lies	Geological investigation, tunnel support and escape arrangements came under scrutiny;

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Case	What happened, with evidence	What it shows about the contradiction
	near the Main Central Thrust; the BRO cited extremely weak rock, and the tunnel had no escape passage. NHAI then ordered a safety audit of all **29 tunnels** under construction.	precise causes rest with the official inquiry, not inference.
Char Dham roads	About 900 km of national highways, announced in December 2016 and split into 53 projects. Critics argued that the split avoided a full environmental assessment. On **14 December 2021** the Supreme Court allowed a double-lane paved-shoulder width on three defence feeder roads, holding that environmental compliance is "the route to sustained development", and created an **Oversight Committee** (Justice A.K. Sikri).	Security and connectivity are real needs; the safeguards decide the outcome.
Teesta III, 2023	On 4 October 2023 a landslide of about 38 million cubic metres of debris fell into **South Lhonak** lake; with glacier calving, it collapsed the left lateral moraine, and the flood waves breached the terminal moraine dam (Scientific Reports, 2026). The flood destroyed the **1,200 MW Teesta III dam** at Chungthang, washed away bridges and parts of NH 10, cutting off north Sikkim, and killed dozens of people. The lake had long been flagged as hazardous; in September 2016 the Sikkim State Climate Change Cell siphoned it with high-density polyethylene pipes.	Known upstream GLOF hazards must inform design floods, spillway adequacy, early warning and downstream planning; the disaster alone does not establish a specific regulatory or engineering breach.
Himachal, 2023	The monsoon caused losses the State put at about **₹12,000 crore**. On the 39 km **Parwanoo-Solan** four-lane, experts blamed **vertical hill cutting** and the lack of paved shoulders; NHAI widened the right of way to 45 to 50 m on the next stretch (Solan-Kaithlighat), which saw fewer slides.	Design choices, not rain alone, decided where roads failed.
Wayanad, 2024	Landslides on 30 July 2024 struck Mundakkai, Chooralmala and Punchirimattom; the Union government told Parliament that 298 people died (Kerala's figures). The sixth draft ESA notification followed on 31 July 2024, naming 13 Wayanad villages.	Exposure of settlements to extreme rain and debris flows; the case for risk-sensitive zoning and safer settlement sites. The event does not show that a particular project caused it.
HOW THE CONTRADICTION CAN BE MANAGED		
Risk-informed planning	Hazard zonation before alignment. The **Landslide Atlas of India** (NRSC, 2023) inventories about 80,000 landslides in 17 States and two Union Territories and ranks 147 districts by risk exposure; about 12.6% of India's area, excluding snow-covered areas, is landslide-prone. MoRTH's 2025 norms require landslide inventories and slope-movement analysis before alignments are finalised. District rankings are a starting point; a project still needs site-level geotechnical investigation.	"Where" is decided by risk first.
Carrying capacity	The Environment Ministry asked all 13 Himalayan States to assess the carrying capacity of hill towns and eco-sensitive zones (guidelines of 30 January 2020; reminder of 19 May 2023), and proposed an expert committee under the G.B. Pant National Institute of Himalayan Environment.	"How much" is capped by the land.
EIA and cumulative impact	Project-by-project clearance misses the combined effect of many projects on one slope or river basin. The	Judge the valley, not only the project.

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Case	What happened, with evidence	What it shows about the contradiction
	Supreme Court's Himachal order (July 2025) noted that assessments often overlook the cumulative impact of multiple projects in the same basin.	
Eco-sensitive areas and zones	**Gadgil panel (WGEEP), 31 August 2011**: about 64% of the Western Ghats as ecologically sensitive, in three zones, with a Western Ghats Ecology Authority. **Kasturirangan group (HLWG), 2013**: about 37%, nearly 60,000 sq km, with a ban on the most destructive activities. Sixth draft (31 July 2024), then the **seventh draft** (S.O. 4106(E), 27 July 2026): 56,825.7 sq km in Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu, proposing a complete ban on mining, quarrying and sand mining, with existing mines phased out within five years of the final notification or at lease expiry, whichever is earlier. These remain **proposals** until a final notification takes effect.	Some places are for protection, not projects.
Slope stabilisation and design	Benching instead of vertical cuts; drainage; retaining structures and rock anchors; tunnels with escape routes; post-monsoon geotechnical investigation; viaducts or tunnels evaluated where slopes are unstable (MoRTH, 2025).	"How" removes risk at the drawing board.
Early warning	**National GLOF Risk Mitigation Programme** (₹150 crore: ₹135 crore from the National Disaster Mitigation Fund, ₹15 crore from the States): a scientific inventory of glacial lakes, early warning systems and automatic weather stations, and lake-risk reduction in Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh. Separately, NDMA has identified 189 high-risk lakes needing mitigation; this is not the programme's beneficiary count. NDMA's GLOF guidelines (October 2020) call for mapping dangerous lakes and land-use planning in GLOF-prone areas.	Residual risk is met with time to act.
Dam safety after Teesta III	After the Teesta III collapse, the **Central Water Commission** decided to review the design flood of existing and under-construction dams vulnerable to GLOFs, to confirm spillway capacity for an extreme flood combined with a GLOF. **GLOF studies are now mandatory** for all new dams with glacial lakes in their catchments, and in July 2025 CWC published guidelines for structural measures to mitigate GLOF effects on dams (MHA reply in Rajya Sabha, 30 July 2025).	A disaster lesson turned into an appraisal and design rule.
Nature-based solutions	Vegetated slopes and bioengineering, protected forests on steep catchments, river buffers and floodplains kept free of building. They can reduce runoff, erosion and slope instability alongside engineering; their cost and effectiveness vary with terrain and hazard, so they are assessed with engineered options, not assumed cheaper.	Ecology does part of the engineering.
Global and national frameworks	**Sendai Framework 2015-2030** (adopted March 2015): four priorities, seven targets; target (d) on reducing damage to critical infrastructure. **PM's 10-point agenda** (AMCDRR, New Delhi, November 2016): first point, all development sectors must imbibe the principles of disaster risk management. **NDMA**: National Landslide	The principle: development itself must be risk-informed.

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Case	What happened, with evidence	What it shows about the contradiction
	Risk Management Strategy (September 2019). **CDRI**: launched 23 September 2019 at the UN Climate Action Summit, secretariat in New Delhi.	

Which intervention answers which risk

Intervention	Landslide, slope failure	Subsidence	GLOF, flash flood	Tunnel collapse
Hazard zonation, siting	Strong	Strong	Strong	Partly
Carrying capacity	Partly	Strong	Partly	No
Design and dam-safety norms	Strong	Partly	Strong (design floods, spillways)	Strong
Early warning	Partly	Partly (satellite monitoring)	Strong	Partly
ESAs, nature-based	Strong	Partly	Partly	No

A teaching summary of the main channel of each intervention, not an official assessment. "Partly" marks an indirect or conditional effect.

Why the contradiction is not absolute. Roads, bridges, power and telecom are the lifelines of rescue and relief. Sendai's target (d) and CDRI's mandate are about **resilient** infrastructure, not less infrastructure. The aim is fewer, safer, better-placed assets.

Why speed is the risk multiplier. "Rapid" development compresses study: geotechnical investigation, monitoring and public consultation take seasons, not weeks. MoRTH's 2025 norms, which ask for post-monsoon investigation and time for slope stability, are a direct answer.

TIER 2 · EXTENDED UNDERSTANDING: THE WHOLE TOPIC AROUND IT

Where management has worked

1. **Reported design improvement:** the Solan-Kaithlighat stretch, with a wider right of way and paved shoulders, reportedly saw fewer slides in 2023 than Parwanoo-Solan; one season is illustrative, not proof.
2. **Audit after failure:** safety audit of 29 tunnels after Silkyara.
3. **Judicial oversight:** Char Dham Oversight Committee reporting to the Supreme Court.
4. **Recovery with conditions:** Joshimath's ₹1,658.17 crore plan on Build Back Better principles.

Where it still falls short

1. **Final notifications:** the Western Ghats ESA remains in draft after seven drafts.
2. **Cumulative assessment:** no binding basin-level EIA.
3. **Carrying capacity:** studies uneven across the 13 States.
4. **Last-mile warning:** sensors at high lakes are hard to maintain.
5. **Local voice:** panchayats rarely shape project siting.

Governance and communities

The **Disaster Management (Amendment) Act, 2025** writes disaster risk reduction into the definition of disaster management, adds national and State disaster databases and lets States create urban disaster management authorities. Local communities are usually the first responders, because specialised teams take time to reach mountain valleys; NDMA's GLOF guidelines therefore stress training local people in search and rescue. Communities also hold **local knowledge** of springs, cracks and old slides that maps miss; in Joshimath, residents had reported cracked homes and petitioned for a halt to blasting weeks and months before the crisis peaked.

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Panchayat-level hazard plans, community monitors and transparent project information turn them from the exposed into partners.

Two debates worth knowing

Should some places be off-limits?

One view: the Gadgil model, wide protection with graded zones and local self-governance. The other: the Kasturirangan model, a smaller core of about 37% under a strict prohibitory regime, with incentives for greener practices beyond it, because people live and earn there. The balanced reading: **zone by risk and ecology**, with communities shaping the rules, and finally notify them.

Can strategic roads justify higher risk?

The Supreme Court accepted defence needs for wider Char Dham roads in 2021. Critics answer that a road that keeps collapsing serves neither soldiers nor pilgrims. The balanced reading: **security and safety converge** when design, oversight and maintenance are funded as part of the project.

4 Pitfalls and variations

The mistakes that cost marks here, the claims never to make, and how the answer changes when the question changes.

4.1 Six pitfalls, each with its correction

All problem, no management

~~A full page on disasters in the Himalaya, two lines on solutions.~~

Keep Part 1 to about a quarter; give management three-fifths.

Disasters that prove nothing

~~Kedarnath 2013 cited only as heavy rain.~~

Pick cases where building and risk meet: Silkyara, Teesta III, Parwanoo-Solan.

Anti-development tone

~~Stop all projects in the Himalaya.~~

Infrastructure is needed; manage where, how much and how.

Frameworks without use

~~Sendai has four priorities and seven targets.~~

Apply target (d) and the PM's first point to project decisions.

Only the Himalaya

~~Ecologically sensitive means the mountains of the north.~~

Add the Western Ghats: Wayanad and the ESA draft.

No view

~~Hence balance is needed.~~

Let risk decide where, how much and how to build.

4.2 Never write these

- "The Supreme Court stopped the Char Dham project."
  It allowed the wider roads in 2021, with an oversight committee.
- "The Western Ghats ESA has been notified."
  The sixth (July 2024) and seventh (27 July 2026) notifications are drafts; none is final.

Discuss how the contradiction between 'rapid infrastructure development' and 'disaster-risk reduction' in ecologically-sensitive areas of India can be managed, with suitable examples.

- "NTPC's tunnel was officially held to have caused Joshimath's subsidence."
  Several causes were suggested; NTPC denied it, and no single cause was settled.
- "Sendai Framework is a binding treaty."
  It is a voluntary, non-binding framework adopted in 2015.
- "The Teesta III dam burst and caused the flood."
  The glacial lake burst; the flood destroyed the dam.
- "Gadgil declared 37% of the Western Ghats sensitive."
  About 64% was Gadgil; about 37% was Kasturirangan.

4.3 If the question changes

If it asks	The structure becomes	What must change
Critically examine the Char Dham project	Aims; benefits; landslides and Silkyara; judgment; safeguards; view	One project in depth.
Role of **EIA** in disaster-prone regions	EIA's design; gaps (cumulative, splitting); reforms	Appraisal at the centre.
Hydropower in the Himalaya	Energy need; Chamoli, Teesta III; GLOF risk; design floods; basin studies	Dams, not roads.
The same question for **15 marks**	Add the decision flow and both debates	Room for evidence.

Discuss how the contradiction between 'rapid infrastructure development' and 'disaster-risk reduction' in ecologically-sensitive areas of India can be managed, with suitable examples.

5

The model answer

One model answer, written to the UPSC Gurus house range of 150 to 153 words (153 words including headings and flow labels; UPSC's printed limit is 150 words), in the form this question calls for: one compact line of four cases for the contradiction, a four-step flow with matched examples for managing it, and a short final part on governance and communities. The introduction covers the whole question; the conclusion settles its demand.

Model answer ## Cases, a flow and matched points

153 words

Fragile Himalayan and Western Ghats regions need roads, power and connectivity, yet rushed construction can amplify landslides, floods and human exposure.

1. The contradiction

Joshimath (2023) subsided despite warnings since 1976; Silkyara's Char Dham tunnel collapse trapped 41 workers; South Lhonak's GLOF destroyed Teesta III; Himachal's vertically cut highway slopes failed.

2. Managing it

Locate hazard maps → **Limit** carrying capacity → **Design** risk-proofing → **Warn** monitoring

- **Siting:** NRSC landslide maps, local hazard records, no-build zones.
- **Capacity:** cumulative basin assessment and carrying-capacity studies before approval.
- **Design:** benched cuts, drainage (MoRTH, 2025); tunnel escape routes.
- **Flood safety:** CWC mandates GLOF studies for new dams in glacial-lake catchments; ₹150-crore GLOF programme funds early warning.
- **Ecology:** notify the Western Ghats ESA; riparian buffers, vegetated slopes.

3. Governance and communities

Independent oversight through the Supreme Court's Char Dham committee (2021); panchayat monitoring, drills and consultation.

Risk-informed infrastructure then serves livelihoods, national security and disaster response, so development stops manufacturing disasters in fragile regions.

DEMAND
The contradiction shown with cases, then the means of managing it, each with an example

HIDDEN DEMAND
The contradiction is not absolute: risk-informed infrastructure is itself DRR; governance and communities decide the outcome

STRUCTURE
About a quarter on the contradiction, three-fifths on management, a short part on governance

BALANCE
Introduction 21 words, conclusion 18 words; 153 words in all

Why it works: the introduction states both sides of the contradiction; Part 1 compresses four cases where building and hazard meet into one line; Part 2, the largest, follows a decision sequence and anchors it in dated Indian instruments (MoRTH's 2025 norms, CWC's mandatory GLOF studies, the GLOF programme); Part 3 answers the hidden demand through oversight and communities; the conclusion reconciles infrastructure's developmental and protective roles.

Discuss how the contradiction between 'rapid infrastructure development' and 'disaster-risk reduction' in ecologically-sensitive areas of India can be managed, with suitable examples.

6 Other ways to write it

The model answer above remains the answer. These outlines show how a different, equally valid answer could be built, and when each choice works.

Approach	How it is built	When it works
Risk-versus-intervention matrix	A small table: landslide, subsidence, GLOF, tunnel collapse against siting, design, warning, with one example per row.	When you want the matching to be explicit.
Project life-cycle answer	Planning, appraisal, construction, operation, recovery; one tool and one case at each stage.	When you think in sequences.
Open with a judgment	Introduction: the Supreme Court's 2021 line that environmental compliance is the route to sustained development; then the cases.	When you want a striking start.
For 15 marks	Add the Gadgil and Kasturirangan debate and the decision-flow diagram.	When there is room.

7 Quick recall and Prelims crossover

Facts for rapid revision and Prelims.

1. **Sendai Framework**: adopted **March 2015**; 2015 to 2030; **4** priorities, **7** targets.
2. **PM's 10-point agenda**: AMCDRR, New Delhi, **November 2016**.
3. **CDRI**: launched **23 September 2019**, New York; secretariat in New Delhi.
4. **National Landslide Risk Management Strategy**: NDMA, **September 2019**.
5. NDMA **GLOF guidelines**: **October 2020**.
6. **National GLOF Risk Mitigation Programme**: **₹150 crore** (₹135 crore NDMF); 4 States. NDMA's high-risk list: **189** lakes.
7. **Landslide Atlas of India**: NRSC, **2023**; about **12.6%** of India landslide-prone.
8. **Disaster Management (Amendment) Act, 2025**: Rajya Sabha passed it with amendments **25 March**; Lok Sabha agreed **27 March 2025**.
9. **Teesta III** (**1,200 MW**) destroyed: **4 October 2023**.
10. **Silkyara**: collapse **12 November 2023**; **41** rescued after **17** days.
11. NHAI audit of **29** tunnels under construction (November 2023).
12. **Char Dham** judgment: **14 December 2021**; Oversight Committee, Justice **A.K. Sikri**.
13. **Joshimath**: 5.4 cm in 12 days (NRSC, preliminary); Mishra Committee **1976**.
14. **Gadgil** (WGEEP), **2011**: about **64%** of the Western Ghats.
15. **Kasturirangan** (HLWG), **2013**: about **37%**, nearly 60,000 sq km.
16. Seventh Western Ghats ESA draft: **27 July 2026** (S.O. 4106(E)); **56,825.7 sq km**, six States; not final.

THE ONE SENTENCE TO CARRY OUT OF THIS DOCUMENT

In a fragile landscape, the safest infrastructure is the one that asked the mountain first: where, how much and how.

Discuss how the contradiction between 'rapid infrastructure development' and 'disaster-risk reduction' in ecologically-sensitive areas of India can be managed, with suitable examples.

8 Write it yourself

Write the answer in 150 words without looking back, then check it against each line below.

	Check	Yes / No
1	Does the introduction state **both sides** of the contradiction?	
2	Does each case in Part 1 show **building and hazard meeting**, not only a disaster?	
3	Is **Part 2 the largest part**, with a clear sequence of tools?	
4	Does each major intervention carry a relevant **Indian case, dated instrument or safeguard**, with how it reduces risk?	
5	Is there a short final part on **governance and communities**?	
6	Does the conclusion give a **view**, at about the length of the introduction?	
7	Is it **150 words or a little over**, with no claim from section 4.2?	

Sources

- Supreme Court of India: Citizens for Green Doon v. Union of India, judgment of 14 December 2021 (as reported by SCC Online and LiveLaw); order of 28 July 2025, paragraph 27, directing the Registry to register a public-interest writ petition on Himachal Pradesh's ecology (as reported by The Tribune and Supreme Court Observer).
- Ministry of Environment, Forest and Climate Change: affidavit in Ashok Kumar Raghav v. Union of India (2023) on carrying capacity of 13 Himalayan States (as reported by LiveLaw); Western Ghats ESA draft notifications listed on its ESA page: sixth, S.O. 3060(E), 31 July 2024; seventh, S.O. 4106(E), 27 July 2026 (Gazette of India, Extraordinary).
- National Remote Sensing Centre, ISRO: Landslide Atlas of India (2023); preliminary report on Joshimath subsidence (January 2023, as reported by The Tribune).
- National Disaster Management Authority: National Landslide Risk Management Strategy (September 2019); Guidelines on Management of Glacial Lake Outburst Floods (October 2020); National GLOF Risk Mitigation Programme (August 2024).
- Ministry of Home Affairs: Joshimath Recovery and Reconstruction plan (30 November 2023); reply in Parliament on the Wayanad landslides (April 2025); Disaster Management (Amendment) Act, 2025 (PRS Legislative Research bill record: Lok Sabha 12 December 2024, Rajya Sabha 25 March 2025, Lok Sabha 27 March 2025); reply in the Rajya Sabha on GLOF risk, NGRMP funding and CWC dam measures (PIB, 30 July 2025).
- Sikkim Department of Science and Technology and Climate Change: South Lhonak Expedition 2016, technical report. Mohanty et al., "Sequence of events that led to the South Lhonak lake outburst flood in Sikkim, India", Scientific Reports 16, 9741 (2026). ISRO: Landslide Atlas of India web entry (18 March 2023).
- Ministry of Road Transport and Highways and NHAI: tunnel safety audit (22 November 2023); revised hill-road construction guidelines (reported December 2025).
- Department of Science and Technology: the Prime Minister's Ten-Point Agenda on DRR (AMCDRR, November 2016). UNDRR: Sendai Framework for Disaster Risk Reduction 2015-2030. Coalition for Disaster Resilient Infrastructure (2019).
- Western Ghats Ecology Expert Panel report (2011); High-Level Working Group report (2013). The India Forum on the Mishra Committee (1976) and Joshimath. The Tribune on the Parwanoo-Solan highway (September 2023). ThePrint on Himachal's 2023 monsoon losses.
- UPSC, Civil Services (Main) Examination, official question-paper archive: upsc.gov.in/examinations/previous-question-papers. Papers consulted: GS Paper I (2016 and 2026); GS Paper III (2013, 2016, 2018 to 2024, and 2026). Questions are identified by year, paper and question number in section 2.2.

Discuss how the contradiction between 'rapid infrastructure development' and 'disaster-risk reduction' in ecologically-sensitive areas of India can be managed, with suitable examples.

YOUR NEXT STEP

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