Growth to feel heat

- What a 1°C rise means

G.S. Mudur

New Delhi, Oct. 22: A single-degree rise in average temperature over India could reduce the country's per capita growth by about 1 per cent, environmental scientists said today after a global study of the economic fallout of climate change was published.

The study by researchers at Stanford University and the University of California, Berkeley, has shown that India is among countries likely to be adversely affected as existing income disparities widen between rich and poor nations in a warming world.

Their analysis, published today in the scientific journal *Nature*, suggests that economic productivity - the efficiency with which societies transform human resources, capital, energy and natural resources into goods or services - peaks, or is highest, at an annual average temperature of about 13°C and declines strongly at higher temperatures.

Rising temperatures could thus impact virtually all countries but hit tropical countries much harder than temperate zone countries.

"Because India is already fairly warm, it could be substantially hurt by rising temperatures, and hurt even more than countries in temperate regions," Marshall Burke, an assistant professor at the centre for food security and environment at Stanford University who led the study, told **The Telegraph**.

"We find that an extra 1°C of warming in a given year will reduce per capita growth by about one percentage point in that year - this is a big effect," said Burke. "So a country growing at three per cent per year would instead be growing at two per cent per year."

The study's results come at a time scientists and government officials from over 190 countries are negotiating a draft international climate pact to be finalised in Paris in December this year to prevent the global average temperature from rising beyond 2°C.

More than 150 countries, including India, have submitted their climate action plans to the UN, pledging to curb their Earth-warming greenhouse gas emissions through actions such as expanding renewable energy, increasing energy efficiency and adding forest land.

"The available pledges have made progress in closing the gap, but they aren't enough to prevent temperatures from rising beyond 2°C," Taryn Fransen, project director with the Open Climate Network, a climate change policy tracking coalition in the US, told **The Telegraph**.

Fransen said the plans pledged thus far are likely to lead to a global warming between 2.7°C to 3.5°C by the year 2100, against the projected 4.5°C in a "business-as-usual" scenario with no substantial action to curb emissions.

Burke and his colleagues studied temperature and economic records from 166 countries over a 50-year period from 1960 to 2010, and analysed how the economic output changed in the years that were unusually cool or warm.

The study reveals a non-linear relationship between temperature and economy - productivity increases to peak at 13°C and then declines as temperatures rise beyond that.

The scientists say this will have implications even for rich nations. "Everybody knows that when they're hot, it is really challenging to focus, work, and be productive," Edward Miguel, a team member at the University of California, Berkeley, said in a media release. "When a few hundred million people are feeling that way, it's the same thing a few times hundred million. The whole economy is likely to slow down."

While several previous studies have hinted at adverse impacts of rising temperatures on crop yields, labour productivity, water resources and human health, the new study examined the link between temperatures and economic growth at a "macro level".

"Our macro-level results lined up nicely with micro-level studies," Solomon Hsiang, an associate professor of public policy at the University of California, Berkeley, and a co-leader of the study, said in a media release.

Five years ago, Hsiang had contended that national economic output should reflect changes in workers' productivity - higher temperatures should mean less productivity. The new study establishes this relationship across a global level.

But their analysis forecasts differences in the economic fallout between countries. Tropical countries exhibit greater responses mainly because they are hotter, not because they are poorer, the scientists said.

Under unmitigated climate change leading to 4°C warming by 2100, India would be 92 per cent poorer than it would have been had climate change not occurred, and China 42 per cent poorer, while the US would be 36 per cent poorer.

However, Russia will be 417 per cent richer and Canada 247 per cent richer as warming is likely to increase their productivity.

More stories in Front Page

- VK says 'dog', rivals see Ravan
- 'Small incidents' and big goal