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Towards a new Asia-Pacific strategy for using space applications to support the 2030 Agenda for Sustainable Development: an opportunity for the space community to shape a sustainable future

** This document has been issued without formal editing*

A. Introduction

1. In September 2015, member states of the United Nations adopted the 2030 Agenda for Sustainable Development, along with 17 Sustainable Development Goals with 169 targets. This Agenda is a Plan of Action for people, planet and prosperity. The Goals and Targets will stimulate action over the next fifteen years in areas of critical importance for humanity and the planet. This includes ending poverty and hunger, combatting inequalities, building peaceful, just and inclusive societies, protecting human rights, promoting gender equality and the empowerment of women and girls, and ensuring lasting protection of the planet and its natural resources. Included in the Agenda is a pledge to leave no one behind and endeavour to reach the furthest behind, first.

2. With the adoption of the 2030 Agenda for Sustainable Development, along with the Sendai Framework for Disaster Risk Reduction and the Paris Agreement in 2015, a new integrated global development agenda has been set. The next 14 years to 2030 will be crucial for shaping our world for generations to come. It is in this context that an immense opportunity is presented to leaders of the space community to address the collective challenges that remain and ensure the successful implementation of the 2030 Agenda for Sustainable Development.

3. Space applications and their associated tools can provide far-reaching solutions to some of the most pressing issues facing humanity, ranging from health, education, food security, agriculture, and natural resource management to disaster risk reduction and resilience-building. They provide satellite-derived data and images that can support evidence-based approaches for better informed decision-making. Of importance is the application of this information for medium-term development planning and more accurate monitoring and evaluation of development interventions. For example, by fusing space derived data such as water levels in rivers with ground based information such as rainfall, action plans can be developed for more effective management of water supply, and if needed prioritization and early warning on national policy setting agendas.

4. Until recently the application of space technologies for enhancing social and environmental benefits were expensive and inaccessible to most countries in the Asian and Pacific region. These technologies were cutting edge and firmly ensconced in the domain of developed countries, their scientists, policy-making organs, and private sector developers. Over the past several years, we have witnessed progress in access to the information that space technologies generate, as a result of an exponential growth in Earth observation technologies, increasingly free access to satellite-derived information and enhanced information sharing through regional cooperation. A number of regional mechanisms have allowed policymakers, practitioners and scientists of developing countries to benefit from satellite-derived information, notably in disaster risk reduction, without needing a space programme of their own.

5.

6. Space Technologies and their potential application are also growing rapidly, and expected to continue to do so over the next 15 years. Advances in remote sensing that include improved spatial resolution, particularly through the use of UAVs, reduced commercial prices for satellite data, the launch of more satellites with better sensors, all provide more frequent imagery and data, on a larger scale, at a lower cost.

7. Now, leaders in space technology applications, have an opportunity to be an integral part of delivering the 2030 Agenda for Sustainable Development. Sharing satellite-derived data and information and making it available to all will be essential for effective implementation, monitoring and review of the Sustainable Development Goals. Furthermore, in recognition of the unprecedented opportunity to apply space technologies, tools and expertise to benefit all areas of society, a Working Group on Geospatial Information (WGGI), was established to support the work of the Inter-agency and Expert Group on SDG Indicators (IAEG). The WGGI recognizes that broad statistical data, earth observations and other data sources can significantly improve monitoring of SDG implementation progress. Space applications and geospatial information generated at the regional level can therefore play a supportive role in global initiatives

8. The objective of the present document is to generate discussion on the practical applications for space technology for development, and stimulate ideas for a new *Asia-Pacific Plan of Action for Space Applications for Sustainable Development to 2030*. The document identifies key cross-cutting themes and assesses intervention areas in which space applications can strengthen implementation of the 2030 Agenda for Sustainable Development. It proposes potential roles for Asia-Pacific's space community working in an enhanced partnership with the United Nations, notably through ESCAP and the Regional Space Applications Programme for Sustainable Development (RESAP). The discussion on space technology itself is limited to some existing challenges or new opportunities on the application of these technologies, and does not address issues of technology transfer or other similar issues that are clearly already in the commercial arena or of a proprietary nature. It builds on the Progress Report of the 20th Intergovernmental Consultative Committee (ICC) of RESAP, which provides an overview of work undertaken in implementation of the existing *Asia-Pacific Plan of Action for Applications of Space Technology and Geographic Information Systems for Disaster Risk Reduction and Sustainable Development, 2012–2017 (5 Year Plan of Action).*

B. The role of space applications in implementing the 2030 Agenda for Sustainable Development

9. In reviewing to 2030 Agenda, the SDGs including means of implementation to following three potential thematic pillars have been identified with greatest potential for involvement of the space community: – (i) disaster risk reduction and resilience, (ii) environment and natural resources, and (iii) geo-spatial information for infrastructure and services. It is under these three pillars,

the new action plan is focused on strengthening the knowledge and capacity of the member States in order to capitalize on innovations in space applications towards achieving the 2030 Agenda for Sustainable Development.

1. Pillar One: Disaster Risk Reduction and Resilience

10. Space applications for disaster risk reduction have received a renewed sense of direction from the international community. The Sendai Framework for Disaster Risk Reduction (2015-2030), outlined four priority areas for action including: understanding disaster risk; strengthening disaster risk governance; investing in disaster risk reduction for resilience; and enhancing disaster preparedness to "Build Back Better". The framework also identified seven global targets to reduce global disaster mortality including increasing the availability of, and access to, multi-hazard early warning systems, disaster risk information to the people. Space applications have a clear role in all priority areas of the Sendai Framework and in helping to achieve the agreed targets.

11. For example, in the area of risk assessment through geospatially identifying hazards, vulnerability and exposure; providing early warning and prediction through on-going monitoring using EO data; disaster emergency response which can be supported through impact assessments, damage assessments and inform the planning and delivery of humanitarian relief; and supporting reconstruction efforts to ensure resilient planning and monitor on-going reconstruction efforts. Much of it informs evidence-based decision-making through the disaster management cycle.

12. Geospatial information, satellite imagery and remote sensing data is already used for risk assessment, which does not necessarily need high resolution imagery. By utilizing existing databases of administrative boundaries, population and building structures, for example, and overlaying historical or potential disaster events, an indication of the hazard and risk to potential vulnerable communities can be quickly developed. More information is constantly being compiled and combined with expanding computational prowess the generation of big data analytics is opening up endless possibilities for building resilience in communities and structures.

13. In the instance of a disaster, space derived information in the form of more specialized satellite imagery or products is critical for impact and damage assessment and rapid emergency response. Often this information is either in the form of radar imagery, which can penetrate through clouds, or high-resolution optical imagery that can help to identify damage to buildings and structures. The specialized data and services are often more costly or not as easily accessible were it not for the international and regional mechanisms dedicated to voluntarily supporting disaster-affected countries. ESCAP's RESAP network, and the use of space applications, has been anchored in disaster risk management practices over the last two decades, while through UN-led initiatives such as the International Disaster Charter, political will, resources and mechanisms have been established which, once in place, can potentially be extended to address

other areas of development.

14. Other important tools within the disaster management cycle include geoportals for disaster risk to ensure that the right information is readily available to the right people making decisions during times of an emergency. Similar to the risk maps mentioned previously, these geoportals incorporate geospatial data and information such as socioeconomic information, important structures like hospitals, schools and other critical infrastructure, informal communities and building structures and environmental features or potential hazards. Once this is available in one place, emergency responders can quickly access and overlay damage maps and images provided through the international community.

Box 1. Eradicating rural poverty in India with space enabled products and services

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) enacted in 2005 aims to enhance the livelihood security of rural people by guaranteeing 100 days of wages in a financial year for adults willing to take up unskilled manual work. This initiative is unique across the globe in poverty alleviation. It is estimated that around 3 million assets are created annually across the country under this rural job scheme, which involves water harvesting, drought relief and flood control as preferred activities. Efforts are underway to strengthen online recording and monitoring of assets created under the MGNREGA to mitigate leakages for example, and for effective mapping of the terrain for future developmental works. The approach also has adopted technological innovations that involve the use of mobile-based geo-tagging and a Geographical Information System (GIS) based information system. The National Remote Sensing Centre of Indian Space Research Organization has developed these geo-spatial solutions on the Bhuvan Geo-portal and also the mobile-based geo-tagging applications for the MGNREGA scheme. Bhuvan facilitates a complete geographic information storage, retrieval, analysis and reporting for completed assets, with a high resolution backdrop of Indian Remote sensing Satellite (IRS) natural colour images.

15. Regional portals are also being developed such as ISRO's Bhuvan (see Box 1), Disaster Aware developed by the Pacific Disaster Centre, while Sentinel Asia continues to provide early warning and geospatial information services to all countries for all disasters. Such initiatives can provide critical data at key times, particularly for those countries less advanced in disaster risk preparedness.

16. In short, as the use of satellite information for disaster management was one of the first internationally agreed uses of advanced satellite technology, the political commitment that has successfully been mobilized means that this thematic area will remain a priority for space leaders in the foreseeable future.

Resilience for Food Security

17. Agricultural productivity is central to poverty alleviation (SDG 1) and achieving food security (SDG 2), as more than half the population of developing economies in Asia-Pacific live in rural areas, and around 40 per cent of the workers are employed by the agricultural sector.[1] Furthermore, the growing population and changing diets means that food production will need to increase 50 per cent by 2030 and 70 per cent by 2050, yet the region is already reaching its limit of available arable land, and may potentially begin losing agricultural land due to degradation and encroaching urbanization.[2]

18. A range of strategies will be needed to improve the quality and productivity of the food production. Meteorological and environment EO satellites can complement many other sources of information and support various strategies to help build resilience or productivity in the agriculture sector. For example, meteorological satellite data has been used for a number of years to help build scientifically accurate forecasts and climate models, which can reduce the risk of crop failure through long term planning and adaptation to potential bad seasons. Remote sensing, using readily available information from environmental monitoring satellites, can regularly monitor the condition of crops over large to localized areas to provide an early warning on vegetation stress due to drought, flooding or pests (Box 2). Furthermore, through building the capacity of agricultural experts to monitor and interpret satellite information, it is possible to directly monitor specific crops to enhance their productivity.

19. More modern sensors, such as hyperspectral and microwave, are able to differentiate the characteristics of specific species of plants and obtain even more detail important to agriculture, such as estimates of soil moisture. Though some of these may be relatively expensive currently, there is great potential for them to become more affordable in the future, or contribute to detailed longer term research and analysis which can support regular in-season monitoring or long term adaptation strategies.

20. Space applications can also be useful for livestock management. For example, one programme in Australia utilizes remote sensing to monitor pasture or fodder production for livestock. Pastures and grazing areas can cover vast areas of land that are often very dry, accurate quantitative monitoring or estimations of biomass available or pasture growth rates can help manage livestock production. Other countries with wide areas of open land for livestock grazing may benefit from the experiences garnered through such programmes.

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[1] UNESCAP, *Economic and Social Survey*, (2016)

[2] Food and Agriculture Organization, *Looking Ahead in World Food and Agriculture Perspectives to 2050* (2011)

Box 2. Regional Drought Mechanism

ESCAP's Regional Drought Mechanism takes advantage of space derived information, products and services from the region's space-faring countries – such as, China, India, Japan, Thailand and others – and shares it with other countries, especially those perennially prone to drought. This service complements WMO's Global Framework for Climate Services by providing more detailed, localized forecasts and monitoring that can be updated during the growing season. The aim is to give a comprehensive real-time drought monitoring and early warning system and to seamlessly link long-term climate scenarios with the seasonal climate outlooks. Countries can use this for monitoring in-season crop stress and issuing timely alerts on the onset of agricultural drought over large areas – allowing mid-course corrections and measures for drought mitigation. The mechanism also develops partnerships, and works with national governments to clarify and build the institutional network required to ensure the early warning services reach the right people. The Mechanism, which provides an introduction to the use of space applications for drought monitoring and early warning, could lead to a range of other tools and services for the agriculture sector in a country, such as crop monitoring, livestock management, water management and drought risk mapping.

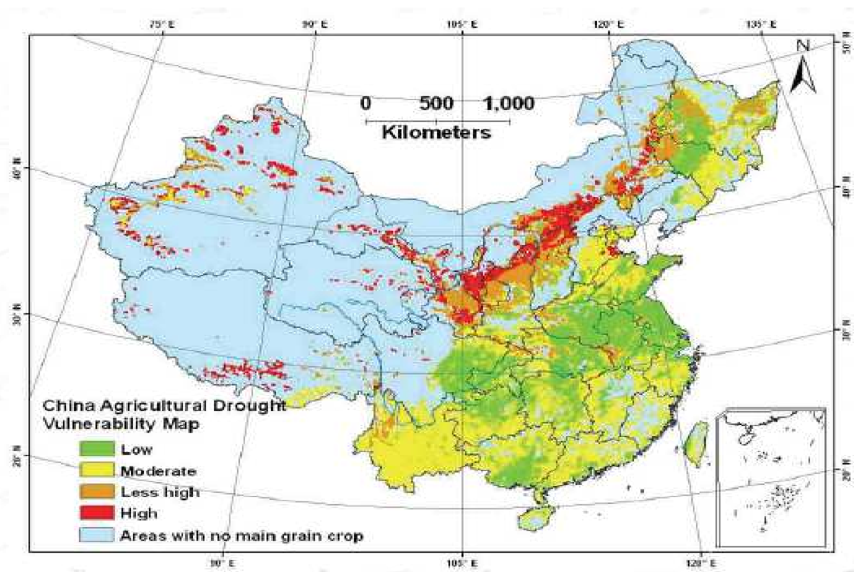

Figure 1 - Satellite-based drought vulnerability map for China

Source: Beijing Normal University, (2015).
Disclaimer: the boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

2. Pillar Two: Environment and Natural Resources

Urban development

21. Urbanization is occurring at a rapid rate. Between 1980 and 2010, the population of urban areas in Asia-Pacific grew by 1 billion people. It is expected to grow by another billion by 2040. By 2018, the population of Asia-Pacific is expected to be 50 per cent urban[3]. Recent economic growth in the region has lifted millions out of poverty and created a rapidly growing urban middle class. However, Asia is still home to the largest slum population and the largest concentration of people living below the poverty line. With this rapid urbanization comes a number of problems, such as growing air and water pollution, a mismatch in the development of basic infrastructure and the growing urban population, increasing social complexity and fragmentation and the struggle for local authorities to keep up.[4] Though space applications may not address all of these issues, they can provide local or national authorities with tools for urban planning and enhanced monitoring and management of urban sprawl in support of SDGs 11 (sustainable cities and communities), 1 (no poverty), 9 (industry, innovation and infrastructure), and 13 (climate action).

22. Geospatial information can provide a better overview of the situation on the ground, which when fused with crowd-sourced information can provide accurate information on settlements, both formal and informal, and general services including the condition of infrastructure and public services. At lower costs, authorities can be alerted of policy shortfalls, while vulnerable groups, which may have been previously excluded from formal data gathering initiatives, can be more readily identified. This type of data can help to inform and accelerate implementation of initiatives such as the upgrade of sites, provision of health and education services, formal census or data gathering initiatives to account for and include such communities within municipal programmes.

23. Some technologies, such as UAVs and other imagery analysis and processing techniques show promise in the future for detecting areas of poverty or specific details in densely constructed urban areas. For example, the Asian Institute of Technology is attempting to map poverty through the distribution of cities, economic composition based on household data and proximity to urban