



COMMENTARY

Development and Greenhouse Gas Intensity in Nepal After 2015: An IPAT Decomposition

SUDIP PUDASAINI

THOMPSON RIVERS UNIVERSITY

This commentary analyzes Nepal's greenhouse gas (GHG) emissions using the IPAT identity with World Bank data from 2000-2022. In particular, the commentary is done to examine Nepal's GHG emissions per unit of GDP pre and post Paris Agreement. Using the Kaya/IPAT framework, greenhouse gas emissions depend on three major factors which are Population (P), GDP per capita known as Affluence (A), and GHG intensity (T) (emissions per unit GDP) written in short where emission is represented by I.

$$I = P \times A \times T$$

After analyzing the factors aforementioned against the series of yearly data, Nepal GHG was constructed from the World Bank for: total GHG (Mt CO₂-eq, AR5 GWP), population (total), and GDP per capita (constant local currency). Where, GDP total = population × GDP per capita; carbon intensity T= emissions / GDP total.

Table 1 represents the average annual growth rate (AAGR) for the available data. The World Bank GHG series for Nepal begins in 2000 and is available through 2022 in the data extracted from the world bank; therefore, the report 2000–2014 (pre-Paris), 2015–2022 (post-Paris), and 2000–2022. The 2015–2022 window is shorter and includes data relating the destructive earthquake (7.9 recharter scale) of the year 2015 and the pandemic of COVID-19.



Table 1: Average annual growth rate of IPAT Forces (Nepal, 2000–2022)

Period	GHG (T)	Population (P)	GDP per capita (A)	Carbon Intensity (I = E/GDP)
2000–2014	+3.0%	+0.9%	+3.2%	-1.0%
2015–2022	+5.6%	+0.9%	+3.5%	+1.1%
2000–2022	+3.6%	+0.9%	+3.3%	-0.5%

Note. Source: Calculations from World Bank.

Before, 2015 the Paris agreement, Nepal had the GDP per capita grow at 3.2% per year, the emission growth rate was 3% and the GHG intensity was declining by 1%. The period after the Paris agreement shows a reversal in the pattern with emission accelerating to 5.6% a year with GDP per capita was increasing by 3.5% per year resulting growth of GHG intensity by 1.1%. The post-2015 rise in emission is driven mainly by an increase in GHG intensity, not by a jump in population which was in constant growth. This pattern does support the hypothesis that post-2015 Nepal saw a relative increase in emissions per unit GDP. To address the issue Nepal has developed and implemented several policies including but not limited to National Climate Change Policy (2019) promoting low carbon emission, renewable energy adoption.

Raihan & Almagul (2022) have argued that CO₂ emissions from 1990–2019, focusing on economic growth, fossil fuels, renewable energy, and agriculture shows that growth in fossil fuel use raises emissions, while renewable energy and agricultural productivity reduce them. The research highlights the potential of renewable energy and agriculture in mitigating emissions and recommends strong regulatory policies for sustainable development. (Raihan & Almagul, 2022)

In another research titled “Carbon footprint of Nepalese healthcare system: A study of Dhulikhel Hospital” it was estimated that the healthcare sector has significant carbon footprint from generators, electricity, transport, Liquid Petroleum Gas, photovoltaic systems, and waste, totaling significant CO₂ emissions alongside local pollutants and methane from liquid and biodegradable waste. Findings highlight the need for healthcare professionals and policymakers to adopt sustainable practices to lower emissions (Adhikari, et al., 2023).

Additionally, in the article “Assessment of pathways of the net zero GHG emission consistent with 1.5 degree target” explained Nepal’s path to net-zero by 2050. If business runs as usual

then energy demand and emissions will rise sharply, but carbon taxes (\$10–800/tCO₂e) could cut emissions up to 84.4%. A mix of carbon tax, sequestration, and energy trade can enable net-zero, though data gaps and limited sectoral coverage remain challenges. (Pradhan, Shrestha, Panday, & Limmeechokchai, 2018).

Probable causes include might include:

- i. Faster expansion of fossil-fuel-intensive sectors (transport, construction);
- ii. Weak regulations and statutory requirements; and
- iii. Greater use of imported petroleum as hydropower variability and grid constraints persist;

and will continue as climate change intensifies. For example, global temperature rise since the start of industrial revolution, Nepal has been experiencing rapid glacial retreat (Tibetan Glacial in 10th July 2025 and Khumbu Glacial in 2024) that could lead to water shortages. Furthermore, erratic precipitation, and more frequent floods and droughts, threaten agriculture, water resources, energy, biodiversity, and livelihoods (Nepal & Kadayat, 2024). Nepal has seen major changes challenges and increasing emission and has adopted the Sendai Framework 2015-2030 into the national law. Development of Disaster Risk Reduction Management Act 2017 and policy the legal basis for Sendai implementation, and established disaster risk reduction governance across federal, provincial and local tiers. However, the fragmentation in institution, limited local capacity, and gaps between national frameworks and local action has hampered the policy level implementation the key plans and policies (Ojha, et al., 2016). Enactment of the Environment Protection Act (2019) and established the Climate Change Management Division under the Ministry of Forests and Environment. These bodies coordinate climate actions, monitor GHG emissions, and facilitate multi-level governance to improve policy enforcement.

In addition to all these efforts National Adaptation Programme of Action (NAPA) for vulnerable communities in agriculture water and forestry, Climate Change Policy (2011, 2019) to provide a framework in renewable energy, Local Adaptation Plans for Action (LAPA) to transfer national priorities to local levels, and Nationally Determined Contributions (NDCs) set economy-wide emission reduction targets for 2030 and 2035 and outline a roadmap toward achieving net-zero emissions by 2045, integrating both mitigation and adaptation strategies across key sectors. These policies provide a structured approach for balancing sustainable development with climate action in Nepal.

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Author

Sudip Pudasaini: Sudippudasaini35@gmail.com, pudasainis@tru.ca

Masters in Business Management, Tribhuvan University

Masters in Environmental Economics and Management, Thompson Rivers University