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Space Technology for Humanitarian Assistance and Disaster Relief in ASEAN

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SYNOPSIS

Space technology plays a crucial role in disaster management for the world's most disaster-exposed region. While ASEAN countries with capabilities in space technology focus on their national endeavours and goals, climate-induced disasters continue to pose a significant transboundary threat. Given this, nations in ASEAN with access to space technology should consider coordinating the use of these resources, especially for the benefit of humanitarian assistance and disaster relief (HADR) in a region where disaster risk is outpacing resilience.

COMMENTARY

In Southeast Asia, climate-induced disasters pose recurring threats to humanitarian needs and vulnerabilities. Notably, the World Risk Report 2023 showed that four out of the top 15 countries with the highest disaster risk are situated in this region. Moreover, disaster risks such as extreme weather events are projected to continue to be significantly impactful in the next 2-year and 10-year periods according to the Global Risks Report 2024.

Climate-induced disasters such as droughts, floods, and tropical cyclones are increasingly devastating, resulting in transboundary impacts in the region. Such impacts present challenges that highlight the importance of collaboration and cooperation. A report by the ASEAN Secretariat underscores this need, employing a methodology that integrates probability models and satellite imagery to assess transboundary risks and plan scenarios accordingly.

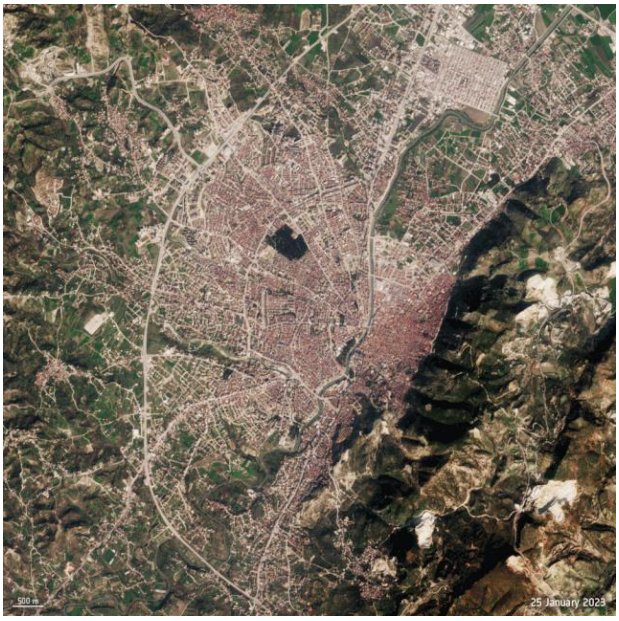
Other forms of space technology, such as earth observation, location services, and satellite-enabled communications, have also been instrumental in HADR efforts responding to such climate-induced disasters. Earth observation data is used to aid rapid damage assessment and inform forecast models to mitigate future disasters. Location services from the Global Positioning System (GPS) is vital in search and rescue operations. Satellite-enabled communications provide essential connectivity in disaster-affected areas as well. These tools not only identify the threat from transboundary and climate-induced disaster risks but also underscore the value of space technology in addressing these challenges.

These opportunities presented by space technology have enhanced coordination and response efforts, showing that such technology has the potential to bridge existing gaps and foster more concerted actions towards addressing complex regional problems.

Space Technology for HADR

Space technology can be distinguished into two types. The upstream type deals with research and engineering, manufacturing, and launches, while the downstream type focuses on applying space-derived data and services on Earth. Those critical for HADR, are part of downstream type.

The United Nations Satellite Centre (UNOSAT) utilises satellite data, particularly satellite imagery, through its emergency mapping service, which was activated 63 times in 2023 to support humanitarian efforts. UNOSAT has contributed to situational awareness for events such as the Turkey-Syria earthquake in February 2023 by conducting damage assessments to assess severity and prioritise response efforts, as well as the ongoing situation of the Occupied Palestinian Territory since October by monitoring displaced populations. Satellite imagery has also been frequently used in this manner during other major disasters in the region, including the 2004 Indian Ocean tsunami, the 2011 Tohoku earthquake and tsunami, 2013 Typhoon Haiyan, and the 2015 Nepal earthquake.



Space satellites Copernicus Sentinel-2, launched by the European Space Agency, captured the effects of the devastating earthquake on the Turkish city of Antakya in 2023. Such satellite data was used through emergency mapping services to support humanitarian efforts and contribute to situational awareness for such events. *Image from Wikimedia Commons.*

Space technology also plays a pivotal role in establishing communication links in disaster-affected areas. During the aftermath of Typhoon Haiyan in the Philippines in 2013, millions were left without access to essential communication services. One of the responding organisations, the International Telecommunications Union, deployed emergency satellite telecommunications equipment. The equipment enabled humanitarian organisations and relief workers to establish communication links to coordinate search and rescue, response, and relief efforts while also serving as a lifeline for survivors to reach out to seek assistance and access information.

Potential Risks

While space technology offers numerous benefits for HADR efforts, there are also several risks. First, the utilisation of information from satellites are characterised by a mutual relationship between cost and usefulness. Second, the increasing amount of assets in space and the lack of debris removal mechanisms or traffic coordination frameworks increase collision risks, endangering satellite-based information services. Third, the privacy and security of the vast amounts of data collected must be ensured, especially in sensitive or conflict-affected regions to prevent misuse or unauthorised access. Lastly, there are ethical considerations surrounding the use of space technology for disaster response, including issues related to consent and surveillance.

Management Approaches

The African Space Strategy, Statute of the African Space Agency, and the African Space Policy collectively guide and shape space exploration, utilisation, and governance of the African Union. The space policy details the frameworks and arrangements necessary for the implementation of the strategy and the functioning of the space agency as in the statute. It includes plans of how to address user needs including those related to early warning systems for natural hazards (as in Objective 1); plans to improve the access and cost-effectiveness of space technology through

partnerships (as in Objective 2, 3, and 6); and plans to enhance sustainability in space by managing asset traffic and space debris (as in Objective 5). While not totally explicit, the policy's mention of plans to develop data-sharing protocols (as in Objective 2) in line with international frameworks appear to be geared towards addressing privacy, security, and ethical concerns on the use of space technology.

The EU space policy generally addresses cost management with its emphasis on the value of partnerships and innovation. The policy also acknowledges the value of space technology, particularly space data, in disaster management. Additionally, the policy details plans to approach space traffic management and consequently, space debris, to enhance sustainability of space endeavours and related services. In terms of secure utilisation and ethical considerations, unlike the African model, the EU model is more direct. While it is under the broader sense of security and defence, it manages to touch on concerns of secure utilisation as well as ethical considerations.

The African and European models demonstrate the effectiveness of intraregional as well as inter-agency coordination. As the complexity and cost of space endeavours continue to rise, such collaborative efforts become imperative.

Progress in ASEAN

In Southeast Asia, Indonesia pioneered the enactment of national space legislation in 2013 through the Indonesia Space Act (ISA), followed by the Philippines in 2019 with the Philippine Space Act. The role and value of space technology to the countries' disaster management are articulated in each respective act. Addressing costs are generally but indirectly addressed through mentions of innovation and international cooperation. Liability clauses in both acts indicate the willingness of both countries to contribute to enhancing the sustainability of space operations by being liable for damages caused by the respective space objects of both countries. Lastly, data security appears to be included under the broader umbrella of national security and defence clauses for both. The ISA is more detailed however, on information dissemination and storage matters.

Initial efforts to bring together regional space endeavours are currently focused on oversight of technologies and activities undertaken by the ASEAN Committee on Science, Technology, and Innovation (COSTI), particularly the Sub-Committee on Space Technology and Applications (SCOSA). While SCOSA's priorities (geoinformatics, space technology applications, and small satellite development) acknowledge the region's contributions to the field, particularly in downstream space technology, the limited prospects is a revelation of the region's relatively young space endeavours.

Prospects for the Region

As climate change exacerbates the impacts of disasters in ASEAN and takes into consideration the value of space technology for HADR, the need to coordinate efforts becomes more evident. While progress in legislating the development and use of space technology remains at the national level, drawing from the African and European models could provide insights on the benefits of concerted space endeavours.

Combined with learnings from regional initiatives by Indonesia and the Philippines, a regional cooperative framework could be devised. The framework could provide a platform where resources and operations can be streamlined, issues can be tackled, best practices can be shared, and innovation can be fostered. Such a collaborative approach can address not just immediate and urgent needs from disasters but also lay the groundwork for long-term cooperation and collective action towards the broader regional goal of resilience.

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