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Space-Based Information for Flood and Drought Risk Reduction

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Images: NASA

Discussion Sessions

Guiding Questions & Background Information

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Introduction

Effective disaster risk management helps preventing that natural hazards like floods and droughts turn into disasters. Space technologies, especially Earth observation and global navigation satellite systems, provide information which can be used for risk assessment. The potential contribution of space-based information to disaster risk management is not yet fully exploited – technical solutions are not tailored enough to the needs on the ground, and the information is rarely easily accessible for disaster managers.

This United Nations/Germany Expert Meeting on the Use of Space-based Information for Flood and Drought Risk Reduction will focus on the use of space technologies to improve disaster risk reduction. Expected outcomes related to this Expert Meeting include:

- Exchange of information on the most up-to-date satellites and Earth observation methodologies to improve to flood and drought risk assessment and reduction;
- Recommendations for the improvement of flood and drought risk management through the use of space based information;
- Elements to contribute to the Post 2015 framework for disaster risk reduction (HFA-2) and to the upcoming World Conference on Disaster Risk Reduction to take place in Sendai, Japan, in March 2015.

As in previous expert meetings, discussion sessions in the format of break-out sessions will be used to target specific topics. Four discussion sessions are scheduled to take place:

Session 1: Space technologies for disaster risk reduction Best practices and lessons learned worldwide on the use of space based information for flood early warning;

Session 2: Flood risk reduction

Session 3: Drought risk reduction

Session 4: The way forward

Session 1: Space technologies for disaster risk reduction

As stated by UNISDR, *disaster-risk arises when hazards interact with physical, social, economic and environmental vulnerabilities*[1]. Hence, since more than a decade ago, UNISDR and other organizations around the world have been calling for concerted action as a way to reduce such disaster-risks. Nevertheless, recent disasters such as the Fukushima nuclear reactor disaster triggered by the tsunami, the extremely large floods in Europe, in the Philippines, as well as other disasters around the world are manifesting the fact that **risks remain hidden from view and from perception until disasters uncover them**. As a way to address this lack of perception, the Hyogo Framework for Action (HFA) which emerged from the World Conference on Disaster Reduction held in Kobe, Japan in January 2005 highlighted that one of the starting points to reduce disaster risk is the knowledge of the hazards and the physical, social, economic and environmental vulnerabilities to disasters that societies and communities face, and of the ways in which such hazards and vulnerabilities are changing in the short and long term. In addition the HFA recognized the value of concerted international cooperation and an enabling international environment as essential to stimulate and contribute to developing the knowledge, capacities and motivation needed for Disaster-Risk Reduction (DRR) at all levels.

Furthermore, both the HFA and the recent declaration of the Rio+20 summit entitled "The future we want" made explicit reference to the need to promote the application of in situ and space-based Earth observations and space technologies to contribute to the assessment of disaster risks as a way to contribute to disaster risk reduction efforts worldwide[2].

With these notions in mind, this discussion session aims to gather comments and suggestions from experts regarding ways to increase and promote the use of space-based applications in DRR in general terms, with a particular focus on disaster-risk assessment.

Objectives: The objectives of this discussion session are

(1) To identify and take note of novel methods to make use of Earth Observation and space technologies to contribute to the assessment of hazards, vulnerabilities, risks and their changes over time;

(2) To identify and take note of new sources of satellite imagery and novel space technologies which can be used in risk management and to discuss how such new sources and technologies should be promoted and used;

(3) To identify lessons learned regarding how to encourage decision makers and disaster-risk managers to make use of space-based information: and

(4) To become aware of critical issues that need to be taken into consideration when promoting the use of space-based information in disaster-risk reduction efforts

[1] http://www.unisdr.org/files/1037_hyogoframeworkforactionenglish.pdf

[2] http://www.uncsd2012.org/content/documents/727The%20Future%20We%20Want%2019%20June%201230pm.pdf

Three **discussion groups** will elaborate outputs on the following topics:

- **Group 1**: Potential uses and limitations of Earth Observation for hazard assessment
- **Group 2**: Potential uses and limitations of Earth observation for vulnerability assessment
- **Group 3**: Potential uses and limitations of Earth Observation to assess changes in risk over time

Guiding questions for Discussion Session 1 Group 1: Potential uses and limitations of Earth Observation for hazard assessment

According to the UNISDR glossary of terms, the term **hazard** is defined as[3]:

"*A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage*." Hazards are usually presented quantitatively in terms of maps displaying the geographical extents of a region which can be affected by events that have specific periods of return as determined from historical catalogues and scientific analysis.

Hydrometeorological hazards include tropical cyclones (also known as typhoons and hurricanes), thunderstorms, hailstorms, tornados, blizzards, heavy snowfall, avalanches, coastal storm surges, floods including flash floods, droughts, heatwaves and cold spells. Such hazards can at times trigger other hazards such as landslides, wildland fires, locust plagues, epidemics; and may contribute to the transport and dispersal of toxic substances and volcanic eruption material.

In the case of floods, typical hazard maps usually display the geographic area which could be flooded once every one hundred years or so. The elaboration of such maps is carried out using hydrological and hydraulic modeling. Hydrodynamic equations are use to model how the discharge in a channel will progress over time and how in the case of floods such discharge overflows past the shores of rivers and covers lands. When there are no flood hazard maps available, satellite imagery can be processed to display geographic areas which posses the same elevation above sea level as a first approximation in case of floods. This approximation works well in dams and lakes as well, but not in coastal floodplains.

Based on these notions, the guiding questions for Group 1 include:

- Hydrological models make use of cross sections of channels of rivers and their corresponding banks as an input to model how floods will gradually cover particular areas. Is it possible to derive such cross sections from satellite data and if so, which could be units of vertical resolution that can be achieved with satellite data?
- Which are the most modern satellites which could be used for flood hazard assessment?
- Which are the strengths and limitations regarding the use of space-based data (satellite images) in the assessment of flood hazards?

[3] UNISDR: **2009 UNISDR Terminology on Disaster Risk Reduction**. Available at: http://www.unisdr.org/we/inform/terminology

Guiding questions for Discussion Session 1 Group 2: Potential uses and limitations of Earth observation for vulnerability assessment

Disaster risk is defined by UNISDR as "*the potential disaster losses, in lives, health status, livelihoods, assets and services, which could occur to a particular community or a society over some specified future time period"*. Disaster risk is assessed combining information regarding hazards, the location of vulnerable elements or assets and their degree of vulnerability.

One parameter that can be assessed using satellite imagery is the exposure of vulnerable elements. Exposure is meant to quantify the number of elements or assets which have the same degree of vulnerability that are located within a specific geographic area that is exposed to a hazard.

- What type of assets or elements could be easily identified using low resolution satellite imagery (crops, entire cities or towns, etc)?
- What is the minimum resolution of a satellite image so that individual houses or buildings can be counted within an area that is exposed to a hazard?
- Is it possible to differentiate buildings according to their type of use just from remote sensing applications? I.e., can remote sensing techniques be used to differentiate a hospital from a hotel or from a government building? Are there specific types of critical infrastructure which could be easily identified using remote sensing techniques?

Guiding questions for Discussion Session 1 Group 3: Potential uses and limitations of Earth Observation to assess changes in risk over time

In recent years, UNISDR has recognized the need not only to target the the reduction of existing risks, but also to take note of the fact that the degree of risk has been increasing in many countries due to an increased exposure of vulnerable elements to hazards, an increase in the degree of vulnerability of elements or assets or the increase in the level of hazards. These increases in the level of risk are associated with uncontrolled urban growth, illegal settlements in high hazard areas, poverty, and migration from rural to urban areas among others. In the case of hazards, IPCC has already stated that climate change is expected to increase the frequency and magnitude of hydrometeorological events, thereby increasing hazards.

Low resolution satellite imagery (i.e. that from AVHRR) is now spanning nearly 30 years and covers the whole world. Imagery from sensors such as MODIS is now spanning a little more than a decade and also covers most of the world with a higher resolution. High resolution imagery from SPOT and other sensors is also available since several decades, but is more restricted in the geographic regions covered.

- Both high and low resolution imagery can be used to track changes in exposure over time. For which types of assets or elements is low-resolution satellite imagery useful?
- Which data are necessary to assess changes in hazards over time? Which of the data can be provided by Earth Observation? Which complementary data is needed from other sources?
- What are the limitations of Earth Observation to assess changes in risk over time?

Session 2: Flood risk reduction

According to UNISDR, disaster risk reduction is "*the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events*".

Flood risk reduction is achieved through several ways:

- Incorporating strong land-use planning regulations as a way to reduce the number of vulnerable assets or elements exposed to floods;
- Reducing the degree of vulnerability of the elements or assets exposed to floods;
- Incorporating physical measures such as levees as a way to control the extent of floods in particular geographic regions.

Recently UN-SPIDER, JB-GIS and ICSU completed the project entitled: "*The Value of Geoinformation for Disaster and Risk Management*"[4]. The project included a poll which was conducted worldwide to gather feedback on the usefulness of geoinformation, including the one derived from space applications. The results of the poll manifested the view that geoinformation could be most useful in the case of floods, whether in the context of flood risk monitoring, flood risk, flood inundation and flood damage assessment maps.

Objectives: The objectives of this discussion session are:

(1) to gather lessons learned on the use of Earth observation techniques from past floods;

(2) to identify ideas on how to enhance the use of the UN-SPIDER Knowledge Portal to support flood risk assessment; and

(3) to come up with recommendations how flood risk management can be improved through the use of space based information.

Three **discussion groups** will elaborate outputs on the following topics:

- **Group 1**: Lessons learned from past floods on the use of geospatial information (e.g. in Central Europe 2002 and 2013, in Bangladesh, the Niger or other basins)
- **Group 2**: Enhancing the use of the UN-SPIDER Knowledge Portal to support flood risk assessment.
- **Group 3**: Improvement of flood risk management through the use of space based information – methodologies and recommendations

Guiding questions for Discussion Session 2 Group 1: Lessons learned from past floods on the use of geospatial information (e.g. in Central Europe 2002 and 2013, in Bangladesh, the Niger or other basins)

In case of floods, satellite imagery is used to elaborate maps of areas which are inundated and to contribute to the assessment of impacts. Regional mechanisms set up by space agencies such as **COPERNICUS-EMS** and **Sentinel Asia**; as well as the **International Charter Space**

[4] http://www.un-spider.org/about/publication/value-geoinformation-disaster-and-risk-management-valid

and Major Disasters often contribute to emergency response efforts through the provision of maps depicting the extent of areas which have been flooded.

In developing countries where the Central Government has to manage all relief operations and has to cope with the impacts with limited resources, such maps are used to identify which areas that have been severely affected by floods would need more humanitarian assistance than others which may not be as severely affected.

As a way to promote the use of such space-based information, it is important to become aware of examples and lessons learned in recent events regarding how such information may have been disseminated to decision makers at local levels and how it was used. Based on these notions, questions to be addressed in this discussion session include:

- What type of geospatial information was available in recent floods?
- Who used the available geospatial information for which purpose? How was it accessed and shared? In what cases was the information useful? What needs to be improved?
- Identify examples from your experience that showcase how the improved use of geospatial information has led to more effective risk assessment of subsequent floods in one country?
- What are the most recent methods and satellites to assess the effects of floods on crops of different types?
- What are the lessons learned regarding the use of space-based products to contribute to the decision-making process, particularly in developing countries, concerning the distribution of humanitarian assistance to those affected by floods?

Guiding questions for Discussion Session 2 Group 2: Enhancing the use of the UN-SPIDER Knowledge Portal to support flood risk assessment

The Hyogo Framework for Action reiterates the view that national governments have the primary responsibility regarding the conduction of efforts to reduce risks. The HFA also recognizes that in the context of increasing global interdependence, concerted international cooperation and an enabling international environment are required to stimulate and contribute to developing the knowledge, capacities and motivation needed for disaster risk reduction at all levels.

The UN-SPIDER Knowledge Portal has been established as a gateway to space-based information. It contains a variety of information including:

- Explicit information on the mechanisms that have been set up by space agencies to contribute to emergency response operations;
- A variety of scientific and technical articles on how space-based applications are used in all phases of the disaster management cycle covering a variety of hazards;
- A dedicated section that hosts links to websites and portals that host different types of satellite imagery, geospatial products (land-use maps, digital elevation models, etc), commercial and open software;
- Databases on training opportunities;
- General information on institutions around the world which are involved in Earth observation, disaster risk management and emergency response operations;
- General information on UN-SPIDER, its activities, the way in which it provides technical advisory support and its networks of Regional Support Offices and National Focal Points as well as official publications.

Based on these notions, it is important to include a specific discussion session regarding how the UN-SPIDER Knowledge Portal could be improved to enhance its usefulness in aiding those in charge of flood risk management in their tasks. Questions to be addressed by this group include:

- Which are the most needed (existing or non-existing) features on the UN-SPIDER Knowledge Portal to support flood risk assessment and flood risk reduction?
- What elements should be incorporated into the UN-SPIDER Knowledge Portal so that experts around the world can contribute actively from their workplace towards the development and testing of step-by-step tutorials on the use of space-based applications in flood risk management? What should be avoided?

Guiding questions for Discussion Session 2 Group 3: Improvement of flood risk management through the use of space based information – methodologies and recommendations

Flood risk management usually entails the implementation of a variety of measures to reduce the level of exposure to floods, the vulnerability of assets and livelihoods, and whenever possible, the hazard of floods with structural and non-structural measures. Space-based information can provide reliable and timely input for more effective flood risk management. In this context, the following question will be addressed by this group:

- What novel satellites are there which can contribute to the generation of relevant information for flood risk management?
- How can remote sensing applications contribute to assess how climate change may modify the behavior of floods worldwide? How can remote sensing applications contribute to assess how land-use changes modify the spatial and temporal behavior of floods?
- What recommendations do you have to improve flood risk management through the use of space technologies?
- How can space applications be used to track and help visualize increasing exposure or changes to flood hazards due to land-use / land-cover changes?

Session 3: Drought risk reduction

Droughts have been affecting regions in Africa including the Horn of Africa in recent decades, leading to famine. Droughts have also affected other regions of the world and FAO, UNCCD, WFP and WMO have joined forces to promote the implementation of national policies targeting droughts.

Earth observations are unique in allowing international organizations such as FAO to identify key hot spots where droughts may have an impact on crops. In addition, several indicators have been developed to combine the use of archived and up to date imagery as a way to contribute to drought early warning systems. Ministries of Agriculture and Food Security organizations could use Earth observation techniques to track the geographical extent of specific crops worldwide and in combination with knowledge concerning the degree of vulnerability of specific crops, such ministries and organizations could develop drought vulnerability maps. Such maps could then be used to identify strategies to reduce the vulnerability of the sector through efforts including the promotion of the exchange of highly vulnerable crops to crops which may be more drought-resistant and hence, les vulnerable.

Climate change will certainly exacerbate the frequency and magnitude of droughts. Earth observations could be used to elaborate a baseline concerning the exposure of vulnerable crops and to identify potential options for adaptation to climate change. In this context, the periodic use of such Earth observation techniques could be used to assess the degree of advancement regarding adaptation to climate change in the agricultural sector at the national level.

Objectives: The objectives of this discussion session are

(1) to gather lessons learned from past droughts;

(2) to identify ideas on how to enhance the use of the UN-SPIDER Knowledge Portal to support drought risk assessment; and

(3) to come up with recommendations how drought risk management can be improved through the use of space based information.

Three **discussion groups** will elaborate outputs on the following topics:

- **Group 1**: Lessons learned from the use of Earth observation in recent droughts (e.g. Horn of Africa, Asia, Latin America)
- **Group 2**: Enhancing the functionality of the UN-SPIDER Knowledge Portal to support drought risk assessment
- **Group 3**: Improvement of drought risk management through the use of space based information – methodologies and recommendations

Guiding questions for Discussion Session 3 Group 1: Lessons learned from the use of Earth observation in recent droughts (e.g. Horn of Africa, Asia, Latin America)

Recent major drought events, such as the 2011 East Africa drought, or other events in Asia and Latin America affected millions of people and their livelihoods as they led to serious food shortages. In these situations in-situ satellite imagery is crucial to assess the dimensions of the disaster. Yet. equally important are archived data and information in order to create time series

and predict the further development of a slow onset event, such as a drought. In order to learn from past experiences and subsequently lessen the risk for future events and strengthen resilience of populations, the following considerations with regards to the use of space-based information are worth discussing:

- What type of geospatial information was available in the different phases of the disaster management cycle for past droughts?
- Who used the available geospatial information for which purpose? How was it accessed and shared? In what cases was the information useful? What needs to be improved?
- What are the most recent methods and satellites to assess the effects of droughts on crops of different types?
- What types of indicators are better for crops in the tropics where there may be both some cloud cover and high topographic relief?
- Are there specific indices that work better in the case of corn? Rice? Wheat?
- What are the lessons learned regarding the use of space-based products to contribute to the decision-making process, particularly in developing countries, concerning the distribution of humanitarian assistance to those affected by droughts?

Guiding questions for Discussion Session 3 Group 2: Enhancing the functionality of the UN-SPIDER Knowledge Portal to support drought risk assessment

The UN-SPIDER Knowledge Portal is a pertinent knowledge hub and gaining access to background knowledge, data and other resources with regard to the application of space technologies to disaster risk reduction, including droughts. It provides links to available archived and data sets, relevant software, studies, background documents and lessons learned.

The UN-SPIDER Knowledge Portal has been established as a gateway to space-based information. It contains a variety of information including:

- Explicit information on the mechanisms that have been set up by space agencies to contribute to emergency response operations;
- A variety of scientific and technical articles on how space-based applications are used in all phases of the disaster management cycle covering a variety of hazards;
- A dedicated section that hosts links to websites and portals that host different types of satellite imagery, geospatial products (land-use maps, digital elevation models, etc), commercial and open software;
- Databases on training opportunities;
- General information on institutions around the world which are involved in Earth observation, disaster risk management and emergency response operations;
- General information on UN-SPIDER, its activities, the way in which it provides technical advisory support and its networks of Regional Support Offices and National Focal Points as well as official publications.

This content needs to be continuously updated, improved and amended. The direct input and feedback from end-users and the communities in this process is necessary. The following questions should therefore be addressed:

- Which are the most needed (existing or non-existing) features on the UN-SPIDER Knowledge Portal to support drought risk assessment and drought risk management?

- What elements should be incorporated into the UN-SPIDER Knowledge Portal so that experts around the world can contribute actively from their workplace towards the development and testing of step-by-step tutorials on the use of space-based applications in drought risk management? What should be avoided?
- What type of content should be incorporated into the UN-SPIDER Knowledge Portal so that Ministries of Agriculture and Food Security and Nutrition Committees at the national level can improve their drought risk management efforts, including drought early warning systems?

Guiding questions for Discussion Session 3 Group 3: Improvement of drought risk management through the use of space based information – methodologies and recommendations

In the framework of the EU/FAO Improved Global Governance for Hunger Reduction Programme, the Food and Agriculture Organization of the United Nations (FAO) is developing the Agriculture Stress Index System (ASIS) to detect agricultural areas with a high likelihood of water stress (drought) at the global level. Based on 10-day METOP-AVHRR satellite data at 1 km resolution, ASIS will support the vegetation monitoring activities of the FAO-Global Information and Early Warning System (GIEWS).[5] The Joint Research Center of the European Commission is working on a Drought Information System.[6] The USGS famine early warning system fewsnet[7] is an operational service based on vegetation indices (NDVI, EVI), rainfall estimations, evapotranspiration and crop soil water index to monitor droughts and their effect on food security. These are some examples how satellite data can support decision making in the case of droughts. Some of UN-SPIDER's Regional Support Offices are currently developing step-by-step procedures on how to use satellite data to monitor and predict droughts in order to support part of UN-SPIDER's mandate to enable countries worldwide to make use of space-based information to support disaster risk management. In this context, the following questions might be worth discussing:

- What novel satellites are there which can contribute to the generation of relevant information for drought risk management?
- What are the products that can be derived from Earth observation which should be incorporated in drought early warning systems?
- How can remote sensing applications contribute to assess how climate change may modify the behavior of droughts worldwide?
- What recommendations do you have to improve drought risk management through the use of space technologies?

[5] Cf. case study featured in the February 2014 UN-SPIDER newsletter (http://www.un-spider.org/sites/default/files/UN-SPIDER_Newsletter022014_online.pdf)
[6] Cf."JRC experience on the development of a drought information system" https://ec.europa.eu/jrc/sites/default/files/lbna25235enn_0.pdf
[7] http://www.un-spider.org/links-and-resources/data-sources/famine-early-warning-systemsusgs

Session 4: The way forward

2015 is a big year for the United Nations: Three major instruments, which are all relevant to disaster risk management, are under discussion: The Post-2015 Framework for Disaster Risk Reduction (HFA2), climate-change agreement (CCA), and the post-2015 sustainable development agenda and goals (SDGs). HFA2 is the main expected outcome of the 3rd World Conference on Disaster Risk Reduction (WCDRR), which will take place in Sendai, Japan from 14-18 March 2015. HFA2 will be the successor of the "Hyogo Framework for Action (HFA) 2005-2015 – Building the Resilience of Nations and Communities to Disasters". WDCCR will be organized in three segments: The intergovernmental segment, the multi-stakeholder segment, and the public forum. The "Adoption of a Post-2015 Framework for DRR, Declaration and Commitments" is the culminating point at the last day on the agenda of the intergovernmental segment.

UN-SPIDER contribution to HFA priority actions

UN-SPIDER is actively contributing to the five priority actions defined in the Hyogo Framework for Action (HFA). With its Technical Advisory Missions (TAMs) UN-SPIDER contributes to priority 1 "ensure that DRR is a national and local priority with a strong institutional basis for implementation". With its follow-up of TAM recommendations, capacity building and the UN-SPIDER Knowledge Portal, UN-SPIDER is contributing to priority action 2 "identity, assess and monitor disaster risks and enhance early warning" as well as to priority action 3 "use knowledge, innovation and education to build a culture of safety and resilience". UNOOSA covers a wide range of thematic areas and space applications including disaster management, natural resources management, environmental monitoring (climate change), tele-health/tele-medicine, global navigation satellite systems, COSPAS-SARSAT, space law, and socio-economic benefit, which all make contributions to priority action four "reduce the underlying risk factors". Finally with its emergency support, UN-SPIDER contributes to priority action 5 "strengthen disaster preparedness for effective response at all levels".

UN-SPIDER involvement in the HFA2, SDG and CCA process

Knowing the value of geo-spatial and space-based information for disaster risk management, UN-SPIDER aims to integrate the use of geo-spatial and space-based information into HFA2 as well as into the SDGs. UN-SPIDER does this by lobbying with relevant partners and by contributing to the Asian consultation process.

During the International Symposium of Integrated Disaster Risk Governance in Beijing on 8-9 May 2014 UN-SPIDER chaired Session 2 of the symposium on "Government Role and Governance" and also gave a presentation entitled "Is Space Technology Contributing Enough to DRR - Challenges with Respect to Implementation of HFA and HFA2". During the round table discussions with Margareta Wahlström - the Special Representatives of the UN Secretary-General for Disaster Risk Reduction - UN-SPIDER, the Economic and Social Commission for Asia and the Pacific (ESCAP) and the National Disaster Reduction Centre of China (NDRCC) proposed to spell out the effectiveness of space-based information in the

HFA2 process. They urged that the Disaster Risk Reduction inputs for the Sustainable Development Goals also highlight the role of space-based information in this context.[8]

UN-SPIDER will also lead together with GFDRR (World Bank) a session at the Pre-Conference Consultation Event of the 6th Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR) in Bangkok, 22-26 June 2014. Theme of the session is "Improving public investments for disaster and climate risk management to protect and sustain development goals". The objectives are to generate awareness about how critical the investment in geospatial and space-based information is to support disaster risk reduction (DRR) and CCA; to demonstrate best practices from the countries that have leveraged/used geospatial and satellite-based information in DRM such as prevention, mitigation, response, recovery and reconstruction planning; and to serve as a forum of participants from national geospatial and space agencies, planning agencies, local governments, mapping communities, donor agencies, etc. to trigger collaboration in geospatial and space-based information in disaster management. A declaration of AMCDRR will be presented at the WCDRR in Sendai. Outputs of the Bonn expert meeting will be integrated into this Pre-Conference Consultation Event in Beijing.

Possible integration of space-based information in HFA2: Enhanced Monitoring System

The UN Special Representative of the Secretary General (SRSG) for Disaster Risk Reduction presented in December 2013 a document with proposed elements for consideration in the Post-2015 Framework for Disaster Risk Reduction (Proposed Elements).[9] The document is based on a long series of consultations that have taken place since early 2012, on countries' reports through the UNISDR HFA Monitor, on the findings of the biennial UN Global Assessment Reports on Disaster Risk Reduction of 2009, 2011 and 2013, on relevant deliberations of the United Nations General Assembly, as well as on a growing literature and practice on disaster risk and resilience. It aims to provide guidance and support for the preparation and deliberations of upcoming Regional Platforms and meetings for disaster risk reduction upon which the future framework will be built. A key message of the Proposed Elements is that sustainable development goals (SDGs) cannot be achieved without managing disaster risk. The document calls for a coherent and compatible approach of all three instruments regarding the management of risk and opportunities.

One central element proposed for HFA2 is the development of an enhanced monitoring system as a consequence of identified weaknesses of the current HFA Monitor.[10] Therefore a new indicator system is proposed for risk management including five indicator families measuring:

1. the level of disaster loss;
2. the countries' risk profile, including intensive and extensive risk;
3. the resilience of a country's economy to probable losses;
4. the country's management of underlying risk drivers, also providing links from disaster risk management to the SDGs and to the climate change convention;

[8] cf. http://www.un-spider.org/about-us/news/un-spider-participates-international-symposium-integrated-disaster-risk-governance

[9] The document can be downloaded in all official UN languages at http://www.preventionweb.net/posthfa/proposed-elements

[10] cf. paragraph 38 ibid.

5. the country's adoption of effective public policies in favor of prospective and anticipatory risk management, corrective risk management and the strengthening of resilience by both the public and private sectors.

Objectives: The objectives of this discussion session are:

(1) To identify and take note of potential ways in which Space-based applications can contribute to the achievement of the goals and targets to be defined in the upcoming World Conference for Disaster Reduction;

(2) To identify strategies to promote synergies among international organizations and mechanisms which focus their efforts on space-based and geospatial information, and strategies so that joint efforts among these international organizations can be used to contribute to the achievement of the goals and targets to be defined in the upcoming World Conference for Disaster Reduction

(3) To identify strategies to promote synergies among government agencies and other relevant stakeholders as a way to institutionalize the use of space-based applications in DRR as a way for these government agencies and other stakeholders at the national level to contribute to the achievement of the goals and targets to be defined in the upcoming World Conference for Disaster Reduction

Three **discussion groups** will elaborate outputs on the following topics:

- **Group 1**: Elements to contribute to the World Conference on Disaster Risk Reduction in Sendai/Japan in March 2015, especially to the Post 2015 framework for disaster risk reduction (HFA2) with a focus on the use of space technologies
- **Group 2**: Strategies to increase cooperation/ coordination/ communication among key initiatives and key players at the international level (UN-SPIDER, GEO, GEOSS, CEOS, Copernicus, Space agencies, RSOs...)
- **Group 3**: Strategies to increase synergies among government agencies at the national level on the generation and use of space-based information in disaster risk reduction

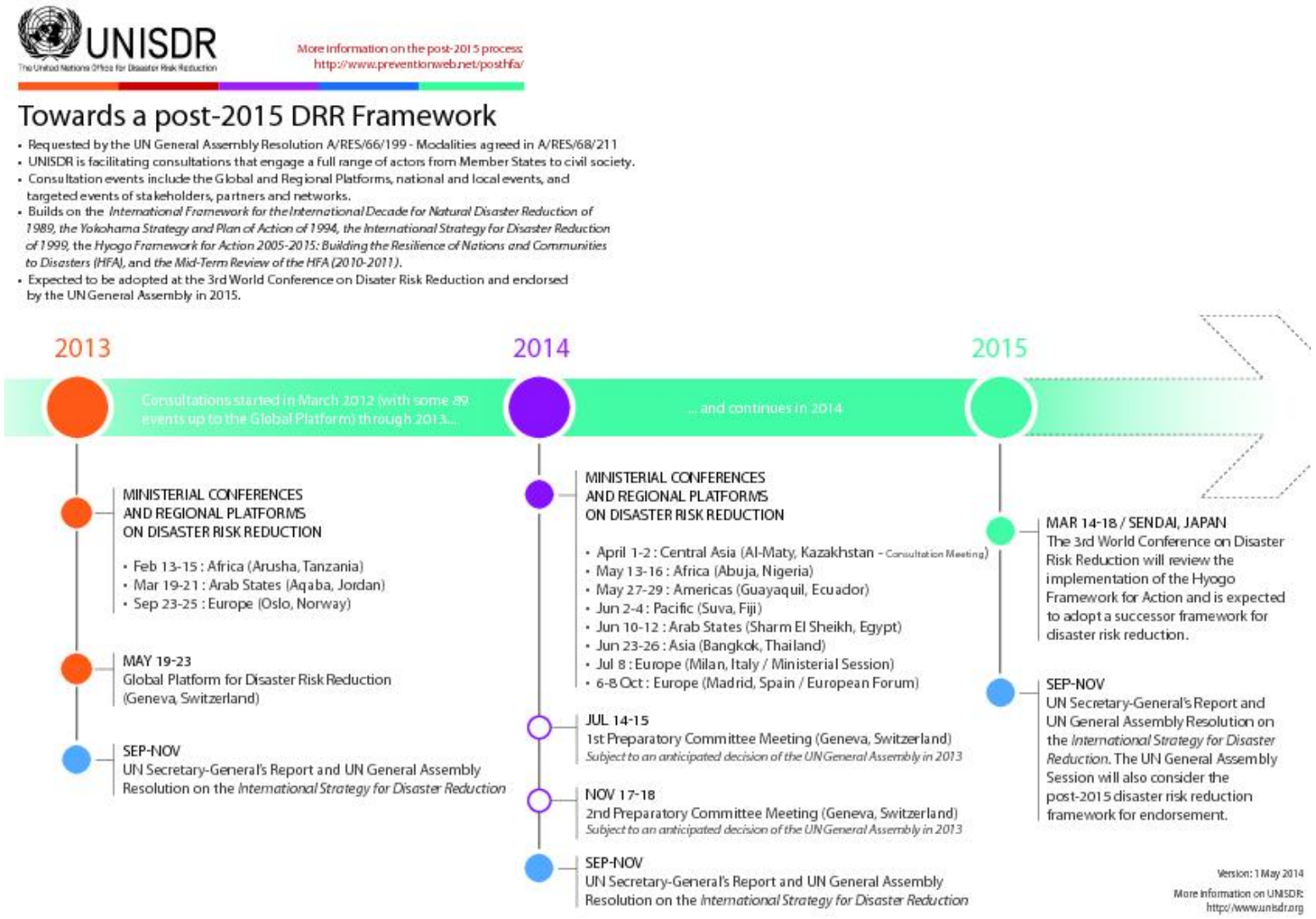

Figure 1: The HFA2 process (Source: UNISDR)

Guiding questions for Discussion Session 4 Group 1: Elements to contribute to the World Conference on Disaster Risk Reduction in Sendai/Japan in March 2015, especially to the Post 2015 framework for disaster risk reduction (HFA2) with a focus on the use of space technologies

As stated in the above introduction, UN-SPIDER aims to integrate the use of geo-spatial and space-based information into HFA2 as well as into the SDGs. The following questions might help to focus the discussion in order to reach an output that could find its way to HFA2:

- It is expected that the Post 2015 framework for disaster risk reduction (HFA 2) will include improved monitoring tools. Which relevant indicators can be monitored with satellite based remote sensing applications?
- Outputs of this discussion session can only find its way to the WCDRR and HFA2 if the message reaches national governments involved in the HFA2 process who would feed it into their declaration. A not-too-technical one-pager to submit to the respective government representatives could serve this purpose. The UN-SPIDER statement at COPUOUS could refer to outputs of this expert meeting to raise awareness among member states. A more solid document at STCS one month before WCDRR could help to provide member states with wording for their interventions at WCDRR. What should be the content of such a document? How could we as a group draft and distribute the document?
- Which other means do you suggest to reach HFA2?

Guiding questions for Discussion Session 4 Group 2: Strategies to increase cooperation/ coordination/ communication among key initiatives and key players at the international level (UN-SPIDER, GEO, GEOSS, CEOS, Copernicus, Space agencies, RSOs...)

UN-SPIDER is serving as a bridge to connect the disaster management, risk management and space communities. Cooperation among key international players is crucial to contribute to the goals emerging from the WCDRR and to promote the use of space technologies during ISDR platform meetings. The following questions may guide the discussion group to define concrete steps how to set up partnerships or platforms of these players:

- Considering the notion of a partnership or platform as a way for all of these international mechanisms to collaborate in the strengthening of capacities at the national and regional level on the use of space-based applications in disaster risk reduction; what key strategies should these partnership include?
- What indicators could be conceived as a way to monitor the degree to which international organizations, working together, contribute to the achievement of the goals that will emerge from the 2015 World Conference on Disaster Risk Reduction?
- What future actions do you recommend to increase cooperation/ coordination/ communication among key initiatives and key players at the international level?

Guiding questions for Discussion Session 4 Group 3: Strategies to increase synergies among government agencies at the national level on the generation and use of space-based information in disaster risk reduction

A recurrent recommendation from Technical Advisory Missions (TAMs) is to strengthen the inter-institutional cooperation and information sharing among government institutions. As a follow-up of TAMs, UN-SPIDER has supported governments to set up inter-institutional teams.

One example is the active inter-institutional team EIGEO in the Dominican Republic.[11] UN-SPIDER sees the institutionalization of collaboration among different governmental bodies as decisive for successful disaster risk management. The following questions focus on the promotion of such inter-institutional teams:

- How can regional and international organizations work together to institutionalize the use of space-based applications at the national level so that they are used to contribute to the achievement of the goals to be proposed in the upcoming 2015 World Conference on Disaster Risk Reduction?
- How can space-based applications be promoted so as to improve synergies among government agencies, academia, the civil society and the private sector to contribute to the achievement of the goals to be proposed in the upcoming 2015 World Conference on Disaster Risk Reduction?
- What future actions do you recommend to increase synergies among government agencies at the national level on the generation and use of space-based information in disaster risk reduction?

[11] Cf. http://www.un-spider.org/advisory-support/training-activities/dominican-republic-national-training-course