

GOVERNMENT OF INDIA
MINISTRY OF EARTH SCIENCES
LOK SABHA
UNSTARRED QUESTION NO. 1823
TO BE ANSWERED ON WEDNESDAY, 13TH DECEMBER, 2023

ALARMING INCREASE IN AEROSOL LEVELS

1823. SHRI SANJAY SADASHIVRAO MANDLIK:
SHRI PRATAPRAO JADHAV:
SHRI SUDHEER GUPTA:
SHRI DHAIRYASHEEL SAMBAJIRAO MANE:
SHRI SHRIRANG APPA BARNE:

Will the Minister of EARTH SCIENCES be pleased to state:

- (a) whether as per the study conducted by Indian Space Research Organization's (ISRO) Physical Research Laboratory, Hindu Kush-Himalaya-Tibetan Plateau region has been witnessing an alarming increase in aerosol levels leading to increased temperatures, altering rainfall patterns accelerating glacier retreat, etc.;
- (b) if so, the details thereof and the reasons for the same;
- (c) whether the study also shows that aerosols alone account for over 50 per cent of the total warming;
- (d) if so, the details thereof and the corrective measures taken by the Government to reduce flow of aerosols in the environment;
- (e) whether Hindu Kush-Himalaya-Tibetan Plateau region having largest ice mass outside Antarctica are melting fast; and
- (f) if so, the corrective measures taken/being taken by the Government to prevent the melting of ice mass in the said region?

ANSWER

THE MINISTER OF EARTH SCIENCES
(SHRI KIREN RIJU)

- (a) Yes Sir.
- (b) The study by the Indian Space Research Organization's (ISRO) Physical Research Laboratory using the ground-based observations of aerosol characteristics including radiative forcing data suggests that aerosol levels have increased specifically over the Indo-Gangetic Plain (IGP) and the Himalayan foothills and have implication which may lead to increased temperatures, altered rainfall patterns and accelerated melting of glacier ice and snow. The said study reports that the aerosol radiative forcing efficiency (ARFE) in the atmosphere is clearly high over the IGP and the Himalayan foothills (80–135 Wm^{-2} per unit aerosol optical depth (AOD)), with values being greater at higher elevations. The aerosol-induced atmospheric warming and deposition of light-absorbing carbonaceous aerosols on snow and ice are reported to be the primary reasons for the current and future accelerated glacier and snow melt.

- (c) Yes Sir. It has been reported that the BC aerosol dominates ($\geq 75\%$) the aerosol absorption over the Indo-Gangetic Plain including the Himalayas throughout the year and aerosols alone account for $>50\%$ of the total warming of lower atmosphere.
- (d) India represents a unique case for aerosol loading, properties and their effects. Varying aerosol sources get activated at different spatial and temporal scales. This changing nature of aerosols temporally and spatially when coupled with different land use nature across India, produces a very complex aerosol radiation-cloud-precipitation-climate interaction. Over the years several institutes, universities and organizations in India have conducted active research under various government initiatives towards characterizing aerosol properties and their effects over the Indian region.
- (e) Yes Sir. The Hindu Kush-Himalaya-Tibetan Plateau region consists of the largest ice mass outside the Polar regions. Several Indian institutes/universities/organizations funded by the Government of India through Ministry of Earth Sciences (MoES), Department of Science & Technology (DST), Ministry of Environment Forest and Climate Change (MoEF&CC), Department of Space (DoS), Ministry of Mines (MoM) and Ministry of Jal Shakti (MoJS) monitor Himalayan glaciers for various scientific studies including glacier melting and have reported accelerated heterogeneous mass loss in Himalayan glaciers. The mean retreat rate of Hindu Kush Himalayan glaciers is 14.9 ± 15.1 meter/annum (m/a); which varies from 12.7 ± 13.2 m/a in Indus, 15.5 ± 14.4 m/a in Ganga and 20.2 ± 19.7 m/a in Brahmaputra River basins. However, glaciers in the Karakoram region have shown comparatively minor length change (-1.37 ± 22.8 m/a), indicating the stable conditions.
- (f) The melting of glaciers is mostly a natural. The recession or melting of glaciers is also caused by global warming and climate change. Therefore, the rate of melting of glacier can't be prevented or slowed down, unless all the factors responsible for the global warming and climate change can be controlled.
