

COBENEFITS Studies in India

- 1. Future development of employment in the power sector, skills and education needed (employment opportunities)**
- 2. Economic prosperity in rural areas (rural development opportunities)**
- 3. Health benefits related to less carbon-intensive power sector (health-related opportunities)**
- 4. Energy access (cost saving and other opportunities)**

1. Future development of employment in the power sector, skills and education needed (employment opportunities)

It is becoming increasingly important to ensure that energy policy, planning and decision-making processes effectively and accurately consider the broader socio-economic impacts associated with the increased deployment of renewable energies. Job creation has become an important factor in promoting power system transformation. However, estimating jobs created due to renewable energy deployment is incomplete without consideration of resulting job losses in other sectors. This includes both job losses due to the replacement of conventional sources of generation, especially coal, and job losses resulting from dynamics within the coal sector. Further, the type and quality of jobs created are important: Policymakers need to know how many jobs are created and lost over time. Skill shortages in the renewables sector are often a result of the general inability of education and training systems to respond to the demands of the growing industry. This may be exacerbated by lack of universities and research centers offering relevant programs.

Therefore, it is proposed to develop quantitative methodologies in order to assess at the national level based on climate mitigation and renewable energies deployment scenarios up to 2050:

- Employment development in the power sector (net analysis including both positive and negative impacts, leading to an overall impact on employment),
- Types of jobs, skills and education needed
- Analysis of job numbers over time (until 2035 on an annual basis, as well as for 2040 and 2050)
- Co-benefits analysis based on climate mitigation and renewable energies deployment scenarios that are accepted by relevant ministries and government agencies.

2. Economic prosperity in rural areas (rural development opportunities)

The study focuses on analyzing the socio-economic development and enterprise development impact in rural areas in India due to growing share of renewable energy, grid connected and off-grid projects.

The study will assess, analyze and quantify the effect of growing shares of renewable energy in the power sector on economic prosperity in rural areas based on different energy and climate

scenarios in India. The assessment should be calculated based on climate mitigation and renewables energies deployment scenarios up to the year 2050.

The service provider is expected to apply a mixed method approach; comprising a combination of qualitative and quantitative methods to analyze all multiple benefits

Key analyses to be conducted within this study include:

- Quantitative assessment of socio-economic development and enterprise development, and other multiple benefits currently being realized in X representative rural communities in X states by grid connected solar, wind, hydro and biomass electricity generation projects. Off-grid projects commissioned in the municipalities should also be considered. The quantification and assessment should involve the following:
 - a. The impact of the installed renewable energy projects on direct and indirect jobs along the value chain created for the people within the communities/municipalities during and after the project execution.
 - b. The effect and impact of the installed renewable energy projects on diversification of household income with regards to improvement in income streams available for households in the communities/municipalities.
 - c. The effect and impact of the installed renewable energy projects on creation and growth of small and medium scale enterprises/businesses with the communities/municipalities within this time period.
 - d. The effect and impact, if any, of the installed renewable energy projects on community inequality in terms of income level and caste-class-gender structures the municipalities.
- Qualitative + quantitative assessment: What are expectations (related to co-benefits) of stakeholders (community, entrepreneurs, policy-makers)? Do they differ? Have they been met after project/intervention completion (if yes, how; if not, why)? Which are the co-benefits elicited by communities in areas which have not seen such an intervention? Develop stakeholder map listing perspectives, areas of conflicts and co-operation. If possible, the results should also be analyzed in a quantitative way.
- Using results obtained from the analyses above, apply accurate calculations and methodology to forecast impacts in these communities/municipalities based on specific energy and climate scenarios up to the year 2050.
- The results obtained from the analysis by the service provider should show a linkage between the renewable energy targets and CO₂ emission reduction/increase in India's energy sector.

3. Health benefits related to less carbon-intensive power sector (health-related opportunities)

The purpose of this study is to assess future health costs savings based on different scenarios of the development of the Indian power system. The foremost objective is to quantify the monetary health benefits related to different scenarios for the development of the Indian power mix. Besides, impact on human life expectancy should also be quantified.

The results of the co-benefits studies will serve as inputs for policy makers on areas to focus on to drive the air quality and health benefits of scaling renewable energy (wind, solar, geothermal and biomass) investments. This, in turn, will inform policy makers about the optimal share of renewable energy technologies when drafting the national NDCs.

4. Energy access (cost saving and other opportunities)

With nearly 200 million Indians without access to electricity, and about 500 million people, still dependent on solid biomass for cooking, it may be acknowledged that India has to still go a long way on securing its energy security objective. The National Energy Policy (NEP) aims to chart the way forward to meet the Government's recent bold announcements in the energy domain: Universal electrification is to be achieved by 2022. Increasingly, solar mini-grids and other off-grid solutions compliment and supplement other sources of electricity in rural areas thus contributing to a secure and reliable electricity supply. Further, they contribute toward a better quality of life, higher productivity and rural development at large. Despite the well-documented benefits of mini-grids, knowledge gaps remain, posing challenges in the expansion of such solutions. There are large numbers of un-electrified hamlets in electrified villages, i.e. electricity infrastructure has only reached one part of the village. These hamlets are ideally suited for setting up mini-grids. It is therefore the objective of the study to assess the feasibility of enabling off-grid renewable energy generation for hamlets in electrified villages with restricted or no access to national power grid infrastructure.

The study looks into the following questions:

- What is the impact of grid extension in rural areas as compared to solar mini-/micro grids in terms of access to secure and reliable electricity supply, affordability, and further socio-economic benefits?
- If renewable energy micro-/mini grids provide the best socio-economic environment solution and also generate the best combined benefit on sustainable way, how can energy access through these options be fostered in rural areas?

It is proposed to do a cost comparison between grid connection and off grid renewable power generation. Avoided costs for the individual and society are to be assessed. In terms of technological scope, the study looks at solar as most off-grid utilities (~80%) run on solar energy. Based on the cost comparison, electricity service benefits for households and SMEs are assessed.