

Climate change in the Indian perspective and its societal impacts*

Various symposia/plenary sessions/panel discussions/popular plenary lectures, and sectional activities spreading over 14 different sections were organized as part of the 102nd Indian Science Congress (ISC).

In the special session on climate change, three invited lectures were delivered – S. Rajan (National Centre for Antarctic and Ocean Research, Goa) spoke on whether the polar regions influence the Indian monsoon. Dhruv Sen Singh (Centre for Advanced Study in Geology, University of Lucknow) spoke on the impact of climate change on glaciers and rivers and its consequences on society. Rajesh Agnihotri (National Physical Laboratory, New Delhi) gave an overview of Indian monsoonal rainfall variability during a global warming era.

Climate and environmental changes certainly affect society, but they have been changing since long and will continue to change in the future also. The issue of climate change has drawn much attention in recent times, especially owing to the realization that the ongoing modernization/industrialization is emitting greenhouse gases into the atmosphere in an unprecedented rate. There is concern that broad-scale industrialization, burning of fossil fuel and biomass burning, deforestation and other developmental activities worldwide might pose a threat to the critical balance that determines 'safe' climatic state of the earth¹. The onus is especially on rapidly developing economies such as China and India, to adapt and mitigate their activities sooner than later. To accomplish this, it is important to recognize the natural climate variability components as it is most likely that anthropogenic influences might exacerbate the former. Future climate change scenarios must be based on better climate models having inputs from

regional expression of climatic changes that have occurred in the past.

The invited talks in the ISC brought out significant advancements in the climate changes occurring in different domains of the earth system. For instance, polar regions could be good repositories of high-resolution climate changes. Rajan brought out the importance of unravelling climatic history from both the polar regions (Antarctica and Arctic). In addition, he mentioned that the polar regions are capable of modulating natural/anthropogenic forcing factors and hence cannot be overlooked. Singh talked about the impact of climate change on the Gangotri glacier and rivers of the Ganga Plain. He mentioned that climate change and global warming are among the greatest environmental, social and economical threats on earth, which is evident from widespread melting of snow, ice, glaciers and rising mean sea level. Most of the warming that has occurred over the last 50 years is considered to be anthropogenic. Therefore, it is important to evaluate the anthropogenic/natural impact as a causative factor of climate change.

Gangotri glacier located in Kumaun and Garhwal Himalaya, is one of the most rapidly retreating glaciers of the world. The pattern of retreat of the Gangotri glacier since 1935, indicates that the rate of retreat is continuously decreasing. It has been suggested that there are many reasons and factors which control the evolution of this glaciated region^{2,3}. Further, all the rivers of the Ganga Plain are characterized by wide valley and narrow channel. The wide valley beyond the channel and the flood plain of the rivers are being used as settlements. The people settled within river valleys are affected by floods during high discharge period and by lateral erosion during low discharge period^{4,5}. Even the Kedarnath tragedy became catastrophic due to the large/settlements within the valley of the river, leaving no space to accommodate the rising/flash flood water⁶⁻⁸. Apart from the social, political and economic losses, these natural calamities also change the landforms and landscape.

Agnihotri mentioned that March to May temperatures (pre-monsoon period) have shown a significant increase after

1990s. He then reviewed monsoonal rainfall changes at regional level in an attempt to understand the influence of global warming on regional precipitation patterns. Major outcomes of his presentation include: (i) monsoon rainfall in India shows a tendency to be above normal in May and June, and below normal in July and August; (ii) three subdivisions, viz. Jharkhand, Chhattisgarh and Kerala show decreasing trend in summer monsoon rainfall (JJAS), while eight subdivisions, viz. Gangetic West Bengal, Western Uttar Pradesh, Jammu and Kashmir, Konkan and Goa, Madhya Maharashtra, Rayalaseema, coastal Andhra Pradesh (Seemandhra) and north interior Karnataka experience enhanced rainfall/increasing trends⁹, and (iii) the hilly state of Uttarakhand is witnessing a decrease in net summer monsoon rainfall (JJAS) since 1960s, but an increasing tendency now in the early monsoon (May and June) precipitation.

All the lectures were well received by scientists/researchers/media personnel, as evident from the interactive discussions held after the technical sessions.

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