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Crowdsourcing and Crisis Mapping in Complex Emergencies

A Rapid Guide

The Communication and Complex Emergencies Project

The Communication and Complex Emergencies Project is a multi-phase collaboration between the University of Adelaide's Applied Communication Collaborative Research Unit (ACCRU) and the Australian Civil-Military Centre (ACMC). The current phase of the project focuses on a range of new information and communication technologies (ICTs) and digital platforms and their role in supporting emergency and humanitarian relief and assistance processes during complex emergencies.

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1. Introduction

1.1 This guidance paper examines the use of crowdsourcing and crisis mapping during complex emergencies. Crowdsourcing is a process facilitated by new information and communication technologies (ICTs), social media platforms and dedicated software programs. It literally seeks the help of ‘the crowd’, volunteers or the general public, to complete a series of specific tasks such as data collection, reporting, document contribution and so on. Crowdsourcing is important in emergency situations because it allows for a critical link to be forged between those affected by an emergency and those who are responding to it. Crowdsourcing is often used by news organisations to gather information, i.e. citizen journalism, as well as by organisations concerned with emergencies and humanitarian aid, i.e. International Committee of the Red Cross, the Standby Task Force and CrisisCommons. Here, crowdsourced data on voting practices and electoral violence, as well as the witnessing of human rights contraventions are helping to improve accountability and transparency in fragile or conflict-prone states. Equally, crowdsourcing facilitates the sharing of individual and collective experiences, the gathering of specialized knowledge, the undertaking of collective mapping tasks and the engagement of the public through ‘call-outs’ for information.¹

1.2 Crowdsourcing can help to increase real time situational awareness and the information derived is often used to map certain events, risks or the emergency response using a range of widely used software applications such as Google Maps or Open Street Map. Crisis mapping enables organisations to visualise emergency information in a low cost manner. In turn, visualisation is an accessible and often user-friendly way to share data and increase situational awareness. In examining crowdsourcing and crisis mapping practices in emergencies this guidance paper:

- Focuses on their broad relevance to complex emergencies;
- Addresses the strengths and weaknesses of crowdsourcing and crisis mapping practices;
- Provides a series of ‘top-tips’ of relevance to humanitarian and emergency workers that can help them to avoid some common pitfalls associated with its use; and
- Provides further resources and links to key crowdsourcing and crisis mapping tools and organizations.

2. Using Crowdsourcing and Crisis Mapping in Complex Emergencies: strengths and weaknesses

2.1 Poor data collection and information management practices can result in ineffective humanitarian and emergency action in times of crisis.² During emergencies getting access to reliable and accurate information quickly is critical to understanding how the emergency is unfolding, who it is affecting and what needs are arising. New information and communication technologies offer new ways to collect, correlate and analyse the significant amounts of information that can be generated during emergencies. New ICTs are extending the reach and ability of emergency and humanitarian response organisations to forge a two-way exchange of information or dialogue with affected populations.

2.2 Crowdsourcing is typically deployed in two distinct ways:

- As a public-wide open call for information, the reporting of a specific task, a particular type of documentation or images; and

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- A restricted call that relies on a targeted group of individuals or organisations to provide the necessary data. Often this type of crowdsourcing is called ‘bounded’ crowdsourcing in which trained individuals collect and collate information from the public for feedback.

Regardless of the type of call-out that is employed, crowdsourcing creates new kinds of relationships with communities that are more dynamic, dialogue-based, democratic and responsive than previous forms of communication or data collection.

2.3 Crowdsourcing, be it of information, data, images or documents tends to be put to a number of well-defined ends during emergencies. These include:

- **Raising situational awareness:** For emergency responders, regardless of affiliation, crowdsourcing has the potential to greatly inform their understanding of emergencies. Because emergencies evolve and change, crowdsourced information can play a sustained role in emergency planning and in the wider humanitarian response. For example: (i) in the preparedness phase prior to an emergency occurring, crowdsourcing helps responders to address potential risks and understand the success of previous work; (ii) crowdsourced data allows humanitarian response strategies to adapt in real time. It can help responders to understand who is affected and where, as well as how the emergency is changing and what challenges and risks are evolving; and (iii) crowdsourcing during the recovery phase of an emergency can help humanitarian and development organizations understand community needs in the weeks and months following the initial emergency.
- **Citizen journalism:** During an emergency such as a cyclone or a conflict, citizens have the potential to inform both national and international news media of important events that are affecting their communities via new ICTs, such as Internet-capable mobile phones.

Many news organisations actively seek content such as information, videos, audio or images directly from the public, especially from contexts in which access for journalists is difficult or dangerous. Community contributed news content has an active role to play in raising wider awareness of suffering, deprivation, human rights abuses and discrimination. Citizen journalism can play an important role in enhancing accountability and transparency of not only government actions, but also wider accountability, i.e. of emergency response organizations to disaster-affected populations.

- **Election monitoring:** Crowdsourced data has been highly influential in bringing attention to voter fraud, voter safety and violence during elections. Either through open or closed/ bounded call-outs, crowd supplied data is helping to reveal unfair voting practices such as intimidation and helping civil society organisations hold governments to account over their electoral practices. When citizens have the ability to feed back data on such issues, the scale of voting malpractice can become fully visible. In turn, crowdsourcing can help to ensure that elections are both free and fair. The not-for-profit Kenyan-based software social enterprise Ushahidi (‘Testimony’ in Swahili) has pioneered election monitoring using a range of software tools such as SwiftRiver to collate and analyse comments from online sources such as Twitter and Facebook concerning issues such as hate speech and electoral violence.
- **Witnessing:** Witnessing is critical to the realisation of human rights and to protecting against human rights abuses. Crowdsourced data can play an important role in fragile contexts, conflict situations, periods of post conflict stabilisation and in complex or humanitarian emergencies. Where social dislocation occurs on a wide scale, human rights infringements often follow. In the wake of the 2010 Arab Spring, during which political unrest swept across North Africa and the Middle East, witnessing played an important

role in the conflicts. Via the posting of blogs, vlogs (video blog) and videos on social media sites such as Facebook and YouTube, as well as on mainstream and alternative news sites, citizens were able to speak out (often at their peril) against the abuses of powerful groups such as governments, the military and various militia groups.

- **Sharing:** Traditionally, most information about emergencies or humanitarian disasters has been handled, collated, analysed and communicated by intermediaries such as media organisations, news services, NGOs, INGOS, bilateral organisations, multilateral organisations and governments. However, new ICTs enable individuals to create and share information with their peers, free from mediation by third party organisations. Citizen generated social media thematic sites, such as those created on Facebook, have enabled spontaneous groups to form to share crowdsourced data on topics such as weather-related events, health scares and humanitarian emergencies. Citizen-created platforms that share crowd-supplied data can rapidly emerge in the wake of a crisis, but may be prone to distortions, abuse and tend not to have the checks and balances in place that support the ability to verify data;
- **Technical sourcing:** Humanitarian and emergency organisations may also use crowdsourcing to address technical questions or issues that they face in the provision of emergency assistance. Specific call-outs to technical specialists in areas such as water and sanitation, communicable diseases and engineering have the potential to yield high-quality data or analysis that emergency workers can utilise in the field. This type of highly bounded crowdsourcing relies on interaction between on-the-ground emergency organisations and international crisis volunteer groups such as the Standby Task Force and CrisisCommons.

2.4 While crowdsourcing takes many forms, it is clear that the ability of affected populations

to contribute data that helps to shape the emergency response also brings with it a number of problems. These include issues such as the potential for data overload, poor data quality, accuracy and veracity, in addition to issues associated with differential access to new ICTs and the technical capacity required to effectively run a crowdsourcing operation. **The following strengths and weaknesses are associated with crowdsourcing during emergencies:**

Strengths:

- Can be very effective in contexts with widespread access to new ICTs such as mobile phones;
- Can be employed in areas with low ICT connectivity via emergency workers/facilitators, i.e. closed/bounded call-outs;
- Closed/bounded call-outs are often more reliable because information is verified by on the ground facilitators;
- Allows affected communities to inform situational awareness in a direct way;
- Allows for real time communication with disaster-affected communities;
- Appeals to young people with high e-literacy rates;
- Can create a dialogue between affected populations and emergency workers; and
- Established crowdsourcing channels can be used to seek information, as well as provide information.

Weaknesses:

- Often requires high levels of new ICT access, literacy and e-literacy;
- May exclude groups without adequate access to new ICTs, such as women, minorities, the elderly, low-income populations and those in remote communities;
- Often requires ICT infrastructure to survive the emergency, i.e. weather events or conflict;
- Open call outs tend to rely on Internet connectivity or SMS access;

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- Open call-outs can lead to information overload, as well as the collection of irrelevant or biased information;
- Crowdsourcing is not integrated very well into government emergency management planning or actions;
- Requires significant labour to filter or moderate inflows of information/data;
- Unverified and inaccurate information/data can lead to distortion and manipulation entering the emergency response and negatively affect situational awareness;
- If bias affects situational awareness service delivery may not reach the most affected populations that are in the greatest need; and
- May leave citizens open to reprisals by governments that are capable of tracing crowd contributions if no encryption tools are used to protect identity.

2.5 Like crowdsourcing, crisis mapping reflects a complex web of human activity and interaction between online and offline worlds. Crowdsourced data derived from open or closed/bounded call-outs made through a range of channels (social media, SMS, researchers) is often manually analysed by volunteer crisis mapping communities or automatically by analytical software programs (i.e. SwiftRiver) prior to being plotted on to a digital map. Increasingly, crisis maps are finding their way into mainstream organisational

practice through use by governmental and inter-governmental bodies. Crisis mapping often takes the form of a 'mash-up' in which data is plotted via applications, such as Google Maps from data secured from the 'crowd'.³ Mash-ups are useful to responders because they can be created quickly, often with global volunteer labour, and can be used to disseminate information to partner agencies with access to the mash-up or map very efficiently. The visualisation of data as a crisis map helps to raise situational awareness in a very direct way.

2.6 Once crowdsourced data is plotted using a mapping tool such as Open Street Map, users are able to search or 'drill into' the data using search terms or by clicking on 'events' or hot spots, which are typically highlighted using red circles. Multiple events may occur in one place and give rise to bigger hot spots. This visualisation helps to provide users with an immediate sense of where things such as conflict are occurring, where food is in short supply and where injured people need assistance. The Libya crisis map (2011) provided below was produced by the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), the United Nations Operational Satellite Applications Programme (UNOSAT) and NetHope in collaboration with CrisisMappers, Standby Task Force, CrisisCommons, Open Street Map, and the Google Crisis Response Team. The map reflects conflict and humanitarian events occurring across Libya.

Figure 1: Libya Crisis Map



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2.7 The following strengths and weaknesses are associated with crisis mapping during emergencies:

Strengths:

- Can lead to engagement with large quantities of data;
- Helps to visualise complex data in a way that is accessible for users;
- Crisis maps are searchable;
- Informs situational awareness;
- Can be completed with the assistance of globally networked volunteers, which helps to free up the valuable time of emergency responders working at the local level;
- Is supported by organisations such as Google, Facebook and Twitter which provide strong leverage for the integration of new ICTs and software tools into humanitarian and emergency practices; and
- Appeals to the desire of globally concerned individuals to volunteer and 'take part' in the crisis response.

Weaknesses:

- Requires ICT infrastructure to survive the emergency;
- Requires high levels of ICT access, literacy and e-literacy;
- Relies on crowdsourced data that may be inaccurate, biased, gender insensitive and not reflective of the experience of the most vulnerable members of society;
- Can lead to volunteer organisations being overwhelmed with data;
- Plotted crowdsourced data can have very low reliability and is often unverified;
- Prone to bias and distortion due to lack of data verification; and
- Citizens contributing to crisis maps may be open to reprisals, as governments can easily trace non-encrypted Internet or mobile phone use.

3. 'Top tips' for using Crowdsourcing and Crisis Mapping in Emergencies

3.1 If considering using **crowdsourcing** as part of an emergency response the following 'top tips' will help identify some of the most important things to consider to ensure success:

Before the Emergency

1. Crowdsourcing activities can help support all phases of an emergency, from preparedness, to the acute phase of a crisis, to the post-crisis recovery and reconstruction period. Because the nature of emergencies is fluid, emergency responders need to ensure that information/data flows from affected populations in a systematic way. Developing a crowdsourcing approach or strategy will help when considering issues such as human and financial resource implications, logistics, the type of call-outs to use and the type of data, information or expertise to seek from the crowd.
2. Emergency and humanitarian organisations engaged in crowdsourcing need to consider issues associated with who is and who isn't included or able to contribute. Vulnerable groups' voices may not be gathered or heard in crowdsourcing exercises by virtue of the fact that they may have inadequate access to ICTs. Developing strategies for including women, low-income populations, the elderly, children, as well as ethnic and linguistic minorities in crowdsourcing is important as this may help correct any bias that enters the process due to higher ownership and access to ICTs by more affluent groups. Bounded or closed crowdsourcing is a useful approach that can help overcome such concerns. It relies on local fieldworkers to collect data from affected communities, after which the data is sent or uploaded for processing and assessment. Such fieldworkers can act as intermediaries between affected populations and emergency and humanitarian organisations.

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3. While crowdsourcing has the potential to improve situational awareness as an emergency unfolds, its use raises critical technical and human resource issues for emergency organisations. Investment in new capacity and skills, new software tools, new ways of working and new partnerships may be required if crowdsourcing is to yield its full potential. Organisational assessment of the relevance and value of crowdsourcing to existing knowledge acquisition strategies should be undertaken prior to the adoption of crowdsourcing as a strategy.

During the Emergency

1. Crowdsourcing can yield large quantities of data and its assessment is a labour-intensive process that requires thought about what information is being requested and from which populations; i.e. the general public in affected communities (open call-out) or emergency workers working in affected areas (bounded/closed call-out). Decide early on what kind of call-out to use. Closed or bounded call outs for information and data utilise local facilitators who relay data back to humanitarian organisations or crisis mappers. Closed call-outs yield data with a higher veracity. Open call-outs can have low veracity; in some instances as little as 5-6% of data may be verified.
2. Crowdsourced data can suffer from issues associated with unreliability, trust and bias. Public call-outs for information may lead to significant quantities of information and if facilitated via new ICTs, information provision may be skewed towards more affluent sections of society that have access to the technology used to report data, i.e. mobile phones. This is especially relevant to the developing world where access to new ICTs is rapidly increasing, but access is far from universal. It is important that assessment of media access, uses and preferences is undertaken, even if such an assessment is rapid. It is also important that humanitarian actions are based on verified information. Sharing data between humanitarian organisations through platforms such as wikis can help ensure that distortions do not enter the aid delivery process.
3. Think about how to 'triage' crowdsourced data. Systematic processes need to be put in place to sort data, decide on its veracity, whether it will be prioritised, have a lower value placed upon it or if it will be rejected. Triage should focus on both the needs of vulnerable populations, and the organisational needs of humanitarian agencies. For example, accurate and timely security information is vital for emergency response personnel and the rapid analysis of crowdsourced data reports can help identify early warning signs of conflict. If working with crisis mapping organisations it is important to understand how they deal with data and decide what is important what is not. It is useful to think of verification practices at this point.
4. Crowdsourcing carries risks for contributors of information/data. Governments can actively monitor Internet use and the activities of humanitarian agencies. Data provided from the 'crowd' can potentially be traced and contributors may be open to reprisals. A key part of any crowdsourcing strategy undertaken in an emergency situation should concern the potential risks to ground-level data collectors (i.e. conducted closed/bounded crowdsourcing) and to the wider public. The promotion and use of encrypted e-mail or messaging platforms (Proton, Wickr) can help protect those who contribute crowdsourced data. In addition, humanitarian agencies can ensure more effective local participation in crowdsourcing by putting in place privacy policies that help to protect the identity of contributors.
5. Crowdsourcing works best when information is reciprocated to communities. Information

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provision by affected communities may be difficult to maintain if no information is given back by emergency responders, i.e. data collected in order to raise situational awareness for responders can be communicated back to affected communities in the format of situational updates and emergency messages that focus on risk and vulnerability reduction.

After the emergency

1. Like all emergency and humanitarian assistance activities, it is important that lessons are learned. Learning lessons, especially about how the data derived from crowdsourcing was managed, analysed and used is important, as it will help to inform future crowdsourcing practice. Disseminating lessons to partners further boosts future partnering and coordination potential.
2. Once lessons have been learned revisit the crowdsourcing and crisis mapping strategy and discuss what changes might need to be implemented to ensure that practice in this area improves and partnerships remain effective.

3.2 If considering using **crisis mapping** as part of an emergency response the following 'top tips' will help identify some of the most important things to consider to ensure success:

Before the Emergency

1. Mapping does not need to wait until an emergency has occurred. Greater efforts can be put into establishing resilient crowdsourcing and mapping networks before emergencies occur through the development of clearly defined strategies and partnerships.
2. Crisis mapping requires significant coordination, leadership and technical capacity (i.e. software competency) if it is to be successful. As mapping becomes more commonplace, complex and longer-term, it is likely that the volunteer interest may wane or be reserved for the highest profile

events. Humanitarian and emergency-focused organisations that value crisis maps and deploy them in numerous contexts need to consider building long term in-house capacity.

3. It is critical to decide on what is important during a crisis. Organisations should clearly define their role, the types of data they seek and the criteria or principles that will be used when engaging in crisis mapping. The most pressing risks or needs faced by affected populations are a good place to start.

During the Emergency

1. Crisis mapping draws upon crowdsourced data, and in turn both draw upon the desire of affected populations and concerned individuals to share information and contribute to humanitarian/emergency solutions. Because of this, crisis mapping can play an important role in increasing organisational accountability and transparency of the aid response, especially to affected populations.
2. Think about whether to build a map using available software tools or whether to partner with one of the volunteer mapping communities. If partnering with a crisis-mapping organisation, it is important to think about the criteria that your organisation requires are brought to bear on crowdsourced information for mapping, i.e. its accuracy and veracity.
3. Deciding on the scale of the map is important. Crisis maps can vary between local street-level maps, to broad national maps. While it is possible to 'drill' into all crisis maps, consider whether the scale of your map should match the scale of your organisation's remit or service delivery, or whether it should address a wider area. Wider coverage brings with it more data to be plotted and more work.
4. Think about how and with whom maps will be shared. Crisis maps have the potential to

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become dynamic resources when fed back to the crowd. ‘Crowdfeeding’ can help generate more information from affected communities and serve to improve accountability, accuracy and veracity.

5. Crisis mapping should not expose mappers or contributors to risk. Establish whether the local environment is benign, or if it carries risks related to citizen-led communication practices such as crisis mapping. If it does carry risks, consider alternative forms of communication or end-to-end encrypted platforms, such as the Proton e-mail service or the Wickr messaging service.

After the Emergency

1. After the emergency has passed establish what lessons can be learned from the experience of engaging in crisis mapping. Learning lessons about how useful the crisis map was in enhancing situational awareness and service delivery is critical; as is understanding how effective partnerships were in delivering timely updates to maps. Also consider how well the crisis map was disseminated, which organisations had access to it, how did it support local partnerships and what did it help your organisation and its’ partners achieve.

4. Crisis Mapping and Crowdsourcing Organisations and Software Resources

4.1 The following table details some of the most significant crisis mapping organisations, as well as crowdsourcing and mapping software tools available:

Crisis Mapping Organisations	Crowdsourcing and Crisis Mapping Software Resource
<p>Standby Task Force (SBTF) - is a volunteer platform and a shared space to assist crisis-affected communities through the use of technology. SBTF focuses on information collection, visualisation, analysis and response and operates along a modular approach, with a total of ten teams each with a specific focus area or responsibility. These teams provide support for mapping activities via the collection of geo-location data and crowdsourced messages from SMS, social media, e-mail, media and voice messages. Source: http://blog.standbytaskforce.com</p> <p>CrisisMappers - leverages mobile and web-based applications, participatory maps, crowdsourced event data, aerial and satellite imagery, and geospatial platforms to power effective early warning for rapid response to complex humanitarian emergencies. With more than 5000 members working in over 162 countries, and with more than 3000 member and affiliate organisations, CrisisMappers is the largest community of experts and practitioners engaged in crisis mapping. Source: http://crisismappers.net</p>	<p>Ushahidi - is a non-profit technology company that specialises in developing free, open source software such as SwiftRiver and Crowdmap for information collection, visualisation and interactive mapping. Originally developed in 2008 to map reports of post-election violence in Kenya, Ushahidi has now been used in a variety of context including the reporting of human rights violations, monitoring elections and disaster response. Sources: http://www.ushahidi.com, http://swifly.org, http://crowdmap.com</p> <p>Google Crisis Response - uses online technology to reach people in need and for use during internal operations during a crisis. Google Crisis Response uses a number of tools including web pages with relevant and up to date emergency information, a person finder web application to find missing persons, as well as online crisis maps using Google Earth to display geographic information, storm warnings, shelter locations and power outages. Source: http://www.google.org/crisisresponse/</p>

Crisis Mapping Organisations (cont)	Crowdsourcing and Crisis Mapping Software Resource (cont)
<p>Crisis Commons - aims to advance and support the use of open data and volunteer technical communities to provide innovation in crisis management. Through a global community of over 3000 volunteers and participants, CrisisCommons works to build and use technical tools to help respond to disasters and improve resilience to crisis. CrisisCommons utilises their mailing list and a wiki tool to collect notes, plan projects and capture and share information.</p> <p>Source: http://crisiscommons.org</p> <p>Digital Humanitarians Network (DHNetwork)- leverages digital networks in support of humanitarian response with the aim to form a consortium of volunteers and technical communities and provide an interface between formal international and humanitarian organisations and informal volunteer organisations. DHNetwork offers real-time media monitoring of both mainstream and social media, rapid geo-location of event and infrastructure data, creation of live crisis maps, data development and cleaning, satellite imagery tagging and tracing, and web-based research.</p> <p>Source: http://digitalhumanitarians.com</p>	<p>Sahana Foundation - provides information management solutions that enable organisations and communities to better deal with disasters. The Foundation builds free open-source software supported by volunteer contributors. Sahana reunites separated families by registering missing and found persons, tracking and managing requests for help from individuals and organisations, tracking organisations and programs disaster response, tracking the distribution and transparency of aid and enabling information sharing across organisations.</p> <p>Source: http://sahanafoundation.org/</p> <p>UN Global Pulse - UN Global Pulse is an initiative that explores how new digital data sources and real-time analytic technology can help policy makers to understand human well-being. The initiative aims to mainstream the use of data mining into development organisations and promote awareness of the opportunities that such data presents for relief efforts and data sharing.</p> <p>Source: http://www.unglobalpulse.org</p>

5. Key Resources

5.1 The following resources can provide more extensive information on both crowdsourcing and crisis mapping in emergencies:

Onouha, M., Pinder, J. and Schaffer, J. - Guide to Crowd-sourcing (2015)

Produced by the Tow Center for Digital Journalism, this resource provides a useful summary of the role of crowdsourcing in journalism and the various ends to which crowdsourced material is put. There is a strong focus on accuracy and veracity issues relating to crowdsourced data.

<http://towcenter.org/research/guide-to-crowdsourcing/>

Center for Security Studies (CSS) - Analysis in Security Policy (2011)

This resource examines the recent phenomenon of crisis mapping and reflects on some of the issues and challenges faced by humanitarian organisations in their engagement with the wider crisis mapping community.

<http://www.css.ethz.ch/content/dam/ethz/special-interest/gess/cis/center-for-security-studies/pdfs/CSS-Analysis-103-EN.pdf>

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Inter-Agency Standing Committee - Accountability to Affected Populations (2013)

This resource is an operational framework that promotes greater accountability in the delivery of emergency and humanitarian assistance. There is a specific focus within the framework on communication and on the need for better integration of communication into relief initiatives to promote awareness of aid delivery objectives, as well as on the scaling up of emergency and risk reduction communication.

http://www.fao.org/fileadmin/user_upload/emergencies/docs/IASC%20AAP%20Operational%20Framework%20March%202013.pdf

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