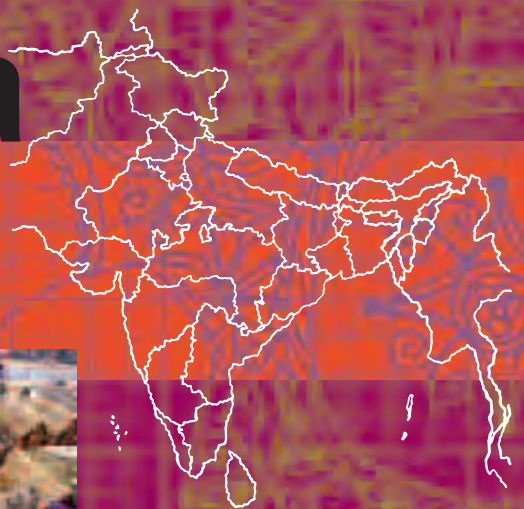


# Socio-economic scenarios for climate change impacts in **India**



Socio-economic factors such as population growth, economic development and technological change will alter the impacts of climate change. Climate impact modelling therefore requires the inclusion of socio-economic scenarios that are consistent with climate change scenarios. Four socio-economic scenarios were developed for India, in line with IPCC guidance, for use with the climate scenarios (see Keysheet 2) and for input to the modelling of climate impacts on different sectors (see Keysheets 4 to 9).

# Developing socio-economic scenarios for climate change impact assessment

Greenhouse gases contribute to climate change and are important inputs to climate change models. Socio-economic factors such as population, growth, economic development, and technological changes will alter the impacts of and adaptation to climate change. Because India has one of the world's largest populations, and is experiencing rapid changes and pressures, it is essential for policymakers to understand socio-economic factors and scenarios for the next century, and how these might affect climate change impacts and related adaptation strategies.

The Energy and Resources Institute (TERI) undertook a study to assess the potential socio-economic scenarios for India that will affect climate change outcomes, for use with the climate change scenarios (see Keysheet 2) and the individual topical studies (see Keysheets 4 to 9).

## The Energy and Resources Institute

The Energy and Resources Institute (TERI) is an independent, not-for-profit research institute in India focusing on scientific and policy research in energy, environment, and sustainable development. It develops and promotes technologies, policies and institutions for the sustainable use of natural resources, large scale adoption of renewables, and reduction of all forms of waste. <http://www.teriin.org>

## Description of methodology

For the purpose of developing socioeconomic scenarios for assessing climate change impacts in India, TERI undertook two related assessments:

- Development of four broad socio-economic scenarios for India in line with national plans for development, and associated projections for population and economic growth.
- Assessment of growth indicators specific to each of the six topical studies undertaken as a part of this research programme.

The socio-economic scenarios for India are consistent with national growth plans in the short and medium term. TERI used data on population density (national, state, coastal districts), urbanisation, and national and sectoral GDP as the basis for these scenarios.

These scenarios were developed within the overall context of the long-term socio-economic scenarios developed by the Intergovernmental Panel on Climate Change (IPCC), to ensure that they are consistent with international guidance. The IPCC developed four narrative storylines (named A1, A2, B1 and B2) in order to provide consistent descriptions of the relationships between emission driving forces and their evolution, and to add context for scenario quantification. Each storyline represents a different direction for demographic, social, economic, technological, and environmental developments, demonstrating the range of possible developments likely to occur over the next hundred years.

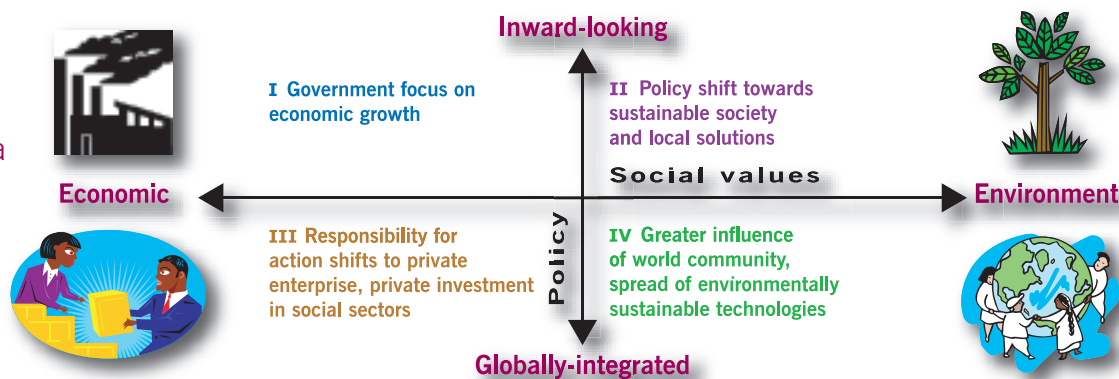
## Socio-economic scenarios for India

The socio-economic framework is based on two dimensions of policy direction and social values, whereby policy orientation can be either inward looking or globally integrated, and where social values focus on either economic growth or environmental consciousness (see Figure 3.1).

The alternative directions along the policy axis correspond to India's level of integration on global policy issues and frameworks for supporting development. Quadrants I and II reflect a more inward-looking approach to global policies and treaties, coupled with command and control-style policies for regulation at a domestic level. Quadrants III and IV reflect stronger integration with the global community, and a shift towards market-based mechanisms as a basis for regulation and economic growth. The social values axis reflects the range of possibilities from a pure focus on economic growth, to emphasis on environmental and social protection. Quadrants I and III correspond to activities that promote economic and industrial development, along with stronger participation by the private sector in traditionally public-sector activities. Quadrants II and IV, by contrast, reflect social values that place a higher concern for social and environmental issues above economic growth.



Figure 3.1  
Framework for  
visions of  
socio-economic  
change for India



TERI estimated population and economic growth under these four scenarios for input into the models developed as a part of this research programme. The findings are contained in the following tables.

Population Projections (millions)

	Scenario I	Scenario II	Scenario III	Scenario IV
1990s	846	846	846	846
2020s	1,354	1,012	1,291	1,228
2050s	1,888	1,646	1,572	1,298

GDP Projections (Rs Crore)

	Scenario I	Scenario II	Scenario III	Scenario IV
1990s	886933	886933	886933	886933
2020s	5094093	3833274	8924904	5866501
2050s	14298068	9304363	33426607	19027395

One crore is 10000000 rupees. One lakh is 100000 rupees.

## Inputs to topical studies

The socio-economic scenarios are built upon the broad themes of changes in population and economic development. In addition to these scenarios, TERI also assessed inputs for each of the six topical studies (sea level, water, agriculture, forests, industry, and health), including demand for foodgrain, water, electricity, and wood products.

Foodgrain demand was estimated by taking into account both human and livestock consumption, and assumes a constant area under cultivation. Associated assumptions of foodgrain imports vary, reflecting different policies (inward or globally integrated).

Projections of Foodgrain Demand

	Scenario I	Scenario II	Scenario III	Scenario IV
<b>Demand for foodgrains (million tonnes)</b>				
1990s	176	176	176	176
2020s	295	220	304	267
2050s	450	392	449	309
<b>Required foodgrain productivity (tonnes/hectare)</b>				
1990s	1.7	1.7	1.7	1.7
2020s	2.3	1.7	2.4	2.0
2050s	3.5	3.0	3.5	2.2

Water demand was calculated using data on projected growth in population, as well as development in industry and agricultural sectors. Total demand for water, as well as demand by sector (agriculture, industry, residential) and river basin, were considered.

Projected Total Demand for Water (billion cubic meters)

	Scenario I	Scenario II	Scenario III	Scenario IV
1990s	629	629	629	629
2020s	2,609	2,444	3,421	2,258
2050s	3,682	3,576	4,341	4,846

Electricity demand is driven by population growth (especially in urban areas) and economic growth. Electricity consumption has been estimated based on per capita power consumption trends in developing countries.

Demand for Electricity by Urban Households (million tonnes of oil equivalent)

	Scenario I	Scenario II	Scenario III	Scenario IV
1990s	3.9	3.9	3.9	3.9
2020s	23.4	17.6	33.8	22.5
2050s	69.4	49.0	69.6	53.3

Wood demand is measured by demand for industrial roundwood (estimated using production trends, and change in GDP by scenario) and firewood (estimated for rural households on the basis of rural population growth; rural-urban population shifts; change in per capita consumption of different biofuels by rural households over time; and shifts towards kerosene away from biofuels by rural households).

Demand for Wood

	Scenario I	Scenario II	Scenario III	Scenario IV
<b>Demand for industrial roundwood (million cubic metres)</b>				
1990s	26.8	26.8	26.8	26.8
2020s	33.4	31.4	39.3	34.6
2050s	36.5	33.7	44.9	38.6
<b>Demand for fire wood (million tonnes)</b>				
1990s	122.2	122.2	122.2	122.2
2020s	203.5	152.0	200.5	199.9
2050s	270.0	235.5	247.3	222.8

## Needs for further research

The socio-economic models relied on existing literature and research at a broad level to assess changes in demography, economy, governance, and technological development. Further areas of research are required to:

- Understand the impacts at a community level (involving vulnerable communities in the scenario building); and
- Identify potential adaptation strategies to address the impacts of climate change.

# Socio-economic scenarios for climate change impacts in India

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- SOCIO-ECONOMIC SCENARIOS
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