



## India's Soil Erosion Crisis

**For Prelims:** [Soil erosion](#), Factors of Revised Universal Soil Loss Equation, Brahmaputra Valley, Factors Contributing Soil Erosion.

**For Mains:** Challenges Related to Soil Health in India, Issues Related to Agriculture.

**Source:** DTE

### Why in News?

A recent study has shed light on the concerning state of [soil erosion](#) across India, revealing significant challenges and implications for [agricultural productivity](#) and environmental sustainability.

- The researchers employed the **Revised Universal Soil Loss Equation (RUSLE)** for pan-India soil erosion estimation. The equation considers factors like predicted crop loss, rainfall, soil erodibility, and land management practices.

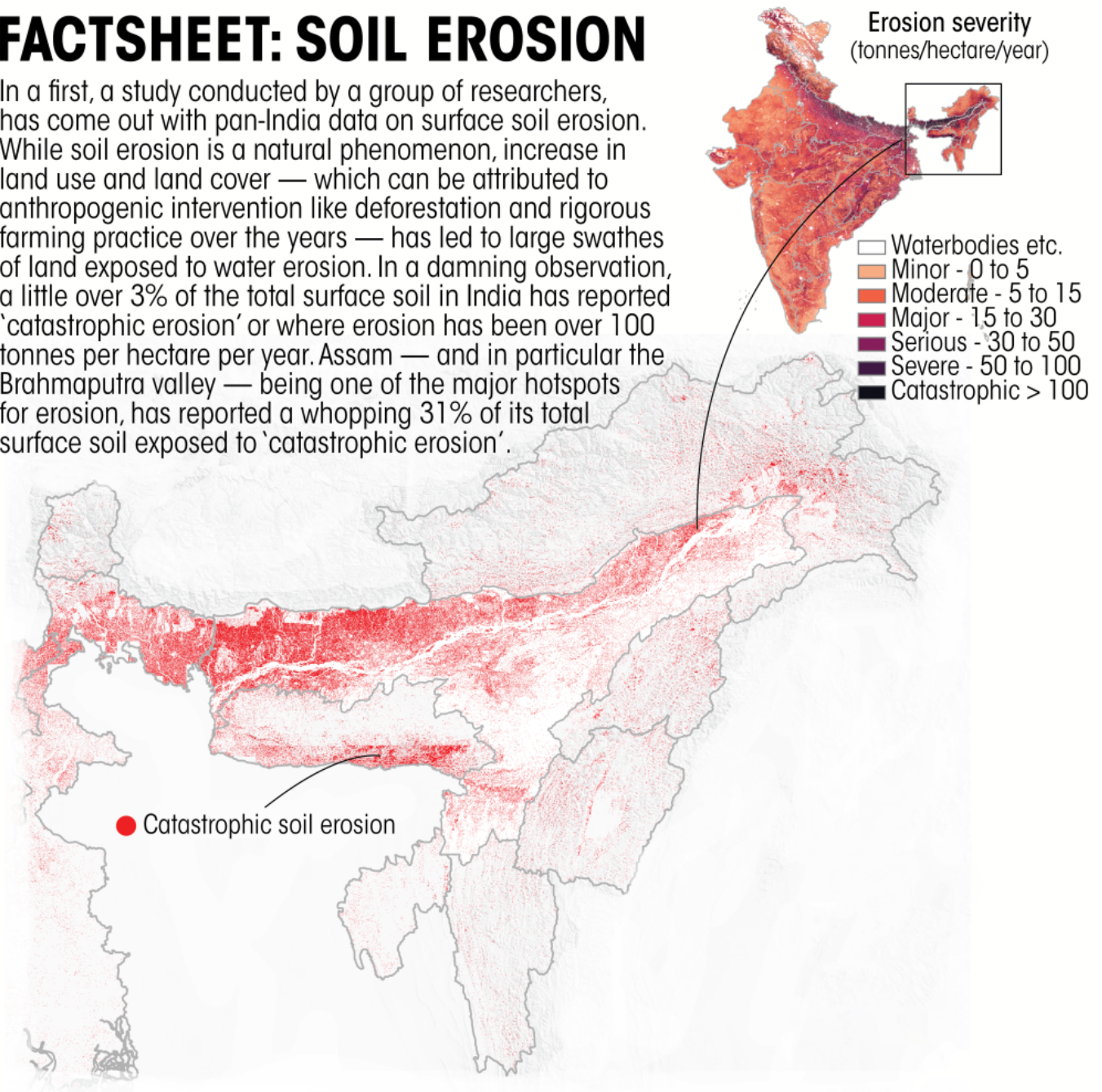
### What are the Key Highlights of the Study?

- **30%** of India's landmass is experiencing "**minor**" **soil erosion**, 3% facing "catastrophic" topsoil loss.
  - [Brahmaputra Valley](#) in Assam is identified as the country's biggest hotspot for soil erosion.
  - Odisha highlighted as another hotspot for "catastrophic" erosion due to anthropogenic interventions.
    - Catastrophic erosion is defined as **over 100 tonnes of soil lost per hectare annually**.

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# FACTSHEET: SOIL EROSION

In a first, a study conducted by a group of researchers, has come out with pan-India data on surface soil erosion. While soil erosion is a natural phenomenon, increase in land use and land cover — which can be attributed to anthropogenic intervention like deforestation and rigorous farming practice over the years — has led to large swathes of land exposed to water erosion. In a damning observation, a little over 3% of the total surface soil in India has reported 'catastrophic erosion' or where erosion has been over 100 tonnes per hectare per year. Assam — and in particular the Brahmaputra valley — being one of the major hotspots for erosion, has reported a whopping 31% of its total surface soil exposed to 'catastrophic erosion'.



## What is the Status of Soil Erosion in India?

- **About:** [Soil erosion](#) refers to the process by which soil is moved or displaced from one location to another.
  - It can occur at varying rates depending on factors such as **climate, topography, vegetation cover, and human activities.**
- **Factors Contributing Soil Erosion:**
  - **Natural Causes:**
    - **Wind:** Strong winds can pick up loose soil particles and carry them away, especially in dry areas with sparse vegetation.
    - **Water:** Heavy rainfall or fast-flowing water can detach and transport soil particles, particularly on **sloped land** or where there's little vegetation cover.
    - **Glaciers and Ice:** The movement of glaciers can scrape and transport massive amounts of soil, while **freezing and thawing cycles** can cause soil particles to break apart and become more susceptible to erosion.

- **Human-Induced Factors:**
  - **Deforestation:** Clearing forests removes trees and other vegetation that hold soil in place with their root networks.
    - This **exposes the soil to the full force of wind and rain**, making it more prone to erosion.
  - **Poor Agricultural Practices:** Conventional farming methods like **excessive tilling** can break down soil structure and leave it vulnerable to erosion.
    - Practices like **leaving fields bare during fallow periods** or using inadequate crop rotation also contribute to the problem.
  - **Overgrazing:** When livestock graze an area too heavily, they can damage vegetation cover, leaving the soil exposed and susceptible to erosion.
  - **Construction Activities:** Land clearing and excavation during construction projects disturb the soil and make it more prone to erosion, especially if proper precautions are not taken.
- **Degraded Soil in India:** According to the **National Bureau of Soil Survey and Land Use Planning**, around 30% of the soil in India is degraded.
  - Of this, around **29% is lost to the sea, 61% is transferred** from one place to another, and **10% is deposited in reservoirs**.

## What are the Challenges Related to Soil Health in India?

- **Low Organic Carbon Content:** Indian soils typically have very **low organic carbon content**, which is crucial for fertility and water retention.
  - The soil organic carbon (SOC) content in Indian soils has declined from 1% to 0.3% in the past 70 years.
- **Nutrient Deficiencies:** A significant portion of Indian soils suffer from deficiencies in major nutrients like **nitrogen, phosphorus, and potassium**.
  - Over-reliance on chemical fertilisers exacerbate this problem.
- **Water Management Issues:** Both **water scarcity and improper irrigation practices** harm soil health. Insufficient water can lead to salinisation, while over-irrigation can cause waterlogging, both impacting soil fertility and structure.
  - Around 70% of irrigation water in India is wasted due to the poor management of the farmer.
- **Socioeconomic Factors:** **Land fragmentation** due to population pressures and economic constraints can make it difficult for farmers to adopt sustainable practices that improve soil health.
  - The average landholding size in India is **1-1.21 hectare**.

## What are the Government's Initiatives Related to Soil Conservation?

- **Soil Health Management under National Mission for Sustainable Agriculture (NMSA):**
  - **Soil Health Card Scheme**
- **Paramparagat Krishi Vikas Yojana (PKVY):** By promoting organic farming, PKVY aims to reduce reliance on chemical fertilisers and pesticides thus allowing natural replenishment of soil nutrients and organic matter, leading to healthier soil.
- **Neem Coating of Urea:** Neem coating slows down the release of urea, making nitrogen available to plants for a longer period and reducing wastage.
  - This translates to less fertiliser needed and potentially improved soil health in the long run.
- **Nutrient Based Subsidy (NBS) Scheme:** This scheme focuses on subsidising essential nutrients (phosphorus and potassium) for plants, besides nitrogen from urea.
  - This encourages balanced fertiliser use, preventing excessive reliance on nitrogen, which can harm soil health over time.

## What Measures can be Adopted to Prevent Soil Erosion and Improve Soil Health?

- **Biochar and Biofertilizers:** Combining biochar application with biofertilizers can be a powerful strategy.
  - **Biochar** holds nutrients and water, while biofertilizers improve nutrient availability and soil health. This can reduce reliance on chemical fertilisers and enhance soil fertility.
    - Biochar is a charcoal-like substance produced by **pyrolysis (heating in absence of oxygen)** of organic materials like crop residues, manure, or weeds.
  - **Biofertilizers** are live microorganisms that can improve soil fertility and plant growth.
- **Drone Technology for Precision Agriculture: Namo Drone Didi Scheme** can be linked with soil conservation.
  - Drones equipped with multispectral sensors can map soil health parameters like **nutrient levels, organic matter content, and moisture levels across large fields.**
  - This data can be used for precision application of fertilisers and amendments, minimising waste and maximising effectiveness.
  - Drones can also be used for **targeted seeding and weed control**, further reducing soil disturbance.
- **Regenerative Agriculture Practices:** Integrating **no-till farming and using compost** can create a customised approach for different areas.
  - Additionally, exploring innovative cover cropping techniques like **multi-species cover cropping** can provide additional benefits like weed suppression and improved soil structure.

**Drishti Mains Question:**

Q. Evaluate the effectiveness of current government policies and initiatives in addressing soil erosion challenges, and propose innovative strategies for sustainable soil management.

**UPSC Civil Services Examination Previous Year Question (PYQ)**

**Prelims:**

**Q. Consider the following statements: (2017)**

**The nation-wide 'Soil Health Card Scheme' aims at**

1. expanding the cultivable area under irrigation.
2. enabling the banks to assess the quantum of loans to be granted to farmers on the basis of soil quality.
3. checking the overuse of fertilisers in farmlands.

**Which of the above statements is/are correct?**

- (a) 1 and 2 only
- (b) 3 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

**Ans: (b)**

**Mains:**

**Q. How far is the Integrated Farming System (IFS) helpful in sustaining agricultural production? (2019)**

