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Understanding the impact of lifestyle on individual carbon-footprint

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Abstract

According to the International Energy Agency, India is the fourth largest emitter of global greenhouse gas (GHG) emissions contributing about 5% of total emissions [1]. But it is also the home to a third of the world's poor. There also exists a large disparity in the living conditions and lifestyles of people living in the rural and urban India. Based on geographical location and lifestyle, an individual's contribution to the global carbon footprint has been estimated in this study. Data on consumption of goods and services resulting in GHG emissions was gathered at the household level through a door to door survey from few localities in Mumbai and rural areas within 100km of boundary. Equivalent carbon emission factors were used to estimate the carbon footprint from major sources like electricity, transport, cooking fuel and food for these areas. The average annual per capita carbon footprint was estimated to be 2.5 tons CO₂e in the urban area and 0.85 tons CO₂e in the rural area. For each of the areas (rural and urban), substantial variation in carbon footprint has also been observed across different socio-economic classes. Limitations: Indirect emissions, emissions related to work and public place were excluded. This study looked at the sectoral contribution (activity-wise, e.g. cooking, transportation etc.) as well as the rural-urban disparity in the individual carbon footprint; which was done for the first time in India.

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1. Introduction

Rising population and concentration of industrial activities in mega-cities are transforming them into source centres of air pollution. Urbanization and energy-intensive economic development are determining factors for emissions of GHGs. Activities such as urban transport, solid waste disposal, domestic fuel use, industrial activities and power generation for meeting the energy demand of the cities generate a considerable amount of GHGs along with other air pollutants. Even in the rural areas of the developing nations the use of traditional fuels, like wood, animal waste and crop residues, has local environmental impacts due to significant emissions of pollutants such as SO₂, NO_x, etc. along with emissions of GHGs like CO₂, CH₄ and N₂O. Carbon footprint is used as an indicator to measure and compare the impact due to such activities across geographies. Carbon footprint is the overall amount of CO₂ and other GHG emissions expressed as CO₂ equivalent associated with a product, along its supply-chain and sometimes including emissions from use and end-of-life recovery and disposal.

India has traditionally been an agricultural country with majority of its population residing in the villages. Even though India's per capita GHG emissions of 1.3 tonnes are well below the world average of 4.4 tonnes (Prayas, Energy Group, 2009), it is the 4th largest global GHG emitter due to its large population. Hence, India's development pathway and corresponding GHG trajectory would have significant implications for the climate change problem. Some developed countries claim that city dwellers have smaller carbon footprint than their rural counterparts. For example, a New Yorkers annual carbon footprint is 7.1 tonnes of CO₂ per capita whereas for US the average annual per capita carbon footprint is approximately 20. Similarly, a Londoners annual carbon footprint is 6.2 tonnes of CO₂ per capita and the average number for UK is approximately 11 [2]. Could this be true for India as well? The present study is motivated by these factors and the following objectives are attempted:

1. To identify the major factors contributing to the individual carbon footprint
2. To understand the relative contribution of various factors to the carbon footprint
3. To study effect of one's geographical location and socio economic status on carbon footprint

There are few studies reported on the urban and rural CO₂ emissions. (GreenPeace India Society, 2007) deals with the comparison of urban and rural household emissions and emissions' distribution among different income classes of India. This study used the bottom up approach for data collection by conducting direct interviews with people who spent a maximum amount of their time at home so as to obtain accurate assessment of energy consumption in the house. A similar comparative study has been done for the households in the UK with a different approach (Druckman and Jackson, 2009). It presents socio-economically disaggregated framework for attributing CO₂ emissions to people's high level functional needs. Based around a quasi-multi-regional input-output (QMRIO) model, the study, in theory, takes into account all CO₂ emissions that arise from energy used in production of goods and services to satisfy the UK household demand, whether the emissions occur in the UK or abroad. Studies in (Garg et al., 2001) provide the inventory of GHG (CO₂, CH₄, and N₂O) emissions for whole India at a national and sub-regional district level. (Kadian et al., 2007) provide the inventory of energy related GHG emission from the household sector in Delhi. (Chakravarty et al., 2009) presents an overview of trends in energy and carbon intensity in the Indian economy, with some insights into their drivers and ongoing policy initiatives in the energy sector that will benefit low carbon growth. (Prayas, Energy Group, 2009) presents a framework for allocating a global carbon reduction target among nations, in which the concept of "common but differentiated responsibilities" refers to the emissions of individuals instead of nations. The income distribution of a country is used to estimate how its fossil fuel CO₂ emissions are distributed among its citizens, ultimately leading to global CO₂ distribution.

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