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Space-based information for crowdsourcing mapping

Report of the Secretariat

Summary

In its resolution 61/110, the General Assembly decided to establish the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) as a programme within the United Nations to provide universal access to all countries and all relevant international and regional organizations to all types of space-based information and services relevant to disaster management to support the full disaster management cycle.

In recent years, advancements in technology have made it possible for volunteer and technical communities to provide increasing support to disaster preparedness and emergency response efforts. Important cornerstones of this virtual effort are the possibility to access and take advantage of satellite imagery, as well as the use of other space-based technologies such as telecommunications satellites and global navigation satellite systems. In view of the need to connect these pioneering communities with both the space industry and the disaster management community, a one-year project on space-based information for crowdsourcing mapping is being carried out, in the framework of the UN-SPIDER programme to identify specific actions that could ensure closer cooperation.

The present report contains a summary of the work carried out in 2011, including the organization of two international expert meetings with the support and cooperation of the Government of Austria and the Secure World Foundation.



I. Introduction

1. In its resolution 61/110, the General Assembly decided to establish the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER) as a programme within the United Nations to provide universal access to all countries and all relevant international and regional organizations to all types of space-based information and services relevant to disaster management to support the full disaster management cycle, and agreed that the programme should be implemented by the Office for Outer Space Affairs of the Secretariat.
2. In recent years, advancements in technologies have made it possible for volunteer and technical communities such as OpenStreetMap, Ushahidi, the Sahana Software Foundation, the International Network of Crisis Mappers, Virtual Disaster Viewer, Google Map Maker, Innovative Support to Emergencies Diseases and Disasters and others to provide increasing support to disaster preparedness and emergency response efforts. The most important cornerstones of this virtual endeavour are the possibility to access and take advantage of satellite imagery, as well as the use of other space-based technologies such as telecommunications satellites and global navigation satellite systems.
3. The United Nations recognizes the importance of such new methodologies for disaster risk management and emergency response. That is evidenced by the involvement of the Office for the Coordination of Humanitarian Affairs of the Secretariat in requesting the establishment of a crisis-mapping platform in Libya and in the support that the Office and the United Nations Foundation provided to the 2011 report of the Harvard Humanitarian Initiative entitled “Disaster relief 2.0: the future of information-sharing in humanitarian emergencies”.
4. In view of the need to connect these pioneering communities with the space industry and the disaster management community, a one-year project on space-based information for crowdsource mapping is being carried out in the framework of the UN-SPIDER programme to identify specific actions that could ensure closer cooperation among the crowdsource mapping, disaster management and space technology communities.
5. The UN-SPIDER programme is ideally positioned for this project, given its mandate and its role within the United Nations, which is to promote the use of space-based information; its established networks that bring together national institutions responsible for disaster management and emergency response, as well as other end-users and providers of space-based solutions and technologies; and its technical foundation, particularly in the area of information technologies.
6. The first activity of this project was a meeting of experts on crowdsource mapping for preparedness and emergency response, held in Vienna on 5 and 6 July 2011. The meeting was aimed at: (a) receiving feedback from experts from the disaster management community regarding how information must be generated and/or tailored to ensure that it could be used effectively; (b) learning about novel potential applications and products that could be elaborated by the crowdsourcing communities supporting preparedness and emergency response; and (c) receiving guidance on how to build upon existing solutions to facilitate the sharing of information within the emergency management communities.

7. The second activity of this project was a meeting of experts held in Geneva on 16 November 2011. The discussions of the second meeting built upon the conclusions and recommendations of the first meeting and were aimed at exploring possible ways of contributing to better coordination of the crowdsourcing communities with the space technology community and on overall improvement of its involvement to facilitate the preparation and processing of space-based products used by the disaster risk reduction and emergency response community. The discussions also targeted opportunities for making space-based information available for disaster risk reduction and emergency response, including access and use, as well as the further involvement of existing mechanisms to ensure increased coordination and cooperation among all three communities.

II. Activities carried out in 2011

A. International meeting of experts on crowdsourcing mapping for preparedness and emergency response held in Vienna in July

8. The two-day meeting of experts on crowdsourcing mapping for preparedness and emergency response brought together 64 experts and practitioners from the following 29 countries: Austria, Belgium, Canada, China, Denmark, Ethiopia, France, Germany, Greece, Guatemala, Haiti, Hungary, Iceland, Italy, Kenya, Malaysia, Netherlands, Nigeria, Norway, Pakistan, Poland, Romania, Samoa, Spain, Switzerland, Thailand, United Kingdom of Great Britain and Northern Ireland, United States of America and Zambia.

9. The meeting was attended by representatives from several United Nations entities, space and remote-sensing organizations and national, regional and international disaster management and civil protection agencies, as well as various actors from the crowdsourcing communities representing voluntary and technical communities, non-governmental organizations, expert groups, universities, research institutions and the private sector.

10. The programme of the meeting consisted of four plenary sessions and parallel breakout group sessions. In the plenary sessions, introductory presentations were used to provide an overview of various topics to be discussed and to give an opportunity to the three communities to brief participants about their fields of expertise. Two “ignite” talk sessions, in which presenters were given five minutes each, were arranged to allow for a maximum number of experts to present their ideas.

11. The breakout sessions focused on the following discussion points:

(a) How does the crowdsourcing mapping community take advantage of existing opportunities and sources of space-based information to support their efforts in helping the emergency and humanitarian response communities;

(b) How can all three communities work together to achieve the long-term involvement of the work of the crowdsourcing mapping community in the support of the emergency and humanitarian response community;

(c) What is the role of the UN-SPIDER programme in helping all three communities.

12. A summary of the main recommendations and conclusions is included in section III below. The meeting notes, with all the considerations and discussion points, as well as the final programme and the final list of participants, can be accessed at www.un-spider.org/node/5118.

13. This first meeting of experts initiated far-reaching discussions and received important and relevant feedback from experts on applications and products elaborated by the crowdsourcing communities, requirements regarding how information must be tailored to ensure its effective use by the disaster management communities, and ways to build upon existing solutions to facilitate the sharing of information. The meeting also contributed to the development of an understanding of the strengths and challenges of the three communities and to explore ways to proceed jointly. One of the recommendations from the meeting was to plan a simulation exercise in Samoa on 30 November 2011, in which the three communities would work together in a coordinated manner for the first time. The discussion points raised, the recommendations and the proposed simulation exercise were then further discussed during the second meeting of experts, which was held four months later.

B. International meeting of experts: crowdsourcing mapping for preparedness and emergency response held in Geneva in November

14. The one-day meeting of experts brought together 72 experts and practitioners from the following 21 countries: Argentina, Australia, Austria, Belgium, Canada, France, Germany, Iceland, Ireland, Italy, Liberia, Luxembourg, Pakistan, Samoa, South Africa, Spain, Sudan, Switzerland, Thailand, United Kingdom and United States.

15. The meeting was attended by representatives from several United Nations agencies, space and remote sensing organizations and national, regional and international disaster management and civil protection agencies, but mostly by representatives from the crowdsourcing communities coming from voluntary networks, non-governmental organizations, expert groups, universities, research institutions and the private sector.

16. This second meeting was purposely organized back-to-back with the International Conference on Crisis Mapping (see <http://crisismappers.net>). This ensured the participation of the crisis-mapping community, which had converged on Geneva to attend its annual meeting, as well as the humanitarian community based in Geneva. The agenda of the second meeting built upon the recommendations and conclusions of the first meeting, focusing on exploring possible ways of contributing to better coordination of the crowdsourcing communities with the space technology community and on overall improvement of its involvement in order to facilitate the preparation and processing of space-based products used by the disaster risk reduction and emergency response community. The discussions targeted opportunities for making space-based information available for disaster risk reduction and emergency response, including their access and use, as well as the further involvement of existing mechanisms to ensure increased coordination and

cooperation of all three communities. The Samoa simulation exercise, proposed during the first meeting, was discussed and fine-tuned during the second meeting.

17. A summary of the main recommendations and conclusions is included in section III below. The presentations, as well as the final programme and the final list of participants, can be accessed at www.un-spider.org/node/5321.

18. The programme of the meeting consisted of four plenary sessions, followed by one closing session, which focused on recommendations and next steps. In the first plenary session, introductory presentations were used to provide an overview of various topics to be discussed and to give an opportunity to the three communities to brief about their fields of expertise. The remaining sessions were used as a platform for presentations and discussions on existing and future opportunities among the three communities. A highlight of these discussions was the introduction and preparation of the Samoa simulation exercise, which was planned for 30 November 2011. All sessions were arranged to allow for a maximum number of experts to present their ideas and interact with everyone in a concise and constructive manner.

C. Support received

19. Both meetings were organized with the support and cooperation of the Government of Austria (through the Federal Ministry for Transport, Innovation and Technology) and the Secure World Foundation. The funding support provided by both partners contributed to defraying the travel and living costs of the 16 participants that attended the meeting in Vienna and the participants that attended the meeting in Geneva.

III. Summary of recommendations and next steps

20. It was noted that crowdsourcing mapping was an interdisciplinary field bridging many areas of expertise, including the need to access and use space-based technologies. In order to understand how such technologies could contribute to the work of the volunteer and technical communities, there was a need to better define how the many fields come together to support crowdsourcing mapping activities and, more specifically, the common questions being asked by all those involved. Bringing together the three communities (crowdsourcing mapping, disaster management and space technology communities) to discuss their fields of expertise provided an opportunity to better understand the questions being asked and the ways that space-based technologies could contribute to solving them.

A. Discussion points

21. Experts attending both meetings noted that crowdsourcing geospatial data and information, including space-based information, enabled an end-user with a specific need to have access to geographical knowledge from both domain experts and ordinary citizens, leading to better decision-making in the area of disaster risk management and emergency response. The “swarm-and-surge” capacity (i.e. the convergence of volunteers to address a specific problem), access to local knowledge

(including from the diaspora community) and the delivery speed of the products were also singled out as the main strengths and advantages of crowdsourcing.

22. Experts also noted the need to raise awareness of how voluntary work was being applied and further the understanding that crowdsource mapping should not be seen as a replacement for the work already being carried out by established organizations and the private sector but rather as an additional support to the disaster risk management process, specifically in the production of geospatial information to support decision-making.

23. Experts stressed the need to map the specific information needs of the end-user community (the actual disaster and emergency response managers dealing with the problem) and, more specifically, how that community was able to access and use the information provided by the volunteer and technical communities.

24. The experts also discussed the information needs of the crowdsource mapping communities, including specific information areas of interest and the existence of available core datasets. The need for feedback from the end-user community on the usefulness of the products delivered with the support of volunteer and technical communities was also stressed.

25. Experts also discussed the use of the term “crowdsource mapping”, as opposed to “crisis mapping”. Crisis mapping was understood as live mapping that focused on crises, with the term “crisis” understood by the volunteer and technical communities as being deliberately broad, from slow-burn crises to sudden-onset disasters. Furthermore, crisis mapping was certainly not restricted to natural, social and environmental issues but might include political and humanitarian crises as well. Crowdsource mapping took the opportunities provided by volunteer and technical communities a step further by encompassing actions and activities that supported the full disaster management cycle and were not only for emergency and humanitarian response.

26. If crowdsourcing was defined as “the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large, group of people in the form of an open call”, crowdsource mapping could be understood as reaching out to the unknown crowd for help in gathering geospatial information, visualizing that information on a map and gaining further insight by analysing the data. Such a crowd would be supporting not only humanitarian and emergency crises but also all the phases of the disaster risk management cycle: prevention, preparedness, early warning, response, early recovery and reconstruction.

27. Finally, the experts summarized the main questions the crowdsourcing community was asking regarding access and use of geospatial data, stressing that those same issues were the ones that had to be solved in order to ensure an increased use of space-based technologies in support of crowdsource mapping. Those issues included the following:

(a) **Preparedness and prioritization**, which referred specifically to the need for geospatial data to be readily available for support during any disaster event;

(b) **Data licensing**, which ensured that satellite imagery was made available to the volunteer and technical communities to support their work;

(c) **Data scramble**, or contribution to the definition and compilation of available geospatial data during a crisis;

(d) **Decision maker's needs**, which contributed to understanding and defining the specific needs of the end-users, more specifically those in charge of making the decisions;

(e) **Impact evaluation**, or ensuring feedback to the volunteer and technical communities;

(f) **Volunteer management**, or bringing together all those willing to volunteer their time and involving them in meaningful activities that contributed to the decision-making process.

B. Simulation exercise

28. During the first meeting of experts, participants considered possible ways of addressing the issue of the organization of training scenarios and bringing the three communities together with the involvement and support of the United Nations. A simulation exercise that also involved the decision makers was identified as a most practical tool. The expert from Samoa offered to organize and host such a simulation exercise and suggested 30 November 2011 as a target date for the activity.

29. Details of the proposed simulation exercise were discussed, including preparing geospatial data and defining the test site and scenario, as well as ensuring close coordination with local decision makers and end-users. Also, satellite data providers would need to be involved to acquire and share data, including archive data. Feedback should also be provided by the end-users, and the results should be disseminated after the exercise as lessons learned. Local bodies should actively participate in the simulation, together with individual experts, concerned organizations and the private sector. It was suggested to have that simulation also involve the volunteer and technical communities and then plan a follow-up meeting for a wrap-up and an exchange of experiences and best practices. It was also considered vital to involve crowds for data validation, as well as the general population, in the exercise.

30. Furthermore, the participants discussed several coordination aspects, such as data hosting and requirements mapping and the issue of organization and dissemination of gathered information. In that regard, the UN-SPIDER knowledge portal was seen as a potential tool.

31. At the second meeting of experts, the same expert from Samoa presented an update on the preparations of the planned simulation exercise. The experts participating in the meeting fine-tuned the proposed exercise, and those who had the possibility of contributing to the activity were involved and provided with a specific role for the simulation.

32. Finally, it was agreed that feedback from the simulation exercise would be made available after the activity and that the lessons learned during the simulation should be incorporated into other similar exercises.

C. Role of the UN-SPIDER programme

33. At the first meeting of experts, the specific role that the UN-SPIDER programme could play in the context of crowdsourcing mapping for preparedness and emergency response was extensively discussed. Experts pointed out that the programme could help in identifying the needs and requirements of the disaster risk management (end-user) community through the established cooperation and networks with disaster risk management and civil protection agencies. It was recalled that end-users operated in a diversified organizational structure, which would have to be carefully mapped and understood.

34. Furthermore, the experts pointed out that the issue of cooperation between the diverse groups without duplication of efforts needed to be considered. That entailed informing communities of each other's activities, as well as providing means of distributing available information. Deepening the understanding about the strengths and capabilities of the three communities was considered a priority.

35. The experts also stated that the development and application of tools should be driven by and adjusted to the needs of end-users. The need for continued capacity-building was considered equally important.

36. The strengths of the UN-SPIDER programme were considered to be in the areas of preparedness, information distribution and awareness-raising. The programme was considered to be in a good position to address decision makers and invite them to relevant activities. Also, the UN-SPIDER programme might be able to facilitate the development of a glossary or lexicon of each community for the benefit of the other participating groups.

D. Next steps

37. Building upon the conclusions of the discussions carried out during the first expert meeting, and more specifically the possible contribution of the UN-SPIDER programme, the experts participating in the second meeting reviewed actions that could contribute to ensuring an increase in the access and use of space-based information to support crowdsourcing mapping activities to the benefit of the end-users.

38. The first consideration was that no new working groups should be established. Work should be carried out within the established communities of interest as implemented by the Office for the Coordination of Humanitarian Affairs. The communities of interest were established as a means of ensuring closer coordination of the United Nations with the volunteer and technical communities in several areas that were identified as needing closer cooperation and coordination.

39. Those communities of interest were envisioned as a very open and transparent set of communities working on thematic topics that benefited the larger community. From the perspective of the Office for the Coordination of Humanitarian Affairs, it was envisioned that the work of each community of interest would be developed and presented in a manner that could be endorsed by globally recognized bodies such as the Inter-Agency Standing Committee. Furthermore, the UN-SPIDER programme should contribute and harness support for the communities of interest that were

focused on the following areas: (a) data licensing; (b) preparedness and prioritization; (c) data scramble; (d) needs of decision makers; (e) impact evaluation; and (f) volunteer management.

40. The UN-SPIDER programme should ensure that data made available to support emergency and humanitarian crisis were also made available to the UN-SPIDER regional support offices, as well as to volunteer and technical communities. In order to do that, the programme should contribute to set up mechanisms, agreements and frameworks that led to wider access to space-based information by the volunteer and technical communities.

41. In the framework of the UN-SPIDER programme, experts should be invited from the volunteer and technical communities to participate in UN-SPIDER technical advisory missions. Such missions were one of the prime activities of the UN-SPIDER programme at the national level. They served to identify the existing capacity to use space-based information, analysing the institutional framework to support disaster management through space-based information and identifying the limitations. They also contributed to helping Governments to overcome current limitations regarding the use of space-based information for disaster management. They further dealt with international cooperation and regional opportunities, networking with regional institutions and setting up disaster management plans. They covered region-specific aspects such as transboundary issues, emergency response, risk assessment, Geographic-Information-System-based disaster management systems and disaster risk reduction. By including experts from the volunteer and technical communities, opportunities in the area of crowdsourcing mapping could be identified and included as recommendations to the Government.

42. The UN-SPIDER programme should focus more broadly on crowdsourcing mapping instead of just crisis mapping, ensuring the support of the volunteer and technical communities for the full disaster risk management cycle.

43. Finally, it was agreed that experts from the volunteer and technical communities should be invited to attend relevant planned UN-SPIDER meetings in 2012, including the third UN-SPIDER meeting of experts on building upon the network of regional support offices, which was planned for February 2012.