



**HAL**  
open science

## Crowdsourcing for quality of life

Eunsu Ahn, Camille Hervé, Laury Zinsz

► **To cite this version:**

Eunsu Ahn, Camille Hervé, Laury Zinsz. Crowdsourcing for quality of life: The case of collaborative crisis mapping. Bobcatsss 2017, Jan 2017, Tampere, Finland. hal-01593574

**HAL Id: hal-01593574**

**<https://hal.science/hal-01593574>**

Submitted on 26 Sep 2017

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## **Title**

# **Crowdsourcing for Quality of Life: The Case of Collaborative Crisis Mapping**

Eunsu Ahn

eunsu.ahn@enssib.fr

École nationale supérieure des sciences de l'information et des bibliothèques  
17-21 boulevard du 11 novembre 1918, 69623 Villeurbanne Cedex, France

Camille Hervé

camille.herve@live.fr

École nationale supérieure des sciences de l'information et des bibliothèques  
17-21 boulevard du 11 novembre 1918, 69623 Villeurbanne Cedex, France

Laury Zinsz

laury.zinsz@enssib.fr

École nationale supérieure des sciences de l'information et des bibliothèques  
17-21 boulevard du 11 novembre 1918, 69623 Villeurbanne Cedex, France

## **Abstract**

The 2010 earthquake in Haiti showed how ICT and digital mapping could help provide emergency humanitarian aid to people affected by conflicts or disasters. Crowdsourced maps have been used by NGOs in order to quickly identify humanitarian needs on the field and provide up to date information. These tools are part of a recent trend in the humanitarian field, using big data, volunteer and technical communities (V&TCs) and collective intelligence networks to support crisis response. Collaboration is at the heart of the process to collect information and data on the field. On this topic, a large part of the literature is centred on the role of these maps in supporting the humanitarian response provided by NGOs.

However, less research has been conducted so far on the use of online mapping tools by the people affected by crisis. What use can these tools have for them beyond the immediate crisis response? How does digital collaborative mapping help improve quality of life for people affected by crisis?

This article analyses several collaborative mapping projects on recent or ongoing crisis in Syria, Nepal and France (Calais), focusing on the possibilities for local populations to be both users and contributors. Case studies are conducted on these maps to propose a typology of contributions. With this typology of information, this article then aims to discuss collaborative crisis mapping as a tool for: accessing information in crisis contexts; empowering communities and developing their abilities to be actors in the crisis response; and building community resilience. Perspectives, but also issues are explored in this article.

## **Keywords**

Humanitarian aid – Collaborative mapping – Crowdsourcing – ICT – Crisis mapping

## **Introduction**

The earthquake that struck Haiti on January 2010 established the major role that information and communication technologies (ICTs) can have in an urgent crisis. ICTs and social media have quickly developed in every area of the world and their use is now globalized. As crisis, such as natural disasters, conflicts and population displacements, becomes more complex ground, sharing

information is crucial to assess the situation. Crisis mapping appears at the junction of “*new technological developments, social and civil activism, and the general availability of spatio-geographical data*” (Cavelty and Giroux, 2012).

Nowadays, crisis mapping is used in various situations by a variety of actors: civil society, humanitarian organisations, governments, NGOs... Collaborative mapping allows anyone to share information and contribute to the mapping process. During the Haiti earthquake, groups of volunteers mapped the country on the open-source application OpenStreetMap to give locals and humanitarian organisations up-to-date maps of roads and buildings. Other groups deployed tools to collect information about urgent needs on the ground through social media, text messages and crowdsourcing. Using a platform called Ushaidi, collected information was then located on an online map. Ushaidi was first used during the post-election crisis in Kenya where anyone could send information and evidence related to violence and human rights violations, which was then located and displayed on the collaborative map (Meier, 2012). These new tools and collaborative practices show the emergence of a “*global, participatory culture*” (Liu and Ziemke, 2013) in crisis management and activism, while Web technologies imply “*a more mature type of socialisation based upon open networks, collaborative work, information sharing and global actions*” (Roche and al., 2011). For humanitarian organisations, these collective intelligence networks are valued for supporting logistics, providing up-to-date information and helping assess the needs of the population.

On this subject, a large amount of scientific literature is devoted to the study of volunteers communities, their organisational practices (Palen and al., 2015; Palen and Soden, 2014; Bittner and al., 2016) and the implications for the humanitarian community (Meier, 2012; Ziemke, 2012, Milner and Verity, 2013).

This article addresses the topic from a new point of view, using an information science framework to analyse collaborative mapping tools, their use and usefulness for people affected by crisis. Modern humanitarianism focuses on putting people in need at the heart of the aid process and thinking about long-term rehabilitation beyond immediate crisis. Keeping this goal in mind, how does digital collaborative mapping help improve quality of life for people affected by crisis?

## **Definitions and plan**

To define what quality of life is, this paper refers to the World Health Organisation Quality of Life (WHOQOL) instrument, which “*assesses the individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns.*” (The WHOQOL Group, 1995). In order to extend this

definition to the humanitarian setting, we will also rely on the standard of respect of individuals' dignity stated in the Code of Conduct for the International Red Cross and Red Crescent Movement and Non-Governmental Organisations (NGOs) in Disaster Relief. The Sphere Project, a practical handbook for humanitarian practitioners developed by international NGOs and the International Red Cross and Red Crescent Movement, reflects the new standards and frameworks for humanitarian response in the 21<sup>st</sup> century and has been adopted as an essential tool by the humanitarian community. This guide gives practical frameworks to ensure the respect of the human dignity and individuals' well-being:

- Information: affected populations have the right to accurate information about the actions and projects related to ongoing crisis and its management. Access to information through the media, safe meeting and discussion spaces should be ensured and people should be encouraged to provide feedback. Information should also be adapted to cultural and linguistic context. Good information sharing practices ensure the transparency of NGO actions, help reduce stress and anxiety and strengthen community responsibility.
- Participation: people must be involved in the crisis response and their initiatives and abilities supported. Participation mechanisms help people understand the situation and increase their feeling of ownership.
- Capacity building: the response must be built on community efforts and capacity, as “*self-help and community-led initiatives contribute to psychological and social well-being through restoring dignity and a degree of control to disaster-affected populations.*” (The Sphere Project, 2011).

As a tool used in crisis response, how does collaborative mapping meet these requirements? To answer this question, this paper describes the potential and challenges of collaborative crisis mapping through case studies focusing on the production, collection, verification, diffusion and conservation of data. Three collaborative crisis maps are analysed: Umap Calais (France), QuakeMap (Nepal) and Syria Tracker (Syria).

This leads to consider collaborative crisis mapping as a tool for accessing information, not only for NGOs but also for affected communities. As a tool for action and empowerment, it represents a medium for collaborative participation, strengthening and supporting community initiative and capacity. Finally, the potential of collaborative mapping to build and support community resilience is explored.

## **Umap Calais**

The Calais “jungle” was a semi-permanent place of life for many migrants from the early

2000s until November 2, 2016. The camp had its own organisation and gave the residents of the jungle access to various basic services.

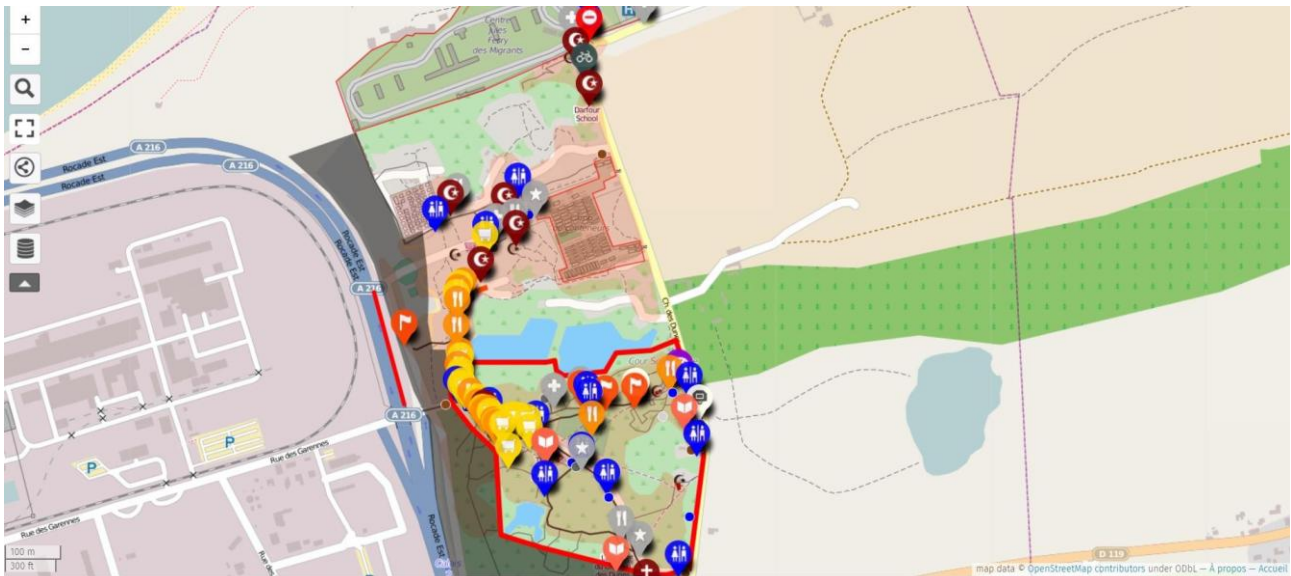


Figure 1: Map of the Calais jungle ([http://umap.openstreetmap.fr/fr/map/jungle-calais\\_71247#18/50.97176/1.90622](http://umap.openstreetmap.fr/fr/map/jungle-calais_71247#18/50.97176/1.90622))

The Calais jungle background map uses OpenStreetMap, which is a platform under open-source license that creates and distributes free geographic data for the world<sup>1</sup> without legal or technical restrictions. Digital mapping of the frame was provided by Mapfugees, a volunteer team assembled in collaboration with refugees from Calais and Grande-Synthe in Dunkirk that creates maps to facilitate humanitarian aid and improve the comfort and safety of residents. The volunteers first made the map base, then traced roads, water points, toilets, showers and kitchens on the map. This project was launched in December 2015. The OpenStreetMap format allows the data to be easily re-used by Geographic Information Systems (GIS) in order to print customized maps. Furthermore, OSM can be used offline through Android and iOS applications.

---

<sup>1</sup> [http://wiki.openstreetmap.org/wiki/Main\\_Page](http://wiki.openstreetmap.org/wiki/Main_Page)

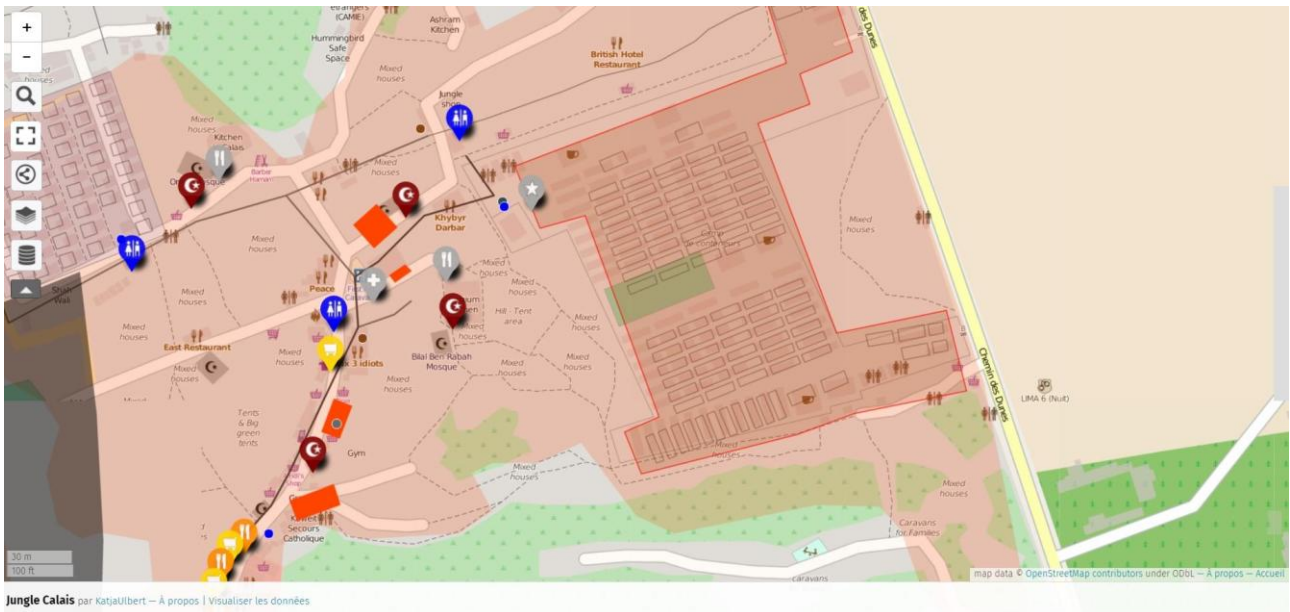


Figure 2: Map of the Calais Jungle ([http://umap.openstreetmap.fr/fr/map/jungle-calais\\_71247#18/50.97176/1.90622](http://umap.openstreetmap.fr/fr/map/jungle-calais_71247#18/50.97176/1.90622))

Mapfugees focused on providing on-site training to residents so they could actively participate in updating the map and providing up-to-date information. According to Mapfugees website, the training includes: OpenStreetMap training, collecting field data, mapping using mobile devices and an introduction to open source GIS software. A refugee is usually paired with a member of Mapfugees and the inhabitants work on their life area. The map is divided into *field papers* in paper format, which are used to gather information. Each change or addition is then applied in OpenStreetMap via the GPS and smartphones of team members. This operation is done outside the jungle for technical reasons (absence of electricity and Internet connection). The inhabitants do not directly modify the digital map but act through the collaborative activities implemented by Mapfugees. This allows, among other things, the moderation of the collected data. Collaboration with the inhabitants of the jungle helps them better understand their cartographic needs. The members of Mapfugees try to respect the terminology given by the inhabitants as much as possible in order to define their reality accurately.

Through these maps, the jungle can become commons<sup>2</sup> (Olstrom, 2010, and Coriat, 2015), which means that the map allows the inclusion of these areas in the world rather than their usual exclusion. The identification of 3G spots and charging stations also shows how the map can be a door to the outside and a situation after the refugee camp. The map may be seen also as a *way out*, a means of integration to the outside (Lobbé, 2016).

Now that the jungle is dismantled, it raises the question of the value of the map as it is no longer effective. Are we moving towards a map as an archive? Quentin Lobbé quotes the french

<sup>2</sup> “Commons” is used to describe the fact that the jungle is something that people share in a larger territory. This “common” is linked by the map to the rest of the town and by extension of the world.

philosopher Jacques Derrida to illustrate these words: "to archive is a gesture of power" (Lobbé, 2016). Archiving can be seen as a way to build resilience and put the process back in the hands of those who have been excluded from their own history and memory. Mapfugees is currently working on the Grande-Synthe refugee camp in Dunkirk.

## QuakeMap



Figure 3: Internet Archive – QuakeMap.org (<https://web.archive.org/web/20150508192525/http://quakemap.org/main>)

On April 25, 2015, a 7.8 magnitude earthquake struck Nepal's capital Kathmandu. The area was hit with aftershocks, including a 7.3 magnitude shock on May 12. The earthquakes killed almost 9,000 people, injured at least 22,000 and destroyed or damaged more than 800,000 homes<sup>3</sup>. Within a few hours from the first shock, the Nepalese non-for-profit civic technology company Kathmandu Living Labs (KLL) created QuakeMap, a crowd-sourced crisis map providing information to both the people in need and the relief workers and volunteers on the ground. QuakeMap is built upon the open sourced platform Ushaidi, which allowed the KLL team to quickly adapt it as a framework for the Nepal crisis and easily customize it whenever they obtained new data to be added on the map.

The QuakeMap website (QuakeMap.org) was closed recently since the map was no longer

<sup>3</sup> Taylor, A. (n.d.). Nepal's Earthquakes: One Year Later - The Atlantic. Retrieved December 13, 2016, from <http://www.theatlantic.com/photo/2016/04/nepals-earthquakes-one-year-later/479772/>

needed by the public, more than a year after the crisis. Thus, we consulted the site “Internet Archive (<https://archive.org>)” where web captures of the platform were archived.

KLL collected the crisis data through multiple means of communication including SMS, e-mail, smartphone application (“Nepal EarthQuake Report” from Android App), Twitter with the #QuakeMap hashtag, and most of all, the platform itself. On the QuakeMap website, anyone could submit a new report by filling in forms including a title, a description, a location name which helped designate the exact position on the map, and categories such as “People trapped”, “Help Wanted”, “Food/Water”, “Blocked Roads”, “Medical Team”, “Shelter”. In terms of categories, the reports were targeted not only at relief organisations but also at the civilians in need of aid. People could also upload photos, videos and a news source link while submitting a report, which would increase information reliability. These reports were then checked and verified around the clock by volunteers of KLL, which allowed them to upload all the information immediately. While phone communication was hard to maintain during the days following the earthquake due to the collapse of cell phone towers, many people were able to connect to the internet with their mobile phones. This was a vital method to share and obtain the information<sup>4</sup>. Moreover, KLL provided offline maps on smart phones and printed paper maps of certain areas to those who had no internet access.

QuakeMap presents the significant characteristic of being the first emergency mapping project led by a local group and not by governments or international agencies. Local groups such as KLL benefit from language and the cultural knowledge, thus allowing them to take an active part in disaster relief operation<sup>5</sup>. This also allowed Nepal army to get information about camps housing earthquake victims and to coordinate relief operations. More than 3,300 people participated in the crisis mapping (Gilmour, 2016). Compared to other crisis maps, QuakeMap allowed relief workers to take action in ongoing crisis by means of local and remote mappers who immediately verified the reported needs.

However, the collaborative map could also be an essential source to rebuild the affected local areas after the crisis. It is therefore important to continue working on mapping in the long-term, in preparation for further disasters which might occur.

---

<sup>4</sup> Heanue, S. (2015, August 16). How open data and social media helped Nepal rebuild after earthquake. Retrieved December 13, 2016, from <http://www.abc.net.au/news/2015-08-16/nepal-earthquake-how-open-data-social-media-helped-rebuild/6700410>

<sup>5</sup> Wall, I. (2016, April 25). Could mapping tech revolutionise disaster response? The Guardian. Retrieved from <https://www.theguardian.com/global-development-professionals-network/2016/apr/25/could-mapping-tech-revolutionise-disaster-response>



## Syria Tracker

The Syria Tracker project is hosted by Humanitarian Tracker, a US-based non-profit organisation dedicated to supporting information in war and crisis contexts. Syria Tracker is a platform that uses crowdsourcing to document human rights violations in the context of the Syrian civil war. The platform uses Ushaidi's Crowdmap API, also used by Quakemap. The API is simple to use and anyone can create their own map using this system. Syrian Tracker data is used by several UN agencies, NGO and press outlets across the world.

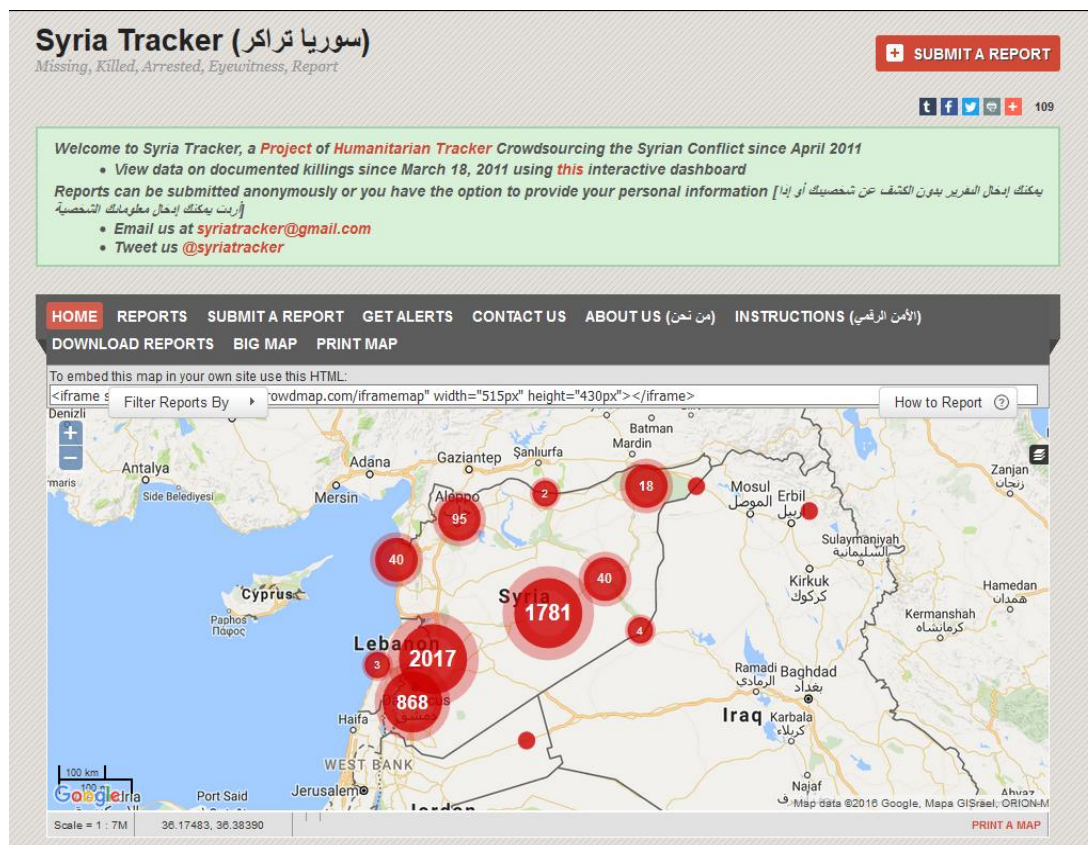


Figure 4: Syria Tracker (<https://syriatracker.crowdmap.com/>) (Dec. 12 2016)

### Erreur ! Signet non défini.

Any person can submit a report containing information related to an event involving human rights violations and its localisation. This information can be: the description of the event, an eye-witness testimony, photos or videos, a tweet. It can be submitted through an online form, by email or by social media using the #syriaspeaks hashtag. However, information cannot be sent by text message as the cellphone network in Syria is not secured. Protecting contributors' privacy is one of Humanitarian Tracker's biggest concerns: in a context of war and political repression, they insist on ensuring users' privacy and offer tools and advices for anonymous submissions. Contributors are advised against sending text messages and encouraged to use TOR, encrypted email services or other anti-surveillance tools. Information related to identity is optional in the online form.

The platform offers several features: advanced search of the reports, data export in CSV and KML, use of categories, web integration, printable maps, reports download, alerts, direct analysis

and visualization of the data.

The other main concern of Humanitarian Tracker is to ensure the veracity of information. Submitted eye-witness reports are verified by volunteers who collect and check for news, photo and video evidence of events through automated data-mining. Volunteers can also endorse the veracity of a report through a credibility vote system. Of 6024 published reports (on the date of Dec. 12), 5947 are marked as verified (about 99% of the published reports). However, Angela Oduor Lungati stated that of 70k reports submitted (in April 2014), only 6% are published on the platform due to the moderation and checking process<sup>6</sup>, which shows a huge loss in the amount of data initially collected and increases information noise.

One of the goals of Syria Tracker was to collect humanitarian needs from locals in Syria. However, the ground became too dangerous for humanitarian organisations: Médecins Sans Frontières left Syria in 2014 due to grave violations of international humanitarian law and access to the country has been closed to foreign journalists and humanitarian workers. In this context, we can assume that the information cannot lead to action on the ground from NGO or international agencies in most of situations and the role of collecting needs became less important. Ziemke (2014) suggests that warzone maps have a strategic role in the conflict, as they depict the dynamics of power and relationship networks which are at the heart of modern warfare. However, Patrick Meier suggests that this type of map can also be used by international human rights NGO such as Amnesty International and the ICC, as it was the case for Lybia Crisis Map, to help future investigations of human rights violations and crimes<sup>7</sup>. Syria Tracker's function can be seen as testimony and repository, in which personal histories can be identified. This map fills a more long-term objective of bringing evidence of human rights violations to light, helping identify and locate victims of crimes, and keeping both individual and collective memory of the war for the Syrian people and for the world.

## Summary and typology

The case studies can be summarized in the following table in order to identify the main functions of each map according to our initial questions:

Table 1: Case studies

Map	Access to information	Action	Resilience
Umap Calais	Refugees give information	The map allows people	The jungle become part

<sup>6</sup> Humanitarian Tracker: Crowdsourcing Syria Crisis since 2011. (n.d.). Retrieved December 20, 2016, from <https://www.usahidi.com/blog/2014/04/08/humanitarian-tracker-crowdsourcing-syria-crisis-since-2011>

<sup>7</sup> Meier, P. (2012, March 25). Crisis Mapping Syria: Automated Data Mining and Crowdsourced Human Intelligence | iRevolutions. Retrieved December 21, 2016, from <https://irevolutions.org/2012/03/25/crisis-mapping-syria/>

<b>Map</b>	<b>Access to information</b>	<b>Action</b>	<b>Resilience</b>
	about the jungle. Access is supported through mediation by volunteers who also give the tools and skills for participation to refugees.	to define and build their own territory.	of the world. Community is no longer confined in an excluded territory and become integrated to the outside, in relationship with the world.
QuakeMap	Users (as contributors) can send reports by various means of communication. Reports are targeted not only at relief organisations but also at the civilians in need of aid.	QuakeMap allows humanitarian agencies, locals and mappers to act immediately in an ongoing crisis. Community stays informed on the aid process, who does what and where, as well as their own needs.	Essential source to rebuild the affected local areas even after the crisis. Encourages self-achievement in the local people and can help prevent further risks, thus enhancing risk management and preparedness.
Syria Tracker	Anonymous access and multiple ways of submitting information. Use of social media to gather information via data-mining. Information is mostly produced by locals.	Collects and amplifies Syrian voices and testimonies. Less short-term action effect as the country is closed to aid organisations and because of the unstable context.	Place of memory, repository, testimony. Documents facts, keeps traces and evidence of personal histories, relationship networks and conflict dynamics. Can help locate and identify victims of crimes even after the conflict.

This case study of three different maps shows the diversity of situations in which collaborative crisis mapping can be used and how each context brings up different issues. QuakeMap dealt with an immediate crisis (natural disaster) where humanitarian aid quickly came. Syria Tracker depicts a long-term crisis in a precarious situation (a civil war) involving human rights violations and crimes that need to be reported. The refugee crisis in Europe and the Calais jungle can also be seen as a long-term crisis. This has led to observe several common issues.

## Conclusion

Collaborative mapping relies on powerful, adaptable and open-source digital tools that can be used to create digital maps in any given situation, whether to collect urgent needs for water, food and shelter, document violence or support humanitarian logistic. As maps are social representations of space, digital collaborative mapping provides people with the ability to express their own perception of their physical and social space. Moreover, as maps become “*a widely available tool for expression and participatio*” (Roche and al. 2011), collaborative mapping also represents a way for individuals to express their needs and concerns regarding where they live in relationship with others, echoing the WHOQOL definition.

For humanitarian organisations, sharing information is at the heart of the aid process. For them, collaborative mapping is a powerful needs assessment tool. Data collected by collaborative maps have been largely used at an institutional level by humanitarian organisations, local and international but also by the media, UN agencies and governments, showing the interest for these collaborative maps. This means that collaborative mapping can be a tool to support humanitarian aid or development but also a powerful communication channel about a crisis.

The collaborative aspect of these maps make participation possible for people involved in the crisis, thus enabling autonomy and self-expression. Cavelty and Giroux qualify the use of ICT in crisis as “*expression of resilience*”, as it lets victims take the initiative of mutual assistance (Cavelty and Giroux, 2012). The case studies have shown several processes that can be seen as resilient building according to the IFRC guidelines on resilience: information sharing and communication, within the community and between the community and external actors; maintaining and visualising relationships networks; self-assessment of needs and problems; enhancing risk management, adaptation and community preparedness in the case of natural disasters (International Federation of Red Cross and Red Crescent Societies, 2014).

On the other hand, several issues can be observed, the first being the accessibility of the technical tools. The text elements of the maps are in English most of the time and language can be an obstacle to accessing information. In the context of urgent crisis, collaborative maps collect huge amounts of data that create a lot of informational noise. Reports platforms like Ushaidi do not handle well the massive production of data and the information life cycle, thus displaying obsolete information on the map. For example, QuakeMap was still displaying clusters of red dots shortly before it was taken down, giving the impression that there were still needs on the ground.

Another issue is data preservation and archiving. A lot of crisis maps went offline after some time, like QuakeMap. This raises the question of whether the data is kept, where and by whom, as it can still be exploited. To learn from a crisis, there is a need to capitalize on information and data,

and collaborative maps can hold an important role even after the crisis to build preparedness, resilience and archiving collective memory. Current technical mapping tools do not tackle the issue of data archiving and how data can be used to learn from crisis.

Collaborative maps can still be used in post-crisis management, therefore technical tools need to be designed to consider the representation and use of datasets after a crisis. If collaborative maps have the potential to build resilience, there is the need of thinking about a long-term use for them. The figure of the “user” or “contributor” needs to be rethought and practices studied as digital tools need to become more inclusive. Access through digital technologies does not necessarily mean equal access and participation. Dynamics of power and barriers exist: language, culture technical and mapping skills, internet access, but also institutional barriers (Bittner and al. 2016). The Mapfugees project in Calais shows the importance of mediation and skills development, either from the community or external actors, in order to ensure participation and help people use and understand the mapping tool.

## References

- Bittner, C., Michel, B., & Turk, C. (2016). Turning the spotlight on the crowd: Examining the participatory ethics and practices of crisis mapping. *ACME: An International E-Journal for Critical Geographies*, 15(1), 207–229.
- Gilmour, E. (2016, April). Mapping for resilience: crowd-sourced mapping in crises. *Humanitarian Exchange*, (66), 33–34.
- Giroux, J., & Cavelti, M. D. (2012). La cartographie de crise : le phénomène et son utilité. *Humanitaire. Enjeux, pratiques, débats*, (32). Retrieved from <http://humanitaire.revues.org/1299>
- International Federation of Red Cross and Red Crescent Societies. (2014). *IFRC Framework for Community Resilience*. IFRC. Retrieved from [http://preparecenter.org/sites/default/files/everyone\\_counts\\_en.pdf](http://preparecenter.org/sites/default/files/everyone_counts_en.pdf)
- Liu, S. B., & Ziemke, J. (2013). From Cultures of Participation to the Rise of Crisis Mapping in a Networked World. In *The Participatory Cultures Handbook* (pp. 185–196). New York/London: Routledge.
- Lobbé, Q. (2016). Cartographier les jungles. *Plein Droit*, (3), 7–10.
- Meier, P. (2012). Crisis Mapping in Action: How Open Source Software and Global Volunteer Networks Are Changing the World, One Map at a Time. *Journal of Map & Geography Libraries*, 8(2). Retrieved from <http://www.tandfonline.com/doi/full/10.1080/15420353.2012.663739>
- Milner, M. E., & Verity, A. (2013, October). Collaborative innovation in humanitarian affairs:

Organization and governance in the era of digital humanitarianism. Retrieved from <https://app.box.com/s/oq2gdcy466j6bpdvzyxt>

Olstrom, E. (2010). *Gouvernance des biens communs*. Louvain-la-Neuve: De Boeck.

Palen, L., Soden, R., Anderson, T. J., & Barrenechea, M. (2015). Success & Scale in a Data-Producing Organization: The Socio-Technical Evolution of OpenStreetMap in Response to Humanitarian Events. In *CHI '15 Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (pp. 4113–4122). Seoul, Republic of Korea: ACM Press. <https://doi.org/10.1145/2702123.2702294>

Roche, S., Propeck-Zimmermann, E., & Mericskay, B. (2013). GeoWeb and crisis management: issues and perspectives of volunteered geographic information. *GeoJournal*, 78(1), 21–40. <https://doi.org/10.1007/s10708-011-9423-9>

Soden, R., & Palen, L. (2014). From Crowdsourced Mapping to Community Mapping: The Post-earthquake Work of OpenStreetMap Haiti. In C. Rossitto, L. Ciolfi, D. Martin, & B. Conein (Eds.), *COOP 2014 - Proceedings of the 11th International Conference on the Design of Cooperative Systems, 27-30 May 2014, Nice (France)* (pp. 311–326). Cham: Springer International Publishing. [http://dx.doi.org/10.1007/978-3-319-06498-7\\_19](http://dx.doi.org/10.1007/978-3-319-06498-7_19)

The Sphere Project. (2011). *Humanitarian Charter and Minimum Standards in Humanitarian Response* (Third edition).

The WHOQOL Group. (1995). The World Health Organization quality of life assessment (WHOQOL): Position paper from the World Health Organization. *Social Science & Medicine*, 41(10), 1403–1409. [https://doi.org/10.1016/0277-9536\(95\)00112-K](https://doi.org/10.1016/0277-9536(95)00112-K)

Ziemke, J. (2012). Crisis Mapping: The Construction of a New Interdisciplinary Field? *Journal of Map & Geography Libraries*, 8(2), 101–117. <https://doi.org/10.1080/15420353.2012.662471>

Ziemke, J. (2014). Conflict mapping 3.0. *The Magazine of the International Red Cross and Red Crescent*. Retrieved from [http://www.redcross.int/EN/mag/magazine2014\\_1/10-11\\_extra.html](http://www.redcross.int/EN/mag/magazine2014_1/10-11_extra.html)