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Report on the United Nations/Viet Nam Workshop on Space Technology Applications for Socio-Economic Benefits

(Hanoi, 10-14 October 2011)

I. Introduction

1. The Office for Outer Space Affairs of the Secretariat organized a series of workshops to promote the use of space technology and its applications for socio-economic benefits, particularly in developing countries.

2. The first workshop was held in Istanbul, Turkey, from 14 to 17 September 2010. The background information and report (A/AC.105/986) containing the recommendations that emanated from that event are available on the workshop website (www.tubitak.gov.tr/spaceworkshop) and the website of the Office for Outer Space Affairs (www.unoosa.org/oosa/en/SAP/act2010/un-turkey/index.html).

3. The second workshop was held in Hanoi from 10 to 14 October 2011. It was organized by the Office for Outer Space Affairs as part of the activities of the United Nations Programme on Space Applications for 2011 and hosted by the Vietnamese Academy of Science and Technology (VAST) on behalf of the Government of Viet Nam, in cooperation with the International Society for Photogrammetry and Remote Sensing (ISPRS) and the National Aeronautics and Space Administration (NASA) of the United States of America. The workshop was co-sponsored by the European Space Agency (ESA).

4. The present report describes the background, objectives and programme of the workshop and contains observations made by workshop participants. The report has been prepared pursuant to General Assembly resolution 64/86.

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A. Background and objectives

5. At the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), Member States recommended that activities of the United Nations Programme on Space Applications should promote collaborative participation among Member States at the regional and international levels[1] and emphasized the development of knowledge and skills in developing countries.

6. At its fifty-third session, in 2010, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposiums and conferences of the Programme on Space Applications for 2011. Subsequently, the General Assembly, in its resolution 65/97, endorsed the activities to be carried out under the auspices of the United Nations Programme on Space Applications in 2011.

7. Pursuant to General Assembly resolution 65/97 and in accordance with the recommendations of UNISPACE III, the United Nations/Viet Nam Workshop on Space Technology Applications for Socio-Economic Benefits was held in Hanoi from 10 to 14 October 2011. In its resolution 54/68, the General Assembly had endorsed the resolution entitled "The Space Millennium: Vienna Declaration on Space and Human Development",[2] adopted by UNISPACE III. UNISPACE III formulated the Vienna Declaration as the nucleus of a strategy to address future global challenges by using space applications.

8. Implementation of the recommendations contained in the Vienna Declaration could support many of the actions called for in the Plan of Implementation of the World Summit on Sustainable Development.[3] In particular, existing space-based tools could contribute to and strengthen the capacities of developing countries to improve the management of natural resources and environmental monitoring by increasing and facilitating the use of data acquired through the use of space technologies.

9. The objective of the workshop was to increase awareness of the socio-economic benefits of space technology applications at the national, regional and international levels. The participants were provided with case studies of socio-economic benefits of space science and technology applications, focusing mainly on satellite remote sensing, satellite communications, global navigation satellite systems (GNSS), capacity-building and regional and international cooperation.

10. The workshop was aimed at contributing to regional and international cooperation by providing an opportunity to exchange up-to-date information on space technology applications that have had socio-economic benefits.

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[1] *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), chap. II, para. 409 (d) (i).

[2] Ibid., chap. I, resolution 1.

[3] *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 2, annex.

11. The workshop had the following specific objectives:

(a) To promote ongoing relevant national, regional and global initiatives that have demonstrated the capabilities and applications of space technology in the area of socio-economic benefits and sustainable development;

(b) To promote regional and international cooperation in the development of space technology and its applications between and among countries at all levels of development, with a particular focus on supporting developing countries through capacity-building activities;

(c) To strengthen regional awareness and information and data exchange networks on the use of space technology;

(d) To address principles and mechanisms for enhancing national, regional and international cooperation in space technology development and applications;

(e) To develop collaborative project ideas that, while addressing specific societal issues confronting individual member States or regions, are globally applicable.

B. Programme

12. Introductory statements were made by the President of the Vietnamese Academy of Science and Technology, a representative of the Ministry of Science and Technology of Viet Nam, the President of ISPRS, a representative of ESA and representatives of the Office for Outer Space Affairs.

13. The workshop consisted of a keynote session, seven thematic plenary sessions, including a panel discussion, and working group sessions. The workshop programme also included a one-day Geographic Information Systems (GIS) hands-on training event entitled “Fundamentals and functionality in GIS”.

14. The programme of the workshop included a series of technical presentations on successful applications of space technology-based tools that provided cost-effective solutions or essential information for planning and implementing programmes and projects for socio-economic benefits.

15. The seven plenary sessions consisted of presentations on the following topics: (a) capacity-building in space technology; (b) remote sensing applications; (c) recent developments in space science and technology; (d) disaster management and satellite-based early warning systems; (e) GNSS applications, GIS and satellite communications; (f) Earth observation and health; and (g) regional and international cooperation.

16. Participants made presentations on relevant activities and contributed to discussions held to identify priority areas for possible follow-up actions and to determine possible partnerships or strengthen existing ones. Four working group sessions were conducted during the workshop.

17. A total of 40 presentations were made by participants from developing and developed countries, and comprehensive discussion sessions were held at the conclusion of each plenary session.

18. One full day of the workshop was devoted to training in fundamentals and functionality of GIS, provided by the Thailand and Viet Nam offices of the Environmental Systems Research Institute, Inc. (ESRI). That training exercise was compatible with the education curriculum “Remote sensing and GIS”, developed by and for the nine-month postgraduate courses organized at the United Nations-affiliated regional centres for space science and technology education (www.unoosa.org/oosa/en/SAP/centres/index.html). The training consisted of lectures, presentations, demonstrations and hands-on exercises on the following topics: (a) “The big picture of GIS”; (b) “GIS power: map meets database”; (c) “Query and analyse spatial relationships”; and (d) “Getting to know ArcGIS online”.

19. Visits to the Space Technology Institute of the Vietnamese Academy of Science and Technology and to the Hanoi University of Science and Technology, particularly its International Collaboration Centre for Research and Development on Satellite Navigation Technology in South-East Asia (NAVIS), were conducted.

C. Attendance

20. A total of 139 participants from the following 22 countries attended the workshop: Angola, Azerbaijan, Canada, Chile, India, Iran (Islamic Republic of), Iraq, Italy, Japan, Kazakhstan, Lao People’s Democratic Republic, Malaysia, Mongolia, Myanmar, Nigeria, Sri Lanka, Thailand, Tunisia, Turkey, United States, Uzbekistan and Viet Nam. Representatives of the Office for Outer Space Affairs, International Telecommunication Union, ESA, ESRI, ISPRS and NASA also participated.

21. Funds allocated by the United Nations and the co-sponsors were used to defray the cost of air travel, daily subsistence allowance and accommodation for 18 participants. The co-sponsors also provided funds for local organization, facilities and transportation of participants.

II. Summary of technical presentations

A. General topics

22. The plenary sessions provided participants with an opportunity to learn how the use of space technology could be of benefit in various areas, such as aviation, maritime and land transportation, urbanization, mapping and surveying, human health, disaster management, food security and sustainable agriculture, environmental monitoring and natural resources management. In the workshop sessions, national and regional successes were described, and potential applications were explained. The plenary sessions led to a discussion on how countries could benefit from cost-effective means of achieving sustainable development goals by strengthening many sectors of space technology and its applications.

23. The presentations made at the workshop were distributed to the participants on CD-ROM. Further information on the programme, background materials and presentations are available on the website of the workshop (www.sti.vast.ac.vn/spaceworkshop_UN_VAST-2011/) and

the website of the Office for Outer Space Affairs (www.unoosa.org/oosa/en/SAP/act2011/Vietnam/index.html).

B. Case studies on international, regional and national cooperation

24. Four case studies that emanated from the workshops hosted by Turkey and Viet Nam were provided in relation to three levels of cooperation to increase awareness of the socio-economic benefits of space technology applications on: (a) ISPRS and NAVIS, for the international level; (b) SharEarth: Cooperative Model for Earth Observation Capacity Development in the Black Sea Region, for the regional level; and (c) NASA, for the national level.

1. International Society for Photogrammetry and Remote Sensing and International Collaboration Centre for Research and Development on Satellite Navigation Technology in South-East Asia

25. ISPRS is a non-governmental organization devoted to the development of international cooperation for the advancement of photogrammetry and remote sensing and their applications. Founded in Vienna in 1910, ISPRS is the oldest umbrella organization in its field and can be summarized by the phrase “information from imagery”. At its last quadrennial Congress, in Beijing, some of the outcomes of the Congress and previous technical developments were summarized and published as the “Beijing declaration” in which society recognized the importance of imagery for measuring and monitoring natural and man-made features on Earth and for exploring other planets of the solar system.

26. At the first workshop, hosted by Turkey, ISPRS acknowledged that the effect of the “Beijing declaration” was spreading throughout the world and expressed its willingness to continue as an active partner in future workshops. An example of such continuing collaboration is an International Council of Scientific Unions project involving ISPRS technologies having to do with “extreme natural hazards and societal implications”. With such ongoing efforts, ISPRS wishes to contribute to answering the question, “What technologies and methodologies are required to assess the vulnerability of people and places to hazards, and how might these be used on a variety of spatial scales?”

27. ISPRS co-sponsored the second workshop, hosted by Viet Nam. Representatives from two of the working groups of ISPRS Commission VIII (working group 2, on health, and working group 6, on agriculture, ecosystems and biodiversity) participated in the workshop, contributing to its basic goal by addressing scientific and technical linkages between satellite monitoring of Earth environments and their resulting socio-economic benefits. One result of the ISPRS contribution was a joint agreement between the Office for Outer Space Affairs and ISPRS to organize a tutorial on space applications for socio-economic benefits at the third workshop, to be hosted by Chile in 2012. A possible aim of the tutorial would be to describe process steps that begin with satellite observations and culminate in actionable social and/or economic decisions.

28. In the past decade, GNSS has become one of the best-known examples of space technology applications for socio-economic benefits. The application of the signals received from existing GNSS, the best known of which are the Global

Positioning System (GPS) of the United States and the Global Navigation Satellite System (GLONASS) of the Russian Federation, has become a cross-cutting tool to support growth in positioning and navigation applications. With Europe's Galileo satellite navigation system and China's Compass/BeiDou navigation system currently being developed and deployed, the number of satellites available will greatly increase, thereby enhancing the quality of services and increasing the number of potential users and applications.

29. To promote the widest use of GNSS, a number of space-based augmentation systems and regional navigation satellite systems will add more satellites and signals to multiple systems of satellites and, as a result, improve positioning, navigation and timing performance in terms of accuracy, availability, reliability and integrity. To benefit from these achievements, countries need to stay abreast of the latest developments in GNSS-related areas and build the capacity to use a GNSS signal.

30. The South-East Asia region is expected to experience the largest number of visible GNSS satellites in the world in the near future. Therefore, it will be one of the best places on Earth to test multi-GNSS solutions. The NAVIS Centre, strategically based in Hanoi, will play an important role in multi-GNSS applications.

31. The establishment of the NAVIS Centre was regarded as a successful example of fruitful cooperation between Europe and South-East Asia, specifically Viet Nam. Starting with the joint European-Asian educational and application development programme on Galileo (JEAGAL) project, funded by the European Commission, from 2005 to 2007, a number of training courses and workshops on satellite navigation were organized for the benefit of Vietnamese policymakers, experts, researchers and students. Continuing the success of JEAGAL, from 2009 to 2010, the second project, called the South-East Asia centre on European GNSS for international cooperation and local development (SEAGAL), funded by the European Union, was aimed at the setting up of an international cooperation centre between Europe and South-East Asia. As a result of SEAGAL, the NAVIS Centre was inaugurated on 1 October 2010.

32. The NAVIS Centre is devoted to awareness, training and research activities in the field of GNSS. As for research activity, NAVIS focuses on the field of multi-GNSS receivers, precise positioning and location-based services, and intelligent transportation system applications of GNSS in the framework of national and international projects.

33. The supporting institutions of NAVIS include the Hanoi University of Science and Technology (Viet Nam), Politecnico di Torino (Italy), Istituto Superiore Mario Boella (Italy) and Universitat Politècnica de Catalunya (Spain). It is important to emphasize that NAVIS, although located in Viet Nam, exercises South-East Asian outreach and aims to expand its activities to all countries of the Association of Southeast Asian Nations (ASEAN) in order to boost collaboration on GNSS technology and research and, at the same time, to strengthen the links with European communities involved in the GNSS field.

2. SharEarth: a cooperative model for Earth observation capacity development in the Black Sea region

34. The constantly changing environmental system of the Earth is causing unpredictable impacts at the local, regional and international levels. An effective understanding and management of the natural and social impacts and implications of these changes requires a systematic study of the Earth's ecosystem. The environmental changes in the Black Sea region, which is home to hundreds of millions of inhabitants and subject to rapid changes in all of its socio-economic, demographic and geophysical parameters, is impossible to study and follow without the effective use of space technology, especially Earth observation.

35. Multisector and multidisciplinary regional collaboration is required to handle this difficult problem for the management of data, harmonizing policies and measures and operational achievements for all the players involved in the Black Sea region. Here, a Black Sea region framework is proposed for setting up observation systems and the harmonization, transmission, sharing, integration and management of information so as to provide all partners with quality, up-to-date data, which is almost impossible for each partner to do alone. The Black Sea region framework is intended to integrate the existing observation networks in the region.

36. The project will be implemented as an innovative cooperative model with the direct involvement of the participating Black Sea region country stakeholders. Building on the above-mentioned capabilities will not only help to close gaps in knowledge about the Black Sea Basin, but will also make it possible to utilize the capabilities and technologies of the next generation of spaceflight missions, Earth observation research and applications. The project approach is expected to increase: (a) the synergy between partner countries; (b) the sharing information on Earth observation; and (c) the level of science and technology used in government, research and academic institutions.

37. The main strategy of the project proposal is to develop a problem-solving and result-oriented methodology for the successful implementation of Earth-observation information systems for Group on Earth Observation (GEO) societal benefit areas and for improving capacities and capabilities in the Black Sea region. The research project will be performed in four phases. Needs and good practices will be identified in phase 1. Phase 2, focusing on real-world practices in the Black Sea Basin, will improve both the national and regional research capacities of existing initiatives. Phase 3 is designed to develop appropriate technical and innovative tools to contribute to a GEO capacity-building strategy. A Black Sea GEO information system based on a GEO portal will be developed to disseminate relevant information to communities. Phase 4 is to address institutional matters and propose the establishment of a cooperative platform in the framework of a suitable partnership for effective collaboration and long-term mechanisms among the countries in the Black Sea Basin.

3. Spin-offs of space technology: perspective of the National Aeronautics and Space Administration

38. NASA has a long history of producing public benefits from the knowledge gained through its pursuit of advances in aeronautics and space, as well as its scientific research on Earth and its environment. These benefits, some created as a

direct result of NASA programmes and some as spin-offs, contribute to many industrial sectors, including health and medicine; transportation; public safety; home recreation; environmental and agricultural resources; computer technology; and industrial productivity. While benefits from NASA programmes are often focused in the United States, many have spanned the globe, including numerous applications that provide vital benefits to developing countries. The areas to which such benefits have been brought include the following: clean drinking water; improved agriculture and food distribution; telemedicine and wireless networks; environmental monitoring and management; disaster warning and relief; educational resources; energy storage; and hazard reduction. A few examples of these applications and benefits are given below.

39. Ensuring a supply of clean water in orbit is critical for the safe operations of the space shuttle and the International Space Station. To address this technology challenge for NASA, the microbial check valve was developed and has been used on every space shuttle mission to prevent the growth of pathogens in the crew's drinking-water supply. This technology is now also the basis for water purification systems currently deployed in rural areas and developing countries around the world.

40. While studying ways of treating astronauts for decompression sickness, NASA invented portable hyperbaric chamber technology that could bring the medical benefits of highly concentrated oxygen to those recovering from the buruli ulcer. Afflicting people in over 30 countries, buruli ulcer causes horrific open sores that prove difficult to heal, as well as other infections and injuries — wherever the patients are. The innovation is in the process of commercialization.

41. For space exploration, NASA needs technologies for the remote delivery of medical care — or telemedicine — for long-duration spaceflight missions. Remote and developing regions have limited infrastructure and benefit from space telemedicine technology. One example is in Ethiopia, with a network for communicating public health information from 126 remote medical clinics to 5 corresponding hospitals. Telemedicine networks are also being used in Iraq, Thailand and Viet Nam to improve public health monitoring.

42. NASA has a network of Earth-observing spacecraft with many applications, such as the Famine Early Warning System Network in Africa, providing early warning on emerging food security issues, and the South Asia Drought Monitor, supplying timely information on drought onset, progression and areal extent.

43. NASA is helping countries of Central America, Africa and now the Himalayas with the Mesoamerican Regional Visualization and Monitoring System (SERVIR), a satellite system that monitors weather and climate. SERVIR helps such countries to track and combat wildfires, improve land use and agricultural practices, address disease outbreaks, biodiversity and climate change, and respond faster to natural disasters.

44. NASA technologies are also being applied to disaster warning and relief. Conventional tsunami warning systems can result in false alarms, with negative societal and economic effects. Researchers at the NASA Jet Propulsion Laboratory have developed GPS-based methods of prediction, leading to more reliable global tsunami warning systems, saving lives and reducing false alarms. Data from NASA spacecraft and NASA research improve the accuracy of forecasts for the landfall,

track and intensity of hurricanes, and increase the lead time for warnings for both hurricanes and floods.

III. Summary of working group sessions

45. At the first workshop, in Istanbul, seven thematic areas were identified as working group themes: urbanization and transportation; water resources and agriculture; air pollution and energy; disaster management; natural resource management; extraterrestrial exploration; and positioning, navigation and timing. In addition, seven cross-cutting sub-themes were identified: weather and climate; health; uncertainty and risk assessment; economic valuation; education, outreach and communication; international space law; and satellite development. The following six working groups continued their deliberations in meetings at the second workshop, in Hanoi.

46. *Working group on natural resources management.* The working group devised action plans for space technology applications for mapping, monitoring and sustainable development of natural resources in areas such as agriculture, forestry, natural vegetation, land, water and ecosystems. The working group felt it was necessary to identify best practices in using space technology, not only for monitoring vital natural resources but also for exploring their sustainability, especially within the context of the imminent impacts of climate change. In order to achieve that goal, the objectives of the working group were to: (a) understand the requirement for different satellite data for the mapping and monitoring of natural resources on various levels; (b) create a repository of the existing remote sensing-derived natural resources status maps; (c) create a database of models for the retrieval of essential biophysical parameters and predicting long-term changes in natural resources; (d) understand the impact of climate change on fragile ecosystems and the interaction of the environment and natural resources; (e) showcase the role of space technology in biodiversity assessment; (f) devise plans for capacity-building on space technology-based natural resources management; (g) create a website of information related to remote sensing data availability; (h) create a document of best practices by collecting information on various uses of space technology applications in natural resources management in different countries; and (i) collaborate with international organizations, such as GEO and ISPRS, with the aim of generating action plans for the sustainable development of natural resources.

47. *Working group on disaster management*. The working group was created to demonstrate international collaboration, on a limited scale, using space technology for disaster management. The working group also identified the need to consider the impact of other ongoing disaster management-related developments and activities. The activities proposed in the working group were expected to complement activities already under way in different parts of the world. The scope and objectives of the working group were to: (a) develop problem-solving tools for the successful implementation of early warning mechanisms for further improving the capacities and capabilities of countries; (b) create awareness, interface and data-sharing environments between working group members; (c) review existing national, regional and international mechanisms for the benefit of countries lacking space technology applications or established mechanisms for such applications;

(d) identify natural and man-made hazards for disaster risk assessment for countries; (e) identify complementary projects or activities to plan limited-scale demonstrations; and (f) explore the possibility of undertaking collaborative studies on topics of common interest.

48. *Working group on urbanization and transportation*. The goal of the working group was to facilitate the integration of space technology into urbanization and transportation applications for sustainable development. To serve this goal, the working group aimed to (a) create a global network; (b) encourage international collaboration among countries and institutions; (c) organize relevant workshops, conferences, seminars and symposiums; (d) strengthen a mechanism for publications as a tool of dissemination of the working group's findings; and (e) exchange experiences and lessons learned through best practices and case studies. The members of the working group agreed to focus on the contribution of space technology to two sectors: (a) urban planning and (b) transportation planning and traffic management.

49. *Working group on environmental monitoring*. The working group aimed to address the needs and requirements of the use of space technology for the monitoring of the environment with a specific focus on air pollution and energy. The working group proposed that it undertake the demonstration of pilot projects related to environmental monitoring as recommended by the workshop and prepare reports demonstrating the practical utility of space-based environmental monitoring for socio-economic benefits. Participants in the working group discussed a number of proposals for pilot projects on the use of space technologies for monitoring air pollution. The group agreed to implement a pilot project for monitoring air pollution and energy transformation in Ulaanbaatar using space technologies and providing reports and recommendations to the workshop organizers.

50. *Working group on satellite development*. The working group was created to undertake satellite (nano-pico) development in developing countries to meet their socio-economic needs. The working group realized that: (a) developing countries lack access to different sources of satellite data necessary for potential applications in remote sensing, maritime monitoring, environment, safety and education; (b) with the growing trend of international collaboration in satellite development, nano-pico-satellites can be built at low cost using local resources; and (c) such satellite development will have significant potential impact in terms of stimulating science and technology education in a developing country. Furthermore, knowledge and experience gained in satellite technology development and applications can also be applied to other fields. Therefore, many developing countries are interested in having their own satellites, and hence, such countries may also contribute to the creation of small-satellite constellations for socio-economic benefits.

51. *Working group on health*. The working group on health was established at the first workshop and focused on applications of Earth-observing technologies to understand how natural environments contribute to or trigger human disease responses. An area of principal interest was that of improving the assimilation of space-based data into numerical models to enhance surveillance systems, decision support tools and early warning systems. The working group reached out to colleagues in the scientific and engineering communities, as well as to health-care and well-being communities of practice. The mission of the working group was

supported by companion working groups of ISPRS, the International Council for Science, the International Union of Geological Sciences, GEO and other entities.

52. The Earth Data Analysis Center at the University of New Mexico, United States, illustrated the use of data derived from Earth observation to model atmospheric anthropogenic dust for respiratory health surveillance. The project was conducted in the South-western United States and was aimed at identifying dust sources, preparing forecast maps for dust storms, and analysing the average particulate matter concentrations in the region. Data have been made available as metadata for use by the wider community. It should be noted that the World Meteorological Organization International Sand and Dust Storm Warning System is a project aimed at establishing a global network to analyse and prepare forecasts of dust storms.

53. Health Telematics of Sri Lanka presented an analysis of socio-economic and environmental factors in the spread of dengue fever epidemics. A set of parameters was identified and data are being collected to utilize space-based technologies such as GPS and GIS. Collected data will undergo further analysis to investigate causes of the growing number of episodes of dengue in some western provinces of Sri Lanka.

54. The Earth Science Data Operations Group at the NASA Goddard Space Flight Center, Maryland, United States, presented a study on the use of Earth-observation data for modelling and monitoring the spread of malaria, dengue and influenza in South-East Asia and the Republic of Korea. The objectives of the study were to detect, predict and reduce risks by analysing and combining both satellite data on the environment and manually gathered data on disease occurrence. Predictions were compared with actual incidence data and showed good accordance.

55. The success of the working group's efforts in Hanoi stimulated ideas for further demonstrating health and socio-economic benefits at the third workshop, scheduled to be held in Santiago de Chile in 2012. In addition to technical sessions that demonstrate individual national progress in merging technologies and engaging both health and decision-making communities of practice, the working group will contribute to the organization of a one- or two-day tutorial to provide participants with state-of-the-art analytical tools for applications development.

IV. Conclusions

56. The workshop provided a forum for the participants from 22 countries to share their experiences in exploring opportunities for collaborative research and development in space technology applications. It increased the awareness of socio-economic benefits of space technology applications at the national, regional and international levels, focusing on satellite remote sensing, satellite communications, GNSS, capacity-building and regional and international cooperation. The workshop attempted to identify space technology applications for socio-economic needs; assessed the current level of developments; determined gaps; and established working groups to address these issues through regional and international collaboration.

57. The recommendations formulated during the working group sessions are summarized as follows:

Satellite development

(a) Encourage regional and international collaboration for local universities and industries to develop small-satellite technology for socio-economic benefits;

(b) Create a working group website and social network group to share and coordinate satellite development activities in working group member countries;

(c) Join the Shared Small Satellites Collective Security, Safety and Prosperity initiative to promote the use of shared small-satellite constellations for socio-economic benefits;

(d) Participate in conferences and workshops to showcase satellite development-related activities.

Health

(e) Integrate Earth-observation products with enhanced predictive modelling capabilities for early warning and the surveillance of environmental factors that have an impact on human health, in cooperation with other national, regional and international organizations and activities;

(f) Build leadership or collaborative roles in appropriate global health initiatives relevant to the programmes and objectives of the Office for Outer Space Affairs;

(g) Develop a register of human health projects and products using Earth-observation technologies;

(h) Link Earth-observation technologies with human health communities, including health professionals, by organizing technical sessions, workshops and symposiums at appropriate venues.

58. Participants recommended that the Space Technology Institute of VAST and the Office for Outer Space Affairs further develop the website of the workshop, which was vital for disseminating information on the workshop.

59. Participants recognized the need for additional workshops and training courses to build upon the results of previous workshops, and the Government of Chile offered to host the third workshop in 2012.

60. Participants expressed their sincere appreciation to VAST for organizing a very successful workshop and for its hospitality.

61. Participants also expressed their appreciation for the significant support provided by the co-sponsors: the Government of Viet Nam, the Office for Outer Space Affairs and ESA; and the co-organizers, ISPRS and NASA.