# Trend of population growth and carbon dioxide emission over the period of 50 years in Nepal

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**Abstract**

*Rapid population growth is often discussed as one of the major causes of increasing Carbon dioxide ($CO_2$) emission. This paper will provide the trend of $CO_2$ emission with changing population over the period of 50 years in Nepal. It will also discuss about the causes and environmental impacts of $CO_2$ emission. This paper will first provide overview of population growth $CO_2$ emission trend in Nepal. It will then discuss the policy interventions and environmental impacts of $CO_2$ emission based on previous researches and findings.*

## Population Growth trend in Nepal

Over the period of last 50 years, the population of Nepal has increased approximately 2.7 folds from 10,719,988 in 1964 to 28,174,724 in the year 2014. The population growth rate of Nepal however, has dropped from 2.60 in 1995 to 1.60 in the 2015.

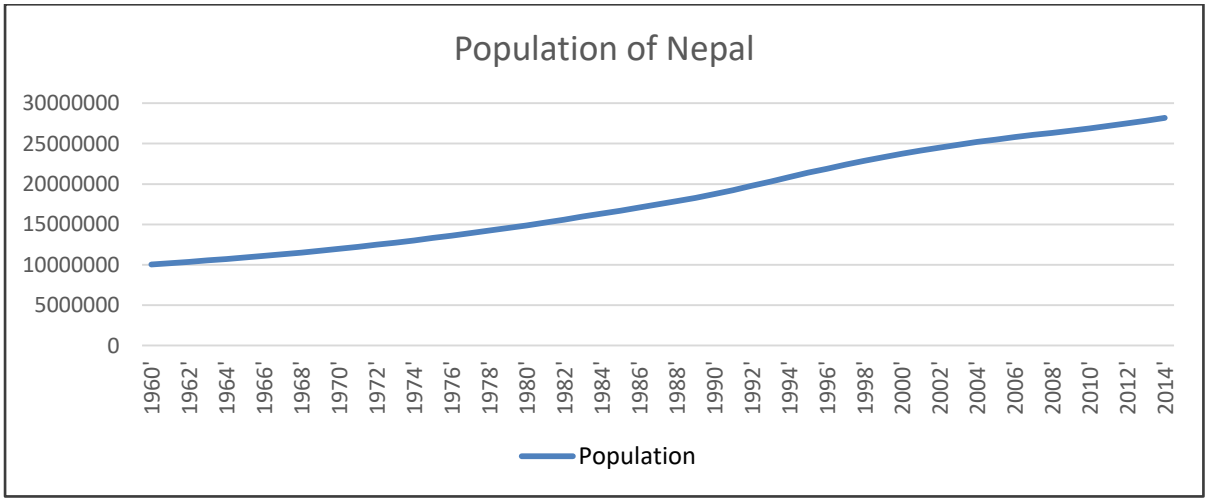


***Figure 1: Trend of Population Growth from 1960 to 2014***

*Source: ADB, 2015*

There are several factors which have been major contributing factors for the rapid population growth of Nepal especially between 1970s and 1990s. These reasons include eradication of Malaria, early nuptiality in many rural communities, need of more hands to support the rural

agriculture, decrement in the rate of morbidity and infant mortality rates due to improved health services, cultural belief, lack of knowledge on birth controlling devices, hesitation on the use of contraceptive methods, preference of son than daughter etc. (Uprety 2001, pp. 41-51).

### Trend of $CO_2$ emission in Nepal

The $CO_2$ emission has been increased from 80.674 kt in the year 1961 to 4334.39 kt in the year 2011. Total number of vehicles in Nepal as of 2013 was approximately more than 1.54 million (Department of Road 2013, p. 4). The major part of the $CO_2$ emission in Nepal has been due to this increased number of vehicles with rapid urbanization. According to MoPE (2004, pp. i-iii), among the total carbon dioxide emission, 31% is contributed by transportation sector. Whereas industrial sector contributes 27%, Residential sector 22% while share of agriculture is just 9%.

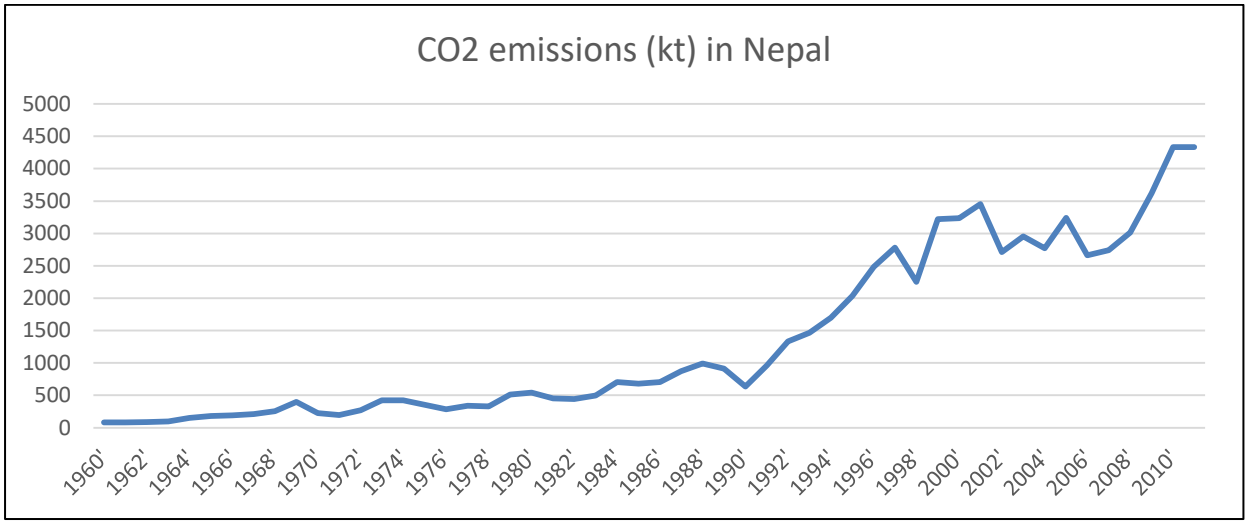


***Figure 2: Total Carbon Dioxide Emission from 1960 to 2010 in Nepal***

*Source: ADB, 2015*

Deforestation and use of fuelwood for energy however also has one of the big shares for $CO_2$ emission in Nepal.

### Relating population growth with CO2 emission in Nepal

Shi (2001, pp. 1-8), mentioned that the rapid population growth is one of the crucial driving factors to increase the global $CO_2$ emissions over the last three decades. But population has been rarely mentioned as one of the biggest factors behind increasing $CO_2$ emission yet (Jiang, & Hardee 2009, pp. 4-10). According to the conventional view, as the affluence

grows, the capacity of energy consumption increases which will lead towards rapid growth of $CO_2$ emissions (Shi 2001, pp. 1-8). And it is obvious that affluence is the result of bigger market which is possible only with bigger population size. Hence, with bigger population size, energy consumption will increase in order to meet the demand which will increase the $CO_2$ emission.

*Figure 3: Rapid urbanization in Kathmandu Valley as a result of population growth and centralization. PC:MyRepublica*

Statistics shows that the highest population growth rate in Nepal has occurred between 1970s and 1990s (Nepal population clock, 2015). But the rate of carbon dioxide emission started accelerating only after 1990s (ADB, 2015). There are several overlying reasons due to which the overall carbon dioxide emission was comparatively lower when the population growth rate was highest. These reasons are as explained below:

*Figure 4: Brick Kiln in Kathmandu shows industrial emission. PC: IAAS*

- According to the statistics of Department of Road (2013, p.4), there were less than 0.28 million vehicles in Nepal which is more than 5.5 times lesser vehicles compared to 2013.
- Since, Nepal was under the liberal '*Panchayat rule'* that restricted the economic liberalization, privatization and the globalization of economy before 1990s, there were not enough room for industries and investments to flourish (Gellner 2007, pp. 50-51).
- Before the democratic system was introduced in Nepal in 1990, only the centre i.e. Kathmandu valley was experiencing the input of huge energy in construction and maintenance of the residential sector (Gallagher 1992, pp. 249-251). Hence, huge portion of Nepal did not require a huge energy for the construction of their residence and the people were relying on naturally occurring resources for housing.
- The huge portion of commercial sector these days use fossil fuels especially for the transportation of goods in Nepal and consume most of the goods manufactured

somewhere else. But Panchayat rule discouraged the development of commercial sector due to which its contribution to $CO_2$ emission was less.

- The large scale modern agricultural system inputs huge amount of energy due to the bigger market and distribution demands (Horrigan et. al. 2002, pp. 445-447). But before 1990s, the traditional form of agriculture was prevalent and bigger distribution was not necessary as road system in Nepal was not completely developed (UNDP 2011, 1-4).

*Figure 5: Smoke from vehicles is one of the major contributors of carbon dioxide emission in Nepal. PC: Earth Journalism Network*

After the introduction of multiparty democratic system in Nepal in 1991, the rate of industrial development accelerated as government had put industrial development and export promotion in the top priority (JICA 2003, 1-8). The core theme of this policy was sustainable economic development in order to promote the national and international investment for the industrial development in the country. After the introduction of democracy, Government of Nepal conducted different campaign supporting the global campaign of controlling population growth (Gonzalez 1990, pp. 3-28). Due to which, the rate of population growth had started retarding. Along with that, public awareness among the local people had started growing about the importance of birth control (Gonzalez 1990, pp. 3-28). It is also important to know that with the rise in income level of people in Nepal, the rate of use of luxury items and other activities for recreation especially in bigger cities like Kathmandu have rapidly increased. These activities too use huge amount of energy resulting in total increment in $CO_2$ emission. These are the reasons why the rate of $CO_2$ emission has accelerated while the population growth rate was retarding.

**Environmental Impact of $CO_2$ emission in Nepal**

The rapid growth of $CO_2$ in enhances the greenhouse effects which are responsible for the global climate change and the phenomenon of global warming. The greater the emission of $CO_2$ greater will be the greenhouse effect and greater the global climate change (ACE 2008,

*Figure 6: High Mountain Meadow from Mount Everest Region of Nepal. PC:Nepal Mother House Treks*

pp. 3-13). Nepal stands in 135$^{th}$ position with 0.011% of the share in the global $CO_2$ emission, while, China in the first and United States in the second position (EIA, 2015). Hence, Nepal's contribution of $CO_2$ emission on global climate change is very negligible. But Nepal is among the most vulnerable countries in the world in term of climate change induced hazards. The Mountain environment of Nepal are particularly highly vulnerable to the impact of climate change (Bradley et al. 2004) due to the several reasons including instable geological condition, lack of sufficient livelihood options and critical ecosystems. The Himalayas are geologically young and fragile and are vulnerable to even insignificant changes in the climatic system (Lama et al. 2009). Studies (Mool et. al. 2001, p. 176; Sharma et al. 2009; Baidhya et al. 2007, pp. 1-13; Shrestha et al. 2010, pp. 1-13) confirm that many glaciers of the high mountain belts of Nepal are leaving glacial lakes with increasing intensity, which in fact is corroborating with the intermediate effects of long term Climate Change by majority of scientists. Many tiny glacial lakes are forming and existing lakes are resizing as a result of climate alteration (Mool et. al. 2001, p. 176). This increasing accumulation of water from the melting glaciers in the glacial lakes at the elevations above 3500m above the sea level has increased the risk of Glacial Lake Outburst Flood (GLOF) in the mountain belts of Nepal such as Lake Imja, Tsho Rolpa and many others. Approximately more than 30 GLOF events have occurred in Nepal since 1964 (Shrestha et. al. 2010, pp. 1-13). GLOF is the biggest threat to the mountain communities as it is highly devastating and they are the biggest source of water without which livelihood in these areas is almost impossible. Several other impacts have been recorded in Nepal which has been believed to be the result of climate change as indicated in

*Figure 7: Rapidly melting Glacier forming huge Imja Lake in Everest Region. PC Dr. Alton Byers*

National Adaptation Plan of Action (NAPA) such as forest fire, draught, flash floods, floods, disease, landslides, avalanche, water scarcity etc. (wwf, 2015).

**Policy formulation and ways forward**

Nepal is still predicted to go through some major political conflicts (ICG, 2015). In this conflicted political situation it is difficult to predict how the upcoming policies will address the demographic and environmental issues and there still are uncertainties surrounding the policies which are already been formed. First population policy of Nepal has been recently formed whose major focus will be to improve people's lives by integrating population issues into development (UNFPA, 2015). Hence this policy should be able to address the issue of population growth. Although the new constitution may have some changes in its policy (basically about the roles and responsibilities) on climate change adaptation, it should prioritize the areas NAPA has indicated to be most vulnerable.

The future $CO_2$ emission of Nepal potentially will be increasing rapidly. The projection by CAT (2015) has indicated the increase of 65% by 2030 compared to 2010 levels. The population and the development necessity potentially will be the major factors behind the increased $CO_2$ levels. This level of $CO_2$ emission in 2030 however can be minimized mainly through controlled population growth rate and the introduction of technologies to reduce the use of fossil fuel and forest resources. This will be the use of green technologies such as use of renewable resources like hydropower, solar energy, biogas plants etc. Raising people's awareness however is the most crucial activity to change people's behaviour and reduce $CO_2$ emissions.

The use of hydropower can highly reduce $CO_2$ emission (Francfort 1997, p. 1). Francfort (1997, p. 1) also has indicated towards the carbon credit opportunities in the developing countries while reduction of carbon tax in the developed countries. Nepal's theoretical hydroelectric potential is 83,000 megawatts while about 42,000 MW is technically and economically viable (Bergner, 2011). The annual hydropower generation in Nepal currently is however less than 700 MW (Bergner, 2011) due to which Nepal face critical energy shortage annually which has increased people's dependency on fossil fuels. Nepal will need appropriate policy and environment in order to promote the investments in hydroelectric projects which also will be the most important steps on Nepal's economic development.

## Conclusion

It is evidence from the statistics that Nepal's population growth rate is in decreasing pace compared to its rate between 1970s and 1990s. The trend of $CO_2$ emission however shows that it has reached its highest ever. The major reason behind the increased $CO_2$ emission has been the number of growing population along with the change in lifestyle after 1990. With the economic growth and changing technology, there has been increased use of means of transportation that uses fossil fuel which has been the biggest contributor of $CO_2$ emission in Nepal. Development of industrial sector however is still a big question mark which however has to happen in order to fulfil the growing demand of economy. Development of industrial sector probably will increase the $CO_2$ emission rapidly. Hence, government should prioritize the use of renewable energy specially hydroelectricity which is highly potential in Nepal and has very less $CO_2$ emission. The impacts of climate change which are already visible in Nepal should be the biggest priority of Government of Nepal which can have huge impact on livelihoods.

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