NEXT IAS

DAILY EDITORIAL ANALYSIS

TOPIC

Environmental Concerns Linked With Artificial Intelligence (AI)

ENVIRONMENTAL CONCERNS LINKED WITH ARTIFICIAL INTELLIGENCE (AI)

Context

- Environmental concerns related to artificial intelligence (AI) are increasingly gaining attention as we witness the rapid integration of AI technologies into various aspects of our lives.

About

- Artificial Intelligence (AI), which is expected to enable transformative changes across several domains, including attempts to find solutions to climate change, has a **very heavy emissions footprint**, the scale of which is becoming evident only now.

- Recently, Google, in its annual environment report released, reported a **13% increase in its emissions footprint in 2023** compared with the previous year. The rise was attributed mainly to the **increased electricity consumption** in its **data centres and supply chains**.

- Google said its data centres consumed **17% more electricity in 2023**, and added that this trend was expected to continue in the coming years because of greater deployment and usage of its AI tools.

Reasons For Heavy Emissions Footprint of AI

- **Energy Consumption:** AI models require substantial computational power for training and inference. As machine learning algorithms become more advanced, their hunger for electricity grows.
  - For instance, a **simple AI query** can consume between **10 and 33 times more energy** than **a regular Google search**. Image-based AI searches may use even more energy. It translates to higher electricity consumption in data centres.
- **Data Processing and Heat Generation:** AI models sift through vast amounts of data during processing, which demands more electrical signals.
  - Additionally, the increased workload generates heat, necessitating powerful air-conditioning or cooling systems in data centres.
- **Increased Demand of Water:** There is an increased demand on water resources as well, required **for cooling of data centres.** There is inadequate data on water consumption of data centres but the centre that serves OpenAI's GPT-4 model in Iowa (US) is reported to have **consumed 6% of the district's water supply** in July 2022.
- **Global Electricity Demand:** Data centres currently account for 1% to 1.3% of global electricity demand. Projections suggest this could double (reaching 1.5% to 3%) by 2026, according to the **International Energy Agency (IEA).**
  - In comparison, despite the growing number of electric vehicles, their share of global electricity consumption remains around 0.5%.
- **Country-Level Impact:** In some regions, data centres' electricity consumption as a share of national demand has already crossed double digits.
  - For example, in Ireland, where tax incentives attract data centres, this share has reached 18%.

Addressing the Challenge

- **Efficient Algorithms:** Developing more energy-efficient AI algorithms can reduce computational requirements.
- **Monitoring and Optimization:** AI can be deployed to monitor emissions in existing processes and optimise them to eliminate wastage or inefficiencies. For instance, AI-driven predictive maintenance can reduce energy consumption in industrial settings.
- **Green AI Research:** Researchers are exploring ways to make AI greener, such as using renewable energy sources for data centres or designing AI models with lower energy footprints.

- **Ethical AI:** As we advance AI, we must prioritise ethical considerations, including environmental impact.
  - UNESCO's Recommendation on the Ethics of Artificial Intelligence aims to shift the balance of power between people, businesses, and governments developing AI.

AI's Role in Climate Action

- **Predictive Capabilities:** AI can enhance predictions related to climate events. For instance, Google's flood forecasting initiative uses AI and geospatial analysis to provide real-time information on riverine floods, helping communities prepare and respond.
- **Efficiency Improvements:** AI can optimise energy usage. Google Maps, powered by AI, suggests fuel-efficient routes, potentially preventing millions of metric tons of CO_2 emissions.
- **Smart Grids:** AI supports the growth of smart grids by handling massive data generated by smart metres, grid monitoring devices, and renewable energy sources. It aids in balancing supply and demand, crucial for integrating renewables effectively.
- **Large-scale Deployment of AI:** Other estimates suggest that the large-scale deployment of AI could help in significant reductions of emissions globally. A recent study found that application of AI to corporate and industrial practices could result in a 5-10% reduction in global emissions by 2030, while generating a value worth $1.3 trillion to $2.6 trillion through additional revenues or cost savings.

Way Forward: Balancing Innovation and Sustainability

- As we embrace AI's potential, we must strike a balance between innovation and environmental responsibility.
- **Responsible Deployment:** Organisations should use AI to monitor and predict emissions, optimise existing processes, and eliminate inefficiencies. Responsible deployment can reduce the overall environmental impact.
- **Energy-Efficient Algorithms:** Researchers and practitioners should focus on developing energy-efficient AI algorithms. Techniques like model quantization and pruning can help reduce computational requirements.
- **Collaboration:** Governments, industry, and research institutions must collaborate to create guidelines and policies that promote sustainable AI development.
  - **In India**, where the **Ministry of Electronics and Information Technology** is working on a **framework for responsible AI**, finding this balance is crucial. The huge environmental toll of AI and data centres will become evident soon, and proactive measures are essential.

Conclusion

- While AI holds immense promise, we must tread carefully to ensure its benefits do not come at the cost of our planet. Balancing technological progress with environmental responsibility is crucial for a sustainable future.

Source: IE

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Mains Practice Question

[Q] How does the adoption of Artificial Intelligence (AI) impact the environment, and what are the associated challenges? Discuss the role of AI in finding solutions to climate change.