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A conference highlighting “Italian science and cooperation at the shadow of K-2”, took place in Islamabad this September. Organised by the Italian supported Ev-K2-CNR and SEED (Social Economic Environment Development) Project, it focused on “Karakoram resources and climate change: glacier, water and ecosystem”. The goal was to present the latest findings by Italian and Pakistani scientists (along with other European scientists working in the area) on the fragile state of the Karakoram mountains’ ecosystem. Regarded as the water towers of the country, the Karakorams are climatically, geologically and ecologically sensitive and are significantly affected by climate change.

What are the main threats to the Karakorams? Firstly you have black carbon (emitted from traditional cooking stoves and diesel engines) and ozone (which is the third most powerful greenhouse gas that makes up urban smog) concocting what is called Atmospheric Brown Clouds or ABCs. These are often visible as the brownish haze seen during dry seasons, especially in the winter months. ABCs end up affecting regional climate change, impacting the hydrological cycle and causing glacial melting in addition to their adverse effects on human health (from inhaling large amounts of air pollutants). According to scientist P. Christofanelli from the Institute of Atmospheric Sciences and Climate in Italy, who conducted

studies in air pollution in the Karakoram recently, “air pollution levels in the Karakoram are lower than in the plains, but transport along the valleys can have an impact on the environment (from black carbon emissions)”.

The other main threat to the Karakoram is from the steady increase in global temperatures, and Ghulam Rasool from the Pakistan Meteorological Department noted that the warmest 18 years in recorded history have occurred in recent years. In the high mountains due to the increase in temperature the snow line is going higher. “In the past they would get lots of snow in the lower altitudes between 2,000 and 3,000 metres, but not anymore ... there is also now a heat wave frequency over the Northern Areas.” In recent years, temperatures in Gilgit have touched 40 degrees Celsius and heat waves have persisted for almost five days. The snow cover has also shifted — instead of January there is more snow in February. “There is now a sharp rise in February snow cover and there is not enough time to convert the snow into ice on the glaciers.” There has also been a shift in monsoon patterns — they are getting stronger and reaching higher altitudes.

Climate change is also impacting the agricultural production of Gilgit-Baltistan where less than 25 per cent of the land is arable. There is also more land-sliding, soil erosion and flooding due to increased rains and lots of pest attacks due to warmer temperatures. Apples, pomegranates and grapes are susceptible to these pest attacks, according to researcher M. Hussain from the Karakoram International University in Gilgit.

The high mountains of Pakistan are responsible for much of the water flows that go into the Indus River, Pakistan’s lifeline; hence it is very important to know how climate change will affect these water flows. There are 11,413 glaciers located in the Upper Indus Basin, with the largest glacier around 1,000 sq km in size. For a few years now, the Karakoram were thought to have been stable, with the slight advancing of glaciers (attributed to increasing winter precipitation).

Scientist D. Bocchiola, from the Politecnico di Milano in Italy, installed hydrometric stations on the Shigar River (which feeds into the Indus) to study the discharge of water near the Karakoram glacier zone. By comparing flow levels and other information, he developed hydrological modeling. Using the Intergovernmental Panel on Climate Change (IPCC)

prediction of a warming of five degrees Celsius by the end of the century (if carbon emissions are not cut significantly), he found that in the Shigar River there would be “increasing discharge ... while the ice volume will decrease drastically. After the first 50 years there would be slight decrease but towards the end there would be consistent decrease in water in the river”. So there would be more water for a number of decades but also an increase in extreme events like floods.

But need we worry if our glaciers are stable or even growing due to the “Karakoram anomaly”? According to the German Professor Winiger who has worked on Pakistani glaciers for several years now, the answer is not that simplistic. “You have to go down to the local level. Each glacier is an individual, each valley is different and we have to understand them”.

Glaciologist C. Mayer from the Bavarian Academy of Sciences and Humanities in Germany who has been studying the large Karakoram glaciers for several years now, noted that the increase in glaciers in the Karakorams is mainly due to surging activities (redistribution from higher parts to lower parts). “The glaciers in the Karakorams are more stable than in other areas, but the glacier changes are due to glacier dynamics. Do not look at area changes, you have to look at elevation changes”. He further clarified that “the Baltoro glacier is only there because of the debris cover. The debris cover increases close to the snout, hence there is no ablation (melting) — you won’t see a climate signal. Ablation occurs higher up where there is no debris cover and goes down to zero near the snout where there is debris cover. Most glaciers are debris covered in the Karakorams. One has to be careful when looking at the signals”. Mass balance measurements are needed to understand what is really happening to the glaciers of the Karakorams, but in his view, “the future of large glaciers is still negative”.
