Open Community Approach for Capacity Building to improve Public Health through Collaborative Mapping for Risk Management and tailored allocation of available resources

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Abstract

One objective of the "Expert Foucus Group – Space & Global Health" (abbreviation: EFG-SGH; former Action Team 6 Follow Up Initiative, AT6FUI) is to support the multinational concept of sharing in an OpenSource, OpenContent, Open Community Environment. The concept of Open Community is used as measure and draft strategy for a participative communication and an efficient knowledge management. In this context the "product" of the Open Community EFG-SGH is an "improved public health by application of space technologies". In 2012 a partly virtually AT6FUI workshop took place in Bonn, from which recommendations for (partly) virtual meetings were derived. At the following 2013-2015 meetings, the recommendations were refined and all the participants even remained in their member states and participated virtually. This study describes a practical application of the Open Community Approach and investigates in how far an Open Community Structure (e.g. a LivingLab) has the potential to support the initial step of collaborative mapping for humanitarian risk mitigation strategies. In this context, the concept of a LivingLab is proposed as support concept of the OpenSource, OpenContent application of collaborative mapping for risk management and tailored allocation of available resources.

1 Introduction

The Action Team 6 was established in 2001 by the United Nations Committee of Peaceful Uses of Outer Space (COPUOS) as a mechanism for initiating the implementation of recommendations of the third United Nations Space Conference UNISPACE III (1999). In 2002 Action Team 6 (UN-OOSA-AT6) proposed an initial action plan. UN-OOSA-AT6 was inactive due to missing resources. In 2007, a new development and focus was elaborated by the co-chairs Canada & WHO. The new focus was to facilitate early warning mechanisms for infectious diseases using space technologies and earth observation data, building human capacities and collaborative structures on national and regional levels. In 2009 India became the new co-chair with Canada.
The last workshop of the Action Team 6 was held in Montreal organised in cooperation with UN-OOSA and ESA, June 19-22, 2011. The subject "Space Technology for Public Health Actions in the Context of Climate Change Adaptation" addressed the following objectives:

- present the latest research, programs, approaches and policies that capitalise on innovative partnerships addressing satellite technology, climate change and public health and

- provide networking and knowledge opportunities in new surveillance and risk assessment methods aimed to address health conditions arising from a fast changing environment in a better way. An informal work session took place after the workshop to expand on the ideas of several participants of the workshop. The first outcome of this session was to explore the scope of a proposed training workshop, to be held from 30th July to 1st August 2012 at the UN Campus in Bonn, organised by the University of Koblenz-Landau in Germany (http://at6fui.weebly.com/at6fui-2012---un-campus.html). This training workshop focused on capacity building in the area of public health and spatial-epidemiology. The second outcome of this session was to explore the format of an organisational unit as member state activity associated to UN-COPUOS responsible for promoting tele-epidemiology and public health. This would be formatted as a collaborative group of practice, based on the desire to share expertise and capacity for all participating countries in an open way.

According to the discussion with and response of the UN-SPIDER representatives in Germany establishing AT6FUI (http://at6fui.weebly.com/) as a UN-COPUOS sub-committee seemed to be very unlikely. The time for the proposed first international AT6FUI workshop in Landau had to be planned in 2011 without having a decision if AT6FUI could continue the work of Action Team 6. UN-SPIDER operated as co-organiser for the workshop 2012 in Bonn (Germany). It was agreed that this decision of co-organisation with UN-SPIDER is preliminary. This provides an operational structure until the AT6 group has made a final decision about its future.

AT6FUI was proposed as a Member State Initiative in the context of AT6 responsible for promoting improvements of public health by application of space technology. AT6FUI had a terminated end communicated in COPUOS 02/2015. Since 2016 the *"Expert Foucus Group – Space & Global Health"* (EFG-SGH) builds on the AT6 and AT6FUI (offical document see **COPUOS 2015 A/AC.105/L.297 http://at6fui.weebly.com/copuos.html)**.

There are two organisational elements, which take place once a year each, forming the EFG-SGH:

- **Political Facilitator:** Sidemeeting of the working group at UN-OOSA COPUOS, where participants have to be appointed as delegates by the member states. Especially for public health activities a support and guiding framework of national public health agencies is necessary, because any public health activity of EFG-SGH needs a national mandate and the cooperation of national and/or regional public health authorities. Member states can trigger an EFG-SGH support via the EFG-SGH meeting at UN COPUOS in February each year. Delegates of the member state trigger the support to a steering committee consisting of official national UN-delegates. These requests determine the EFG-SGH workshop contents for further developments and will return official statements according to the developments and objectives back to the member states, that triggered a support request. To address the issues of security and quality of service for an *Open Community approach*, the subcommittee decides to move approved elements from the information sharing branch into a quality assured and political approved branch of the joint EFG-SGH depot for capacity building. Open Community is a generalisation of the concept of OpenSource to other collaborative effort. The term "open" for an Open Community refers to the opportunity for anyone to join and contribute to the collaborative effort. The direction and goals are determined collaboratively by all members of the community. The resulting work ("product") is made available under a free license, so that other communities can adapt and build on them. In this context the "product" of the Open Community is an "improved public health by application of space technologies" [cf. http://at6fui.weebly.com/open-community-approach.html].
- **Academic Community of Practice:** An AT6FUI/ EFG-SGH Workshop resp. International Expert Meeting, where a wider target audience for knowledge sharing, development and implementation is addressed for promoting tele-epidemiology and public health, is implemented. The United Nations University (UNU) established in 1973 functions as an

Academic Arm of the United Nations and links with international academic and policy-making communities. AT6FUI/ EFG-SGH can be regarded as a contribution of the overarching UNU activities, because the UNU undertakes research into the pressing global problems of human survival, development and welfare that are the concern of the United Nations and its member states.

As public health problems are multi-factorial and collaborative mapping requires close stakeholder collaboration, a ***Living Lab*** can be applied, because it approaches these problems by an integrating concurrent research concept in a user-centred, open-innovation ecosystem. A spatial represenation of requirements, constraints and contributions of the user response supports a spatial analysis of user-driven innovation by incorporation of collaborative mapping. The concept of Living Labs applies a user-centred open-innovation approach and [SCHUMACHER & FEURSTEIN, 2007] describe a Living Lab as a systemic innovation approach in which all stakeholders in a product, service or application participate directly in the development process. Other concepts also evident from various definitions of Living Labs are open innovation ecosystems, territorial contexts, concurrent research and innovation processes, where users have the opportunity to play an active role in the development of new services, products or processes [FØLSTAD, 2008].

In the AT6FUI workshops, among others one milestone could be reached with the basic structure of a Living Lab for El Salvador with the objective to lower the risk of chronic kidney disease for the agricultural community. The main objective of Living Labs in the context of EFG-SGH is that benefits of space technologies should reach the communities and that the research concept quantifies the impact on public health.

2 Objectives

2.1 Objectives of EFG-SGH

The following items describe the main objectives of EFG-SGH.

- The first objective is to support the multinational concept of sharing in an OpenSource, OpenContent, Open Community environment.
- Furthermore EFG-SGH wants to identify the national objectives that overlap with objectives for mitigation of structure equivalent public health problems in other member states. This objective is important as it results in sharing of developmental workloads between the different member states.
- Another aim of EFG-SGH is to enhance cross national collaboration for public health problems and their mitigation by application of space technologies.
- Finally, EFG-SGH wants to support the member states that they can successfully mitigate their public health problems on their own by capacity building. EFG-SGH can operate as a networking hub and as a back office established by the concept of a Living Lab.

2.2 Objectives of this study

This study describes a practical application of the Open Community Approach and investigates in how far an Open Community Structure has the potential to support the initial step of collaborative mapping for humanitarian risk mitigation startegies. In this context, the concept of a LivingLab is proposed as support concept of the OpenSource, OpenContent application of collaborative mapping for risk management and tailored allocation of available resources.

Furthermore, a description of the Conference Procedures applied within EFG-SGH is provided, to enable the reproduction of the concept, so that also stakeholders from developing countries can apply the concept to implement joined problem solving activities.

3 Methodology

The research stance used is interpretivism, the approach is inductive and the strategy is action research with qualitative methods and a longitutional time horizon, [cf. SAUNDERS et al., 2012].
Public health problems are multifactorial and collaborative mapping requires close stakeholder collaboration. A living lab approaches these problems by an integrating concurrent research concept in a user-centred, open-innovation ecosystem. This approach is promising for the concerns of EFG-SGH. The approach of virtual conferences enables the different parties of the Living Lab to communicate without the exclusion of parties due to financial issues (e.g. traveling expenses).
The application of space technologies leads e.g. to processed remote sensing data in a GIS for collaborative spatial mapping of risk and resources to enable the derivation of humanitarian risk mitigation strategies. The main purpose of Living Labs is an accessibility of GIS information results in public awareness and local and regional response activities on risk mitigation integrated in innovative tailored work-flows. E.g. the application GPS and precision farming with low cost technologies and a cheap single smart phone could implement a precision farming approach for reduced pesticides usage with the same agricultural productivity. The smart phone can be used with an OpenSource navigation system (e.g. Navit) and offline maps (e.g. from OpenStreetMap) for tailored treatment strategies for the crops. Space technology will be used for crop health detection and monitoring. This application of space technology is a precision farming support with low cost technology and OpenSource-Software on a smart phone. User involvement and feedback in these instances are crucial to ensure that the product meets the requirements of the users and that it is understood by the users. Within the Living Lab environment this user involvement is guaranteed.
The Open Community approach is the basic principle of EFG-SGH's work. Two main constituents of the Open Community approach are working with OpenContent and OpenSource software.
The "open" in OpenContent is a similarly continuous construct. In this context, "open" refers to granting of copyright permissions above and beyond those offered by standard copyright law. Open Content then, is content that is licensed in a manner that provides users with the right to make more kinds of uses than those normally permitted under the law - at no cost to the user.

The primary permissions or usage rights of OpenContent are expressed in the "4Rs Framework":

- *Reuse* - the right to reuse the content in its unaltered / verbatim form (e.g., make a backup copy of the content)
- *Revise* - the right to adapt, adjust, modify, or alter the content itself (e.g., translate the content into another language)
- *Remix* - the right to combine the original or revised content with other content to create something new (e.g., incorporate the content into a mashup)
- *Redistribute* - the right to share copies of the original content, your revisions, or your remixes with others (e.g., give a copy of the content to a friend) [http://www.opencontent.org/definition/] The most appropriate licensing model for EFG-SGH is Creative Commons [http://creativecommons.org/choose/]. E.g. WikiPedia uses this Creative Commons as OpenContent License. This licensing model ensures a free access and a further development of e.g. capacity building material even after EFG-SGH is closed.

The underlying software technology can play a critical role for implementing tele-epidemiology for public health and the use of space technology for collaborative risk mapping and the allocation of public health and medical resources. To assure free access to an IT-environment the capacity building

material supports the implementation with OpenSource software, e.g. the Geographic Information Systems GRASS GIS or Quantum GIS [http://www.gnu.org/copyleft/gpl.html]. The basic concept of the OpenSource licensing model ensures the free usage and the right to modify the software and content to the individual needs of member states. Furthermore, OpenSource/Content licenses can protect the donate labour force to an Open Community form commercial reselling of a free product. Thus, free does not imply an arbitrary usage of the content or the software (e.g. for a commercial purpose to sell the OpenSource Product). The main benefit of an Open Community approach is that most licensing models incorporate and support an evolutionary concept where users and/or developers are granted the right to modify, adapt or add to the OpenContent or OpenSource software, but all modifications and adaptations have to be published under the same licensing model. This concept legally ensures that nobody can use the donated support of EFG-SGH for commercial use. Prominent examples of OpenSource software licenses are the GNU General Public License (GPL). For example, the Geographic Information System GRASS is published under GPL [http://www.gnu.org/copyleft/gpl.html].

As mentioned above, the two organisational elements of the yearly structure are the EFG-SGH workshops on the one hand, which serve as the participatory environment for development, implementation, information collection and sharing operating on a joint depot of support material. On the other hand, there is the meeting of EFG-SGH at UN-OOSA COPUOS in February, which serves as the political interface of EFG-SGH. For the workshop environment of EFG-SGH the application of an Open Community approach fits as well. The Open Community approach enables open participation for development, implementation, information collection and sharing. The suggested approach allows and supports a two-way-traffic from local implementing units to officials and from officials to local implementing units, which is essential for successful collaborative mapping in risk contexts. The officials are determined by the target audience of the workshop. EFG-SGH is established as a networking hub for supporting promoting tele-epidemiology and public health by application of space technology. The open licensing model for content and software ensures sustainable access to a joint depot of EFG-SGH.

3.1 Partly Virtual Conferences

Procedures:

The basic principle of reducing the total cost of ownership (TCO) for members which implies that more communities with financial constraints can apply software and content, can be applied for the conference setting as well to facilitate remote scientific stakeholer collaboration. The reduction of the financial threshold to participate in a conference was significantly reduced. The following description of the Conference Procedures is applied, so that stakeholders from developing countries can join the problem solving activities.

Participants register online for the workshop like it is common for other conferences. If a participant wants to present a topic on the workshop, she/he can apply her/his presentation on the registration form. This year (2016), for the first time, a pilot for the integration of paper submission to the low cost meeting design is tested. After the registration period is over, the EFG-SGH organisers develop the workshop agenda with its several sections. The uniqueness is the design of the workshop. It ensures a virtual participation without the necessity of physical attendance. The participants can take part via Virtual Participation Mode (VPM) either from their place of work in their member states or from regional organised meeting points in the different member states. The communication platform of the workshop is a browser-based videoconference software.

The VPM is necessary for the workshop concept to overcome the limitations of funding the travel expenses and accommodation. Presentations of the workshop are available in a video- or screencast-format two weeks before the official workshop starts. These videos are created by the authors of the contributions. Participants can download and watch the videos and screencasts prior to the workshop

and they can register for videoconferencing during a consultation-hour or in a chat environment with a group of participants to pose questions to the presenter. Face-to-face questions during the workshop and the answers will be recorded in the chat environment, so that people in a VPM can follow the discussion and comment to the items. The videos of the presentation are displayed on one data projector, the chat environment on a second one, also visible for the face-to-face audience.
The support concept is based on joint depot of digital content. Because of different requirements and constraints in the member states the digital content should incorporate a licensing model, that allows modification, translation, rewriting, adding and substituting elements in the provided digital resources. It is essential for the sustainability of an Open Community approach, that the rights to change the available resources are attached to the course material itself and that they are not provided by a single person or institution, that is granting individual rights for a period of time and/or for selected institutions, member states or projects. As mentioned above all presentations on the workshop will be available as a video or a screencast presentation for assessing the knowledge through the web portal of EFG-SGH. Making these presentations available for the EFG-SGH community is one example of open sharing through joint depot of multimedia resources.

Technology Description:
Mainly two technological aspects are important for the described Open Community approach of the EFG-SGH workshops: One aspect is the creation and provision of the Open Content material, collection of Open Source Software, that provides the features to perform a certain task. Furthermore, there is a requirement to perform a communication platform and exchange platform during the workshop, that provides Open Access to results without charging readers and authors. At the same time the quality assurance has to be established. Versioning of documents assures the openness of the development, while digitally signed documents of selected versions with open documentation of the reviewer assures the quality of the signed documents with the scientific reputation of the reviewing scientists or reputation of an Organisation (e.g. WHO).
The essential Open Content materials for the workshop are the videos of the presenters. On most other conferences speakers present their information on slides and add their audio comments at the stage during the presentation. This is not possible for the EFG-SGH workshops, as the concept of virtual attendance of the participants would not work out otherwise. The easiest and most sustainable way to do this is to create videos, which include the information of the slides and the audio comments to the slides. For the video creation the slides of the presentation saved as image files and the audio comments saved as audio files are necessary. In a video editing software (e.g. KDEnlive [https://kdenlive.org/]) the image files of the slides and the audio files have to be jointed together and the length of the single files has to be adjusted.
The second possibility is to create screencasts, which record the actions on the computer screen during recording time. The creation of the screencasts needs special screencast software (e.g. Vokoscreen [http://www.kohaupt-online.de/hp/]). Screencasts are very useful for tutorials and process descriptions at the computer. In both cases, the final product is a video file, which becomes OpenContent when it is uploaded to a video share platform like YouTube. In order to make it easier for interested people to find the videos after the workshop, they should all be organised in one video channel.
A browser-based videoconference (VC) software (e.g. Flashmeeting [http://flashmeeting.e2bn.net/]) has proven to be appropriate as a communication platform for the AT6FUI workshops. The software itself runs on a server, which can be rent according to a timetable. One has to book the meeting time directly at the provider of the VC server. Access to the server can be provided with the link to the meeting. To fully take part at the virtual meeting, the following hardware requirements have to be fulfilled:

- The participant needs to have internet connection the whole time, as the platform is browser-based.

- The computer of the participant needs speakers, a microphone and a camera for communication.

The hardware configuration can be tested and adjusted before entering the virtual meeting room. In the virtual meeting room all participants have the possibility to communicate with the others via speech and video signal. In the meeting room, only one participant is allowed to talk at the same time. The participant, who wants to speak next has to queue in a numbered line. If it is necessary, participants can also interrupt each other with an interrupt function. Additionally all participants can share information in a chat area and upload documents on a download platform. It has proven to be useful to have one regional meeting point, which fulfils the organisational functions. Those functions include keeping an eye on the timetable, introducing the next presentation and leading the discussions.

Challenges & Disadvantages of the Virtual Meeting Structure:

There are also several challenges for the presented virtual meeting structure. One main challenge is the time shift between the different countries. E.g. the 2013 meeting was held in the time zone of El Salvador. Members with the biggest time shift between the time zone of their country and the time zone of El Salvador came from India. Between these countries the time shift is about 12 hours. For an Indian participant the meeting is held through the night. Another disadvantage between a virtual meeting and a meeting with physical participation might be the lack of personal contact e.g. in lunch or coffee breaks. From our point of view it is important to have this personal contact and it helps to develop sympathy or to trust a person. Therefore, we tried to solve this problem by opening a flash meeting for the breaks. However, we have recognised that the participants need a “real” break where they can walk around or get into the fresh air. Thus, the break flash meetings were not used by the participants to get in touch with other participants.

Furthermore, strong internet connection is necessary to use the VC-tool and to be able to participate in the meeting without any inconveniences.

Advantages & Benefits of the Virtual Meeting Structure:

The benefits of the virtual meeting structure are the low costs for the participants and the sustainability of the meeting. The participants do not have to pay for travel costs. This is important especially for participants from developing countries where it is often a problem to pay the travel expenses for such meetings. Because of this the participation is not restricted due to the lack of money and thus every person who is interested in the topic or is seen as important for the project can participate.

Also the sustainability of the collaboration is higher than in conventional meetings. Like mentioned before because of the low cost approach it might be possible for every person to participate each year at the meeting. With the participants their scientific knowhow and the developments of prior meetings stay in the project and thus the collaboration is more sustainable than in conventional meeting structures, where people can only participate if the travel costs are paid.

Prior to the conference the talks are recorded. During the meeting the talks are played as a video. These videos stay in the internet and can be watched by the participants again, by people interested in the topic or by people dealing with similar problems.

4 Developments & Results

A new meeting structure in the context of an Open Community approach with regional meeting points was established. After the 2012 meeting, a report about the performance of the meeting was created, where possible improvements and necessary changes in the meeting structure were written down. Improvements in the organisation and in the meeting performance can be recognised when comparing

the 2012 meeting with the 2013 meeting [http://at6fui.weebly.com/at6fui-2013---el-salvador.html]. For example in 2012 most people participated physically at the meeting point in Bonn. Because of the improvements in the meeting structure it was possible, that all people could participate virtually in 2013 and the following meetings.
With the help of this meeting structure it is possible to work within a project with different project partners from all over the world. E.g. the EFG-SGH used this meeting structure to discuss and to evaluate a concept for a living lab in El Salvador with project members from Canada, El Salvador, South Africa, India and other countries. The novelty of our approach of the meeting structure in comparison to other approaches of virtual conferences like [ANDERSON, 1996], is that the virtual conference serves in our case as preparation for the establishment of problem solutions, e.g. a Living Lab structure. In the 2013 workshops first milestones could be reached with the basic structure of a Living Lab for El Salvador with the objective to lower the risk of chronic kidney disease for the agricultural community. This meeting structure is also used for side-meetings in the framework of the UN-COPUOS.

5 Business Benefits

Based on the desire to share expertise and capacity for all participating countries in an open way, it seems to be appropriate to reduce obstacles for implementation and to provide an environment for wide applications, easy copying, testing in educational environment and replicating successful case studies without the necessity to buy extra licenses.
A business benefit for the participants and the organisers of the meeting is the low cost approach. Due to the loss of travel costs for the virtual meeting it is possible to visit other conferences or spend the money in other steps of the project. Also the organisation of a meeting is less expensive than organising a conventional meeting. Because of the use of OpenSource software the software used for organising the meeting is for free.
Sharing the OpenSource approach does not exclude the use of commercial software, products and services. Commercial services and products do not belong to the joint depot of resources so that users can clearly distinguish between open free resources from the depot and commercial services. For software tools the underlying approach assumes, that the member states with the financial ability to maintain commercial and costly IT infrastructure will be able to finance the transformation from the shared OpenContent solutions into their proprietary IT environment, while developing countries can take the solution in OpenSource IT-environment without limitations of copying and paying for licenses that are necessarily attached to commercial products. The OpenContent support material of learning environments leads directly to the implementation and/or the enhancement of their national approaches in tele-epidemiology and public health for risk reduction and optimised temporal and spatial resource management according to risks. The AT6FUI collaborative group of practice is appreciating commercial solutions, especially when there is no other option for it. The transparency that a service is commercial and/or will include licensing fees in the long run must be ensured in any case.
The structure, advantages and disadvantages of the virtual meeting are written down in a report. This report can be used by other organisations which want to organise a virtual meeting. This increases the sustainability of a virtual meeting and problems of such a meeting structure can be avoided and thus time and money can be saved.
Overall, to organise a meeting in the context of the Open Community approach saves money and time of the participants and organisers.

6 Conclusions

In the context of UN-OOSA the objectives include that benefits of the application of space technologies can reach rural communities or regions suffering form a certain public health problem.
In Open Communities a Living Lab is a research concept that creates a user-centred, open-innovation ecosystem. The main objective of Living Labs in the context of EFG-SGH is that benefits of space technologies should reach the communities and that the research concept quantifies the impact on public health.
The approach of virtual conferences enables the different parties of the Living Lab to communicate without the exclusion of parties due to financial issues (e.g. travelling expenses).
By implementing low cost technologies and the approach of an Open Community, the developed products can be provided free of charge to the population and in the case of the use of OpenSource software, local computer scientist can enhance the software easily and adapt it to their needs [http://open-source.gbdirect.co.uk/migration/benefit.html].
In the AT6FUI workshops 2012-2015, a milestone could be reached with the basic structure of a Living Lab for El Salvador with the objective to lower the risk of chronic kidney disease for the agricultural community. Furthermore, the conference procedures applied within EFG-SGH contributes to the objective of collaborative mapping for risk management and tailored allocation of available resources, because this way also stakeholders from developing countries can join problem solving activities. It is recommended for the next EFG-SGH expert meeting to present contributions to collaborative mapping of different angles to derive stakeholders of the LivingLab and workflows within the LivingLab to be able to reach the goal of collaborative mapping for risk management and tailored allocation of available resources.

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