**Climate Change and Space Technology**

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Pakistan is facing grave consequences of climate change in form of glaciers melting, floods, droughts, unprecedented rains, heat waves, and smog. According to the 2022 report of the UN body Intergovernmental Panel on Climate Change (IPCC), “Pakistan would face greater consequences of climate change in the coming decades in rural and urban areas. It further predicts “more locusts attack due to more conducive temperature and increased rains in deserts.”

The report also mentioned that Pakistan lost two per cent of agriculture production in the fiscal year 2019-20.

Such predictions about the threats of climate change and environmental issues for Pakistan will have more negative impacts on the already struggling socio-economic development of the country. It requires smart minds with smart technological solutions to deal with this emergency. One innovative area which needs attention for its utilization in fighting the menace of climate change in Pakistan is space technology. The application of space technology is being emphasized all over the world to solve many problems. The use of space technology to mitigate and adapt to climate change can be a useful tool. According to the European Space Agency “Space technologies have led to several inventions that benefit the environment and save energy. Satellite-based systems are reducing vehicles’ carbon dioxide emissions, remote-sensing technology is making wind turbines more efficient, and information from weather satellites is helping solar cells to produce more energy.”

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The use of space technology in Pakistan can be fruitful in many ways. First of all, metrological satellites are early warning systems and can predict extreme weather conditions like unprecedented rains, droughts, and floods. Effective, timely reporting and countering measures can reduce the impacts of catastrophes caused by climate change. These early warning systems are being used by the Metrological Department of Pakistan but sometimes delayed actions result in big catastrophes. In case of floods, satellite images can help to keep a check on damages and help rescue missions to strategise their relief operations by targeting the most effective areas. It can be used to evaluate financial losses in form of infrastructure damages like hospitals, schools and homes. The evidence-based reports through these images will also help to estimate the kind and number of relief packages required like food, medicines, and shelters. The world is relying on satellites to monitor climatic changes in the Arctic and Antarctic regions, especially glacier melting. Such advanced technology can be utilized to supervise such changes in our northern areas which are home to the highest mountain ranges in the world. The technique of geo sensing can be helpful to estimate the forest cover in the country. It can also keep a check on the progress of forestation projects by providing details about the area forested and the growth of trees. It will also help in the timely reporting of timbre mafias in case of illegal tree cutting and make them accountable. Smog is another phenomenon faced by the residents of Lahore city, creating health issues and disrupting everyday routine. One of the reasons behind smog is the burning of crops which is usually banned now before the arrival of winter. The satellites can also keep a check and provide proof against farmers who violate the laws and burn crops. The use of space technology can also help to decrease fuel consumption which results in less carbon emission. The abrupt use of brakes and using accelerators repeatedly increases fuel consumption. The Global Positioning System (GPS) guides the drivers about the economical driving style by giving information about the traffic and road disruptions.

There are several suggestions to effectively utilize space technology to mitigate and adapt to climate change impacts in Pakistan. First of all, we need to introduce these topics and subjects in our education institutions teaching climate change/environmental sciences and space technology. The government and private sector should create job opportunities in specialized areas like the use of space technology in climate change. To meet demand and supply, and reduce unemployment, we need to provide counselling to the youth of Pakistan to choose innovative areas in higher studies especially the use of space technology in climate change issues. The Higher Education Commission must collaborate with other countries leading in research to apply space technology in the fight against climate change to provide a scholarship in this particular area. Such scholarship opportunities should be shared on regular basis directly and timely with faculty of environmental/ climate change departments, and institutions teaching space technology, and also on digital media platforms of the Higher Education Commission. We need to arrange more workshops and seminars with international experts on this topic to keep ourselves updated with new research, inventions, and developments in this area.

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