



# General Assembly

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## Committee on the Peaceful Uses of Outer Space

### Report of the Expert on Space Applications\*

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\* In the present report, it was necessary to summarize each of the activities organized during 2015 under the United Nations Programme on Space Applications, the last of which was concluded on 21 December 2015.



## **I. Mandate of the United Nations Programme on Space Applications**

1. In its resolution 37/90, the General Assembly decided that the United Nations Programme on Space Applications should be directed towards the following objectives:

(a) Promotion of greater exchange of actual experiences with specific applications;

(b) Promotion of greater cooperation in space science and technology between developed and developing countries, as well as among developing countries;

(c) Development of a fellowship programme for in-depth training of space technologists and applications specialists;

(d) Organization of seminars on advanced space applications and new system developments for managers and leaders of space application and technology development activities, as well as seminars for users in specific applications;

(e) Stimulation of the growth of indigenous nuclei and an autonomous technological base with the cooperation of other United Nations organizations and/or States Members of the United Nations or members of the specialized agencies;

(f) Dissemination of information on new and advanced technology and applications;

(g) Provision or arrangements for provision of technical advisory services on space applications projects, upon request by Member States or any of the specialized agencies.

2. In its resolution 59/2, the General Assembly endorsed the Plan of Action proposed by the Committee on the Peaceful Uses of Outer Space for the implementation of the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III)<sup>1</sup> (A/59/174, sect. VI.B) and urged all Governments, entities of the United Nations system and intergovernmental and non-governmental entities conducting space-related activities to carry out the actions contained in the Plan of Action on a priority basis for the further implementation of the recommendations of UNISPACE III, in particular its resolution entitled “The Space Millennium: Vienna Declaration on Space and Human Development”.<sup>2</sup>

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<sup>1</sup> See *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3).

<sup>2</sup> Ibid., chap. I, resolution 1.

## II. Orientation of the Programme

### A. Thematic priorities and initiatives

3. The Programme is aimed at further promoting, through international cooperation, the use of space technologies and data for sustainable economic and social development in developing countries by increasing the awareness of decision makers of the cost-effectiveness and additional benefits to be obtained; establishing or strengthening capacity in developing countries to use space technology; and strengthening outreach activities to disseminate awareness of the benefits obtained.

4. The overall strategy of the Programme is to focus on selected thematic priorities that are critical for developing countries, define and work towards objectives achievable in two to five years and build on the results of previous activities. The thematic priorities are environmental monitoring, natural resource management, satellite communications for tele-education and telemedicine applications, disaster risk reduction, the use of global navigation satellite systems (GNSS), the Basic Space Science Initiative, climate change, the Basic Space Technology Initiative, the Human Space Technology Initiative, and ecosystems and biodiversity.

5. Additional Programme directions include spin-offs of space technology, promotion of youth participation in space activities and promotion of private industry participation in the activities of the Programme.

6. The Programme is implemented by:

(a) Providing support for education and training for capacity-building in developing countries through the regional centres for space science and technology education, affiliated to the United Nations;

(b) Organizing workshops and seminars on advanced space applications and space technology, as well as short- and medium-term training programmes;

(c) Conducting initiatives with long-term plans and goals to enhance capacity-building activities in basic space science, basic space technology and human space technology;

(d) Strengthening its long-term fellowship programme to include support for the implementation of pilot projects;

(e) Supporting or initiating pilot projects as a follow-up to activities of the Programme in areas of priority interest to Member States;

(f) Providing technical advisory services, upon request, to Member States, bodies and specialized agencies of the United Nations system and relevant national and international organizations;

(g) Enhancing access to space-related data and other information.

7. The Basic Space Science Initiative, launched in 1990, is a long-term effort for the development of astronomy and space science through regional and international cooperation in the field on a worldwide basis, in particular in developing countries. The Initiative has contributed to the international and regional development of astronomy and space science through annual workshops on basic space science, the

organization of the International Heliophysical Year 2007 and the implementation of the International Space Weather Initiative. The Basic Space Science Initiative has led to the establishment of planetariums, astronomical telescopes and space weather instrument arrays, primarily in developing countries. In 2015, the Programme organized a symposium on the use of science and data products from International Space Weather Initiative instruments.

8. The Basic Space Technology Initiative was launched in 2009 to support capacity-building in space technology development, with a particular focus on small-satellite missions. After the conclusion in 2011 of a three-year series of symposiums on small-satellite programmes held in Graz, Austria, a new series of international symposiums on basic space technology development was started in 2012 and will be continued in 2016. In 2015, the Initiative provided input for the preparation of the guidance on space object registration and frequency management for small and very small satellites for the fifty-fourth session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (A/AC.105/C.2/2015/CRP.17) and continued the United Nations/Japan Long-Term Fellowship Programme on Nanosatellite Technologies, implemented in cooperation with the Government of Japan and the Kyushu Institute of Technology.

9. The Human Space Technology Initiative was launched in 2010 with the aims of promoting international cooperation in human spaceflight and space exploration-related activities; promoting increased awareness among countries of the benefits of utilizing human space technology and its applications; and building capacity in microgravity education and research. The Initiative is currently conducting the third cycle of the Zero-Gravity Instrument Project, the second cycle of the Drop Tower Experiment Series and the new United Nations/Japan Cooperation Programme on CubeSat Deployment from the International Space Station Japanese Experiment Module (Kibo) “KiboCUBE”.

## **B. 2030 Agenda for Sustainable Development**

10. The General Assembly adopted the outcome document of the United Nations summit for the adoption of the post-2015 development agenda, entitled “Transforming our world: the 2030 Agenda for Sustainable Development”, in September 2015. It contains the 17 Sustainable Development Goals.

11. The Programme has done a preliminary assessment on how to align its work to the Sustainable Development Goals and will continue to refine it until UNISPACE+50, when the Programme will finalize its alignment to the Goals. The following paragraphs contain the results of the preliminary assessment.

12. The Programme’s activities are basically in line with the Sustainable Development Goals.

13. A new thematic priority (ecosystems and biodiversity, see A.AC.105/2015/CRP.10) was initiated for the Programme in 2015 in relation to Goals 14 and 15. That new thematic priority may be regarded as an extension of the thematic priorities on environmental monitoring and natural resource management. Space technology and its applications can contribute to the monitoring of biodiversity and ecosystem dynamics and the conducting of wildlife management by

making use of information gathered from Earth observation satellites and GNSS. The Programme will organize a series of workshops, bringing together relevant space technology and biodiversity experts, and will strengthen partnerships with various organizations working on monitoring and protecting ecosystems and biodiversity, such as the United Nations Environment Programme (UNEP). The Programme will also address the applicable regulatory frameworks and aim to involve relevant governmental and non-governmental organizations.

14. The Programme has been organizing activities focusing on tele-health and tele-epidemiology for global health. In order to enhance that thematic priority, which is related to Sustainable Development Goal 3, the Programme organized a meeting on the applications of space science and technology for public health in cooperation with the World Health Organization (WHO) that was held in Geneva on 15 and 16 June 2015 (A/AC.105/1099). The Programme will continue to strengthen its partnership with WHO and will undertake more substantive projects under Goal 3.

15. The Programme has been collaborating with the regional centres for space science and technology education, affiliated to the United Nations, and conducting various fellowship programmes to build capacity in space science and technology around the world. The Programme will continue to strengthen its educational activities related to Goal 4 by enhancing collaborative activities with the regional centres and introducing fellowship programmes on new thematic priorities. The Drop Tower Experiment Series fellowship programme is a newly developed programme in which student teams from developing countries are provided with opportunities to conduct experiments on microgravity science and technology at the Bremen Drop Tower, in Bremen, Germany.

16. The Programme would also like to strengthen the Basic Space Science Initiative, the Basic Space Technology Initiative and the Human Space Technology Initiative by focusing on their capacity-building activities that relate to Goal 3 and creating new partnerships, which comes under Goal 17. For example, the Basic Space Technology Initiative conducted the International Space Weather Initiative, under which more than 1,000 instruments were deployed worldwide as part of 17 different space weather observational arrays by academic institutions worldwide. The Human Space Technology Initiative has been conducting the Zero-Gravity Instrument Project, under which 45 schools and institutions from around the world are carrying out microgravity science experiments. Those Initiatives are demonstrating their potential to create and enhance partnerships with external organizations to carry out the Initiatives' activities.

### **III. Activities of the Programme**

#### **A. Training for capacity-building in developing countries**

##### **1. Regional centres for space science and technology education, affiliated to the United Nations**

17. In its resolution 70/82, the General Assembly noted with appreciation that the regional centres for space science and technology education, affiliated to the United Nations, had continued their education programmes in 2015 and agreed that they

should continue to report to the Committee on the Peaceful Uses of Outer Space on their activities.

18. The Programme has invited all the regional centres to submit reports on their educational activities and operational status and on recent developments in their work. Information, reports and presentations on the activities of the regional centres are available on the website of the Office for Outer Space Affairs of the Secretariat ([www.unoosa.org/oosa/en/ourwork/psa/regional-centres/index.html](http://www.unoosa.org/oosa/en/ourwork/psa/regional-centres/index.html)). A summary of those reports is contained in “Capacity-building in space science and technology: regional centres for space science and technology education, affiliated to the United Nations” (ST/SPACE/41).

19. The overall goal of the regional centres remains to develop, through in-depth education, indigenous capacity for research and applications in remote sensing and geographic information systems, satellite meteorology and global climate, satellite communications, space and atmospheric science, GNSS and space law. Curricula for those disciplines have been developed at meetings held in the framework of the Programme.

20. Information on the postgraduate courses offered by the regional centres supported under the Programme is included in annex III to the present document.

## **2. Fellowship programmes for training**

21. The masters in navigation and related applications programme is a joint initiative of Politecnico di Torino and Istituto Superiore Mario Boella, Italy, with the collaboration of the Istituto Nazionale di Ricerca Metrologica and the Office for Outer Space Affairs. The programme has been structured to effectively meet labour market demand for high-level technicians with a broad vision of GNSS technology and environmental monitoring applications. Four representatives of governmental organizations and research and academic institutions from India, Iran (Islamic Republic of) and Viet Nam were selected by the Office for Outer Space Affairs, together with the sponsoring organizations, to study at the Politecnico in Turin, Italy. The programme commenced in October 2015.

22. The Office for Outer Space Affairs and the Government of Japan continued the United Nations/Japan Long-Term Fellowship Programme on Nanosatellite Technologies in cooperation with the Kyushu Institute of Technology, as part of capacity-building activities under the Basic Space Technology Initiative. Six candidates, from Bangladesh, Costa Rica, Egypt, Mexico, Mongolia and Turkey, selected from among 155 qualified applicants, began their studies at the Institute in October 2015. The deadline for applications for the 2016 programme is 24 January 2016. Details of the application procedure are available from the website of the Office for Outer Space Affairs.

23. The Office for Outer Space Affairs and the Government of Germany launched the Drop Tower Experiment Series in November 2013. In collaboration with the Centre for Applied Space Technology and Microgravity and the German Aerospace Centre (DLR), the Series offers selected research teams the opportunity to conduct their own microgravity experiments at the Drop Tower in Bremen, Germany. In the second cycle in 2015, a student team from the Universidad Católica Boliviana “San Pablo” (Plurinational State of Bolivia) was awarded the fellowship. Their experiment consists of examining and evaluating in a microgravity environment the

property of an alloy of nickel and titanium that has shape memory. The team successfully conducted its experiments from 24 to 27 November 2015. The announcement of opportunity for the third cycle was released on 1 November 2015, with a deadline for applications of 31 March 2016.

## **B. Projects for capacity-building in developing countries**

24. The Zero-Gravity Instrument Project (see A/AC.105/1108) was launched in 2012 as part of the capacity-building activities of the Human Space Technology Initiative. Under the Project, a number of microgravity-simulating instruments, called clinostats, have been distributed to schools and institutions worldwide. The Project is expected to provide unique opportunities for students and researchers to observe natural phenomena under simulated microgravity conditions on the ground and to inspire them to undertake further study in the fields of space science and technology. In order to provide straightforward instructions for teachers and students on performing experiments on plant growth using the clinostats in a school laboratory, the Teacher's Guide to Plant Experiments in Microgravity (ST/SPACE/63) was developed and is now available from the website of the Office for Outer Space Affairs.

25. The Office for Outer Space Affairs and the Government of Japan, in collaboration with the Japan Aerospace Exploration Agency (JAXA), launched a new programme, the United Nations/Japan Cooperation Programme on CubeSat Deployment from the International Space Station Japanese Experiment Module (Kibo) "KiboCUBE", in September 2015. The programme is aimed at providing opportunities to educational or research institutions from developing countries to deploy cube satellites (CubeSats) from the Japanese Experiment Module Kibo. Each institution will develop and manufacture its own CubeSat, and JAXA will transport it to the International Space Station and deploy it from the Japanese Experiment Module Kibo. It is the first joint programme between the United Nations and Japan to open up the unique capability of the International Space Station to the world. It will raise awareness of the role that space science and technology play in promoting sustainable development and will contribute to building capacity in space science and technology. The first announcement of opportunity for the programme was released on 8 September 2015, with a deadline for applications of 31 March 2016.

## **C. Space science and technology and their applications**

### **1. Enabling space technologies**

26. The United Nations/Russian Federation Workshop on the Applications of Global Navigation Satellite Systems held in Krasnoyarsk, Russian Federation, from 18 to 22 May 2015 (A/AC.105/1098) was organized by the Office for Outer Space Affairs in cooperation with the Russian Federal Space Agency (Roscosmos), on behalf of the Government of the Russian Federation. The workshop was hosted by the joint stock company Academician M.F. Reshetnev Information Satellite Systems. The objectives of the five-day workshop were to: (a) strengthen regional information and data exchange networks on the use of GNSS technology, including various training programmes and capacity-building needs in GNSS and its

applications; (b) develop a regional plan of action that would contribute to the wider use of multi-constellation GNSS and its applications, including the possibility of one or more national and/or regional pilot projects in which interested institutions could incorporate the use of GNSS/Global Navigation Satellite System (GLONASS) technology; and (c) define recommendations and findings to be forwarded as a contribution to the work of the International Committee on Global Navigation Satellite Systems (ICG).

27. Participants in the workshop noted that applications using GNSS covered a large array of sectors, including all forms of transportation (road, air, maritime and rail), energy production and distribution, advanced technologies (timing, scientific applications, Earth observation and network synchronization), life saving (emergency and location-based services) and disaster management. Nevertheless, the applications were susceptible to disruption in the operation of GNSS receivers when malfunctions, failures or interference occurred. Radio frequency interference, detection and mitigation had, therefore, become topics of paramount importance owing to the increasing number of services and applications based on positions obtained by means of GNSS. In order to take appropriate steps to protect GNSS users from interference and to improve the robustness of GNSS in countering interference, the need to raise the awareness of national spectrum managers and administrators regarding the threat of unwanted interference was identified as a possible area of focus. In that context, participants recommended that ICG conduct technical seminars and lectures focusing on GNSS spectrum protection and interference detection and mitigation.

28. The meeting on the applications of space science and technology for public health held in Geneva on 15 and 16 June 2015 was a follow-up activity to the United Nations Expert Meeting on the International Space Station Benefits for Health held in Vienna on 19 and 20 February 2014 (A/AC.105/1069). The meeting on the applications of space science and technology for public health brought together WHO representatives and representatives from the space community to: (a) assess the status of space technology-related contributions to addressing health issues; (b) identify relevant technologies and applications that are not yet being used by the health sector; (c) identify barriers and potential solutions for implementing space technology-related health applications; and (d) consider opportunities for aligning relevant space-related activities, such as research activities on the International Space Station, ongoing activities within the Group on Earth Observations and other frameworks relevant to the priorities of WHO.

29. The discussions at the meeting were centred around four issues: (a) updating the table mapping International Space Station health research activities and technologies to WHO leadership priorities; (b) utilizing space technology for areas related to the activities of WHO; (c) preparing a resolution for consideration by the World Health Assembly to raise awareness about the role of space science, technology and applications for public health; and (d) considering a dedicated call for a proposal for health-related research on the International Space Station linked to WHO leadership priorities. The meeting participants also identified various collaborative projects such as utilizing sensors and portable diagnostic equipment and water purification technologies to access safe water based on the space technologies developed for the International Space Station.



## 2. Space science

30. The United Nations/Japan Workshop entitled “Space Weather: Science and Data Products from International Space Weather Initiative Instruments” was held in Fukuoka, Japan, from 2 to 6 March 2015 as part of the activities of the Basic Space Science Initiative (A/AC.105/1096). The objectives of the Workshop were to: (a) review the status of space weather instruments (in situ and spaceborne), data access, availability and collection and modelling efforts to advance space weather research and improve space weather forecasting; (b) support the continued deployment of ground-based International Space Weather Initiative instrument arrays and data exploitation; (c) continue the development, particularly in developing countries, of space science schools and other space weather education activities, which encourage students to consider a career in space science; (d) review the role of international cooperation in addressing space weather-related issues, such as possible further cooperation towards truly global space-weather monitoring capabilities; and (e) consider opportunities for international cooperation in the standardization, sharing and wider and timely use of space weather data, including for operational purposes.

31. The substantive discussions at the Workshop focused on the continuation of International Space Weather Initiative activities and on linking them to operational space weather monitoring and to activities under the item on space weather on the agenda of the Committee on the Peaceful Uses of Outer Space and to the work of the Expert Group on Space Weather. Specific recommendations were made with regard to maintaining and upgrading the International Space Weather Initiative instrument network, international coordination of space weather research, issues of data policy and operational use of Initiative data, and future Initiative activities. In particular, the Workshop participants recommended establishing an Initiative data archive and open data policy and also tasked the Initiative’s steering committee with drafting relevant guidelines and policies. In addition, they recommended that the steering committee consider preparing an action plan that would outline the goals, schedule and implementation of future Initiative activities.

## D. Technical advisory services and regional cooperation

32. The Programme supported the third meeting of the University Space Engineering Consortium-Global (UNISEC-Global), held in Tokyo from 3 to 5 July 2015. The aim of UNISEC-Global is to foster space engineering education and capacity-building in space technology development worldwide. It currently has local chapters in 11 countries. The Programme also supported the sixth CanSat Leader Training Programme, organized by UNISEC-Japan and held at Hokkaido University in Sapporo, Japan, from 24 August to 4 September 2015. The CanSat activities are an affordable and highly motivating starting point for teaching hands-on space engineering skills that can be transferred and applied to the development of actual space hardware. The Programme provided travel support for four of the participants, from Angola, Bangladesh, Tunisia and Turkey.

33. The Programme was invited by the European Space Sciences Committee of the European Science Foundation to report on its activities under the Basic Space Science Initiative. In the past, the Committee had contributed to the discussions

under Action Team 14, on near-Earth objects, and is interested in seeking opportunities to enhance its cooperation with the Committee on the Peaceful Uses of Outer Space.

34. The Programme supported a workshop entitled “Bridging information communication technologies and the environment: making information talk and technologies work for water security” that was held at the Central European University in Budapest from 6 to 10 July 2015. The workshop was part of a joint project between UNEP and the University, organized under the framework of its summer university. Resources for the workshop were provided by the Abu Dhabi Global Environmental Data Initiative in the context of the Eye on Earth Alliance. Twenty environmental specialists from 15 countries participated in the workshop and had the chance to discuss a number of technologies, including remote sensing, geospatial technologies, data publishing and decision support systems. In particular, the roles of satellite-based Earth monitoring and remote sensing for environmental studies and management were discussed. The Programme provided travel support to some of the participants and delivered a number of lectures and practical training sessions.

35. The Programme co-sponsored a workshop in cooperation with the Joint Research Centre of the European Union to bring together governmental organizations from countries in the eastern part of the European Union and a selected panel of experts to discuss existing and evolving needs in crop monitoring at the national and regional levels. Such needs are directly relevant to food security and natural resource management in the region as well. The workshop was organized in the context of novel technology applications and availability of free and open high-resolution satellite imagery from the Copernicus Sentinel 1 and 2 satellite sensors. The workshop recommendations will be used by the Joint Research Centre to identify new products and services for agricultural monitoring to benefit the European Union and neighbouring States.

36. The Programme provided the International Society for Photogrammetry and Remote Sensing with financial support to assist a number of participants from developing countries to attend its annual Geospatial Week workshop, which was hosted in France from 28 September to 2 October 2015. The workshop was an opportunity for participants from developing countries to be part of a very rich scientific programme that covered geoinformation issues in data collection, information extraction and data quality control and dissemination.

37. The Programme supported the African Leadership Conference on Space Science and Technology held in Sharm El Sheikh, Egypt, from 1 to 3 December 2015, by providing financial support to allow a number of participants from developing countries to attend. At the Conference, participants shared information on space-related activities at the national and continental levels in Africa. The draft African space policy and African space strategy were also presented, before being submitted to the African Union in 2016.

## **E. Summary of activities related to the United Nations Programme on Space Applications**

### **1. Activities of the Programme carried out in 2015**

38. Details on the meeting and workshops held in 2015 are provided in annex I.

### **2. Activities of the Programme scheduled for 2016**

39. The symposiums and workshops scheduled for 2016, together with their objectives, are listed in annex II.

### **3. Activities of the regional centres for space science and technology education, affiliated to the United Nations, during the period 2014-2016**

40. The nine-month postgraduate courses to be offered by the regional centres for space science and technology education, affiliated to the United Nations, during the period 2014-2016 are listed in annex III.

## **IV. Voluntary contributions**

41. The successful implementation of Programme activities in 2015 benefited from the support and voluntary contributions in cash and in kind from Member States and their institutions as well as from the assistance and cooperation of regional and international governmental and non-governmental organizations.

42. The following Member States and governmental and non-governmental organizations provided support for the Programme's activities in 2015:

(a) China, which provided \$20,000 in support of the implementation of the Programme;

(b) Japan, which provided \$20,000 in support of the implementation of the Human Space Technology Initiative;

(c) The host Governments of events held in the framework of the Programme, which defrayed the costs of local organization and facilities and of room, board and local transportation for some participants from developing countries (see annex I). The in-kind support given in 2015 by those Governments is estimated to have amounted to approximately \$203,000;

(d) Member States and their space-related institutions, as well as regional and international organizations, which provided sponsorship to experts for giving technical presentations and participating in discussions on activities of the Programme (see annex I and reports on individual activities);

(e) The European Space Agency, which provided \$45,000 in support of the implementation of the Programme;

(f) The International Astronautical Federation, which provided €20,000 in support of the implementation of the Programme.

## Annex I

## United Nations Programme on Space Applications: meeting and workshops held in 2015

<i>Title of activity and place and date held</i>	<i>Sponsoring country</i>	<i>Sponsoring organization</i>	<i>Host institution</i>	<i>Funding support</i>	<i>Number of countries and international entities represented</i>	<i>Number of participants</i>	<i>Document symbol of report</i>
United Nations/Japan Workshop on Space Weather: Science and Data Products from International Space Weather Initiative Instruments Fukuoka, Japan 2-6 March 2015	Japan	Japan Society for the Promotion of Science, National Institute of Information and Communications Technology, Tohoku University, Solar-Terrestrial Environment Laboratory of Nagoya University, Fukuoka Convention and Visitors Bureau, Ministry of Foreign Affairs and Ministry of Education, Culture, Sports, Science and Technology	Kyushu University	The United Nations and co-sponsors provided full or partial financial support for 21 participants.	35	118	A/AC.105/1096
United Nations/Russian Federation Workshop on the Applications of Global Navigation Satellite Systems Krasnoyarsk, Russian Federation 18-22 May 2015	Russian Federation	Russian Federal Space Agency (Roscosmos) and International Committee on Global Navigation Satellite Systems	Joint stock company Academician M.F. Reshetnev Information Satellite Systems	The United Nations and co-sponsors provided full or partial financial support for 23 participants.	22	80	A/AC.105/1098

<i>Title of activity and place and date held</i>	<i>Sponsoring country</i>	<i>Sponsoring organization</i>	<i>Host institution</i>	<i>Funding support</i>	<i>Number of countries and international entities represented</i>	<i>Number of participants</i>	<i>Document symbol of report</i>
Meeting on the applications of space science and technology for public health Geneva 15 and 16 June 2015	Switzerland	-	World Health Organization	The United Nations and co-sponsors provided full or partial financial support for one participant.	10	35	A/AC.105/1099

## Annex II

## United Nations Programme on Space Applications: schedule of symposiums and workshops for 2016

<i>Title</i>	<i>Place and date</i>	<i>Objectives</i>
United Nations/Costa Rica Workshop on Human Space Technology	San José 7-11 March 2016	To exchange information on achievements in the human space programmes; discuss how to promote international cooperation by further facilitating the participation of developing countries and industries in human space exploration-related activities; create awareness of the benefits of human space technology and its applications; and build capacity in microgravity science education and research.
United Nations/India Workshop on the Use of Earth Observation Data in Disaster Management and Risk Reduction: Sharing the Asian Experience	Hyderabad, India 8-11 March 2016	To demonstrate operational programmes and tools that make use of Earth observation data to address the disaster management cycle, including understanding disaster risks, responding to emergencies, assessing damage and loss and providing inputs to mitigate disasters; synthesize experiences and lessons learned by Asian countries, the most vulnerable region, and make effective use of Earth observation for disaster management; and promote the use of Earth observation in disaster-prone areas in order to prepare for, mitigate and respond to natural disasters, plan and build more resilient infrastructure and allow for more sustained, inclusive and sustainable growth, in line with the 2030 Agenda for Sustainable Development.
United Nations/Kenya Workshop on Space Technology and Applications for Wildlife Management and Protecting Biodiversity	Nairobi 27-30 June 2016	To address the growing demand for space-based information and space technologies as Earth observation and satellite positioning for biodiversity monitoring and wildlife management. As the first workshop on these topics organized by the United Nations Programme on Space Applications in Africa, a special session might address coastal ecosystem observations. Recent advancement in this domain will be presented, and specific needs in Africa will be identified for further action in better applying the benefits of space technologies to the domain of biodiversity.
United Nations/Austria Symposium on Integrated Space Technology Applications for Climate Change	Graz, Austria 12-14 September 2016	To discuss ways in which countries affected by climate change can make better use of space applications to assess vulnerability to climate change; identify potential alternatives in the context of mitigation and adaptation to climate change; improve synergies among space agencies and organizations targeting efforts on climate change; strengthen international and regional cooperation in climate change; and raise awareness about recent advances in space-related technologies, services and information resources that can be used to assess the impacts of climate change and the effects of measures implemented to reduce such impacts.

<i>Title</i>	<i>Place and date</i>	<i>Objectives</i>
United Nations/International Astronautical Federation Workshop on Space Technology for Socioeconomic Benefits	Guadalajara, Mexico 23-25 September 2016	To discuss space technologies, applications, information and services that contribute to sustainable economic and social development programmes, with a primary focus on the use of satellite telecommunications for early warning systems; increase awareness among decision makers and representatives of the research and academic community of space technology applications for addressing economic development; examine low-cost space-related technologies and information resources in the thematic areas that are available for addressing economic development needs in developing countries; promote educational and public awareness initiatives and contribute to the capacity-building process; and strengthen international and regional cooperation.
United Nations/Islamic Republic of Iran Workshop on the Use of Space Technology for Dust Storm and Drought Monitoring in the Middle East Region	Tehran 5-9 November 2016	To address topics related to the use of space technologies in drought monitoring as well as for dust storm tracking and monitoring. A particular focus will be on Central Asia, which is often affected by such environmental phenomena. Also, in collaboration with the United Nations Environment Programme, the secretariat of the Framework Convention for the Protection of the Marine Environment of the Caspian Sea and other stakeholders, a session will be dedicated to considering the specific benefits of space tools in the wider environmental monitoring of the Caspian Sea basin. Knowledge will be exchanged on various applications in these domains and on the applicability of existing drought monitoring systems to the region, addressing specific concerns of the host Government and neighbouring countries.
United Nations/Nepal Workshop on the Applications of Global Navigation Satellite Systems	Kathmandu 5-9 December 2016	To introduce GNSS and its applications to transportation and communications, aviation, surveying, mapping and Earth science, management of natural resources, the environment and disasters, precision agriculture and high-precision mobile applications; discuss space weather effects on GNSS and dual-frequency receivers; promote a greater exchange of actual experiences with specific applications; and encourage greater cooperation in developing partnerships and GNSS networks, in the framework of the regional reference frames.
United Nations/South Africa Symposium on Basic Space Technology	South Africa 2016	To address the status of capacity-building in space technology development, in particular as related to small satellite activities, with a focus on Africa; consider opportunities for regional and international cooperation, as well as legal and regulatory issues of space technology development, including the long-term sustainability of outer space activities; and discuss the development of the curriculum on basic space technology.

## Annex III

### Regional centres for space science and technology education, affiliated to the United Nations: schedule of nine-month postgraduate courses, 2014-2016

#### 1. Centre for Space Science and Technology Education in Asia and the Pacific

<i>Year</i>	<i>Venue</i>	<i>Activity</i>
2014-2015	Indian Institute of Remote Sensing, Dehra Dun, India	Nineteenth Postgraduate Course on Remote Sensing and Geographic Information Systems
2014-2015	Space Applications Centre, Ahmedabad, India	Ninth Postgraduate Course on Satellite Meteorology and Global Climate
2014-2015	Physical Research Laboratory, Ahmedabad, India	Ninth Postgraduate Course on Space and Atmospheric Science
2015-2016	Indian Institute of Remote Sensing, Dehra Dun, India	Twentieth Postgraduate Course on Remote Sensing and Geographic Information Systems
2015-2016	Space Applications Centre, Ahmedabad, India	Tenth Postgraduate Course on Satellite Communication
2015-2016	Space Applications Centre, Ahmedabad, India	First Postgraduate Course on Global Navigation Satellite Systems

#### 2. African Regional Centre for Space Science and Technology — in French Language

<i>Year</i>	<i>Venue</i>	<i>Activity</i>
2014-2015	Mohammadia School of Engineers, Mohammed V University-Agdal, Rabat	Eleventh Postgraduate Course on Remote Sensing and Geographic Information Systems
2014-2015	Mohammadia School of Engineers, Mohammed V University-Agdal, Rabat	Fifth Postgraduate Course on Satellite Meteorology and Global Climate
2015-2016	Mohammadia School of Engineers, Mohammed V University-Agdal, Rabat	Twelfth Postgraduate Course on Remote Sensing and Geographic Information Systems
2015-2016	Mohammadia School of Engineers, Mohammed V University-Agdal, Rabat	Sixth Postgraduate Course on Satellite Meteorology and Global Climate



### 3. African Regional Centre for Space Science and Technology — in English Language

<i>Year</i>	<i>Venue</i>	<i>Activity</i>
2014	Obafemi Awolowo University, Ile-Ife, Nigeria	Twelfth Postgraduate Course on Remote Sensing and Geographic Information Systems
2014	Obafemi Awolowo University, Ile-Ife, Nigeria	Eleventh Postgraduate Course on Satellite Communications
2014	Obafemi Awolowo University, Ile-Ife, Nigeria	First Postgraduate Course on Global Navigation Satellite Systems
2015	Obafemi Awolowo University, Ile-Ife, Nigeria	Thirteenth Postgraduate Course on Remote Sensing and Geographic Information Systems
2015	Obafemi Awolowo University, Ile-Ife, Nigeria	Twelfth Postgraduate Course on Satellite Communications

### 4. Regional Centre for Space Science and Technology Education for Latin America and the Caribbean

<i>Year</i>	<i>Venue</i>	<i>Activity</i>
2013-2014	National Institute of Astrophysics, Optics and Electronics, Tonantzintla, Puebla, Mexico	Eighth Postgraduate Course on Remote Sensing and Geographic Information Systems
2014-2015	National Institute of Astrophysics, Optics and Electronics, Tonantzintla, Puebla, Mexico	Ninth Postgraduate Course on Remote Sensing and Geographic Information Systems

### 5. Regional Centre for Space Science and Technology Education for Western Asia

<i>Year</i>	<i>Venue</i>	<i>Activity</i>
2013-2015	Royal Jordanian Geographic Centre, Amman	First Postgraduate Course on Remote Sensing and Geographic Information Systems

### 6. Regional Centre for Space Science and Technology Education in Asia and the Pacific (China)

<i>Year</i>	<i>Venue</i>	<i>Activity</i>
2015-2016	Beihang University, Beijing	First Postgraduate Course on Remote Sensing and Geographic Information Systems
2015-2016	Beihang University, Beijing	First Postgraduate Course on Global Navigation Satellite Systems