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MAINS 2027 EDITION

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UPSC CSE MAINS

GEOGRAPHY OPTIONAL

PAPER II

Contemporary Issues Notes

The complete Contemporary Issues section of Paper II — environmental hazards and epidemics, pollution, land use and degradation, population and food security, unrest and regional disparity, sustainable development, the linking of rivers and globalisation, with previous year questions.

Compiled by Arvind KrS

HAZARDS · POLLUTION · DEGRADATION · FOOD SECURITY · DISPARITIES · GLOBALISATION

20	4	114	55
Chapters	Units	Previous year questions	Diagrams and figures



IN THIS BOOK

01 Environmental Hazards

02 Land Use, Environment and Degradation

03 Population, Food, Unrest and Sustainable Growth

04 Linkage of Rivers and Globalisation

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Geography Optional — Contemporary Issues

Paper II · Geography of India: Contemporary Issues

Mains 2027 Edition · Compiled November 2026

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The outline map of India on the cover and on the chapter and unit pages is decorative and not to scale.

How to read these notes

Every chapter is marked against the questions UPSC has actually asked on it, so the points that matter most stand out on the first read and are quick to find at revision.

Flood is natural; flood disaster is partly made by people.

Yellow marker: key point. A point that carries the ideas UPSC has asked about in this chapter. Read these first, and make sure each one is in your answer.

A flood is a high water level that overtops the natural banks along any part of a stream and spreads over land that is normally dry.

Blue marker: definition. The cleanest definition of a term, ready to open an answer with.

Floods are thus seasonal for the most part. **Flash floods** also occur, with little warning and a short, violent rise.

Saffron underline: PYQ term. A key term or phrase that appears in this chapter's previous year questions.

Nature and Causes of Floods

PYQ 2026 · 2025 · 2023 +6

PYQ tag on a heading. The years in which UPSC asked about this section. Sections without a tag are background or linking material.

PYQ RADAR **16** questions Last asked **2026**

PYQ radar. At the start of each chapter: how many times the topic has been asked, and how recently. The contents page shows the same count for every chapter.

Suggested method. First read: the whole chapter. Revision: the yellow and blue marks, the tagged headings and the PYQ list at the end of the chapter. Last week before Mains: the PYQ list alone, answering each question in your head from the marked points.

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UNIT 01 | 6 CHAPTERS

Environmental Hazards

Ecological issues; environmental hazards: landslides, earthquakes, tsunamis, floods, droughts and epidemics.



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GEOGRAPHY OPTIONAL | PAPER II · CONTEMPORARY ISSUES

Floods: Causes, Impact and Measures



PYQ RADAR **16** questions Last asked **2026** 2026 ×2 · 2025 · 2023 · 2022 · 2021 · 2019 ×2 · 2018 · 2016 · 2015 · 2012 · 2005 · 2004 · 2000 · 1993

CONTENTS

01 Nature and Causes of Floods
02 Flood-Prone Areas of India
03 Flood Management
04 Previous Year Questions

- A **flood** is a high water level that overtops the natural banks along any part of a stream and spreads over land that is normally dry. A flood along a coast comes from a surge of the sea.
- **Flood is natural; flood disaster is partly made by people.** A river in spate turns into a disaster when it reaches crops, homes and roads on its floodplain.
- India's flood-prone area is put at **40 million hectares** by the Rashtriya Barh Ayog (1980), and higher in later official counts. The **Ganga and Brahmaputra plains** carry the largest share.

01 Nature and Causes of Floods

PYQ 2026 · 2025 · 2023 +6

Floods

- A stream floods when its **discharge exceeds the capacity of its channel**. The excess spills over the banks and submerges the adjoining land, so the **channel and floodplain together** carry the water.
- Floods are commonly tied to a stream or river, and are a normal part of a basin's **hydrological cycle**.
  - Floods and droughts are its two extremes. Too much monsoon rain gives one, and failed rain gives the other.

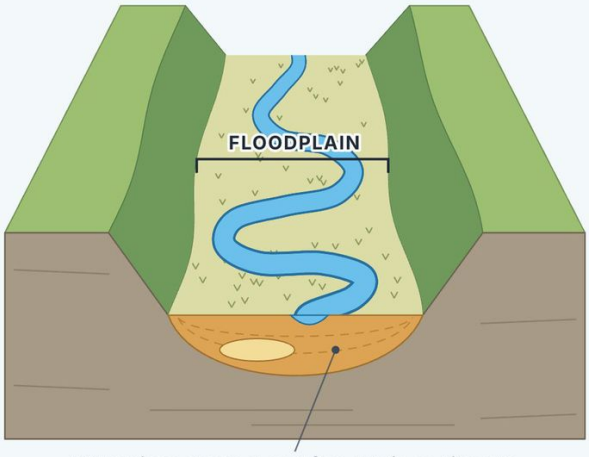
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CONTEMPORARY ISSUES · FLOODS

A River Valley in Normal and Flood Conditions

When discharge exceeds the capacity of the channel, the channel and floodplain together carry the water.

Normal conditions



Flood conditions



Schematic. Not to scale.

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- **Floods and droughts** are, on the one hand, **cumulative hazards** that build up with the season. On the other hand, the peculiar nature of the Indian monsoon can bring both to different pockets of the country in the same year.
  - The Brahmaputra valley can flood while Rajasthan suffers drought.
- Floods are thus **seasonal** for the most part. **Flash floods** also occur, with little warning and a short, violent rise.

Causes of Floods

- Compared with many other disasters, the causes of floods are **well established**. Riverine floods build up relatively slowly, in well-identified regions, at an expected time of year.
  - **Flash floods and dam failures** are the exceptions.
- A serious flood usually needs several unfavourable factors at once, and human activity now sharpens all of them.

GROUP	FACTORS
Meteorological	Heavy rainfall; tropical cyclones; cloudburst; heavy melting of ice and snow
Physical	Large catchment areas; changes in river systems; inadequate drainage; silting of beds; landslides in river courses; tsunami and sea surges

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GROUP	FACTORS
Human	Deforestation; siltation from land misuse; faulty farming and irrigation; collapse of dams; accelerated urbanisation

Natural Causes

- **Heavy rainfall and cloudbursts:** concentrated rain leaves rivers unable to accept more surface run-off, and the water spills over the adjoining land.
- **Heavy melting of ice and snow**, which swells Himalayan rivers.
- **Changes in river systems and large catchment areas:** the **Kosi** shifts its course and floods new ground, and a large catchment delivers more water to one channel.
- **Sediment deposition and silting of river beds**, which reduce channel capacity.
- **Transgression of the sea** at the time of a **tropical cyclone**.
- **Tsunami** in coastal areas, and **landslides in the course of rivers**, which dam a river and then release a flood.

Cloudbursts

- A **cloudburst** is **very intense rain over a small area**. The working measure is **100 mm or more in an hour, over about 20–30 sq km**. Older accounts describe thunderstorm rain of over 50–100 cm within a few hours.
- **Mechanism:** warm, humid air is forced up a mountain slope and builds towering **cumulonimbus clouds**.
  - Weak upper winds fail to disperse them, and the moisture comes down in one spot.
  - The extra moisture from wet ground on Himalayan slopes may add to it.
- **Where:** most frequent in the **Himalaya in the monsoon**, but rare and severe events occur elsewhere.
  - **Musi river, Hyderabad (1908):** a great flood that destroyed much of the city.
  - **Leh (August 2010):** cloudbursts struck the cold-desert town.
  - **Mumbai (26 July 2005):** the Santacruz station of the India Meteorological Department recorded **944 mm in a day**.
- **Why they do damage:** water, boulders and debris arrive within minutes in narrow valleys, leaving little time to escape.

Man-made Causes

- Unlike many natural disasters, **human beings play an important role** in both the origin and the spread of floods.
- **Deforestation:** it causes soil erosion and landslides.
  - Vegetation holds the soil, which acts as a sponge and soaks up much of the rain. Once it is lost, run-off rises and **river beds silt up**.
- **Unscientific land use and bad farming practice:**
  - Fields left bare let soil and water flush into rivers.
  - Even the **wrong direction of ploughing**, up and down a slope, speeds run-off.

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- **Faulty irrigation:** canals and field systems that cut across natural drainage hold water back.
- **Collapse of dams:** the failure of the **Machhu dam at Morvi (1979)** drowned the town.
- **Increased urbanisation: hard, impermeable surfaces** reduce the land's ability to absorb rain.
  - Less water infiltrates, so **the volume and rate of surface run-off rise**.
  - **Mumbai's floods** turned on this, along with encroachment and blockage of the **Mithi River**.
- **Living on the floodplain:** growing settlement of floodplains and river beds, against the old principle that a river should keep its right of way, places more people in harm's way.

Consequences of Floods PYQ 1993

- Although floods are only a **temporary inundation**, they do extensive damage. Their frequency, intensity and magnitude are rising, and they now cause more damage than almost any other single disaster.
- **Lives and property:** floods take lives and destroy property every year.
- **Crops:** the agricultural season is temporarily lost, and fertile soil cover may go with it.
- **Habitats and animals:** habitats are changed or destroyed, and animals drown.
- **Communication and services:** breaks in rail and road links and in essential services stop the movement of people and goods.
- **Health:** water-borne and infectious diseases such as **cholera and gastro-enteritis** spread soon after floods.
- **Positive consequences:** floods also **deposit fertile silt** on fields, which is good for crops, and **recharge the groundwater table**.
- **Scale:** for 1953–2010, a Parliamentary Standing Committee report gave an average of about **7.2 million hectares** affected each year.
  - **Over three-fourths of the crop and property damage** falls on the northern plains: Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal and Assam.
  - The poorest, living at the edge of settlements, are usually **hit hardest**.

Flash Floods and Glacial Lake Outbursts PYQ 2025 · 2022 · 2019

- A **glacial lake outburst flood (GLOF)** is the sudden release of water from a lake held back by **moraine** or ice.
  - **Triggers:** avalanches, debris flows, rock falls or landslides into the lake; earthquakes; thawing permafrost; heavy rain.
  - **Vulnerable types:** moraine-dammed, ice-dammed and ice-cored lakes.
  - **Effect:** a wall of water and debris that can travel far down the valley with very little warning. Retreating glaciers are enlarging such lakes.
- **Kedarnath, 16–17 June 2013:** heavy rain filled **Chorabari Tal**, less than 4 km above Kedarnath. It overflowed and possibly burst through its moraine rim, and the town was almost wholly destroyed.
  - The National Institute of Disaster Management reported in 2013 that **169 had died and 4,021 were missing**, the missing being later presumed dead.
  - The event was called the **Himalayan Tsunami**, since monsoon and westerly systems had combined over the Himalaya.

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  - **Causes argued over:** rain and glacial melt are the natural side. Environmental groups also blame **illegal construction on floodways, road widening, hydropower blasting and heavy pilgrim traffic**, which they call a man-made share of the disaster.
- **South Lhonak, Sikkim, 3–4 October 2023:** the lake's outburst swept down the Teesta and destroyed the Teesta III dam at Chungthang.
- **Dharali, Uttarkashi, 5 August 2025:** a debris-laden flood down the Kheer Gad buried much of the village. The Ministry of Jal Shakti first reported a cloudburst, but others pointed to a landslide or a blocked valley. The State ordered a technical inquiry.
- **Response:** the **National GLOF Risk Mitigation Project** (2024) has an outlay of **Rs 150 crore** for Arunachal Pradesh, Himachal Pradesh, Sikkim and Uttarakhand. About 195 lakes are listed as at risk.
  - The **Central Water Commission** monitors **2,843 glacial lakes and water bodies over 10 hectares** from June to October each year (May 2026). It reports 46 Himalayan hydropower projects as vulnerable, all now with early warning systems.
  - Other steps include **mapping and monitoring**, heeding forecasts, and building to hydrological and ecological principles.

02 Flood-Prone Areas of India

PYQ 2016 · 2015 · 2005 +1

Flood Distribution in India

PYQ 2005

- Floods recur in India and bring heavy losses to lives, property, livelihoods, infrastructure and public utilities.
- **Extent: 40 million hectares** out of a geographical area of **3,290 lakh hectares** is prone to floods, which is about **12%**, or one-eighth of the land.
  - **The Rashtriya Barh Ayog (National Commission on Floods)**, set up in 1976, gave this figure in **1980**. It found the flood-prone area had grown from **25 million hectares in the 1960s to 34 million in 1978**.
  - Its method, adding each State's worst year, has been criticised, as floods can reach land not hit in that year.
  - The **XII Plan Working Group** revised the figure to **49.815 million hectares**.
- **State shares of damage:** an older State-wise study put **about 27% in Bihar, 33% in Uttar Pradesh and Uttarakhand, and 15% in Punjab and Haryana**.
  - Uttar Pradesh and Bihar hold about a third of the flood-prone area.
- **Main zone:** the **Ganga–Brahmaputra–Meghna basin**, which accounts for nearly 60% of the country's total **river flow**. The flood problem concentrates where the water does.
- **North Indian rivers:** the middle and lower courses of the **Ganga, Brahmaputra and Kosi** flood because of their **very low gradient**. The flat plains offer too little slope to drain the water.
  - The **Damodar and Mahanadi**, though Peninsular rivers, also flood in their lower courses.
- **Peninsular rivers:** these are mature rivers with **hard rock beds** and stable courses, in shallow valleys. Floods are less serious overall and are worst in the **deltas and lower reaches**, where silt builds up.
- **East coast:** parts of it are particularly prone to **cyclones in October–November**, with a smaller season in April–May. These bring strong winds, storm surges, tidal waves and torrential rain.

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FLOOD REGION	RIVERS	WHY IT FLOODS
Ganga River Region	Yamuna, Gomati, Ghaghra, Gandak, Kosi, Son, Burhi Gandak, Bagmati, Mahananda, Damodar	Tributaries from both the Himalaya and the Peninsula; low gradient; silt; drainage congestion
Brahmaputra River Region	Brahmaputra and its tributaries, Barak	Over 250 cm of rain; heavy silt; narrow valley; earthquakes
North-West River Region	Satluj, Beas, Ravi, Chenab, Jhelum, Ghaggar, Markanda	Poor surface drainage; waterlogging; man-made barriers
Central and Deccan India	Mahanadi, Godavari, Krishna, Cauvery, Narmada, Tapi	Stable courses overall; silted deltas; high tides; cyclones

- **Ganga River Region:**
  - **Uttar Pradesh:** eastern districts flood through the Rapti, Sharda, Ghaghra and Gandak. The west has **drainage congestion** around Agra, Mathura and Meerut.
  - **Bihar:** floods are almost annual in the north, through the Burhi Gandak, Bagmati, Kamala, Kosi and Mahananda. The **Kosi** is known for its shifting course: on **18 August 2008**, its embankment breached at Kusaha in Nepal and the river took up an old channel, flooding land long thought safe.
  - **West Bengal:** the south and centre flood through the Mahananda, Bhagirathi, Ajoy and Damodar, because of **inadequate channel capacity and tidal effect**. Floods have continued on the Damodar even after its dams were built.
  - **Delhi:** the Yamuna reached a record **208.66 m on 13 July 2023**, above the 207.49 m of 1978.
- **Brahmaputra River Region:**
  - Floods are almost annual on the **Brahmaputra and its tributaries**, where heavy rain, silt and valley form all work against drainage.
  - **The valley is narrow**, about 80 km at its widest, and the bed has been raised by silt. Earthquakes such as those of 1897 and 1950 have changed river levels.
  - **31.05 lakh hectares out of 78.52 lakh hectares**, nearly 40% of Assam, is flood-prone (Rashtriya Barh Ayog, on Assam's official figures).
  - **Assam, 2026:** the State Disaster Management Authority's count reached **104 deaths by 14 August 2026**, with **Upper Assam districts** such as Sivasagar and Golaghat badly affected.
- **North-West River Region:**
  - **Punjab:** floods are near-annual, with intense ones every 4–5 years. Canals, highways and railways built **across the natural slope** obstruct drainage, along with building in low-lying areas near Ludhiana and Patiala.
    - In **2025**, 12 of its 23 districts were affected by early September.
  - **Haryana:** a **saucer-shaped surface** stops free run-off, so that even moderate rain can flood it.
  - **Ghaggar:** it once died out in the Rajasthan sands, and now occasionally submerges land there.
  - **Jammu and Kashmir:** the Jhelum raises Wular Lake and threatens Srinagar. The Chenab and Tawi endanger Jammu and Akhnoor.

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- **Central and Deccan India:**
  - Rivers are mostly stable, so floods are a smaller problem. The **Mahanadi, Godavari, Krishna and Cauvery deltas** flood through silting and shifting channels, and high tide makes it worse.
  - **Keralam (Kerala):** short rivers from the Western Ghats do heavy damage when in spate.

CONTEMPORARY ISSUES · FLOODS

India: Flood-Prone Areas

The shaded States are the eleven in the box of older figures. Telangana is shaded as part of the Andhra Pradesh of those figures.



Flood-prone areas
Other areas
Country capital

Older figures, from 2012
Flood-prone area of eleven States

State	Million hectares
1. Uttar Pradesh	7.34
2. Bihar	4.26
3. Punjab	3.70
4. Rajasthan	3.26
5. Assam	3.15
6. West Bengal	2.65
7. Haryana	2.35
8. Odisha	1.40
9. Andhra Pradesh*	1.39
10. Gujarat	1.39
11. Keralam (Kerala)	0.87
Total	**31.76**

* Andhra Pradesh as it was before Telangana was formed in 2014.

India as a whole
40 million hectares
Rashtriya Barh Ayog, 1980
49.815 million hectares
XII Plan Working Group

Boundaries: Survey of India outline (datameet). Not to scale.

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03 Flood Management

PYQ 2026 · 2025 · 2023 +6

Flood Control Management

- The Central and State Governments use **structural** measures, which modify the flood, and **non-structural** measures, which modify the damage.
  - After the floods of 1954, the main thrust was on reservoirs, embankments, channel works, town protection and river training.

Flood Forecasting

- **Purpose:** advance notice of a flood gives time to move people, cattle and goods, and so cuts the loss.
- **Start:** the **Central Water Commission (CWC)** began flood forecasting in **November 1958**, with its first station at the **Old Railway Bridge, Delhi**.
- **Network:** the older figure of **175 stations** dates from 2014. By **2 May 2026**, the network had grown to **360 flood forecasting stations (201 level and 159 inflow)**, drawing on **1,543 hydrological stations** and 1 central and 36 divisional control rooms. It covers the flood-prone States and Union Territories.

YEAR	FORECASTING STATIONS
1958	1
1985	145
2014	175
2019	325
2026	360

- **Season:** daily warnings run through the flood season, usually given as **May to October**. The Commission now uses three periods:
  - 1 May–31 October in the Brahmaputra, Barak and Jhelum basins;
  - 1 June–31 October in other basins up to the Krishna;
  - 1 June–31 December south of the Krishna.
- **Activities:** collecting river and weather data; sending it to forecasting centres; analysis and formulation of a forecast; and dissemination.
  - State **control rooms** pass warnings on and organise relief and rescue.
- **Accuracy:** a level forecast is counted accurate if within 15 cm, and an inflow forecast if within 20% of actual discharge.
- **New tools:** the Commission now issues **7-day advisory forecasts** and runs the **FloodWatch India** app.
  - **C-FLOOD**, launched on **2 July 2025** with the National Remote Sensing Centre and the Centre for Development of Advanced Computing, gives **2-day inundation forecasts down to village level**. It

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began with the Godavari, Tapi and Mahanadi basins and is planned to cover all forecasting stations by 2027.

- **Across borders:** a **flood data arrangement with Nepal** dates from 1988. India's data memoranda with China on the Brahmaputra and Satluj **lapsed in June 2023 and November 2020**, and India has pressed for renewal.

Reduction in Run-Off

- This works well because run-off falls when more surface water **infiltrates** in the catchment, above all through **large-scale afforestation in the upper catchment**.
  - The canopy intercepts raindrops, while **roots, leaf litter and humus** hold water.
  - Less run-off means **less soil erosion**, so there is **less silt** and the channel keeps its capacity.
- In the Indo-Gangetic plain, **dug wells along seasonal channels** can force water underground, as its soft soils and large aquifers allow.

Construction of Dams

- **Dams and multipurpose projects** store surplus water in reservoirs and release it under control, cutting flood peaks.
  - Several were built in the First Five-Year Plan, and many more in later plans.
  - **Examples:** Tilaiya, Konar, Maithon and Panchet in the Damodar system; Bhakra on the Satluj; Hirakud on the Mahanadi; Pong on the Beas; Nagarjuna Sagar and Tungabhadra in the Krishna basin; Ukai on the Tapi.
- Ponds, tanks, marshes and old quarries serve as **smaller detention basins**.

Channel Improvements and Construction of Embankments

- **Channel improvement:** flood-prone rivers are **deepened and widened**, and their beds cleared and straightened. Banks are held by riprap, spurs and deep-rooted trees.
- **Diversion into canals and depressions:** water from such rivers is led into canals, which store it for a time. The **Ghaggar scheme** diverts **340 cumecs** into depressions before the river enters Rajasthan.
- **Embankments:** the Central and State Governments have raised many, along the **Brahmaputra, Krishna, Godavari, Gandak, Kosi, Narmada, Tapi, Son, Satluj** and their tributaries.
  - Older figures show the scale: about **10,821 km by 1978** and more than **33,630 km by March 2000**. Assam holds about a third, with 934 km on the Brahmaputra and 2,400 km on its tributaries, and Bihar about a fifth.
  - **Limits:** they shift a flood more than they control it. Silt confined to the channel **raises the bed**, and a breach can then be worse than the flood it was built to stop. The Kosi in 2008 is the standard case.

Flood Plain Zoning

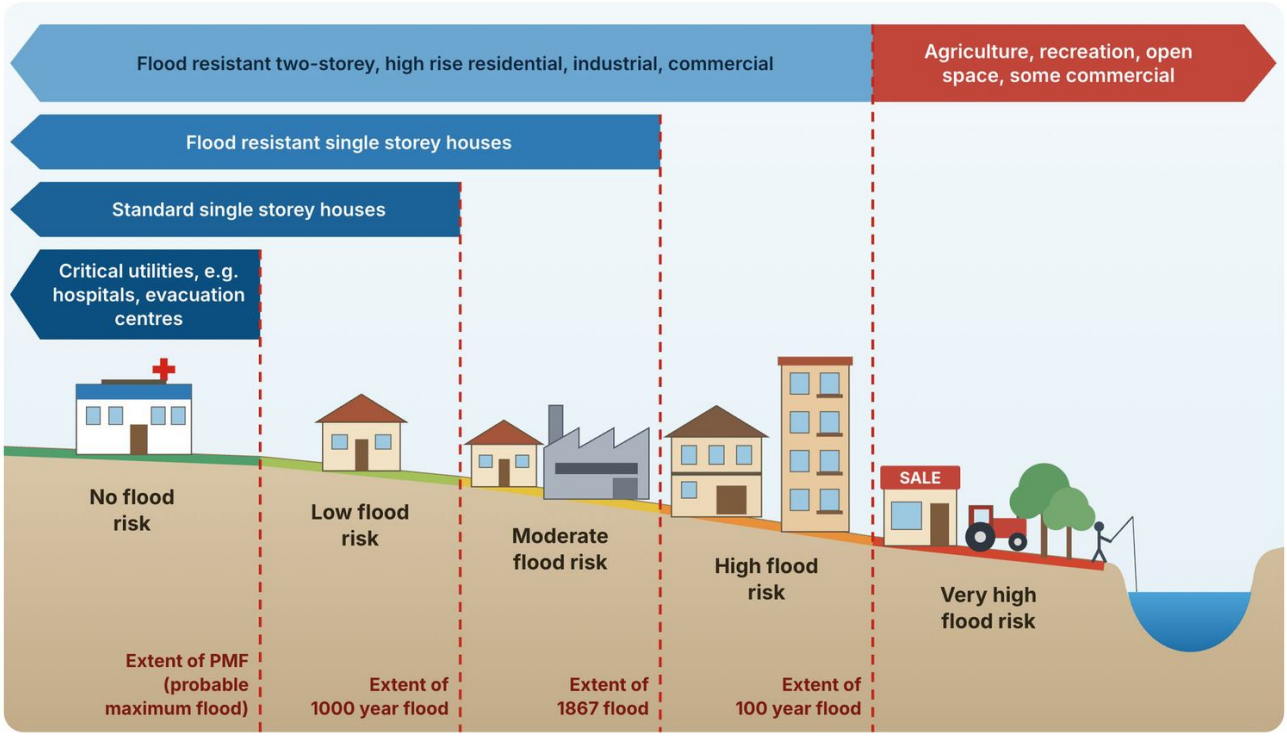
- This rests on **information about floodplains**: which strips act as floodways, and how the land along them is used. Flood-prone land is mapped and graded, and the use of each zone is controlled.
- The Central Flood Control Board proposed zoning in **1957**, and a **model bill** went to the States in **1975**.
  - Its features were a zoning authority, delineation and notification of limits, restrictions on use, compensation, and power to remove constructions.

- By May 2026, **eight States** had adopted it through an Act or policy: Manipur, Rajasthan, Jammu and Kashmir, Uttarakhand, Bihar, Arunachal Pradesh, Assam (Bodoland Territorial Council) and Tamil Nadu.

CONTEMPORARY ISSUES · FLOOD PLAIN ZONING

Graduated Planning Controls

Each use is kept behind a set flood line. The example is from Australia: the 1867 mark is the Hawkesbury–Nepean flood, and an Indian plan would set zones from its own flood records.



Schematic. Not to scale.

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NDMA Guidelines for Flood Management

STRUCTURAL	NON-STRUCTURAL
Reservoirs, dams, other water storages	Flood plain zoning
Embankments and flood walls	Flood proofing
Drainage improvement	Flood management plans
Desilting and dredging of rivers	Integrated watershed management
Diversion of flood water	

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STRUCTURAL	NON-STRUCTURAL
Afforestation and catchment area treatment	

- **Watershed management** links run-off control with both land and water use.

Government Programmes for Flood Management

- **Legislative measures:** construction of industrial and residential units in flood-prone areas is to be restricted, and buildings, factories and houses are to be kept out of zones next to the channel.
  - Land flooded only occasionally should stay under **green belts**, with **social forestry** encouraged on the floodplain.
- **National Flood Control Management Programme, 1954:** the first national policy statement on flood control, given on **3 September 1954**, set out three types of measures:
  - **Immediate** (about two years): data collection and emergency protection.
  - **Short-term** (the next few years): spurs and embankments at selected sites.
  - **Long-term:** storage reservoirs on rivers and tributaries, and further embankments.
- **National Hydrology Project, 2016:** a central sector scheme of **Rs 3,679.77 crore**, with **50% of the outlay from a World Bank loan**. It gathers hydro-meteorological data for storage and analysis in real time, open to any user at State, district or village level.
- **Flood Management and Border Areas Programme, 2021–26: Rs 4,100 crore** in all, approved in February 2024.
  - Rs 2,940 crore is for flood control, anti-erosion, drainage and anti-sea erosion works, with central funding of 90% for special category States and 60% for others.
  - Rs 1,160 crore is for works on rivers shared with neighbouring countries.
- **Protection so far:** of the 40 million hectares, about **32 million** was judged protectable by structural means.

Mitigation (Post-Flood Management)

- Rescue operations
- Speedy restoration of the transport system
- Supply of safe drinking water
- Repairing power, telephone and sewerage lines
- Providing food, shelter and clothing
- Survey to assess the loss and compensation
- Rehabilitation of properties
- Desilting and dewatering of inundated areas
- Contingency plan for the agriculture sector
- **Community resilience:** local warning, shelters and trained volunteers, along with risk-based planning, reduce the toll at each stage of the flood cycle.

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Previous Year Questions

2026	Disaster risk reduction and community resilience are the two pillars that need to be prioritized in the flood prone areas of India. Critically analyse.
2026	With suitable examples describe the hazards of flood plain settlement.
2025	Explain the causes of glacial lake outburst flood.
2023	Discuss the problems of floods and their management with special reference to the Indo-Gangetic Plain.
2022	The incidence of extreme rainfall events and flash floods in recent times has led to devastating consequences for people living in low-lying areas and flood plains of the country. Discuss.
2021	Describe the problems of cloudburst in India, giving suitable examples.
2019	Examine the problems of Glacial Lake Outburst Flood (GLOF) in India.
2019	The impact of floods on life and property can be most effectively reduced by hazard mapping. Comment.
2018	Explain the natural and anthropogenic causes and mitigation measures of frequent flooding in Mumbai.
2016	Describe the flood-prone areas and their management problems in the Ganga Plains.
2015	Account for the growing frequency and intensity of floods in India, and suggest short- and long-term remedial measures indicating the chronically flood-prone areas.
2012	Explain the causes, impact and remedial measures of flood-hazards in the middle Ganga plain. Represent the flood-affected areas of middle Ganga plain on a sketch map in your answer-book.
2005	Give an account of the distribution of flood-prone areas of India and the programmes and policy of controlling the impact of floods in the country.
2004	Explain the causes, impacts and remedial measures of flood-hazards in Middle and Lower Ganga plain.

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2000 Give a reasoned account of either flood hazards or drought hazards occurring in India, and also suggest measures for controlling them.

1993 Delineate the flood-prone areas of India by drawing a sketch map in the answer book and discuss the causes and consequences of floods in the North Indian plains.

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UNIT 03 | 5 CHAPTERS

Population, Food, Unrest and Sustainable Growth



Population explosion and food security; problems of agrarian and industrial unrest; regional disparities in economic development; concept of sustainable growth and development.

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GEOGRAPHY OPTIONAL | PAPER II · CONTEMPORARY ISSUES

Concept of Sustainable Growth and Development



PYQ RADAR **4** questions Last asked **2025** 2025 · 2008 · 2005 · 2004

CONTENTS

01 The Concept
02 Historical Background
03 Concept of Environmental Sustainability
04 Sustainable Development Today
05 Previous Year Questions

- **Sustainable development** is the idea that human societies must meet their needs without compromising the ability of future generations to meet theirs.
  - The standard definition comes from the **Brundtland Report (1987)**.
- More specifically, it is a **way of organising society so that it can last**. It weighs present demands against future ones, such as preservation of the environment and natural resources and **social and economic equity**.
- The idea is **dynamic**. Its meaning varies between countries with their cultural, political and economic traditions.
- **India's progress** is tracked through indices such as the **SDG India Index**, whose national score rose from 57 (2018) to 71 (2023–24).

01 The Concept

Origin and Meaning

- **First use:** the term came into wide use in the **World Conservation Strategy (1980)**, a document prepared by the International Union for Conservation of Nature with UNEP and WWF.
- **Popularised by:** the World Commission on Environment and Development, chaired by **Gro Harlem Brundtland**, in *Our Common Future* (1987), also known as the Brundtland Report.

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- **Roots in resource management:** sustainability grew out of the utilitarian, technocratic idea of sustained yield.
  - Sustained yield is the rate of use of a renewable resource that can be kept up without endangering its future flow.
  - Forest conservation follows the same logic: it calls for proper use without lasting harm, rather than a refusal to use.
- **The classic definition:** humanity has the ability to make development sustainable, to ensure that it "meets the needs of the present without compromising the ability of future generations to meet their own needs".
- **The limits it recognises:** these come from the present state of technology and social organisation in their effect on environmental resources, and from the ability of the biosphere to absorb the effects of human activities.

Growth and Development

PYQ 2005 · 2004

- **Economic growth** is a rise in output and income. **Development** is the wider gain in a society's economic, social and political life, and care for the environment now counts as a further dimension.
  - Sustainable growth asks whether output can keep rising without running down its natural base. Sustainable development asks whether well-being can keep improving, and for whom.
- Each discipline sees development differently:

DISCIPLINE	FOCUS
Economics	Productivity, per capita income, worker efficiency, removal of poverty
Sociology	Quality of life, social harmony, social justice, institutional change
Political science	Power structure and the role of government as promoter and planner
History	Change over time in economic, social and political institutions
Geography	A synthesis of economic, social and political progress with environmental preservation

- **The geographer's questions** are regional: how development is spread across space, what it does to local ecology, and which **regional disparities** it leaves behind.
  - Regional planning therefore has a principle of ecological equilibrium: plans for a region should work in harmony with nature and keep within its ecological balance.
- Three **interdependent pillars** are usually named, **environmental, social and economic**. How they combine in practice, with equity within and between generations, is the subject of **planning for sustainable development**.

A Contested Idea

- **The concept keeps changing.** New technology alters the **quantity of usable resources**, so the sustainable level of use must keep being revised.

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- **Critics** argue that it has become a convenient formula for avoiding hard questions of growth and distribution. The result has been **much confusion** over what sustainability means.
- **It joins conservation with livelihoods**, particularly in developing countries.
- Its definition shows a great divide between developed and developing countries:

BASIS	DEVELOPED COUNTRIES	DEVELOPING COUNTRIES
Main concern	Economic and technological aspects of development	Poverty and the basic needs of the poor
Environmental link	Pollution, consumption, efficiency	Forests, soils and water as sources of livelihood
Shared belief	Science and technology can solve problems of development, urbanisation and industrialisation	The same

02 Historical Background

From Crisis to Concept

- **The Industrial Revolution** lies behind the idea. From the second half of the **19th century**, Western societies began to see that their economic and industrial activity had a large effect on the environment and the social balance.
- A series of **crises** in the 20th century raised awareness that a **more sustainable model** was needed:

YEAR	ECONOMIC AND SOCIAL CRISIS
1907	American banking crisis
1923	Hyperinflation in Germany
1929	Start of the financial crisis of the 1930s
1968	Worldwide protests against bureaucratic elites
1973 and 1979	Oil shocks
1982	Debt shock of developing countries

YEAR	ECOLOGICAL CRISIS
1954	Rongelap nuclear fallout

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YEAR	ECOLOGICAL CRISIS
1956	Minamata mercury poisoning, Japan
1967	Torrey Canyon oil spill
1976	Seveso disaster
1984	Bhopal gas disaster
1986	Chernobyl nuclear disaster
1989	Exxon Valdez oil spill
1999	Erika oil spill

- **Slower crises** ran alongside these: global warming, air pollution, damage to the ozone layer and the loss of biodiversity.

The Tragedy of the Commons

- **Garrett Hardin**, an ecologist and philosopher, published "The Tragedy of the Commons" in **1968**.
  - **Argument:** individuals acting independently and rationally in their own interest end up working against the common interest and exhaust shared resources.
  - **Mechanism:** free access and unlimited consumption extinguish a finite resource. Hardin saw unchecked population growth as a main driver of this over-use.
  - **His conclusion:** humanity must radically change how it uses common resources to avoid disaster.
- **Elinor Ostrom** (*Governing the Commons*, 1990) later showed that communities often manage commons well through their own rules, an insight reflected in India's stress on joint forest management and van panchayats.

The Limits to Growth

- In **1972**, a team led by **Dennis Meadows**, with **Donella Meadows**, Jørgen Randers and William Behrens III, ran a computer simulation for the Club of Rome to project what could happen on a planet of limited resources.
  - **Five variables:** world population, industrialisation, pollution, food production and non-renewable resource depletion.
  - **Assumption:** these variables grow exponentially, while technology's ability to increase resources grows only linearly.
- **Main result:** without limits to growth, **economic and social collapse** would come within the 21st century.
- **Later checks:** Graham Turner (2008, 2014) found that decades of real data tracked the model's standard run closely. On this reading, pollution and its consequences are a leading threat to sustainable development. The **Limits to Growth model** has also drawn heavy criticism for its assumptions.

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Stockholm 1972

- As knowledge of global politics grew, the first historic conferences followed. The **UN Conference on the Human Environment** met at **Stockholm in 1972**.
  - It was the first big meeting of world leaders organised by the UN on the human impact on the environment and its relation to economic development.
  - A main goal was a common outlook and common principles to guide the world in preserving the "human environment".
  - It created UNEP, and Indira Gandhi used the occasion to link poverty and environment.

Human Development Index

- As people accepted that the planet has limits and that **progress means more than economic growth**, integrated measures appeared, such as the **Human Development Index (HDI)**.
- The HDI is a statistical tool of the **UN Development Programme**, first published in **1990**, which measures countries' economic and social achievement.
  - It has three dimensions: a long and healthy life, knowledge, and a decent standard of living.
  - Companion reports track wider matters such as financial flows, mobility and human security.
- UNDP's annual report ranks countries by the index, which gives a **periodic check on development**. The **2025 report** (data for 2023) ranks India **130th of 193**, with a value of 0.685.

The Brundtland Report and the IPCC

- ***Our Common Future* (1987)** gave the **most widely accepted definition** of sustainable development, and stressed that development has **limits**.
- Awareness of climate change led to the **Intergovernmental Panel on Climate Change (IPCC)**, created in **1988** by the World Meteorological Organization and UNEP.
  - **Purpose:** to assess and share knowledge of how human activity affects climate, with its causes, consequences and responses.
- The physical basis:
  - **Carbon dioxide and methane** occur naturally and keep the earth warm enough for life as we know it.
  - **Excess emissions** raise the planet's temperature, because part of the heat the earth radiates, which would otherwise escape to space, is trapped in the atmosphere.

Millennium Ecosystem Assessment

- Called for by the UN Secretary-General **Kofi Annan** in 2000, this **four-year study** began in **2001** and reported in 2005, drawing on more than 1,300 experts.
- **Aim:** to assess how changes in ecosystems affect **human well-being**, and to find the scientific basis for their **conservation and sustainable use**.
- Main findings:
  - Humans have changed ecosystems more quickly and widely than ever before, with a large and largely irreversible loss of biodiversity.

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- These changes improved well-being and the economy, but at a cost: ecosystem services were degraded, poverty persisted in many communities, and the risk of non-linear change increased.
- **Degradation of ecosystem services** would probably worsen over the 21st century.
- Degradation could still be reversed while meeting rising demand, but only with significant changes in policy across public and private sectors.

03 Concept of Environmental Sustainability

- **The human–environment relation must be symbiotic.** It calls for protection, conservation and better management of the earth's natural resources.
  - **Restoration of vital resources** must go along with their exploitation, so a change of attitude towards restoration is vital for sustainable growth.
  - Ecosystems take a long time to reach their climax, so damage is slow to heal.
- **An ecosystem has four characteristics: complexity, stability, diversity and resilience.**
  - Its integrity can be kept if we know its carrying capacity, its capacity for assimilation and its renewability.
  - Because it is integrated, harm to one component can endanger the whole.
- **Biodiversity** must be conserved through measures that restore both **natural and modified ecosystems**, the link developed under **biodiversity and sustainable development**.
- **Population matters**, because the quality of human life cannot be separated from the quality of the environment.
  - The man–land ratio indicates the carrying capacity of land and the assimilative capacity of the ecosystem, and it should be kept stable.
  - **Indian examples of pressure on carrying capacity:** Punjab draws about 156% of its annual groundwater recharge (Central Ground Water Board, 2025), and 29.8% of India's land was undergoing degradation in 2018–19 (Space Applications Centre).
- Environmental planning has four objectives:
  - **protection** of the environment;
  - **rehabilitation and restoration** of the ecosystem;
  - **enhancement of the carrying capacity** of natural and human-controlled ecosystems;
  - **creation, expansion and improvement** of new ecosystems.
- **Kamal Taori** links sustainable human development with the question of **happiness**, the lessons of history, the role and attitudes of planners, the organisation of resources, and the effects of hopeless and hopeful situations.
  - His long-term measures are appropriate technology, judicious implementation of policy, women's participation, rational economic behaviour and the right blend of the material and the spiritual, in order to save the earth for future generations.

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04 Sustainable Development Today

PYQ 2008 · 2005 · 2004

Global Framework

- Today's framework is **strong on paper, with a long way still to go**.
- **Rio Earth Summit (1992)** adopted Agenda 21 and opened the climate and biodiversity conventions. The 2030 Agenda (25 September 2015) set 17 Sustainable Development Goals with 169 targets.
  - **Progress:** the UN's *SDG Report 2026* finds 36% of targets with data on track or moving moderately, 49% moving too slowly and 15% in reverse.
- **Climate science:** the IPCC's Sixth Assessment Synthesis Report (March 2023) found about **1.1°C of warming** already. To keep to 1.5°C, emissions would need to peak before 2025 and fall about 43% by 2030 from 2019 levels. Keeping warming below 2°C also calls for rapid cuts in carbon dioxide emissions.
  - The World Meteorological Organization put 2025 at about **1.43°C** above the 1850–1900 average.
- Climate talks:
  - **COP30, Belém (November 2025):** the "Global Mutirão" decision called for **tripling adaptation finance by 2035**, and the Tropical Forest Forever Facility was launched. A roadmap away from fossil fuels was left out of the final text.
  - **COP31** is set for Antalya, Türkiye, on 9–20 November 2026, with Australia leading the negotiations.

India's Position

- SDG scores:
  - **SDG India Index 2023–24** (NITI Aayog): national score **71**, from Bihar (57) to Keralam (Kerala) and Uttarakhand (79).
  - **Sustainable Development Report 2026:** India ranks **94th of 167** with a score of 68.3, against 99th in 2025 and 112th in 2015.
- **Climate pledges:** **net zero by 2070**; 50% non-fossil installed power capacity, reached in June 2025; and an NDC for 2031–35, approved in March 2026, with a 47% cut in the emission intensity of GDP from 2005 levels.
- Policy instruments:
  - **Mission LiFE (2022)**, the **Green Credit Programme (2023)** and the carbon market (2023).
  - The **Jan Vishwas Act, 2023**, which decriminalised many minor offences under the Environment (Protection) Act and the Air Act and moved them to penalties. Supporters see simpler compliance, and critics see weaker deterrence.
- **Forests: 25.17%** forest and tree cover (2023), against a goal of **one-third**.

Actors

- **Many actors work with different audiences**, with the shared aim of raising awareness and creating conditions for sustainable practice.
- **The United Nations** is a main player. It organises meetings of world leaders and runs campaigns such as **#BeatPlasticPollution** and **#SolveDifferent**.

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- Business:
  - The World Business Council for Sustainable Development (WBCSD), formed in **1995**, helps member companies move towards a sustainable world.
  - **Recognition schemes** reward good practice, mostly through a stamp or label: B Corp, the Rainforest Alliance and the Fairtrade Foundation. The Conscious Capitalism movement works alongside them.
- Circular economy:
  - The Ellen MacArthur Foundation leads work on how societies and businesses can use natural resources in the way nature does.
  - **Aligning operations across supply chains** allows new ecological business models, such as growing mushrooms on coffee waste.

Green Architecture PYQ 2025

- **Meaning:** designing buildings to use less energy, water and material and to give a healthy indoor climate.
- **Principles:**
  - **Passive design:** orientation, shade, cross-ventilation and insulation suited to local climate.
  - **Efficient systems** and renewable energy.
  - **Water:** harvesting, reuse and low-flow fittings.
  - **Materials:** local, recycled and low-carbon.
  - Traditional Indian forms, such as jalis and courtyards, already use many of these ideas.
- **India:** IGBC and GRIHA ratings, the Energy Conservation Building Code and Eco-Niwas Samhita for homes.
- **Response to climate change:** buildings use about a third of India's electricity, so better design reduces emissions and helps people cope with heat.
- **Challenges:** higher upfront cost, weak enforcement, few skilled workers, and limited reach in small towns and low-cost housing.

Previous Year Questions

2008	Explain the concept of sustainable development and examine its relevance.
2005	Elucidate the concept of sustainable growth and development.
2004	Evaluate the concept of sustainable growth and development.

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2025 While defining the ‘Green architecture’, discuss its principles and challenges in response to climate change in India.

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01 **Environmental Hazards** 6 chapters · from page 5

02 **Land Use, Environment and Degradation** 7 chapters · from page 89

03 **Population, Food, Unrest and Sustainable Growth** 5 chapters · from page 200

04 **Linkage of Rivers and Globalisation** 2 chapters · from page 247

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