Rethinking Growth through the Sustainability Nexus

This editorial is based on "A 'nexus' approach towards sustainability" which was published in The Hindu Business Line on 23/09/2025. The article brings into picture the tradeoffs India faces between food security, water, and biodiversity as it races toward the 2030 SDGs. It emphasizes adopting an integrated nexus approach linking agriculture, water, and ecosystems for sustainable and equitable development.

For Prelims: Sustainable Development Goals 2030, Biodiversity conservation, Renewable energy, PM E-DRIVE, PM Surya Ghar- Muft Bijli Yojana, Indian Council of Agricultural Research, National Mission for a Green India, Jal Jeevan Mission, Namami Gange Mission, Plastic Waste Management (Amendment) Rules, 2024, International Solar Alliance, Coalition for Disaster Resilient Infrastructure.

For Mains: Progress that India has Made Towards Sustainability and Green Growth, Challenges that Confront India's Pursuit of Green Growth and Sustainability.

As India races toward the **Sustainable Development Goals 2030** with just 5 years remaining, the country faces a critical challenge of managing complex tradeoffs between different SDGs, **where progress in food security often compromises water resources and biodiversity conservation.** Traditional development strategies that treat forests, agriculture, and water as separate domains are proving inadequate for India's rapidly changing landscapes and growing environmental pressures. The solution lies in adopting an integrated **"nexus approach" that acknowledges the intricate linkages between biodiversity, agriculture, and water** while prioritizing equity, sustainability, and community participation.

What Progress India has Made Towards Sustainability and Green Growth?

- **Renewable Energy Transition: India is at the forefront of a global renewable energy revolution. The nation has aggressively pursued its climate action targets by rapidly scaling up its renewable energy capacity, making it a global leader in clean energy deployment.**
    - This is driven by large-scale solar and wind projects, which have made green power increasingly affordable and accessible.
    - As of October 2024, 46.3% of India's total installed electricity capacity, or 203.18 GW of 452.69 GW, came from renewable sources.
        - This includes a monumental surge in solar power, with installed capacity increasing more than 30-fold (since 2014) to approximately 94.16 GW as of November 2024.
- **Pushing for Electric Mobility:** India is accelerating its transition to electric vehicles (EVs) to reduce air pollution and dependence on fossil fuel imports.

- The government's PM E-DRIVE incentives for EV adoption and the expansion of charging infrastructure, creating a favorable ecosystem for the industry.
- This policy push has seen a rapid increase in EV penetration, which has risen from a mere 0.1% six years ago to nearly 5% currently, with two- and three-wheelers leading the charge.
- In a landmark achievement, the PM Surya Ghar- Muft Bijli Yojana facilitated the installation of 7 lakh rooftop solar systems, further mainstreaming sustainable energy.

- **Sustainable Agriculture and Land Restoration:** India has made significant strides in sustainable agriculture and land conservation to protect its biodiversity and enhance carbon sinks.
  - The **Indian Council of Agricultural Research (ICAR)** launched 109 **climate-resilient seed varieties in 2024.**
  - **Government initiatives, such as the** National Mission for a Green India, **focus on restoring degraded forests and promoting agroforestry.**
  - The India State of Forest Report 2023 highlighted a positive trend, with the country's total forest and tree cover spanning 25.17% of its land area, a notable increase from previous years.
  - This growth has added an estimated 2.29 billion tonnes of carbon sink since 2005, putting India on track to meet its goal of creating an additional 2.5 to 3 billion tonnes of carbon sink by 2030.
- **Comprehensive Water Management:** Recognizing water security as a critical component of sustainable development, India has implemented large-scale initiatives to conserve water and ensure its equitable distribution.
  - The Jal Jeevan Mission aims to provide safe and adequate drinking water through individual household tap connections to all rural households.
    - The mission also mandates source sustainability measures, such as rainwater harvesting and greywater management.
  - The Namami Gange Mission has made significant progress in rejuvenating the Ganga River, improving the compliance status of polluting industries along its banks, leading to a substantial reduction in effluent discharge.
- **Circular Economy and Waste Management:** India is transitioning toward a circular economy by implementing robust policies on waste management and single-use plastics.
  - The Plastic Waste Management (Amendment) Rules, 2024 are a major step towards countering plastic waste and strengthening the Extended Producer Responsibility framework for plastic packaging.
  - This policy push is complemented by a growing focus on waste-to-energy projects and a significant increase in the recycling and utilization of hazardous waste.
    - India is currently developing the Bandhwadi plant in Gurugram, which is set to be India's largest waste-to-energy (WTE) plant at 25 MW.
- **Green Finance and Innovation:** India has established itself as an attractive destination for green finance and is actively promoting innovation in sustainable technologies.
  - The government has liberalized its foreign direct investment (FDI) policy, allowing 100% FDI under the automatic route for the renewable energy sector, attracting billions in investments.
  - Nearly $12.67 billion has been received as foreign direct investment (FDI) in the renewable energy sector (as of March, 2025),
    - This financial and policy support has also catalyzed the development of cutting-edge technologies like green hydrogen, with the National Green Hydrogen Mission setting a target of 5 million tonnes of production by 2030.
  - India is also expected to **operationalise the India Carbon Market by 2026** under which **13 major sectors** will be given mandatory emission-intensity targets.
- **Global Climate Leadership: India has moved from being a passive participant to an active leader in global climate negotiations.**
  - By announcing an ambitious Net-Zero by 2070 target at COP26 and launching the International Solar Alliance (ISA) and Coalition for Disaster Resilient Infrastructure (CDRI), India has shown a strong commitment to global cooperation.
    - This proactive diplomacy has made it a credible voice for climate action and sustainable development.
  - India's efforts have been recognized on the global stage, with its overall score on the NITI

Aayog SDG India Index improving to 66 in 2020-21, and its rank on the UN Sustainable Development Goals (SDG) Index entering the top 100 for the first time in 2025 (99th rank).

What Challenges Confront India's Pursuit of Green Growth and Sustainability?

- **Grid Integration and Transmission Bottlenecks: While India's renewable energy capacity is expanding rapidly, the existing power grid infrastructure is not equipped to handle the influx of intermittent solar and wind power.**
  - This creates significant grid instability and 'curtailment,' where renewable energy generated is intentionally wasted because the grid cannot absorb it.
  - According to the Institute for Energy Economics and Financial Analysis (IEEFA), over 50 GW of renewable capacity was stranded as of mid-2025 due to transmission delays and a lack of power purchase agreements (PPAs), stalling progress in states like Rajasthan.
- **High Dependence on Coal:** India's energy security is still overwhelmingly dependent on coal, which remains the primary source for electricity generation.
  - The nation's rapidly growing energy demand for industrialization and urban development makes a complete and swift transition away from coal difficult.
  - Recently, India's Union Minister for Coal and Mines stated in September 2025 that coal continues to account for about 70% of the country's power consumption, with demand projected to rise further to about 1.6 billion tonnes by 2030.
    - This continued reliance poses a significant hurdle to India's climate commitments and air quality targets.
- **Challenges in Electric Vehicle Adoption:** Despite government incentives, the transition to electric vehicles (EVs) faces significant challenges, particularly a lack of robust charging infrastructure and high upfront costs.
  - While two- and three-wheelers have seen notable adoption, the market for passenger EVs is still nascent.
  - The high cost of batteries, coupled with insufficient public and private charging stations in tier-2 and tier-3 cities, deters potential buyers.
    - India will require a total of 3.9 million public and semi-public charging stations by 2030, maintaining a ratio of 1 station for every 20 vehicles.
- **Fragmented and Ineffective Waste Management:** India faces a persistent and escalating solid waste management crisis, with a large portion of waste ending up in overflowing landfills and open dumps.
  - Despite government rules on waste segregation and plastic bans, implementation remains a major challenge due to a lack of civic awareness, inadequate collection infrastructure, and limited processing capacity.
  - According to the Ministry of Housing and Urban Affairs, while 75-80% of waste is collected, only 22-28% is actually processed or treated, with the remainder contributing to environmental pollution and public health hazards.
- **Water Scarcity and Pollution:** Water management is a severe challenge, with a combination of over-extraction, inefficient usage, and widespread pollution straining resources.
  - The agricultural sector, which accounts for over 80% of India's water consumption, relies heavily on unsustainable groundwater extraction, leading to a drastic depletion of water tables in states like Punjab and Haryana.
  - Over 600 million Indians face high to extreme water stress, with 200,000 deaths annually due to inadequate safe drinking water. (International Centre for Sustainability)
- **Vulnerability of Sustainable Agriculture:** The adoption of sustainable farming practices is constrained by climate change, fragmented land holdings, and over-reliance on chemical inputs.
  - The legacy of the Green Revolution has led to soil degradation and water pollution, while small land sizes make it difficult for farmers to adopt new, technology-intensive methods like precision farming.
    - Agricultural Census 2015-16 reported the average size of land holdings in India to be 1.08 hectares, a decrease from 1.15 hectares in the 2010-11 census.
  - Worryingly, India's drought-prone area has increased by **57% since 1997**, while instances of heavy rainfall have risen by almost **85% since 2012. (World Bank)**
- **Hurdles in Green Finance: Despite increasing interest, the green finance market in India**

faces significant hurdles related to high costs, lack of standardized metrics, and limited long-term appetite from domestic investors.
    - Many sustainable projects, particularly in renewable energy and green infrastructure, have long gestation periods and complex risk profiles that deter conventional lenders.
    - The lack of a clear, unified taxonomy for green projects and the high cost of issuing green bonds continue to limit the scale of financing needed to meet India's ambitious climate targets, creating a substantial financial gap for its green transition.
    - For instance, as of **December 2024**, India's sustainable debt issuance (including green, social, sustainability, and sustainability-linked bonds) had reached **$55.9 billion** yet **green bonds still comprise only a small share of the broader bond market.**

How Can India Effectively Advance Its Path Toward Green Growth and Sustainability?

- **Decentralize the Renewable Energy Grid: Instead of a single, centralized national grid, India should focus on creating a network of distributed, micro-grids that integrate local renewable energy sources like rooftop solar and small-scale wind.**
    - This decentralized approach would increase energy independence, reduce transmission losses, and empower local communities.
    - By simplifying the regulatory framework for micro-grids, the government can enable a bottom-up energy transition that is more resilient and less susceptible to the bottlenecks of large-scale infrastructure projects.
- **Implement a Carbon Price and Emissions Trading System:** To internalize the environmental costs of pollution, India should introduce a market-based mechanism like a carbon price or a cap-and-trade system for major industrial sectors.
    - This would incentivize companies to reduce emissions by making it financially beneficial to invest in cleaner technologies and production processes.
    - A predictable and consistent carbon price signal would drive private sector innovation and investment in low-carbon solutions, helping to decouple economic growth from emissions.
- **Mandate Circular Economy Principles:** India's waste crisis can be addressed by moving away from a linear "take-make-dispose" model to a circular economy.
    - This requires comprehensive policies that mandate product design for durability, repairability, and recycling.
    - By establishing Extended Producer Responsibility (EPR) frameworks across all industries, the government can hold manufacturers accountable for the entire lifecycle of their products, from sourcing to disposal.
- **Invest in Sustainable Public Transport:** To reduce urban air pollution and traffic congestion, India must prioritize and heavily invest in integrated, low-carbon public transport systems.
    - This goes beyond just metros and buses; it includes a network of dedicated bus rapid transit (BRT) corridors, last-mile connectivity with electric rickshaws and bicycles, and pedestrian-friendly urban planning.
    - By making public transport convenient and reliable, the government can reduce the reliance on private vehicles and their associated emissions.
- **Promote Climate-Smart Agriculture:** To secure food production while conserving natural resources, India must champion climate-smart agriculture.
    - This involves promoting practices such as conservation tillage, precision farming with sensor technology, and diversified cropping systems.
    - By providing farmers with subsidies and training for sustainable practices, the government can improve soil health, reduce water consumption, and make the agricultural sector more resilient to climate shocks.
- **Mainstream Green Finance:** India's climate goals require a massive influx of capital, which can be mobilized by making green finance a mainstream investment choice.
    - The government should create clear taxonomies for what constitutes a "green" project and offer tax incentives for green bonds and loans.
    - A Green Investment Bank could be established to provide low-cost capital and de-risk projects, attracting private and foreign investment and creating a robust, long-term financing ecosystem for the sustainable transition.
- **Ensure Integrated Water Resource Management (IWRM):** India must adopt an ecosystem-

based approach to water governance by treating rivers, wetlands, and groundwater as interconnected systems rather than isolated resources.
    - This requires decentralized water budgeting at district levels, stricter groundwater regulation, and promotion of water-efficient technologies like drip irrigation.
    - Urban areas should mandate rainwater harvesting, wastewater recycling, and “blue-green infrastructure” for sustainable supply.
        - By integrating climate resilience into water policies, India can balance equity, efficiency, and sustainability in water use.
- **Accelerate "Lifestyle for Environment" Awareness:** Behavioral change is as crucial as policy and technology.
    - India can foster a cultural shift toward sustainability by integrating environmental education into the national curriculum from an early age.
    - The movement needs to be institutionalized, with a curriculum that teaches resource conservation, waste reduction, and the principles of a low-carbon lifestyle, empowering citizens to make informed, sustainable choices in their daily lives.

Conclusion:

“Sustainability is not a choice between growth and nature, it is the art of growing with nature.” India’s path to green growth and sustainability hinges on balancing development with ecological stewardship, equity, and innovation. By embracing integrated solutions, nexus planning, green finance, and climate-smart practices, the nation can turn challenges into opportunities. The journey demands **collective action, resilient institutions, and behavioral transformation.**

Drishti Mains Question:

India aspires to achieve rapid economic growth while also ensuring environmental sustainability. In this context, critically examine the challenges in India’s green growth pathway and suggest measures to effectively balance development with sustainability.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. The Partnership for Action on Green Economy (PAGE), a UN mechanism to assist countries transition towards greener and more inclusive economies, emerged at (2018)

(a) The Earth Summit on Sustainable Development 2002, Johannesburg.

(b) The United Nations Conference on Sustainable Development 2012, Rio de Janeiro.

(c) The United Nations Framework Convention on Climate Change 2015, Paris.

(d) The World Sustainable Development Summit 2016, New Delhi.

Ans: (b)

Q. Sustainable development is described as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In this perspective, inherently the concept of sustainable development is intertwined with which of the following concepts? (2010)

(a) Social justice and empowerment

(b) Inclusive Growth

(c) Globalization

(d) Carrying capacity

Ans: (d)

Mains

Q. Access to affordable, reliable, sustainable and modern energy is the sine qua non to achieve Sustainable Development Goals (SDGs).” Comment on the progress made in India in this regard. (2018)