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Outer Space and Climate Change: India's Leading Role in Fostering Sustainable Development across the World

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Synopsis

On the 3rd of June 2016, for the first time, under the impetus of the Indian Space Research Organisation (ISRO) and the French Space Agency (CNES), space agencies of more than 60 countries agreed to engage their satellites, to coordinate their methods and their data to monitor climate change. In general terms, everybody agrees that the climate across the world is changing. The consensus is both scientific as also ordinary. Ordinary indications abound in rising temperatures, unseasonal rains, floods, drought etc and all of the above is supported by strong scientific evidence that the global climate is changing and that human activity is contributing significantly to this trend. Amongst the prime repositories of scientific evidence lie space-based technologies and space-derived information that play a key role in climate knowledge, science, monitoring and early warning. Space-based information contributes to assessment of climate change and also helps monitor the effectiveness of adaptation strategies apart from monitoring climate change. Satellite observation coverages are inherently global and they provide a vital and important means of bringing observations of the climate system together for a global perspective.

As in case of satellite coverage and space capabilities in general that are transborder and inherently international in character, climate is also likewise in character. For instance, polar earth observation satellites in low earth orbit typically have orbital passes over every point on earth, communication and meteorological satellites in the Geostationary Earth Orbit typically cover one-third of the area below them etc. With regards to climate, Greenhouse gas emissions have the same impact on the atmosphere whether they originate in New Delhi, Tokyo, Washington, London or Beijing. Consequently, action by one country to reduce

emissions will do little to slow global warming unless other countries act as well. Border limitations do not apply and climate change is a global challenge that demands a coordinated international response. Ultimately, an effective strategy would demand international commitments, action and also resources that are inherently international in character. Hence, space based capabilities that are inherently global in character are well suited to tackle the global problem of climate change and India's action in introducing outer space as an effective response option is both extraordinarily sagacious and practical. While the rest of the world's leading space faring nations tend to be focussed on Anti-Satellite tests, the militarisation and weaponisation of space etc, India has shown the way to effective peaceful utilisation of space. As a matter of fact, by bringing together nations for responding to the common threat of climate change that has manifold security implications ranging from water and food security to conflicts and wars over resources, it has given new life to the principles of peaceful use of outer space and international cooperation that otherwise are embroiled in legal semantics and definitional issues.

Outer Space and Environmental Negotiations

A brief overview of international climate change negotiations indicates an international recognition of the need for an international response since the 1992 Earth Summit in Rio de Janerio that led to the signing of the United Nations Framework Convention on Climate Change (UNFCCC). The Convention established a long-term objective of stabilizing greenhouse gas concentrations in the atmosphere "*at a level that would prevent dangerous anthropogenic interference with the climate system*". It also set a voluntary goal of reducing emissions from developed countries to 1990 levels by 2000 - a goal that most countries did not meet. Currently 191 parties, including the US, have ratified the UNFCCC. This was followed by the 1997 Kyoto Protocol, which sets binding targets to reduce emissions 5.2 percent below 1990 levels by 2012. The Protocol entered into force on February 16, 2005, which made the Protocol's emissions targets binding legal commitments for those industrialized countries that ratified it. A variety of countries, including the US did not ratify the Kyoto protocol. Many more rounds of talks have followed since referred to as the Conference of Parties (COP) with the latest round being the COP-21 round in Paris. Overall, environmental negotiations have been complex, elaborate and time consuming with no outstanding record of arriving at comprehensive agreements or consensus. The deliberations in most cases have been vexed with a variety of interest groups, sub-interest groups etc clashing over an equally myriad variety of issues[1].

It was during COP-21 that the significant role played by space capabilities in climate change became dramatically apparent to the

parties involved. During the conference, the German Aerospace Center (DLR) Earth Observation Center (EOC) revealed that the ozone hole over Antarctica has increased by 2.5 million square km than what it was at the same time in 2014[2]. DLR researchers used earth-observation satellites to determine that the ozone hole over Antarctica currently extends more than 26 million square km — an area larger than the North American continent. The above was amongst the prime drivers that led to space agencies around the world to agree to share each other's satellite findings to monitor climate change, particularly greenhouse gas emissions. As mentioned earlier, satellites play a vital role in the discovery of climate change and in monitoring whether mitigation and adaptation measures are being followed by countries. As a matter of fact, out of the 50 important climate factors, 26 can only be monitored from space. These include sea level rise and atmospheric greenhouse gas accumulations. Thus, putting into action the Paris climate conference plans heavily depends on being able to monitor whether countries are meeting their pledges or not. To do this, space based earth observation and data is indispensable. Experts need to look at satellite data for correct inferences and decisions.

India, Climate Change and Outer Space

Climate change threatens to have a catastrophic impact on ecosystems and the future prosperity, security and well-being of all humankind. The potential consequences extend to virtually all aspects of sustainable development – from food, energy and water security to broader economic and political stability. Global observing systems, particularly space based systems play an important role in gauging these threats, in monitoring the Earth's climate system and support decision-making about climate change adaptation, prediction and mitigation, including addressing the needs identified under the United Nations Framework Convention on Climate Change. Satellites contribute to the monitoring of greenhouse gases related to deforestation and industrial processes, the changing of ice in polar caps and glaciers, sea-level rise, temperature changes, as well as several essential climate variables. Space technology is also crucial for the continued observations and long-term monitoring of the Sun's effects on Earth's environment and climate, for aiding climate change modelling, or for the observation of the change in the ozone layer and its effects on the environment and human health, to mention a few.

In pursuance of the above need, on April 3, space agencies from across the world decided to build an independent international system that will centralize the data received by satellites. This agreement, called the New Delhi Declaration, was formally implemented on May 16 and on June 3, space agencies from over 60 nations with Indian Space Research Organisation (ISRO) and the French Space Agency (CNES) as

catalysts agreed to interconnect their satellites and integrate their techniques and information to oversee greenhouse gases produced by human activity. Amongst these 60 nations, leading space faring agencies like the National Aeronautics and Space Administration (NASA) from the U.S. and the Japan Aerospace eXploration Agency (JAXA) are also included. The objective is to synchronize the satellite information so they can be put together and be studied for comparison over time. The network of satellites will be used to generate large volumes of "big space data," which will be studied over time.

It is in the above context that one needs to take cognisance of the sterling role played by India in the above affair. The New Delhi Declaration that officially came into effect Monday 16 May translates the intent of the world's space agencies to support the Paris Agreement reached at the COP21 climate conference. This declaration is a first, having achieved consensus across the global space community. More than 60 nations have signed up to work together to establish an international, independent system for estimating and curbing global greenhouse gas emissions based on accepted data. The New Delhi Declaration calls for evolving space-based operational tools combining in-situ measurements and increased computing resources. To this end, space agencies will need to develop new technologies and encourage their research community to contribute actively with new models. Success will depend above all on cooperation to cross-calibrate instruments and validate their measurements. Certain satellites are already paving the way like GOSAT for JAXA and OCO-2 for NASA, and in the near future TANSAT for China, the Copernicus programme's Sentinel series and of course MERLIN for CNES and DLR, and MicroCarb for CNES[3]. The declaration serves to break the impasse in environmental negotiations and shows the path to breaking the impasse in the United Nations Committee on Peaceful Uses of Outer Space (UNCOPUOS) that has been dead-locked since 1998. All-in-all, the endeavour is extraordinarily significant in that it addresses a common threat to security in a manner that is benevolent and yet effective. The incentive to cooperate far exceeds that of any reason to not cooperate. The statement of the ISRO Chairman, A.S. Kiran Kumar sums it "*It is overwhelming to see the unilateral support of all space agencies to use space inputs for monitoring climate change*"[4]. The support is forthcoming since the threat is common and no national sensitivities are provoked and also since the action is downright benevolent in character. The concept of combat in the modern sense is no longer restricted to the narrow confines of military conflict nor is the concept of security. Both have evolved and are more complex and vast than ever before. Combatting climate change is a global endeavour and it augurs well that India is open to challenges beyond its sovereign territory and even better that it is no longer

hesitant to take the lead. The world believes that "*the Delhi Declaration is a first, having achieved consensus across the global space community*", it would do well for the nation to continue to be a catalyst to change and expand beyond the space community to the world at large. After all, India is the birth place of the philosophy of "*Vasudhaiva Kutumbakam*" that believes all humanity is but one family.

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])

Notes

[1] For a detailed overview of environmental negotiations, see www.pon.harvard.edu/shop/papers-on-international-**environmental-negotiation**-series accessed on 07 Jun 2016.

[2] ESA, CEOS, "The Earth Observation Handbook" at http://www.eohandbook.com/cop21/capabilities/earth_observation_plans_atmosphere.html accessed on 07 Jun 2016.

[3] Press release of CNES, "New Delhi Declaration comes into effect", at https://presse.cnes.fr/en/new-delhi-declaration-comes-effect-worlds-space-agencies-working-tackle-climate-change accessed on 06 Jun 2016.

[4] ISRO, "World's Space Agencies unite to face climate change", 03 Jun 2016 at http://www.isro.gov.in/update/03-jun-2016/world%E2%80%99s-space-agencies-unite-to-face-climate-challenge accessed on 05 Jun 2016.