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Item 2 of the provisional agenda*

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

Draft Asia-Pacific plan of action on space applications for sustainable development (2018–2030)

Summary

The draft Asia-Pacific plan of action on space applications for sustainable development (2018–2030) is developed as a follow-up to the Asia-Pacific Plan of Action for Applications of Space Technology and Geographic Information Systems for Disaster Risk Reduction and Sustainable Development, 2012–2017. It is a regionally coordinated plan of action that harnesses space applications and digital innovations to help countries in Asia and the Pacific, particularly those with special needs, to achieve the Sustainable Development Goals.

The draft plan of action is developed in response to a request received at the twentieth session of the Intergovernmental Consultative Committee on the Regional Space Applications Programme for Sustainable Development, which was held in New Delhi from 31 October to 1 November 2016, and at the Asia-Pacific Space Leaders Forum, held in New Delhi on 2 November 2016. The plan of action was formulated through an extensive and inclusive consultation and drafting process that consisted of an open-ended Drafting Committee comprising senior technical experts, nominated by Governments of members and associate members of the Economic and Social Commission for Asia and the Pacific (ESCAP), as well as the Intergovernmental Consultative Committee at its twenty-first and twenty-second sessions. Thailand was elected as Chair of the drafting process. The draft plan of action contained in the present document was endorsed by the Intergovernmental Consultative Committee, at its twenty-second session, held in Bangkok on 30 August 2018. The development of the plan of action has been inclusive, collective, open and driven by country needs. Actions and activities are not designed to be implemented by one entity alone, but rather to guide national sustainable development and stimulate regional cooperation in support of global initiatives.

Given the good practices and experiences that emerged from the implementation of the previous Asia-Pacific Plan of Action for Applications of Space Technology and Geographic Information Systems for Disaster Risk Reduction and Sustainable Development, 2012–2017, and in line with the thematic areas contained in the regional road map for implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific, the current draft plan of action addresses the following thematic areas: (a) disaster risk management; (b) natural resource management; (c) connectivity; (d) social development; (e) energy; and (f) climate change. The implementation

* ESCAP/MCSASD/2018/L.1.

modalities are through: (a) research and knowledge-sharing; (b) capacity-building and technical support; and (c) intergovernmental discussions and regional practices. Among the three, capacity-building and technical support has been recommended by the Intergovernmental Consultative Committee as a priority for most Asia-Pacific countries in implementing the plan of action.

The plan of action comprises two parts. First, the main body of the text identifies guiding principles, relevant mandates, modalities including activities cutting across all thematic areas, and means of implementation. The second, an annex, contains specific actions identified under each thematic area. As the draft plan of action covers a long implementation period until 2030, the Intergovernmental Consultative Committee, at its twenty-second session, also recognized the need to review and amend the plan of action periodically to reflect the evolving needs of countries, emerging technologies, shifting priorities and unforeseen challenges arising in the region. The draft plan of action also foresees enhanced cooperation and partnerships, at the regional level, between existing Regional Space Applications Programme for Sustainable Development members, intergovernmental mechanisms and international and technical organizations.

The role of the ESCAP secretariat has been to facilitate and coordinate among members and associate members in developing the draft plan of action.

I. Introduction

1. Asia and the Pacific has become a hub of innovation which is transforming the way in which we live, work, and relate to one another. Digital innovation such as artificial intelligence, big data, the Internet of things and cloud computing brings new and innovative solutions to pressing global problems. Faster and more versatile digital connectivity, satellite data, geographic information systems and spatial analysis have become increasingly accessible and available, generating more evidence-based data to support real-time decision-making. Geospatial information has also increasingly been incorporated into development planning, which has led to more accurate monitoring and evaluation of development interventions. As a result, geospatial information applications have come to play a more prominent role in the implementation and realization of the 2030 Agenda for Sustainable Development.¹

2. Despite advances in the availability and quality of space-derived information, several gaps and challenges remain for their effective use at the regional and national levels. A lack of capacity and resources in terms of finance, space-derived data, knowledge and expertise, specific tools and well-trained human resources is a common problem. Many developing countries, including small island developing States, do not have the capacity to utilize, analyse and interpret space-derived data. Other challenges include a weakness in policies, procedures, guidelines and standards for acquiring, sharing and utilizing space-derived products and services, and the lack of procedural harmony between agencies and countries.

3. Through the long-standing framework of the Regional Space Applications Programme for Sustainable Development, ESCAP has brought together space agencies and relevant stakeholders to discuss and address challenges surrounding space technology applications and geographic information systems in disaster risk reduction and sustainable development.

¹ Economic and Social Commission for Asia and the Pacific (ESCAP), “Artificial Intelligence and Broadband Divide: State of ICT Connectivity in Asia and the Pacific 2017” (Bangkok, 2017). Available at www.unescap.org/publications/artificial-intelligence-and-broadband-divide-state-ict-connectivity-asia-and-pacific.

Pursuant to resolution 69/11, the Commission endorsed the Asia-Pacific Plan of Action for Applications of Space Technology and Geographic Information Systems for Disaster Risk Reduction and Sustainable Development, 2012–2017.

4. The regional road map for implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific² offers a framework for the development and implementation of the Asia-Pacific Plan of Action on Space Applications for Sustainable Development (2018–2030), hereinafter referred to as the Plan of Action. The priority thematic areas under the regional road map were social development, disaster risk reduction and resilience, climate change, management of natural resources, connectivity, and energy.³ The regional road map also identifies mechanisms for the operationalization of the Sustainable Development Goals, emphasizing the importance of data and statistics, technology, finance, policy coherence and partnerships.⁴

5. For these challenges to be overcome, action is required at the national, regional and international levels. This Plan of Action has been developed by senior experts from relevant national and regional agencies nominated by their Governments, including policymakers of many countries without a space programme of their own, who are keen to develop their countries capacity to access and use these applications for practical purposes.

6. The manner of selection of specific actions within the Plan of Action has been inclusive, collective and driven by country needs. Actions are not designed for one entity to implement alone, but to guide national development and stimulate regional action. It is designed to provide both a consolidated needs assessment for countries in the region that wish to utilize space applications for sustainable development and a guide for partners that wish to support those countries in meeting the needs.

7. The Plan of Action comprises two parts. First, the main body of the text identifies guiding principles, relevant mandates, modalities including activities cutting across all thematic areas, and means of implementation. Second, an annex contains specific actions identified under each thematic area. As the Plan of Action covers a long implementation period until 2030, the Intergovernmental Consultative Committee, at its twenty-second session, also recognized the need to periodically review and amend the Plan of Action, to reflect the evolving needs of countries, emerging technologies, shifting priorities and unforeseen challenges arising in the region. The Plan of Action also foresees enhanced cooperation and partnerships, at the regional level, between existing Regional Space Applications Programme for Sustainable Development members, intergovernmental mechanisms and international and technical organizations.

Relevant mandates and sequential development of the Plan of Action

8. The 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction 2015–2030 and the Paris Agreement collectively constitute a global development agenda, which will play an important role in shaping the world for generations to come. Accessibility of space-derived data and information will be essential for its implementation, monitoring and realization.

² Commission resolution 73/9.

³ See E/ESCAP/73/31, annex II.

⁴ Ibid.

9. The Regional Space Applications Programme for Sustainable Development was created in 1994 at the First Ministerial Conference on Space Applications for Development in Asia and the Pacific held in Beijing. During this Conference, three instruments were adopted: the Beijing Declaration on Space Technology Applications for Environmentally Sound and Sustainable Development in Asia and the Pacific; the Strategy for Regional Cooperation in Space Technology Applications for Sustainable Development; and the Action Plan on Space Applications for Sustainable Development in Asia and the Pacific.⁵

10. The second phase of Regional Space Applications Programme for Sustainable Development was launched after the Second Ministerial Conference on Space Applications for Sustainable Development in Asia and the Pacific held in New Delhi in 1999, and two instruments were adopted: the Delhi Declaration on Space Technology Applications in Asia and the Pacific for Improved Quality of Life in the New Millennium; and the Strategy and Action Plan on Space Technology Applications for Sustainable Development in Asia and the Pacific for the New Millennium.⁶

11. In December 2012, members and associate members of ESCAP, attending the Intergovernmental Meeting on Asia-Pacific Years of Action for Applications of Space Technology and the Geographic Information System for Disaster Risk Reduction and Sustainable Development, 2012–2017, adopted the Plan of Action for the period 2012–2017.⁷

12. At the twentieth session of the Intergovernmental Consultative Committee held in New Delhi from 31 October to 1 November 2016, it was noted that a new regional plan of action was required after 2017, and that the new regional plan of action should reflect the emerging needs specific to the region and subregions, taking into account several previous ESCAP resolutions covering disaster risk management, connectivity, the 2030 Agenda and the needs of small island developing States.⁸

13. 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 secretariat's preparation 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.

14. Consequently, the Intergovernmental Consultative Committee on the Regional Space Applications Programme for Sustainable Development at its twenty-first session, held in Bangkok in October 2017, agreed on the 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

⁵ *Official Records of the Economic and Social Council, 1995, Supplement No. 17 (E/1995/37)*, para. 261.

⁶ See E/ESCAP/1166.

⁷ See E/ESCAP/SASD/3/Rev.1.

⁸ E/ESCAP/ICC(21)/4. Available at [www.unescap.org/sites/default/files/E_ESCAP_ICC\(21\)_4_Draft%20outline%20of%20AsiaPacificPlanofAction%202018-2030.pdf](http://www.unescap.org/sites/default/files/E_ESCAP_ICC(21)_4_Draft%20outline%20of%20AsiaPacificPlanofAction%202018-2030.pdf).

the fullest extent to meet their individual and regional needs for achieving the Sustainable Development Goals.⁹

15. At its first meeting, held in late May 2018, the Drafting Committee for the Plan of Action prioritized 48 Goal targets to which space applications could most significantly contribute to the priority thematic areas outlined in the regional road map.

16. In June 2018, the United Nations convened the United Nations Global Space Summit (UNISPACE+50) high-level segment, held in Vienna in commemoration of the fiftieth anniversary of the first United Nations Conference on the Exploration and Peaceful Uses of Outer Space, which marked a significant step towards chartering a comprehensive Space 2030 agenda. The United Nations Global Space Summit encouraged all States to continue to promote and actively contribute to strengthening international cooperation in the peaceful use of outer space and facilitating the realization of the Sustainable Development Goals, considering the needs of developing countries.

17. At the Intergovernmental Consultative Committee at its twenty-second session, held in Bangkok in August 2018, participants endorsed the activities in the priority thematic areas based on the regional road map which can support the work towards attaining many Sustainable Development Goals: (a) disaster risk reduction and resilience; (b) management of natural resources; (c) connectivity; (d) energy; (e) social development; and (f) climate change. Committee members also provided concrete actions that can be associated with those targets, specifically: (a) research and knowledge-sharing; (b) capacity-building and technical support; and (c) intergovernmental discussions and regional practices.

18. The Plan of Action has three broad aims. First, it includes activities at the international, regional and national levels, focusing on the six priority areas identified in the regional road map. Second, the Plan of Action identifies the means and modes of implementation. Third, it promotes partnership and collaboration between member States, United Nations agencies, intergovernmental mechanisms, and international and technical organizations in the implementation of the Plan of Action.

19. The final draft Plan of Action, along with a draft ministerial declaration, will be considered by the members and associate members at the ad hoc session of the Intergovernmental Consultative Committee, which will be held in Bangkok on 8 and 9 October 2018, and then presented for adoption at the third Ministerial Conference on Space Applications for Sustainable Development in Asia and the Pacific, which will be held in Bangkok on 10 October 2018.

II. Modalities and means of implementation

20. The Plan of Action emphasizes six broad thematic areas identified under the Regional Roadmap, to help focus across the breadth of space applications while actions provide the scope for implementation, as shown in the figure provided.

⁹ See E/ESCAP/ICC(21)/9. Available at www.unescap.org/sites/default/files/E_ESCAP_ICC%2821%29_9_SummaryReport_REV.pdf.

Overview of the Asia-Pacific Plan of Action on Space Applications for Sustainable Development

Vision

Member States in the Asia-Pacific region can access and use space science, technology and its applications to the fullest extent at the national and regional levels to achieve the goals set out in the 2030 Agenda for Sustainable Development.

Mission

Member States of the Economic and Social Commission for Asia and the Pacific and the Regional Space Applications Programme for Sustainable Development network to implement the Regional Space Applications Programme as the Asia-Pacific regional framework for the coordination and strengthening of regional space cooperation in support of the regional road map for implementing the 2030 Agenda for Sustainable Development in Asia and the Pacific.

Priority themes and targeted actions

Six priority themes and three targeted actions were identified to implement the Plan of Action.¹⁰

Review of implementation

Phase I: 2018–2022

Phase II: 2022–2026

Phase III: 2026–2030

Actions in priority themes

21. Actions were identified under specific themes (annex). The following sections summarize these actions in general:

(a) Disaster risk reduction and resilience

22. The Sendai Framework specifically highlights the use of space applications, including geographic information systems, to enhance measurement tools, data collection, data analyses and dissemination of data.¹¹ To reduce disaster risk and build greater resiliency among communities and regions, the Plan of Action seeks to strengthen integrating digital innovation with space applications for disaster risk reduction, damage assessment and emergency response, as well as monitoring multi-hazards related to agriculture and climate. These actions will contribute to the implementation of Sustainable Development Goals 2 (Zero hunger) and 13 (Climate action) and are in line with the Sendai Framework, which sets global common standards and targets for disaster risk reduction. Disaster risk reduction is incorporated in 25 targets in 10 of the 17 Sustainable Development Goals.¹²

(b) Management of natural resources

23. Improving natural resource management and protection of ecosystems is a key priority in the regional road map. Space applications can offer valuable

¹⁰ A matrix of actions for thematic areas is attached as an annex to the present document.

¹¹ General Assembly resolution 69/283.

¹² See *ibid.*

information to support conservation and sustainable resource management. The proposed actions will support implementing Goals 6 (Water and sanitation), 9 (Industry, innovation and infrastructure), 11 (Sustainable cities and communities), 12 (Responsible consumption and production), 14 (Life under water) and 15 (Life on land), among others. Many activities have cross-cutting benefits to other sectors such as water management, sustainable marine and coastal ecosystems, forests resources, urban planning, land degradation and desertification.

(c) Connectivity for the 2030 Agenda for Sustainable Development

24. Seamless connectivity across transport, information and communications technology, and trade sectors is a key theme highlighted in the ESCAP report *Enhancing Regional Economic Cooperation and Integration in Asia and the Pacific*. The commitment to integration, regional cooperation, and connectivity was highlighted in the regional road map. The proposed actions in this thematic area, which can be supported by the use of geospatial information and tools, include creating more capacity development opportunities, access to the Internet with low-cost information and communications technology for poorer communities, building smart transport systems, facilitating study on cross-border immigrant and internal disaster displacement, will contribute to the implementation of Goals 3 (Good health and well-being), 4 (Quality education), 9 (Industry, innovation and infrastructure), 10 (Reduce inequalities) and 11 (Sustainable cities and communities).

(d) Social development

25. Social development is a cross-cutting issue for many Sustainable Development Goals and focuses on ameliorating disparities in income and wealth across all communities. The proposed actions in this area that focus on using earth observation in support of mapping poverty and vulnerable groups, identifying health risk hotspots, monitoring and cleaning up pollution and contamination will contribute to the implementation of Goals 1 (Poverty eradication) and 3 (Good health and well-being).

(e) Energy

26. In 2011, the Sustainable Energy for All initiative was launched to ensure universal energy access. Clean and affordable energy is a prerequisite for achieving many of the other Sustainable Development Goals.¹³ Specific proposed actions under this thematic area will be concentrated on the effective use of space-derived data and geographic information systems for identification and mapping of the renewable energy potential, such as hydropower and geothermal and solar energy. It will significantly contribute to the implementation of Sustainable Development Goal 7 (Affordable and clean energy).

(f) Climate change

27. Responding to climate change is a major global challenge. The implementation of the United Nations Framework Convention on Climate Change and the Paris Agreement is essential to the achievement of at least four Sustainable Development Goals.¹⁴ The regional road map works to help

¹³ *Enhancing Regional Economic Cooperation and Integration in Asia and the Pacific* (United Nations publication, Sales No. E.18.II.F.5).

¹⁴ Available at www.un.org/sustainabledevelopment/climate-change-2/.

member States transition into more efficient, low-carbon economies to mitigate and adapt to the impacts of climate change.¹⁵ The proposed actions under this area will focus on innovative geospatial information for climate modelling and scenario development, including impact and vulnerability mapping, through existing programmes.

III. Action areas to define the scope of implementation

28. Action areas were introduced to provide parameters to the scope of implementation, with many identified under specific themes. A detailed overview of these is provided in the annex to the present document. Modalities under each of these actions which cut across all themes are also discussed below. The Intergovernmental Consultative Committee agreed that capacity development and technical support was a priority for most countries in the region, while recognizing that research and knowledge-sharing, through regional cooperation platforms, remain important supporting actions.

A. Research and knowledge-sharing

29. Research and knowledge-sharing activities are critical in further establishing the significant role that space applications can play in supporting actions under the different thematic areas. In addition, the acknowledgement of emerging and frontier technologies has been recognized, although in many cases it is unknown how those supporting digital innovations can be integrated with space applications. Actions which were identified as cross-cutting include:

(a) Research and share knowledge on the use of space applications to support sustainable development;

(b) Research and share knowledge on the barriers to utilizing space applications, including historical analysis of experiences to inform future recommendations development;

(c) Encourage the exchange of experts, professionals and resource personnel on space applications to support knowledge-sharing;

(d) Engage with youth to stimulate research and take advantage of innovations from young entrepreneurs.

B. Capacity-building and technical support

30. The majority of actions identified under this action area includes the development of capacity or provision of technical support on methodologies or the use of technologies. For that reason, the Intergovernmental Consultative Committee has suggested the need to clarify specifically which methodologies or technologies, whenever possible. Cross-cutting and reoccurring actions identified in this action area include:

(a) Develop capacity and provide technical support to access, analyse and utilize earth observation data and information, particularly for countries with special needs and those with limited capacity to use space applications;

(b) Provide technical support to access and easily understand information and research related to space applications;

¹⁵ Commission resolution 73/9.

(c) Provide technical support on integrating space applications with digital innovations, other sources of data and existing geospatial data platforms for evidence-based decision support.

C. Intergovernmental discussions and regional practices

31. The majority of actions identified under this action area involves working with existing intergovernmental mechanisms and with international and technical organizations. Given the breadth of thematic and sectoral areas covered, and the need for engagement across a broader set of line ministries and responsible authorities, beyond the traditional space applications sector, it is well-understood that actions are to be taken as appropriate and in line with national plans and individual circumstances. Specific actions that reoccur for this action areas and cut across all themes include:

(a) Support discussions and facilitate cooperation on the development of guidelines for integrating geospatial information with other sources of data to support relevant activities;

(b) Develop a common understanding and work towards developing standards on spatial scale, temporal resolution and cartographic elements with regard to space applications;

(c) Collect, share and promote good practices and experience on space policies and legislation, particularly those that support regional cooperation;

(d) Raise awareness of the benefits and the barriers to accessing space applications at the policy and senior government levels;

(e) Facilitate discussion, cooperation and promote good practices in the use of satellite data, tools, products and applications for sustainable development and encourage resource allocation at the national level for this purpose;

(f) Work with existing intergovernmental mechanisms, and international and technical organizations to share satellite data and information to support their relevant agendas, coherent with the thematic areas identified in the Plan of Action and the Sustainable Development Goals;

(g) Given the increasing commercialization of space applications, promote and facilitate discussions with private and commercial entities to support and continue Governments' access to satellite data and products for sustainable development.

IV. Means of implementation as an ongoing collective effort

32. The Plan of Action is designed to provide both a consolidated needs assessment for countries in the region that wish to utilize space applications for sustainable development, and a guide for partners that wish to support those countries in meeting the needs.

A. Complementarity and partnerships with global and regional initiatives

33. Implementation of the Plan of Action will contribute to the harmonization of regional actions and aims to reduce duplication of efforts, enhance cooperation and strengthen partnerships. It is a collective action between member States, the United Nations system, regional and international institutions, including the private sector and other stakeholders. Regional cooperation should be strengthened by enhancing networking and

harmonization among the relevant initiatives and efforts being made, and by enlarging the base of stakeholders around a common theme. It is not envisioned that new mechanisms will be established, but that greater coordination will be strengthened with existing mechanisms.

34. Regional and global space mechanisms are currently involved in the implementation of the 2030 Agenda. For example, the Group on Earth Observations, through the Asia-Oceania Group on Earth Observations, has been implementing a range of activities involving the use of space-based Earth observation for specific thematic purposes such as oceans, biodiversity, climate change and water management. Other regional space cooperation frameworks, such as the Asia-Pacific Regional Space Agency Forum, and the Asia-Pacific Space Cooperation Organization, also have extensive programmes in various thematic areas. The Committee of Experts on Global Geospatial Information Management are presently working to bring together geospatial experts and national statistical institutes to build the capacities to link statistics with geospatial information in the measurement of key indicators in the Sustainable Development Goals. The Plan of Action further seeks to engage, as appropriate, with the work of other relevant United Nations bodies, such as the United Nations Institute for Training and Research Operational Satellite Applications Programme, the Office for Outer Space Affairs and the entities of the United Nations system represented in the United Nations Inter-Agency Meeting on Outer Space Activities.

35. Finally, the Plan of Action aims to enhance synergy by strengthening regional cooperation and harmonizing regional initiatives. ESCAP and other institutions involved in the development of this Plan of Action can help by providing a brokering service between countries, linking experts with those requiring support for specific actions.

B. Existing capacities in the region

36. Work relating to space applications and the benefits it provides to many sectors is rapidly evolving. Many agencies and regional or international groups are undertaking research and discussions on how space applications can be used to address concerns around natural resource management, climate change, food security and poverty eradication. Presenting this academic work to policymakers who can address these issues in an informed manner is an important role that organizations like ESCAP can play. Having intergovernmental committees in macroeconomics and poverty reduction, environment, trade, transport, energy, information and communications technology, disaster risk management, social development and statistics, ESCAP is ideally suited to advocate and sensitize ministers and government officials, bringing good practices from various organizations, the scientific and space community to the end users and decision makers. Furthermore, many countries have developed space policies or have initiatives and tools which they are willing to share or even help adapt to the conditions of other countries.

37. In addition, several countries in the region have experts already experienced in the use of space technologies for many applications and are willing to provide expert training, advice, tools and information to countries that are less experienced or have less access, often as in-kind contributions of their time and resources. Countries are actively engaged in supporting other developing countries with capacity-building, software, satellite and remote-sensing data, information and communications technology applications and expert advice.

C. Resources

38. To support the actions set forth in the Plan of Action, appropriate and targeted financing will be needed. While it is envisaged that implementation and financing will primarily be the responsibility of national Governments, multiple financing sources can be utilized, and innovative ways sought, to support implementation at the national and regional levels.

39. Financial resources will assist countries in responding to some of the identified challenges. To support and enable the use of space applications and their associate tools for sustainable development, a trust fund could contribute to narrowing the capacity gaps in the region, ensuring that an integrated approach is developed based on adequate resources, comprising a network of partners and linking to other initiatives outside the region. Other donors and partners could also support individual activities or parts of the Plan of Action.

40. Many countries are already providing considerable in-kind support through satellite imagery and data, training, expert advice, software or tools, infrastructure, experience sharing and personnel to maintain regional resources and support other national Governments, all of which amounts to over a million dollars a year. Several countries in the region have experts already experienced in the use of space technologies for many applications and are willing to provide expert to countries less experienced. Governments have supported activities in the past, though great potential also exists to harness private sector support or develop effective public-private partnerships.

V. Phased review of progress towards the Plan of Action

41. The Intergovernmental Consultative Committee recognizes the need to review and amend the Plan of Action, as it covers a period until 2030, to reflect the evolving needs of countries, emerging technologies, shifting priorities and unforeseen challenges arising in the region. As a result, a phased review has been suggested over four-year periods. It should be noted that different subregions and countries have their own priorities. For example, research and knowledge-sharing are a higher priority for the Pacific region, and therefore small island developing States are likely to prioritize activities that fall into this category.

42. It is not the intention of all countries or partner organizations to implement all activities under this Plan of Action. It will guide participating countries and organizations on actions required of Governments, and allows intergovernmental mechanisms, national Governments and international and technical organizations to prepare their own work plans to support the Plan of Action. Progress towards implementation of the Plan of Action can be reported by member countries to the Regional Space Applications Programme network, to share experiences and seek support to overcome challenges through regional cooperation.

Annex

Matrix of the Plan of Action

Disaster Risk Reduction and Resilience

Goals and targets	<i>Action Area 1 Research and knowledge-sharing</i>	<i>Action Area 2 Capacity-building and technical support</i>	<i>Action Area 3 Intergovernmental discussions and regional practices</i>
<p>Sendai Framework for Disaster Risk Reduction</p> <p>Targets: 1, 2, 3, 4</p>	<ul style="list-style-type: none"> Identify interfaces between, and integration of, traditional space-based information and frontier technologies to address disaster risk management and build resilience. Research opportunities for utilizing Global Satellite Navigation System for infrastructure and utilities mapping, relevant to disaster damage assessment. 	<p><i>Innovation</i></p> <ul style="list-style-type: none"> Develop capacity in integrating and utilizing space applications with new methods, tools and technologies, from other digital innovations, for the mapping process. 	<ul style="list-style-type: none"> Promote the use of Global Satellite Navigation System technologies in disaster risk reduction and management at the policy level. Discuss the potential concept of a common regional information technology system to support activities related to space applications for sustainable development.
<p>Sustainable Development Goal 11: Sustainable cities and communities</p> <p>Target: 11.5</p>	<ul style="list-style-type: none"> Share knowledge on the use of space-based information to enhance people-centred early warning systems and better understand elements at risk. 	<p><i>Risk reduction</i></p> <ul style="list-style-type: none"> Provide technical support on how to integrate, enhance and strengthen multi-hazard early warning systems and real-time situational analysis for rapid-onset disasters, including flash floods from high-altitude lake and glacial outbursts, as well as slow-onset disasters, including drought and sand and dust storms. 	<ul style="list-style-type: none"> Integrate geospatial analytical techniques and products into emergency and crises management processes and plans, according to national circumstances. Promote the use of space applications in strengthening early warning systems by sharing good practices and discuss challenges in disseminating early warning information. Promote the use of space applications for critical infrastructure mapping and support actions related to building resilient societies. Integrate space applications to support the Sendai Framework Monitor system and relevant indicators.

Disaster assessment

- Identify, collect and compile ground-based data required for disaster preparedness and response, e.g., population density, infrastructure (housing type), elements at risk and other baseline data.
- Integrate ground-based and satellite systems for effective monitoring of disasters and critical infrastructure.
- Provide access to pre- and post-disaster satellite data to affected countries for damage assessment.
- Consult with meteorological satellite providers to provide data and information to disaster-affected countries, e.g., through data sharing norms or the International Charter on Space and Major Disasters
- Collect good practices on satellite-mapping products which can contribute to developing guidelines and principles.

Emergency response

- Develop and share tools, publications and guidelines relevant to earth observation for disaster response.
- Research and share knowledge on mobile information and communication technology tools for emergency response.
- Support and encourage becoming parties to the International Charter on Space and Major Disasters and regional frameworks, such as Sentinel Asia.
- Continue to ensure the smooth coordination of earth observation data provided to disaster-affected countries, through existing global and regional mechanisms.

Food production

Sustainable
Development
Goal 2: Zero
hunger
Target: 2.4

- Analyse factors that determine crop productivity using statistical and modelling approaches, such as crop outlook, pest and insect outbreaks. using agrometeorological information derived from earth observation data.
- Demand mapping for food production and processing against population density to understand the food security needs of the vulnerable sections.
- Provide technical support to map infrastructure related to food storage, warehousing, etc. and socioeconomic information to ascertain demand and distribution.
- Develop capacity in terms of seasonal forecasting and its impact on agriculture.
- Provide technical support for near real-time monitoring of weather conditions using meteorological and earth observation satellite data.
- Support relevant discussions on seasonal forecasting and share good practices on common agricultural crops in existing intergovernmental forums, such as Group on Earth Observations Global Agricultural Monitoring.

Agroecosystem resilience

- Mainstream climate information for agroecosystem resilience, e.g., livestock, aquaculture, fisheries, alternate livelihoods.
- Share knowledge on developing soil maps for ecosystem management
- Strengthen the capacity of countries to use satellite data for agroecosystem resilience, including analysing geospatial data for multi-hazard early warning, such as flood, drought and cyclone.
- Develop and strengthen user-tailored decision support tools for drought monitoring, early warning and management.
- Share experiences and findings from drought management systems which can contribute to regional policy discussions.

Precision agriculture

- Research the application and integration of unmanned aerial vehicles, global navigation satellite systems, remote sensing and frontier technologies to support precision agriculture.
 - Provide technical support to countries pursuing precision agriculture using unmanned aerial vehicles, global navigation satellite systems and earth observation data for managing agricultural conditions.
 - Promote the integration of space applications with other digital innovations to support precision agriculture.
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Climate hazards

Sustainable Development Goal 13: Climate action
Target: 13.1

- Integrate climate models, hazard information and earth observation data for improving climate resilience.
 - Provide technical support in disseminating information and results on multi-hazard risks, derived from climate change models and earth observation data, to decision makers and those working at the policy levels.
 - Develop capacity for modelling climate hazards, as well as scenario and impact modelling.
 - Collect good practices on using space applications to better understand climate-related hazards, which can contribute to developing guidelines and principles.
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Management of Natural Resources

Goals and targets	<i>Action Area 1 Research and knowledge-sharing</i>	<i>Action Area 2 Capacity-building and technical support</i>	<i>Action Area 3 Intergovernmental discussions and regional practices</i>
<p>Sustainable Development Goal 6: Clean water and sanitation</p> <p>Targets: 6.1, 6.3, 6.5, 6.6</p>	<ul style="list-style-type: none"> • Research and share knowledge on the applications of geospatial information for water recycling and treatment. 	<p style="text-align: center;"><i>Water quality</i></p> <ul style="list-style-type: none"> • Develop capacity for and provide technical support on mapping water quality including oil spills, algae blooms and other pollutants. 	<ul style="list-style-type: none"> • Share good practices on methodologies for mapping water quality.
	<ul style="list-style-type: none"> • Research to better understand how space applications can support estimations of water availability and loss, including rainfall, snow, ice, surface, subsurface and ground water. • Share knowledge and identify hotspots for water demand in urban and agricultural areas. • Identify areas for water harvesting structures and watershed ecosystem restoration. 	<p style="text-align: center;"><i>Water resource management</i></p> <ul style="list-style-type: none"> • Develop capacity for and provide technical support on mapping and monitoring water resources, such as satellite-derived rainfall estimates, snow, ice caps and glaciers, surface, subsurface and ground water, including ground water recharge sites for watershed management scenarios. • Develop capacity for and provide technical support on mapping water-related infrastructure, such as irrigation channels and pipelines. • Provide technical support on integrating space applications with meteorological and ground-based data, for water resource management. • Develop capacity for adapting existing programmes to identify the status of water bodies. • Provide technical support for combining space applications with other data sources for water accounting at the local and watershed scale. 	<ul style="list-style-type: none"> • Contribute to regional cooperation efforts in the use of space applications for the development of water management plans. • Support intergovernmental discussions and facilitate cooperation on transboundary water-related issues, through the provision of space applications and tools. • Work with existing intergovernmental mechanisms and international and regional organizations to provide satellite data and information to support water management and monitoring, as appropriate. • Promote standard methodologies and techniques for monitoring transboundary river basins and water catchments.
<p>Sustainable Development Goal 9: Industry, innovation and infrastructure</p> <p>Target: 9.4</p>	<ul style="list-style-type: none"> • Research the integration of space applications and frontier technologies to support change detection of infrastructure and industries. 	<p style="text-align: center;"><i>Infrastructure</i></p> <ul style="list-style-type: none"> • Develop capacity for the monitoring of infrastructure and buildings, including complex large-scale engineering projects, to ensure environmental sustainability. • Provide capacity for the use of geospatial information, engineering data and risk information for modelling to inform urban planning and management. 	<ul style="list-style-type: none"> • Share good practices on the use of space applications for change detection of infrastructure.

	<i>Cultural heritage</i>		
<p>Sustainable Development Goal 11: Sustainable cities and communities</p> <p>Targets: 11.4, 11.6, 11.b</p>	<ul style="list-style-type: none"> • Research on the use of satellite data to protect and safeguard cultural and natural heritage. 	<ul style="list-style-type: none"> • Develop capacity for identifying and mapping cultural and natural heritage sites, including 3D modelling and terrestrial laser scanning for visualisation. 	<ul style="list-style-type: none"> • Work with existing intergovernmental mechanisms and international and regional organizations to provide satellite data and information to support the implementation of national heritage protection plans.
	<i>Waste management</i>		
	<ul style="list-style-type: none"> • Research the use and integration of space applications with other sources of data, for management of waste, including collection and transportation. 	<ul style="list-style-type: none"> • Provide technical support on the use of space applications and analysis for site selection, landfill monitoring and waste management (solid, liquid and gas). • Develop capacity for the use of remote sensing and global navigation satellite systems to monitor the collection and transportation of waste. 	<ul style="list-style-type: none"> • Work with existing intergovernmental mechanisms and international and regional organizations to provide satellite data and information to support waste management policies.
<i>Urban planning</i>			
	<ul style="list-style-type: none"> • Research techniques for using space applications and frontier technologies to monitor unplanned development of urban settlements over time. 	<ul style="list-style-type: none"> • Develop capacity for mapping and modelling urban and peri-urban areas and settlements. • Develop capacity to use space applications to monitor urban pollution, including urban heat island effects and air and water quality. • Develop capacity to use space applications and other digital innovations for mapping urban areas and facilities to support urban planning. • Develop capacity to use space applications and other digital innovations to monitor unplanned development of urban settlements over time. 	<ul style="list-style-type: none"> • Promote standard methodologies and techniques for monitoring air quality. • Extend existing early warning systems, including for sand and dust storms, to encompass other subregions, where relevant. • Share experiences and good practices on the use of space applications for urban planning, to inform policymakers and local governments.
<i>Consumption and production</i>			
<p>Sustainable Development Goal 12: Responsible consumption and production</p> <p>Target: 12.2</p>	<ul style="list-style-type: none"> • Research how space applications can be used to raise public awareness of natural resource consumption and management over time. 	<ul style="list-style-type: none"> • Develop capacity for mapping consumption and production patterns in different areas and sectors using geospatial information. 	<ul style="list-style-type: none"> • Work with existing intergovernmental mechanisms and international and regional organizations to promote the use of space applications for corporate social responsibility.

Sustainable
Development
Goal 14: Life
below water

Targets: 14.1,
14.2, 14.4,
14.5, 14.7

Water pollution

- Identify the appropriate models to monitor and map coastal and ocean water quality.
 - Develop capacity to use space applications to assess the impacts of pollution near coastal areas and in marine environments.
 - Provide technical support and develop capacity to monitor and model the impacts of sedimentation on marine ecosystems.
 - Work with existing intergovernmental mechanisms and international and regional organizations to provide satellite data and information to support the development and implementation of guidelines for marine pollution management.
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Marine ecosystems

- Share experience on monitoring marine ecosystems, such as marine sanctuaries, mangrove, coral, seagrass, etc.
 - Provide technical support and develop capacity in zonal identification and mapping, including potential fishing areas, protected areas, etc.
 - Work with existing intergovernmental mechanisms and international and regional organizations to provide satellite data and information to support the management of marine ecosystems.
 - Contribute to regional cooperation efforts in the use of space applications to support the management of marine ecosystems.
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Coastal ecosystems

- Better understand the global and local causes of coastal erosion and monitor subsidence using space applications.
 - Monitor shoreline changes using satellite data to understand the level of deposits and erosion and understand its impact on marine life.
 - Provide technical support to monitor and analyse coastal ecosystems, including sea surface temperature, chlorophyll, fish distribution, etc.
 - Promote standard geospatial methodologies and techniques to interpret coastlines.
 - Support discussions and facilitate cooperation on marine and coastal regulations, zoning and area planning through the provision of space applications and tools.
 - Share good practices on monitoring and providing solutions to prevent erosion using space applications.
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Sustainable fisheries

- Research and share knowledge on the methodologies and techniques for using space applications to support fisheries.
 - Provide technical support and develop capacity for the use and integration of geographic information systems, global navigation satellite systems and satellite communications with marine and maritime services to support monitoring of and enforcement against unauthorized fishing and vessels.
 - Identify good practices and promote cooperation on using space applications to support sustainable fisheries.
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Sustainable Development Goal 15: Life on land

Targets: 15.1, 15.2, 15.3, 15.4, 15.5

Forests

- Develop methodologies for detecting forest cover change and disturbances, including invasive species, fire, haze, etc., using high-resolution satellite data.
- Develop capacity to assess deforestation and forest changes over time using satellite data.
- Provide technical support for fire risk mapping, haze and mapping of protected areas.
- Provide technical support, including satellite data, tools and knowledge, to monitor forest dynamics and to aid in forest management.
- Provide technical support and develop capacity to identify afforestation and reforestation areas.
- Work with existing intergovernmental mechanisms and international and regional organizations to provide satellite data and information to support conservation and management of forests.

Biodiversity and endangered species

- Identify threats to ecosystem and monitor biodiversity loss.
- Research and share knowledge on the use of mobile technology or automated image recognition for monitoring natural habitats.
- Research on methodologies and techniques for identifying and managing biodiversity and endangered species.
- Provide technical support and develop capacity for using satellite data and global navigation satellite systems to support monitoring and enforcement of protected areas and species.
- Provide technical support on monitoring recovery of terrestrial ecosystems, including 3D mapping and slope and terrain analysis.
- Work with existing intergovernmental mechanisms and international and regional organizations to provide satellite data and information to support conservation and management of terrestrial ecosystems, in line with international agreements.
- Work with existing intergovernmental mechanisms and international and regional organizations to agree on standards and methodologies for biodiversity characterization.

Land use change

- Share knowledge on methodologies for integrating space applications and frontier technologies for land use classification.
- Provide technical support and develop capacity on monitoring land use change across all terrestrial ecosystems.
- Work with existing intergovernmental mechanisms and international and regional organizations to agree on standards and methodologies for the identification of land use classifications.

Land degradation and desertification

- Research and share knowledge on the use of space applications to support methodologies in mapping land suitability and land capability.
- Provide technical support to develop capacity to identify land degradation and desertification.
- Work with existing intergovernmental mechanisms, and international and regional organizations, to provide satellite data and information to support the development and implementation of land degradation neutrality guidelines.

Connectivity

Goals and targets	<i>Action Area 1 Research and knowledge-sharing</i>	<i>Action Area 2 Capacity-building and technical support</i>	<i>Action Area 3 Intergovernmental discussions and regional practices</i>
<i>Road traffic incidents</i>			
Sustainable Development Goal 3: Good health and well-being Target: 3.6	<ul style="list-style-type: none"> • Research the integration of satellite data with ground information and other sources of data, to identify traffic conditions, hazardous areas and driving behaviours. 	<ul style="list-style-type: none"> • Provide technical support and develop capacity to integrate satellite data and ground data from multiple sources to identify accident hotspots, observe traffic conditions and analyse driving behaviours. 	<ul style="list-style-type: none"> • Work with existing intergovernmental mechanisms and international and regional organizations to provide satellite data and information to support the development and implementation of traffic rules and regulations, transport management and infrastructure, to minimize road traffic incidents and inform other relevant policies.
<i>Scholarships</i>			
Sustainable Development Goal 4: Quality education Target: 4.b	<ul style="list-style-type: none"> • Promote ongoing research in space applications for sustainable development, through scholarships and research grants, and share knowledge on relevant innovative research. 	<ul style="list-style-type: none"> • Continue to provide capacity development opportunities through scholarships to support the use of space applications for sustainable development. 	<ul style="list-style-type: none"> • Share experiences on scholarship programmes and good practices on maximizing the impacts of scholarship recipients. • Discuss opportunities for increasing the number of scholarships to conduct innovative research in space applications, particularly for countries with special needs.
<i>Access to the Internet</i>			
Sustainable Development Goal 9: Industry, innovation and infrastructure Target: 9.c	<ul style="list-style-type: none"> • Research innovations in satellite communications to support cost-effective access to the Internet. 	<ul style="list-style-type: none"> • Develop capacity to utilize satellite communications and establish low-cost information and communications technology to improve access to the Internet, especially for poorer communities. 	<ul style="list-style-type: none"> • Contribute to regional cooperation efforts in the use of space applications for improving access to the Internet.

Migration

Sustainable Development Goal 10: Reduced inequalities
Target: 10.7

- Research and share knowledge on how geospatial information can be used to map historical trends in migration.
- Research on how high-resolution satellite imagery can be integrated with frontier technologies to identify displacement from disasters and complex emergencies.
- Develop capacity to utilize geospatial information and high-resolution satellite imagery to study migration, including cross-border and internal disaster displacement, temporary shelters and structures, etc., for humanitarian and development purposes.
- Work with existing intergovernmental mechanisms and international and regional organizations to provide satellite data and information to support the orderly, safe, regular and responsible migration and mobility of people and to inform planned and well-managed migration policies.

Transport systems

Sustainable Development Goal 11: Sustainable cities and communities
Targets: 11.2, 11.3

- Research how space applications, information and communications technology and frontier technologies can support the development of smart and safe transport and logistics services and systems.
 - Develop capacity to monitor ground, air and marine transport using space applications and other data and information.
 - Share good practices on the use of space applications to support the development of efficient and resilient transport systems and relevant policies.
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Social Development

Goals and targets	<i>Action Area 1 Research and knowledge-sharing</i>	<i>Action Area 2 Capacity-building and technical support</i>	<i>Action Area 3 Intergovernmental discussions and regional practices</i>
	<i>Poverty</i>		
Sustainable Development Goal 1: No poverty Target:1.5	<ul style="list-style-type: none"> • Research methodologies on how to utilize space applications to identify and distinguish socioeconomic development, e.g., poverty mapping, satellite data for night lights. 	<ul style="list-style-type: none"> • Develop capacity to produce poverty maps to understand the spatial distribution of poverty and inequality. 	<ul style="list-style-type: none"> • Discuss ways to integrate space applications and geospatial information into poverty measurement and methodologies.
	<i>Vulnerable groups</i>		
	<ul style="list-style-type: none"> • Economic mapping to understand the impacts of climate-related events on the socioeconomic conditions of vulnerable groups. 	<ul style="list-style-type: none"> • Develop capacity on how to disaggregate and geo-reference vulnerable groups from integrated data sources and map against natural hazard exposure. 	<ul style="list-style-type: none"> • Promote the disaggregation of vulnerable groups when using space applications to map socioeconomic indicators.
	<i>Health management</i>		
Sustainable Development Goal 3: Good health and well-being Targets: 3.9, 3.d	<ul style="list-style-type: none"> • Better understand health risks and identify the causal factors of disease spread, including human and animal, etc. • Research on how geographic information system, global navigation satellite systems and satellite communications can be used to minimize the spread of health epidemics. • Research methodologies for geo-referencing and disaggregating health data, such as obesity and malnutrition. • Research and share knowledge on the use of satellite communications to address gaps in telemedicine. • Extend research in early warning, risk mapping and risk reduction to incorporate health risks to livestock, agriculture and aquaculture. 	<ul style="list-style-type: none"> • Develop capacity to map health risk hotspots using geospatial information and big data. • Monitor health impacts, including those of livestock, agriculture and aquaculture through earth observation data. 	<ul style="list-style-type: none"> • Share good practices from the health sector, and work with existing intergovernmental mechanisms, international and regional organizations and relevant implementing agencies that could benefit from the use of geo-information science. • Promote cooperation among neighbouring countries and work with intergovernmental mechanisms and international and regional organizations to address transboundary health risks, i.e., the spread of disease or condition of air quality.

Contamination and pollution

- Identify hazardous chemicals, pollutants and contaminants using satellite information.
- Build capacity on how to monitor and support the clean-up of pollution and contamination using earth observation.
- Provide technical support in monitoring and forecasting movement of air mass and ocean currents, in the context of pollutants (i.e., oil spills).
- Develop capacity to use space applications to monitor air pollution including dust, smog and other pollutants from hazardous chemicals, pollutants and contaminants.
- Raise awareness on different sources of data on pollutants and contaminants and work with existing intergovernmental mechanisms and international and regional organizations in this regard.

Energy

Goals and targets	<i>Action Area 1 Research and knowledge-sharing</i>	<i>Action Area 2 Capacity-building and technical support</i>	<i>Action Area 3 Intergovernmental discussions and regional practices</i>
	<i>Modern and sustainable energy services</i>		
Sustainable Development Goal 7: Affordable and clean energy Target: 7.b	<ul style="list-style-type: none"> • Research and map the renewable energy potential using space applications. • Research the use of satellite data and information to identify traditional energy sources. • Research the integration and use of space applications with other sources of data to determine energy demand and consumption. • Research the use and movement of biomass stocks using space applications. • Research the use of space applications for energy infrastructure site selection. 	<ul style="list-style-type: none"> • Develop capacity to map the sources and movement of biomass energy. • Develop capacity to use space applications for identification and mapping of renewable energy potential such as hydropower and geothermal and solar energy. • Develop capacity to use space applications for mapping and supporting the development and planning of power lines, gas lines and necessary infrastructure for delivery and transport of energy services. 	<ul style="list-style-type: none"> • Share good practices and facilitate cooperation on how space applications can support the development of standards and methodologies for the identification of renewable energy potential.

Climate Change

Goals and targets	<i>Action Area 1 Research and knowledge-sharing</i>	<i>Action Area 2 Capacity-building and technical support</i>	<i>Action Area 3 Intergovernmental discussions and regional practices</i>
<i>Mitigation and adaptation</i>			
Sustainable Development Goal 13: Climate action Target: 13.2	<ul style="list-style-type: none"> • Research on measuring greenhouse gas concentration from meteorological satellites. • Share knowledge on the use of space applications to support mitigation and adaptation programmes in agriculture, forestry and water, e.g., crop selection, water resource management. • Contribute to research in developing climate scenarios to understand projected climate events based on historical data and information, including climate impact and vulnerability mapping. • Share knowledge on the use of space applications for climate adaptation and mitigation in urban planning and management. Explore the use of remote sensing and global navigation satellite systems for adaptation. • Explore the use of remote sensing and global navigation satellite systems for adaptation. 	<ul style="list-style-type: none"> • Provide technical support on monitoring and measuring greenhouse gas emissions and absorption. • Develop capacity for using space applications for climate modelling and scenario development, including impact and vulnerability mapping, through existing programmes. 	<ul style="list-style-type: none"> • Promote the use of evidence-based information to support decision-making on the effects of climate change. • Support existing intergovernmental mechanisms, and international and regional organizations, and their relevant programmes on the use of space applications for adaptation and mitigation of climate change.