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**The United Nations/Germany International Conference on
Earth Observation — Global Solutions for the Challenges of
Sustainable Development in Societies at Risk**

Note by the Secretariat

The present document contains the outcome summary of the United Nations/Germany International Conference on Earth Observation — Global Solutions for the Challenges of Sustainable Development in Societies at Risk, held in Bonn, Germany on 26-28 May 2015.

I. Background

1. 2015 is a decisive year as intergovernmental negotiations held with the support of the United Nations will culminate in three global frameworks that are geared to steer development trends worldwide as a way to continue efforts towards sustainable development addressing the challenges posed by climate change and natural hazards.

2. Already in March of this year, during the World Conference on Disaster Risk Reduction held in Sendai, Japan, governments of 187 countries launched the Sendai Framework for Disaster Risk Reduction. This framework defines goals and priorities for action as a way to enhance the resilience of nations in the next fifteen years (2015-2030). Later in September of this year, the United Nations Summit will adopt the Post-2015 development agenda as a way to provide continuity to the Millennium Development Goals that were launched one and a half decades ago. Furthermore, parties to the climate change convention are conducting negotiations to establish a universally acceptable framework on climate at the 21st Conference of Parties to be held in Paris, France.



3. These global frameworks, to be serving as policy frameworks at the highest international level, will provide guidance on the efforts that need to be conducted at local and national levels, and how regional and international organizations should work together to support these efforts.
4. Earth observation is an essential resource to track the status of our natural resources, to monitoring the climate, the land, the oceans and polar caps and other features of our planet. When incorporated in routine monitoring activities, Earth observation supports informed decision-making at the local, national, regional and global level. Earth observation is helping us find ways to reduce disaster risks; identify different alternatives to plan our adaptation to climate change, prepare better to manage those unavoidable losses and damages triggered by disasters, and contribute to monitor how efforts are leading to sustainable development.
5. Based on the successes of the use of Earth Observation as a tool that helps societies take note of relevant issues related to the environment (land, oceans and atmosphere); it is important to advocate and promote its use to contribute to monitor the efforts conducted by countries worldwide as a way to reduce greenhouse gas emissions, to reduce the growth of settlements in areas exposed to natural hazards, and to make a more rational use of the environment in order to pave the way for a more sustainable development. Equally important is the need to promote the use of Earth observation in the indicators included in these global agreements; as a way to contribute to harmonized national reporting systems.
6. Equally important is the need to enhance the cooperation among existing regional and international institutions dedicated to Earth observation as a way to facilitate the use of this technology in countries exposed to hazards and climate change. Such cooperation should lead to improved technical support, capacity-building and technology transfer.

II. The United Nations/Germany Conference on Earth Observation

7. This United Nations/Germany International Conference on Earth Observation — Global Solutions for the Challenges of Sustainable Development in Societies at Risk (Bonn Conference) brought together more than 120 experts from thirty-six countries including representatives of government agencies, research institutions, regional and international organizations, private sector companies and non-governmental organizations. It was organized by the UN-SPIDER programme on behalf of UNOOSA, in cooperation with the German Federal Ministry for Economic Affairs and Energy (BMWi) and the German Aerospace Center (DLR). It benefitted from the generous financial support provided by BMWi, as well as the support provided by Secure World Foundation, the City of Bonn and DigitalGlobe.
8. The Bonn Conference was used to showcase the most recent developments on the use of Earth observation and integrated space technology applications to address the challenges of climate change and disaster risk reduction and to contribute to efforts targeting sustainable development worldwide. It provided the setting to discuss ways in which Earth observation can be used to contribute to assess the effectiveness of the processes to be launched in the coming years by Member States as a way to reach the goals and targets included in these three global agreements.

9. The Joint UN-Space — Bonn Conference High-Level Panel on Space-based information for development was organized as an integral segment of the Bonn Conference on 28 May 2015. The Panel provided an opportunity to the participants of the Bonn Conference to engage in a dialogue with the United Nations system to review challenges and opportunities in mainstreaming space technology in key areas under the post-2015 development frameworks, and to look into common perspectives for increasing the use of Earth observations for attainment of global development goals.

10. UNOOSA/UN-SPIDER used the Conference to conduct a specific session on the use of Earth observations in disaster risk reduction as a way to highlight efforts conducted in the context of the World Conference for Disaster Risk Reduction which took place in Sendai, Japan, in March 2015. Of particular relevance was the session of the Global Earth Observation Partnership within the Conference. This Global Earth Observation Partnership for Disaster Risk Reduction is a voluntary commitment on behalf of 17 partners to advocate for the use of Earth observations in disaster risk reduction efforts; to facilitate synergies among institutions involved in Earth observation and disaster risk reduction; to strengthen capacities of government agencies and local institutions on the use of Earth observation; and to provide visibility to the benefits of Earth observation in regional events organized by the United Nations Office for Disaster Risk Reduction (UNISDR).

11. Additionally, UNOOSA/UN-SPIDER hosted the annual spring meeting of the International Working Group on Satellite-based Emergency Mapping (IWG-SEM) back to back with the Conference. The IWG-SEM is a voluntary group of organizations involved in satellite-based emergency mapping which supports disaster response by improving international cooperation in such mapping activities. In the group's spring meeting in Bonn a special emphasis was given to the topic of collaborative mapping, including crowd-sourcing and distributed analysis/computing and aspects of social media for satellite-based disaster mapping. The meeting was also the occasion for UNOOSA/UN-SPIDER to take over the annually rotating position of official Chair of the group.

12. The Conference facilitated the coordination of global efforts carried out by the space community to contribute to the implementation of the Sendai framework for disaster-risk reduction; particularly to assess disaster-risks and in the areas of disaster preparedness and early warning systems.

13. Furthermore, the conference also promoted the use of Earth Observation to track and to identify ways to assess climate-related extreme events affecting sustainable development efforts worldwide. It provided a forum for experts to discuss novel methods to use Earth Observation to assess potential losses and damages contributing to the mechanism launched in 2013 during the COP in Warsaw; and to use Earth observation to contribute to adaptation efforts which were launched during the COP in Cancun in 2010.

14. In addition, the conference allowed experts and decision makers focusing efforts on sustainable development to explore how best to take advantage of the opportunities offered by the space community to contribute to their efforts. In this context, the conference was used to identify ways in which Earth Observation can be used explicitly to contribute to the implementation of the new framework for

sustainable development and to track progress in the various targets that the framework includes.

Relevant issues raised

15. Experts participating in the conference reiterated the fact that Earth observation from space contributes to our understanding of the environment and of our impact on the environment; and in other applications such as the tracking of the exponential growth of cities around the world. They also noted that Earth observation helps us become aware of extremely slow processes that go unnoticed such as ground subsidence due to extraction of ground water in urban areas and in refugee camps, the motion of tectonic plates and deformation in the domes of active volcanoes. Earth observation allow us to improve our early warning systems worldwide through the tracking of tropical storms in all oceans and seas of the world, to contribute to the assessment of risks, and to response efforts through the generation of maps depicting areas affected by floods, earthquakes, forest fires, tsunamis and other hazards.

16. Space agencies worldwide contribute to efforts targeting development through the generation of relevant geospatial information. However, it is important to keep in mind that the construction of, and the putting in orbit of satellites is a process that takes several years. In this sense, they are accepting their responsibility to contribute to sustainable development in areas such as disaster risk reduction, precision agriculture and environmental monitoring.

17. Despite these efforts, Earth observation is not used to its full potential in all countries around the world. In least developed countries, resources are extremely limited and hence such resources are used to target issues such as poverty and health. In many countries there is a lack of institutional capacities to take advantage of the opportunities offered by the space community, including through enhanced access to satellite imagery through the implementation of open data policies by many of the space agencies around the world.

18. Therefore, the conference provided an excellent opportunity to discuss strategies to promote the use of Earth observation and other satellite technologies and to work together to contribute to the achievement of the goals and targets stipulated in the three global frameworks (disaster risk reduction, climate change and sustainable development).

19. The Sendai framework for Disaster Risk Reduction, which is one of the three global frameworks which was already launched last March, already recognizes the usefulness of Earth observation and satellite-based technologies. The Sendai framework incorporates explicit texts on the use of these technologies to contribute to the understanding of risks (Priority Area 1), and calls for regional and international organizations to cooperate as a way to support their use at the national and local levels through technology transfer, capacity-building and technical advisory support. The Sendai framework also includes preparedness, response and recovery as one of its four priorities, where Earth observations and other space-based applications can also be used.

20. Experts from UN-SPIDER and DLR made participants aware of the launch of the Global Earth Observation Partnership during the World Conference on Disaster Risk Reduction held in Sendai, Japan in March of 2015. The partnership is a

voluntary commitment on behalf of regional and international organizations, space agencies and national disaster risk reduction agencies to advocate for the use of Earth observations in disaster risk reduction efforts; to facilitate synergies among these members as a way to strengthen capacities of government agencies and local institutions on the use of Earth observation and to provide visibility to the benefits of Earth observation in regional events organized by the United Nations Office for Disaster Risk Reduction (UNISDR). The conference was used to conduct a meeting of the partnership where issues related to upcoming activities, terms of reference and governance were discussed.

21. In the coming months, countries will work together to design the indicators to monitor how countries are achieving the goals and targets stipulated in the Sendai framework for DRR. It is important for UN-SPIDER and the Earth observation community to position the use of Earth observation as a source of data for the proposed indicators.

22. In Ukraine, as in other countries, archived and up-to-date Earth observations are used to track the effects of droughts on crops, to contribute to assess financial losses due to droughts and to classify droughts in terms of periods of return (annual, five years, 10 years, 30 years, etc.).

23. However, in some cases, products derived from Earth observation are not easily interpreted and applied by end users. This is the result of the fact that the language used by scientists when presenting the results of their research is different to the language used by end users. In addition, it is important to keep in mind that different users have different needs and expectations on how data can be used.

24. In the context of climate change, Earth observations have been important to observe, understand for foresee changes in the climate system in the planet. These observations are being used in a systematic fashion by the Global Climate Observing System (GCOS) to generate policy-relevant information that finds its way to the International Panel on Climate Change (IPCC), the United Nations Framework Convention on Climate Change (UNFCCC), the World Meteorological Organization (WMO) and other regional and international organizations. The value of systematic observations has been recognized in the climate change negotiations and parties to the climate change convention have agreed to support and further develop programmes and networks to facilitate data collection and systematic observation.

25. Participants took note of the efforts conducted by the Global Climate Observing System (GCOS) to enhance the use of data gathered from satellites and were made aware of calibration efforts that need to be conducted as a way to combine satellite data with in-situ measurements to monitor changes in the climate and on the efforts conducted by GCOS to enhance the use of satellite data in the coming decades.

26. As a way to use data in a systematic fashion in the context of climate change, specific Essential Climate Variables (ECVs) have been identified and agreed upon; and are being monitored on a continuous basis. Several of these ECVs are being monitored using satellites. In this case, inter-calibration efforts have been carried out as a way to facilitate the use of data generated via satellites.

27. Participants took note of the usefulness of combining ground-based, aerial and space-based observations as a way to generate more precise information.
28. Participants were reminded of the many on-going efforts related to the use of Earth observations in climate change, and hence of the need to avoid the duplication of efforts. They were also made aware of the benefits of coordinated approaches among regional and international organizations leading to improved quality of the information provided to decision makers as a way to facilitate the decision-making process in the international negotiations related to climate change.
29. As a way to expand the observation time when using space-based applications, it is important to consider the use of long-term vessels in space such as the International Space Station. This station, currently used for a variety of experiments on material science, biology, and pharmaceutical products; can be fitted with instruments to monitor Earth. One application could be to monitor greenhouse gas emissions, thereby contributing to monitor emissions at the country level that can be linked to international agreements on emissions.
30. When considering adaptation to climate change, it is important to take note that adaptation efforts encompass many areas and sectors of development, for example in coastal urban areas, in agriculture, in the management of natural resources, etc. Earth observation can contribute to identify ways to adapt to the different types of manifestations of climate change, including for example land-use planning in coastal areas, particularly in the case of megacities which are growing exponentially. In the case of agriculture, data and information derived from Earth observation can find its application in irrigation and in the construction of dams to mitigate the extent of floods in flood-plains and at the same time to alleviate the effects of droughts through irrigation. Earth observation can also contribute in the area of health.
31. Taking into consideration the effects of climate change in exacerbating hydrometeorological events such as floods and droughts, it is important to identify ways to make use of Earth observation to contribute to identify ways to prepare for and respond to such events. In addition, it is important to facilitate links between the space community and developing countries that need to find solutions to the effects of climate change in the case of such hydrometeorological events.
32. In the context of sustainable development, Earth observation is finding applications in tracking the spatial and temporal evolution of informal settlements and cities, and to spot different processes in different cities or settlements around the world. Now the need is to find ways to make use of Earth observation in a more systematic way in urban planning. For example, in determining access of urban populations to green spaces, which are important for mental health.
33. In addition, Earth observation can be used to track vector-borne diseases, and to track the dispersion of smoke due to forest fires or volcanic ash in case of eruptions. Both the smoke and ashes can be harmful to people.
34. While recognizing the benefits of Earth observation, experts made participants aware that in the context of sustainable development, there are several parameters that can only be assessed through ground-based surveys. Therefore, it is important to conduct efforts as a way to facilitate the integration of ground-based and space-based data when contributing to efforts targeting sustainable development.

35. Earth observations can help link actors working in different areas such as environment and health. Now there is a need to facilitate synergies between actors at different sectors and at different levels.

36. While different United Nations agencies and regional and international organizations are embarked on capacity-building efforts to promote the use of Earth observations, at times these efforts are conducted using different terminology, applications and procedures. The United Nations agencies and these organizations could benefit from a harmonization of capacity-building efforts, for example by employing the best practices of UNESCO-UNEVOC and the United Nations University (UNU).

37. In a similar fashion, experts from the private sector made participants aware of a variety of products and services that private companies are offering to contribute to efforts targeting disaster risk reduction, climate change and sustainable development. Taking note of the advances made by the private sector, a general recommendation was also made to consider public-private partnerships as a way to promote the use of Earth observation in a variety of applications.

38. The participants also agreed upon the capabilities and opportunities of space-based information and earth observation as an objective and reliable control mechanism to support evaluation of goals, targets and indicators as laid down in the respective frameworks and conventions related to disaster risk reduction, climate change and sustainable development. It was stressed that the value adding chain of data provided by space-based and earth observation technologies towards information, towards knowledge for informed decision-making and towards supporting the monitoring of framework/convention compliance and framework/convention outcomes needs to be considerably strengthened. This essentially includes technology and knowledge transfer and adequate communication strategies to ensure the implementation at the local, national, regional and global levels.

39. In the context of UNSPACE, United Nations agencies used the Bonn Conference as the venue for the annual meeting. Representatives of United Nations agencies used the meeting to take note of the use of space-based applications on behalf of different United Nations agencies in these fields of climate change, disaster risk reduction, and sustainable development. They agreed to identify areas of cooperation as a way to advance the use of Earth observation in these fields in a unified way.

Suggestions and recommendations

40. Thus far, the space community has been at the forefront of promoting the use and benefits of Earth observation in a variety of applications. However, there is a lack of recognition of the potential of the use of this type of observation stemming from developing countries which are desperately looking for solutions. Therefore, it is important to continue efforts to promote the benefits of the use of Earth observation and other satellite applications. It is important to showcase explicitly the value of the investments done in placing satellites in orbit to carry out Earth observation activities. It is important to incorporate the value of Earth observations in the global economy.

41. As a way to promote the use of Earth observation, the space agencies have implemented open data policies that facilitate access to selected satellite imagery. As a way to take advantage of these open data policies, efforts should be conducted to institutionalize the use of satellite imagery covered in such open data policies.

42. Earth observation is systematically used to monitor several Essential Climate Variables (ECVs) by organizations such as the Global Climate Observing System; to track deforestation processes and to track the melting of ice in polar caps and glaciers among others. However, there are other applications where such observations are not carried out in a systematic fashion, but more in the modality of research project focusing on specific applications in selected geographic regions. Hence, there is a need to conduct efforts to streamline and “institutionalize” the use of Earth observation in specific applications, for example in disaster risk reduction and to monitor variables that can be used in the indicators to be launched in the context of disaster risk reduction, climate change and sustainable development.

43. The use of Earth observations is more common in the context of disaster response efforts. The space community has established mechanisms such as the International Charter Space and Major Disasters, Sentinel Asia, and COPERNICUS EMS. However, there are only very few efforts targeting disaster risk reduction. Hence, there is a need to make the space community aware of the need to establish similar mechanisms such as the International Charter in the context of disaster risk reduction. Developing countries around the world could benefit from an International Charter for DRR. As a way to carry out a coordinated international approach to the use of Earth observations in DRR, UNOOSA/UN-SPIDER, DLR and other 17 partners have joined forces to launch the Global Earth Observation Partnership during the World Conference for Disaster Risk Reduction held in Sendai, Japan. This voluntary partnership needs to be strengthened and supported so that it can promote and facilitate the use of Earth observation and other satellite-based applications as stipulated in the Sendai framework for DRR.

44. Taking into consideration the critical issue that at times Earth observation results are presented in a format that is not easily interpreted by end users and decision makers, it is important for UNOOSA/UN-SPIDER and the recently launched Global Earth Observation Partnership to facilitate the generation or translation of Earth observation information into a format or modality that is easy to use by decision makers and end users involved in disaster risk reduction and emergency response. In a similar fashion, it is important to facilitate the communication among scientists who are generating information and end users in civil protection or disaster management agencies. Such an effort will help scientists understand the needs from the point of view of end users and will allow end users to become aware of what is possible when using satellite technologies.

45. Earth observation can find their use in monitoring ECVs. Satellites can contribute to monitor greenhouse gas emissions, but it is important to be aware that the design, construction, launch and positioning in orbit of satellites is a process that takes several years. Hence, it is important for users of space-based information to think of this issue when considering the monitoring on long-term processes.

46. When thinking of ECVs, it is important to keep in mind that these ECVs have been recognized and agreed upon as a way to track the climate. This notion of ECVs should be promoted in the context of DRR and in adaptation to climate change.

Those stakeholders involved in DRR and in adaptation to climate change could benefit from sets of agreed variables that can be used to track progress, to monitor processes and when assessing risks. UNOOSA and UN-SPIDER should take note of the processes conducted years ago by key stakeholders involved in the definition and agreement of ECVs as a way to outline a procedure which could be used to agree on a set of variables which could be used for DRR and for adaptation to climate change. This task should also incorporate the notion of inter-calibration as a way to ensure that data collected via in-situ measurements is consistent with data collected using satellites (for example rainfall data in specific regions and estimations of rainfall in those regions based on satellite measurements).

47. Taking into consideration existing efforts on the use of Earth observation and the requests included in frameworks such as the Sendai framework regarding the need for the provision of technical support and the need to facilitate technology transfer; it is important for agencies and organizations, including those of the private sector, to find ways to cooperate through partnerships and joint activities so as to avoid duplication of efforts, to make stakeholders at local and national levels aware of existing initiatives and opportunities offered by the space community, and to facilitate the combination of ground-based, aerial and space-based data.

48. When thinking about capacity-building on the use of Earth observation, it is important to think about harmonization of procedures so that these capacity-building efforts may have better impacts in countries.

49. In a similar fashion, as a way to advocate and facilitate the use of Earth observation in applications related to disaster risk reduction, climate change and sustainable development; it is important to think of integrated solutions as those that can be provided through private-public partnerships. These could also be in the form of integrated tools or applications which can combine ground-based, aerial, and space-based data. As a final remark and taking into consideration the suggestions made by experts and participants during this conference, it is important to continue bringing together stakeholders from the disaster risk reduction, the climate change and the sustainable development communities to facilitate the exchange of lessons learned, information and knowledge on the use of Earth observation and other space-based technologies; and to facilitate linkages with stakeholders representing local and national organizations involved in disaster risk reduction, climate change and sustainable development.

50. Further efforts are also needed to appropriately transfer space-based information and Earth observation to support goals and targets and to contribute to the evaluation of outcomes of the agreements and frameworks in the fields of disaster risk reduction, climate change and sustainable development. Of particular relevance is the need to conduct efforts to facilitate the transfer of science/technology developments into routine practice as a way to enhance the effective use of the information and knowledge provided by space-based technologies and Earth observation.

51. Furthermore, participants and experts also reiterated the need to continue efforts to promote the use of Earth observation in the context of the Sendai framework, as well as in the context of the frameworks and agreements to be launched regarding the sustainable development goals and climate change.