Assessing the impacts of Scaling up 5G Communication Networks in India: A macro-econometric sub-national framework

Topic: Regional input-output modelling (1)
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India's communication technology sector has experienced rapid growth over the past decade, with 812 million broadband subscribers and declining data tariffs. Today, the country boasts the second-largest telecom subscriber base and one of the largest internet user bases globally. Existing technologies like 3G and 4G have already showcased the transformative power of mobile connectivity, improving access to education, healthcare, financial services, and employment, particularly in underdeveloped and rural regions. India now stands at a pivotal juncture, with ambitious policies aimed at increasing the deployment of next generation 5G technology. These advancements promise unprecedented speed and data accessibility for users, driving digital transformation across sectors. However, they also come with substantially higher energy consumption and increased carbon emissions, necessitating proactive strategies to balance technological progress with environmental sustainability.

Objectives

This paper examines sub national economic and environmental impacts of scaling up 5G communication networks across 10 major Indian states (around 80 % of total subscriber base in India). The analysis focusses on:

1. Estimating the direct and indirect contributions to GDP and employment through infrastructure and digitally enabling sector at state level.
2. Assessing the energy and environmental implications of rolling out of these technologies with respect to state-level decarbonization trajectory.

Methodology

This paper creates a production block for the 5G communication technology for Indian states. At present the total penetration of 5G network in India is close to 240 million users which will reach 940 million users by 2030. The production block includes both the infrastructural inputs for the communication networks including installation of towers and land procurement and investment in enhanced energy demand from the telecom towers along with contribution from digitally enabling sectors as per the OECD definition. Using E3-India, a macro econometric simulation model the sector and state desegregated direct and indirect GDP and employment effects are estimated for this analysis. Further, the economic and environmental impact of enhanced energy demand are also estimated for the same.

Preliminary results

Preliminary findings suggest that while the nationwide deployment of 5G networks by 2030 will generate substantial economic gains across Indian states, the associated environmental costs are significant. Based on projected subscriber growth, 5G adoption alone is expected to contribute approximately 178 million tons of CO2 emissions. These estimates highlight the need for energy-efficient infrastructure, renewable energy integration, and policy interventions to mitigate the environmental impact of large-scale network expansion while maximizing economic benefits.