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Supporting the implementation of the Sustainable Development Goals in Asia and the Pacific through universal access to and use of space applications

Achieving universal access to and use of space applications for sustainable development

Note by the secretariat

Summary

Digitally driven innovations have had a significant impact on the development of geospatial information services in the region. Faster and more versatile digital connectivity, higher resolution satellite-derived images and geographic information systems have become increasingly accessible and available, generating more data to inform decision-making in real time.

The present document contains a brief review of emerging trends in the Asia-Pacific region as well as the challenges to be addressed and opportunities available. It highlights a number of emerging regional best practices as they pertain to the thematic areas that have been identified in the draft Asia-Pacific plan of action on space applications for sustainable development (2018–2030), namely, (a) disaster risk reduction and resilience, (b) climate change, (c) management of natural resources, (d) connectivity with regard to the 2030 Agenda for Sustainable Development, (e) energy and (f) social development. These thematic areas are aligned with those identified in the regional road map for implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific.

The ministers and high-level representatives attending the third Ministerial Conference on Space Applications for Sustainable Development in Asia and the Pacific are invited to consider the issues raised in the present document and on that basis adopt the plan of action as well as a ministerial declaration to promote the most effective utilization of space applications and geospatial information services for sustainable economic and social development across the region.

* ESCAP/MCSASD/2018/L.1.

I. Innovative applications of space and geospatial information in Asia and the Pacific

1. The Asia-Pacific region is rapidly evolving into a hub of innovation as advances in digital technologies related to the Internet of things, artificial intelligence, big data, cloud computing, robotics and automation transform the way in which people live, work and relate to one another.

2. Digitally driven innovations have also had a significant impact on the development of geospatial information services in the region. Faster and more versatile digital connectivity, higher resolution satellite-derived images and geographic information system (GIS) images have become ever more accessible, generating a rich base of data that can inform decision-making in real time. Such innovative technologies can accelerate the implementation of global development agendas, including the Sustainable Development Goals, the Sendai Framework for Disaster Risk Reduction 2015–2030 and the Paris Agreement.

3. They can provide far-reaching solutions to pressing issues that humanity faces, from disaster risk reduction, natural resources management, climate change, connectivity and social development to energy.

4. Countries in Asia and the Pacific are increasingly integrating space technology, Earth-observation data and geospatial data and combining their outputs with statistical and demographic data for near real-time spatial analysis of conditions and modelling of complex and dynamic risk scenarios. Digital maps and other visualizations are particularly useful for supporting the evaluation of impacts across sectors and regions and allowing change over time to be monitored in a more consistent and standardized manner. The result is improved decisions, policy and accountability. These outcomes are beginning to have a transformational impact on many of humanity's most significant challenges in the developing world, improving the ability of global scientists, resource and planning managers and politicians to monitor and protect fragile ecosystems, ensure resilient infrastructure, manage climate risks, enhance food security, build more resilient cities, reduce poverty and improve governance. The sections below illustrate this potential through selected examples from countries in Asia and the Pacific.

A. Disaster risk reduction, resilience and climate change

5. The Asia-Pacific region is the most disaster-impacted region in the world. Since 2005, the region has recorded more than 60 per cent of total global deaths, 80 per cent of affected people and 45 per cent of total economic damages due to disasters.[1] Over the coming decade, as economic growth rises and population expands, and as climate change continues, the region's exposure to disasters is expected to continue to increase, as are the economic losses.

6. Space technology and geospatial data have emerged as strong tools to analyse disaster risks, enhance detection and prediction, and support recovery and rehabilitation from disaster damage. By enhancing resilience through better preparation and planning, risks and impacts are reduced and this directly contributes to targets under the Sendai Framework and the Sustainable Development Goals on hunger, health, cities and climate action.

[1] See E/ESCAP/73/31, annex II.

7. Mapping of disaster risk indicators, such as population density, housing, infrastructure and hazards; strengthening of early warning systems with space applications and data; and building countries' capacity to use geospatial portals, tools and models to assess and manage hazard impacts are all priority action areas. Considerable emphasis is also placed on using space applications to map and support resilient agricultural systems. Suggestions include capacity-building for countries to map crops, drought risks, nutrients and soil features. Climate and weather forecasting and assessing and managing climate change impacts, such as shifting ecosystems or crop patterns, also feature prominently.

8. Some countries in this region are already using space applications for disaster management. For example, for effective management of disasters, especially water management and flood forecasting, the Central Water Commission in India and Google have agreed to share expertise on flood forecasting to help improve disaster risk reduction. Google will provide state-of-the-art technologies related to artificial intelligence and geospatial mapping. Currently, the Central Water Commission disseminates information regarding floods and forecasting, however with the data and information provided by Google, flood prediction will become more people-centric, location specific and accurate which will contribute to more timely and actionable flood warnings.[2]

9. The Geo-Informatics and Space Technology Development Agency of Thailand has used geospatial data through space applications to create an open source platform of high-level, data-driven monitoring systems. These systems utilize a combination of Earth-observation imagery, GIS data and national disaster survey data embedded into a web map service. The four main monitoring systems cover floods, wildfire, drought and coastal radar for use by policymakers, crisis managers and governors in decision-making.

10. The Government of Georgia has also developed a Geoportal of Natural Hazards and Risks (http://drm.cenn.org) which has been effective for public and authorized disaster reporting, allowing the dissemination of geospatial information among local communities to foster good governance for disaster risk reduction.

11. The deployment of GIS-based safety map services by the Government of the Republic of Korea since 2014 has helped increase attention to disaster situations. This service is available to 229 municipalities and gives people access to safety information through multiple media platforms, such as computers and mobile phones, to identify location-based disaster risks and information on the degree of risk of landslides and floods, coastal flooding forecasts, and landslide and earthquake history.

12. Advanced emergency communication systems using geospatial services in China is another good example. The emergency satellite communication system in China has provided important support in disaster situations, such as droughts and floods, by helping search and rescue efforts as well as relief work. The BeiDou Navigation Satellite System has significantly improved the accuracy and reliability of data and has been widely used in forest-fire prevention, disaster reduction and relief, and emergency rescue, as well as hydrological monitoring, weather forecasting, surveying and mapping.[3]

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[2] Express News Service, "Central Water Commission, Google tie up to better flood forecasting", *New Indian Express*, 18 June 2018.

[3] China, State Council Information Office, *China's Space Activities in 2016* (Beijing, 2016).

13. The Economic and Social Commission for Asia and the Pacific (ESCAP), in collaboration with space-faring countries in the region, has continued to provide timely services and support on space-derived data and products to countries affected by severe disasters. An average of more than 400 high-quality satellite images and tailored products have been provided annually for damage assessment, from disasters that include drought, cyclone, earthquake and flood. More than $1 million in in-kind contributions of free data and expert services are estimated to have been provided by ESCAP member States.

14. The Regional Cooperative Mechanism for Drought Monitoring and Early Warning has supported the capacity-building of member States in their use of space applications. Regional service nodes in China, India and Thailand have provided customized technical support, information, tools and other service products to countries such as Cambodia, Mongolia, Myanmar and Sri Lanka. This has not only helped them to more effectively monitor and address drought but has enhanced their long-term human and institutional capacity to use space applications for other purposes.

15. In 2018, ESCAP and the Association of Southeast Asian Nations (ASEAN) undertook a joint study on drought on the topic "Ready for the dry years: building resilience to drought in South-East Asia". The study's proposal was to capitalize on knowledge-based innovations by promoting risk-sensitive policies and interventions based on space-derived in-season and long-term drought monitoring and assessment.

16. Since 2016, ESCAP has assisted Pacific island countries, with sponsorship from the Government of Japan and technical support from the Government of Indonesia, with their efforts to strengthen institutional capacities in the use of geospatial data and to build national geo-portals as key components of multi-hazard early warning systems for extreme weather-related disasters.[4] The Common Alerting Protocol, a digital format for exchanging emergency alerts in internationally standardized format, has been implemented in Solomon Islands[5] and Tonga. Furthermore, national meteorological services authorities in these countries are now able to make available weather predictions with a resolution of 2.3 km, compared to the 25-km resolution that was possible previously.

17. Space-derived data and geospatial information are also increasingly being used to monitor greenhouse gas emissions and climate change impacts and to support various mitigation and adaptation activities such as land-use change detection, mapping to help to identify areas for reforestation, protected area monitoring and management, mapping human settlements and mobile apps for waste management.

18. Space applications using satellite data can be used to facilitate periodic monitoring of mangroves over large areas. Key Earth-observation sensors that use synthetic aperture radars provide suitable data for regular monitoring and

[4] Information on training activities and workshops under this project is available at www.unescap.org/events/first-pacific-regional-workshop-multi-hazard-risk-assessment-and-early-warning-systems; www.unescap.org/events/training-national-geo-database-and-geo-portal-drr-and-sustainable-development; www.unescap.org/events/1st-expert-group-meeting-pacific-strategy-knowledge-hub-early-warning-system; and www.unescap.org/events/training-national-multi-hazards-early-warning-systems-geo-spatial-applications-disaster-risk.

[5] See https://smartalert.met.gov.sb.

change detection in cloud-prone coastal regions. This data, coupled with other optical and digital elevation data, provide annual global mosaics at a resolution of 25 m for national wetland practitioners and decision makers as well as non-governmental organizations. For example, the Global Mangrove Watch, established under the science programme of the Japan Aerospace Exploration Agency, provides geospatial information about mangrove extent and changes.[6]

19. Several other countries are also incorporating space applications into their climate response strategies. For example, in the Bangladesh Climate Change Strategy and Action Plan 2009, emphasis is placed on geospatial applications using satellite technology by developing an easy to understand early warning and forecasting system that improves the prediction and accuracy of cyclone tracking and flooding.[7] Similarly, the Department of Meteorology of Sri Lanka is developing downscaled high-resolution climate change scenarios for specific regions by combining models provided by the Met Office Hadley Centre of the United Kingdom of Great Britain and Northern Ireland, including the Hadley Centre Coupled Model and the regional climate model from the Providing Regional Climates for Impacts Studies system. To improve its weather forecasting capability, the Department of Meteorology is also using receiving stations for data from geostationary weather satellites and is receiving imagery and data from Meteosat, the Moderate-resolution Imaging Spectroradiometer, the Advanced Scatterometer and Oceansat to analyse the various weather and climate impacts.

B. Management of natural resources

20. In the field of natural resources management, space technologies have extensive applications. Improved management of natural resources and the protection of ecosystems are key priorities in the regional road map for implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific. Currently, the Asia-Pacific region consumes more than half of the world's natural resources with increasing rates of absolute resource use and increasing resource use per person.[8] This issue also cuts across or impacts several other thematic areas, particularly social protection, climate change and disaster risk management. This work can support relevant Sustainable Development Goals including those related to fresh water, oceans, land and the consumption and production of resources.

21. To help improve natural resources management, GeoScience Australia has used Earth observation and GIS to create online web maps for natural resources management by providing data from several areas, including geology, water resources, environmental monitoring, and marine and coastal data. The natural resources management of marine systems is one area of focus, and an online interactive system has been developed, which is called the Australian Marine Spatial Information System, a web-based interactive mapping and decision support system that improves access to integrated government and non-government information in the Australian marine jurisdiction.[9]

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[6] Group on Earth Observations, *Earth Observations in Support of the 2030 Agenda for Sustainable Development* (Tokyo, Japan Aerospace Exploration Agency, 2017).

[7] Office for Outer Space Affairs and National Institute of Aeronautics and Space of Indonesia, "United Nations/Indonesia International Conference on Integrated Space Technology Applications to Climate Change: abstracts" (Jakarta, 2013).

[8] See E/ESCAP/73/31, annex II.

[9] www.ga.gov.au/scientific-topics/marine/jurisdiction/amsis.

22. Deforestation control and agricultural mapping are among the main natural resources management activities of the state-owned Russian Space Systems company. Its eight satellites provide both raw and processed imagery to end users, which include not only state agencies of the Russian Federation but international public and private entities.[10]

23. The fishing community in India has greatly benefited from satellite-based advisories on potential fishing zones which are provided in local languages. Such advisories help fishers increase their catch (by 2–5 times) and reduce search time (by approximately 30–70 per cent), which are considered unique successes of this effort.[11]

24. In Turkey, precision agriculture practices are being developed to analyse wheat, corn and cotton crops by using multispectral satellite imagery and aerial data. Ground measurements will also be collected to analyse the data in a GIS. This work is under the Hassa project, which aims to help improve the efficiency of farms and enhance production by reducing inputs such as water, fertilizer and pesticides into agricultural land.

25. Many countries in the region have a series of planned projects calling for regional cooperation such as monitoring surface water and watersheds, water quality, evapotranspiration, groundwater and groundwater recharge sites, water quality and ice. In addition, some countries plan to monitor and map changes to coastlines with regard to the ocean, marine protected areas, fisheries and coral reefs and to monitor and model ocean water quality and impacts on marine ecosystems. Suggested action areas for land use include monitoring forest dynamics, land degradation, ecosystem dynamics and changes, and identifying forest fire risk.

C. Connectivity for the 2030 Agenda

26. Space technology applications and geospatial data are key components in optimizing the expansion and integration of infrastructure such as highways, railways, dry port networks and digital connections, which makes connectivity more inclusive by spreading the benefits extensively to marginalized people and helps to boost economic growth.[12]

27. Connectivity is important for achieving many Sustainable Development Goals related to health, industry, reducing inequalities, cities and infrastructure. For this reason, ESCAP administers the Asia-Pacific Information Superhighway initiative, which aims to increase the availability and affordability of broadband Internet across Asia and the Pacific by strengthening the underlying Internet infrastructure in the region.

28. The China Belt and Road Spatial Information Corridor provides space information service capabilities and improved information communication to countries and regions involved in the Belt and Road initiative to promote international cooperation between China and those countries on disaster risk reduction, ecological environmental monitoring and scientific research. The initiative aims to improve cooperation on space applications and to foster scientific research in fields using integrated Earth observation, such as ecological environment, water resources, climate, transport, urbanization,

[10] Remote Sensing of the Earth, http://russianspacesystems.ru/bussines/dzz/ (in Russian only).

[11] Kiran Kumar, Chair of the Indian Space Research Organization, statement to the Asia-Pacific Space Leaders Forum, New Delhi, 2 November 2016.

[12] See E/ESCAP/73/31, annex II.

mineral resources and energy, geological disasters, world heritage protection, satellite mapping and value prediction.

29. The Government of the Russian Federation has an initiative to build a Great Eurasian Partnership to support sustainable economic growth in the region. One of its key components is the deployment of intelligent transport systems using the Global Navigation Satellite System. Since 2015, all trains in the Russian Federation have been equipped with satellite trackers, and the Government introduced regulations on the mandatory installation of the Global Navigation Satellite System in every new vehicle sold starting in 2017, for road tracking. As a result, real-time tracking on deliveries and shipments is possible, and the initiative's aim is to streamline regulations, promote competition and encourage entrepreneurship to support growth.[13] By linking it to the emergency call system of the European Union, eCall, the initiative also aims to bring rapid assistance to motorists involved in a collision anywhere in the Russian Federation.

30. Together with physical connectivity, knowledge-sharing and improved communication technologies will help to narrow the digital divide between lower and lower-middle income and upper and upper-middle income countries in the region. In Fiji, satellite connectivity has allowed the University of the South Pacific to expand its online programmes to a dozen other countries in the region, with half of its student body using online distance education tools.[14]

31. Looking forward, GIS and satellite data will be key to not only optimizing the expansion and integration of highway, railway and dry port networks across the region but also to providing further insights into how transport connectivity affects social and economic status. For example, research has shown that poor access to road networks is spatially correlated with the incidence of poverty. Furthermore, a range of new frontier technologies will continue to accelerate the roll-out of intelligent transport systems, with Global Positioning System-tracking improving transport efficiency and safety.[15]

D. Energy

32. Alongside the rapid expansion and growth experienced throughout Asia and the Pacific, nearly half a billion people still lack access to electricity. More than 80 per cent of the countries in the region have targets to improve energy efficiency and increase the share of renewable energy within the region.[16]

33. Space applications can support work on Sustainable Development Goal 7 on affordable and clean energy by making it possible to assess the renewable energy potential of countries in the region, to keep track of biomass stocks, and to map energy infrastructure such as transmission lines, gas pipelines and untapped energy resources. Some pollutants from the energy sector could also be monitored.

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[13] Business Wire, "Russia transportation and logistics market insights report 2017: research and markets", 2 January 2018.

[14] Mike Jensen and Michael Minges, *Ensuring Sustainable Connectivity in Small Island Developing States* (Geneva, Internet Society, 2017).

[15] See E/ESCAP/MCT(3)/12.

[16] See E/ESCAP/73/31, annex II.

34. In India, the potential of solar and wind power is being harnessed by using remote sensing technology and mapping renewable energy sources. Satellite data are used to assess the actual solar power potential of concentrated solar power and centralized solar photovoltaic systems in each district. GIS and remote sensing can help to identify key solar power locations, calculate technical requirements and identify the economic viability of systems.[17] To increase renewable energy consumption in India, a comprehensive GIS-based energy map and a geospatial energy portal are being developed.[18]

35. In Georgia, the energy sector is one of the main users of space applications and data resources. Space applications, such as digital maps and satellite imagery and data on the ownership of lands and registration, are used in the construction of hydropower plants and to analyse potential sites for natural oil and gas reserves.[19]

36. With support from member States, ESCAP built the Asia Pacific Energy Portal in 2015, which provides access to comprehensive statistical data and visualizations, which are possible thanks to space applications.[20]

F. Leaving no one behind (social development)

37. Geospatial data can be used in a wide variety of ways to improve social support systems and planning. Geospatial information integrated with planning, census and other social information enables efficient and effective allocation of facilities and resources. Many countries already use it for infrastructure, town planning, telemedicine and tele-education, and poverty mapping. They also link it to hazard maps and cultural heritage sites maps and use it to inform the selection of the best location for services and facilities, such as transportation systems, schools and hospitals.

38. For example, the Government of Singapore promotes the use of geospatial data and space applications through a range of public applications it has developed within various departments. The main application includes OneMap, a detailed and compressive online map developed by the Singapore Land Authority with other government agencies, which shows updated day-to-day information and services such as bus times, land queries, school queries and traffic data. These data are available through an application and are free, and a range of features, such as intelligent search, navigation, timely updates and extra information, are provided.[21] The other applications developed by the Government of Singapore include an emergency application which connects

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[17] Richa Mahtta, P.K. Joshi and Alok Kumar Jindal, "Solar power potential mapping in India using remote sensing inputs and environmental parameters", *Renewable Energy*, vol. 71 (November 2014).

[18] India, presentation to the Drafting Committee for the Asia-Pacific plan of action for space applications for sustainable development (2018–2030) at its first meeting, Bangkok, 31 May and 1 June 2018. Available at www.unescap.org/sites/default/files/Committee%20Member%20Presentation-India_0.pdf.

[19] Georgia, presentation to the Drafting Committee for the Asia-Pacific plan of action for space applications for sustainable development (2018–2030) at its first meeting, Bangkok, 31 May and 1 June 2018. Available at https://www.unescap.org/sites/default/files/Committee%20Member%20Presentation_Georgia_rev_0.pdf.

[20] See E/ESCAP/CE(1)/8.

[21] https://onemap.sg/main/v2/.

first responders to people experiencing a medical emergency. When an alert signal is activated, nearby first responders can respond using the shortest route mapped to the first aid seeker, before the ambulance arrives. The Singapore Police Force has also developed a security application, Police@QG, that informs users of safety-related issues in their neighbourhood (for example, crime incidents, police appeals and missing people) and allows them to search for and locate police stations.[22]

39. The use of GIS data in countries such as the Philippines shows that access to road infrastructure and proximity to major markets have a significant effect on poverty incidence and thus serve as useful tools in infrastructure planning for poverty reduction.[23]

40. In the Republic of Korea, geospatial information is used for a number of social programmes and initiatives. For example, geospatial data are used to identify the optimal location to build social welfare facilities for disabled persons.[24] A smart complaint system has been developed for citizens of Seoul, who can submit their complaints about road damage, illegally dumped garbage and illegal parking with geographic location and information. They can register the complaint in real time via smartphone applications, together with relevant information and images.[25]

41. The Poverty Alleviation and Development Office in Guizhou Province, China, has developed the Fupin Cloud geospatial service platform.[26] It is a GIS-based platform which records the information of every poor family in the province, which is overlaid with other geospatial data, including geometry, industry, house, population and income. By recording all geospatial information, the Government is able to locate poor families to plan poverty alleviation programmes.

42. The Government of India enacted the Mahatma Gandhi National Rural Employment Guarantee Act in 2005 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. The programme provides assets needed by low-income workers in times of need, for example seed or machinery which will help their farm. In return, the workers provide free labour to rehabilitate, build or maintain areas of land identified for environmental rehabilitation, water harvesting, drought relief or flood control. Geospatial tools and location-based services are being utilized for planning, implementation and monitoring of nearly 2 million assets through the use of mobile-based geo-tagging.[27]

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[22] www.sgsecure.sg/e-learning.

[23] Brandon Manalo Vista, "Exploring the spatial patterns and determinants of poverty: the case of Albay and Camarines Sur Provinces in Bicol Region, Philippines", Master of Science dissertation, University of Tsukuba, 2008.

[24] Kwang-Hoon Son, "A case study on functional shift and specialization of social welfare centre to social welfare for people with disability utilizing GIS analysis in Haeundae-Gu of Busan Metropolitan City", abstract, *Journal of Community Welfare* (Republic of Korea), vol. 44 (2013).

[25] Seoul Solutions, www.seoulsolution.kr.

[26] Guizhou-Cloud Big Data, www.gzdata.com.cn/c73/20170508/i777.html.

[27] Kiran Kumar, statement (see footnote 11).

II. Gaps and opportunities

43. Despite advances in the availability and quality of space applications and information, several gaps and challenges to their effective use at the regional and national level remain. A lack of capacity and resources, such as those related to finance, tailored tools and human resources, is a common problem. Processing geospatial information into a form that can be effectively used for accurate and evidence-based decision-making can be very time consuming and errors can easily be made. Many developing countries, including small island developing States, do not have a critical mass of people who can utilize, analyse and interpret space applications information at the country level.

44. Additionally, within countries there is often a lack of communication, information-sharing and coordination which acts as a barrier between potential end users and data providers. Related to this is the lack of understanding by end users of the potential use of space applications products, including how to interpret the products. There is a greater need for effective, user-friendly tools to bridge the gap between the space applications community – with its own language, priorities and means of working – and the potential end users who could benefit from Earth-observation information. In addition, many excellent pilot activities are being conducted in the region, but unless the benefits and potential of these activities are applied across other important sectors, including planning and financing, they will remain academic activities and will not be incorporated into country development plans.

45. Another challenge is often a weakness in policies, procedures, guidelines and standards for acquiring, sharing and utilizing space-based products and services. Existing procedures are often not harmonized between agencies and countries that need to cooperate, particularly during disasters. There may be security or privacy issues with the data or information, or a culture of not sharing. Also, geospatial data and information may not be accepted by Governments as official statistics.

46. Though a number of challenges to effectively using space applications exist at the national level, enhanced regional cooperation can help overcome many challenges in ways that can be innovative and cost effective.

A. Capacity-building and sharing experiences, programmes and policies

47. Several countries in the region have experts in the use of space technologies for many applications and are willing to provide training, advice, tools and information to less experienced countries. Under the Regional Cooperative Mechanism for Drought Monitoring and Early Warning, the regional service nodes in China, India and Thailand have been providing customized technical support to several developing countries to enhance the use of Earth-observation data for drought monitoring and assessment, which in turn has helped build long-term human and institutional capacity.

48. This methodology can be adapted or expanded to other tools, such as land-cover or fisheries mapping, once a critical mass of technical experts has been established in a country. ESCAP and other organizations such as the Office for Outer Space Affairs, the Operational Satellite Applications Programme of the United Nations Institute for Training and Research, the United Nations Initiative on Global Geospatial Information Management and the Group on Earth Observations can help by providing brokering services between countries, linking experts with those requiring support on specific issues.

49. Furthermore, many countries have developed space policies, initiatives and tools which they are willing to share or even help to adapt to the national conditions of other countries. In addition to the Commission's Regional Space Applications Programme for Sustainable Development, other regional initiatives such as the Asia-Pacific Regional Space Agency Forum, the Asia-Pacific Space Cooperation Organization and the Centre for Space Science and Technology Education in Asia and the Pacific, for example, provide opportunities to pair together experts from various countries. Many have also conducted pilot studies or programmes which could be scaled up with enough support.

50. Raising awareness about the potential of space applications among end users requires advocacy and communication that uses the regional platforms as well as the language understood by end users, particularly high-level policymakers in planning, financing or other line ministries. Because ESCAP has intergovernmental committees on macroeconomics and poverty reduction, environment, trade, transport, energy, information and communications technology, disaster risk management, social development and statistics, it is ideally suited to the task of advocating with and sensitizing ministers and government officials and disseminating good practices from various organizations and the scientific and space communities to end users and decision-makers.

B. Regional guidelines, norms and policies

51. Many countries face the same issues when it comes to developing policies and guidelines, and therefore regional standards and templates can help to provide a foundation for national customization. In addition, some agreement may also be needed on the use and validity of shared space applications data in specific sectors which will require coordination among countries.

52. The development of thematic standards or guidelines can be divided into two types: (a) standards, norms and guidelines for a particular thematic area, such as building codes for particular hazards, guidelines for sustainable marine or forest management, or subregional policies for managing transboundary resources; and (b) standards related directly to geospatial information, such as data-sharing policies or validating geospatial data accepted by national statistical offices.

53. For the first type, space applications can be of immense help to support collaborative work related to a watershed, forest or ocean which crosses national boundaries. Consideration should be given to whether institutions or programmes already exist on the management of these resources and how working with these groups to provide better transboundary data for decision-making can be handled. This then addresses the issue of cross-cutting themes, where the space community is advising the policymakers, who will address the management issues. Suggested areas for this kind of work include the monitoring and mapping of water, oceans, forests, air pollution, disease outbreaks, building codes, transboundary infrastructure and trade routes, disaster hazards, land cover and land degradation.

54. For the second type, there are opportunities to create agreements on issues such as sharing data, developing standards which enable national statistical offices to use geospatial data in their official statistics, and developing codes on how to best access and use geospatial data for specific purposes. Suggested areas for this work include statistical standards, guidelines on access and use of Earth observation data for specific sectors, data-sharing

policies and guidelines, and standards for image classification of specific objects such as tree species.

55. As an example, ESCAP worked with partners within the United Nations system and ASEAN to develop a series of handbooks providing guidance on the use of innovative space applications and how to harness their potential to address disaster risks in the region. The series is comprised of three handbooks: *Sharing Space-based Information: Procedural Guidelines for Disaster Emergency Response in ASEAN Countries*; *Specific Hazards: Handbook on Geospatial Decision Support in ASEAN Countries*; and *Innovations in Disaster Rapid Assessment: A Framework for Early Recovery in ASEAN Countries*. These handbooks can help to build the institutional capacities of countries in the region seeking to integrate innovative space-based information within their disaster risk management processes, while also addressing the needs of both geospatial information providers and decision-makers.

C. Regional sharing of satellite infrastructure, data and platforms

56. A growing body of satellite data is already shared for free from various sources and for many purposes. In addition, the International Charter on Space and Major Disasters enables the sharing of high-resolution satellite imagery in the events of disasters.

57. Beyond this, regional data platforms accessible to many countries for various purposes should be established. Presently, to develop a map using remote sensing data, such as developing a drought index, the raw satellite data require extensive and time-consuming pre-processing. If the same data are used to produce information on a different issue, for example to view water resources, they would need to be processed again. This leads to considerable time-consuming duplication.

58. The Open Data Cube initiative seeks to address this challenge. It increases the value and impact of global Earth-observation satellite data by providing analysis-ready data which have been pre-processed, corrected and validated, significantly reducing the time required to produce information products. Due to the massive amount of data available, cloud-based data hubs could be utilized to house a regional Data Cube, with all countries contributing information and resources to make it sustainable. Developing partnerships with cloud providers could also reduce the costs of sustaining the process. This kind of cooperation could provide massive benefits to all sectors by making space applications more accessible than ever before.

D. Financing and in-kind support

59. Many countries are already providing considerable in-kind support through expertise, satellite imagery and data, and the sharing of experience and personnel to maintain regional resources, all of which amounts to millions of dollars a year. In addition, financial support is also required. A regional programme which harnesses the strength, skill and expertise of the space community and the development of training programmes, standards, shared infrastructure and resources makes accessing and effectively utilizing space applications significantly more cost effective.

60. Financial resources will assist member States in responding to some of the identified challenges. Governments have supported activities in the past, though great potential also exists to harness private sector support or to develop effective public-private partnerships.

61. ESCAP has longstanding experience in administering trust funds, as demonstrated by the Multi-Donor Trust Fund for Tsunami, Disaster and Climate Preparedness in Indian Ocean and Southeast Asian Countries. Since 2005, the Trust Fund has been a vehicle for knowledge-sharing on data, tools and expertise, effectively supporting disaster resilience in high-risk, low-capacity countries across Asia and the Pacific. The Trust Fund has contributed to all aspects of people-centred early warning systems and has made a vital contribution towards establishing and maintaining the regional public good.

62. To support and enable the use of space applications and their associated tools for sustainable development, as foreseen in the draft Asia-Pacific plan of action on space applications for sustainable development (2018–2030), it is proposed that a dedicated trust fund be established. Its aim would be to promote a comprehensive and coordinated approach to resource mobilization to ensure the sustainable implementation of the plan of action and contribute to narrowing the capacity gaps in the region. Such an integrated approach, based on adequate resources, would necessarily encompass a network of partners, including private sector players, and it would be linked to other existing initiatives outside the region.

III. A new Asia-Pacific plan of action on space applications for sustainable development (2018–2030)

63. The Asia-Pacific Space Leaders Forum, which was held in New Delhi on 2 November 2016, highlighted the role of space applications in the implementation of the Sustainable Development Goals and expressed support for the preparation by the secretariat of a new Asia-Pacific plan of action on space applications for sustainable development (2018–2030) for adoption at the third Ministerial Conference on Space Applications for Sustainable Development in Asia and the Pacific. The aim of the plan of action would be to further scale up the use of space applications and geospatial information in order to implement the regional road map for implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific and relevant global agendas.

64. Consequently, the Intergovernmental Consultative Committee on the Regional Space Applications Programme for Sustainable Development, at its twenty-first session, held in October 2017, agreed on a vision for the plan of action: that, by 2030, all countries in the Asia-Pacific region would be able to access and use space science, technology and their applications to the fullest extent to meet their individual and regional needs for achieving the Sustainable Development Goals.[28]

65. At its first meeting, held in May 2018, the Drafting Committee for the new plan of action prioritized the Sustainable Development Goal targets to which space applications could most significantly contribute. The Drafting Committee was of the view that the 48 targets selected should contribute to the priority thematic areas outlined in the regional road map, in the following order: (a) disaster risk reduction and resilience; (b) climate change; (c) management of natural resources; (d) connectivity; (e) energy; and (f) social development. Each of these thematic areas could support the work to attain many Sustainable Development Goals. Committee members also provided concrete actions that could be associated with those targets, centred around (a) research and knowledge-sharing; (b) capacity-building and

[28] See www.unescap.org/sites/default/files/E_ESCAP_ICC%2821%29_9_ SummaryReport_REV.pdf.

technical support; and (c) regional norm- and standard-setting intergovernmental processes.

66. The Drafting Committee was also of the view that the new regional plan of action should encompass and define a concept entitled "Space+", which would seek to (a) leverage frontier technologies such as artificial intelligence and big data; (b) engage end users in multiple sectors, including youth and the private sector; (c) more effectively manage information through the creation of a regional or national cloud-based metadata platform; and (d) strengthen implementation through the creation of a trust fund and through enhanced partnership with global and regional stakeholders.

67. The final draft plan of action, together with a draft ministerial declaration, will be considered by the members of the Intergovernmental Consultative Committee on the Regional Space Applications Programme for Sustainable Development at its ad hoc session on 8 and 9 October, and then presented for adoption at the third Ministerial Conference on Space Applications for Sustainable Development in Asia and the Pacific, on 10 October 2018. It is proposed that the outcomes be submitted to the Commission for endorsement at its seventy-fifth session, in 2019.

IV. Issues for consideration

68. The ministers and high-level representatives of the member States may wish to take the following actions:

(a) Adopt the ministerial declaration and the Asia-Pacific plan of action on space applications for sustainable development (2018–2030) and recommend that the Commission endorse them at its seventy-fifth session, in 2019;

(b) Provide suggestions on how to support the secretariat in leading the implementation of the Asia-Pacific plan of action on space applications for sustainable development (2018–2030);

(c) Provide further guidance to the secretariat on the actions suggested in the present document and the means of implementation of those activities.

