

BRIEF FOR PRACTITIONERS

Enabling the Implementation of Drones into Local Disaster Preparedness

Key considerations from challenges and lessons learned in Chile

Combining the need for local capacity development and ownership in disaster risk management (DRM), with the opportunities presented by more accessible drone technology, a study was carried out through the Master of Disaster Management program at University of Copenhagen, Denmark, to understand and assess the barriers for the implementation of humanitarian drones into local disaster preparedness. While drone technology is becoming more easily accessible as prices drop and the technology becomes more user-friendly, drones are often utilized only in the event of a disaster, as they are managed by international organisations or private actors. By building national and local capacity and integrating drones into DRM processes and protocols, the use of drones can be tailored to the risks and needs in the local context and they can be used in reducing risks and increasing preparedness. Through a field study in Chile to identify key benefits and challenges of drone implementation from lessons learned, combined with experiences from other actors and countries, the study identified a potential for drones in disaster preparedness, as well as current barriers for drone implementation, which should be considered and addressed for drones to effectively be implemented into local disaster preparedness efforts.

The potential and benefits of drones for disaster preparedness

- **Drones are versatile tools** that can be used in all phases of DRM and for many types of hazards, as they can be outfitted with different cameras and sensors depending on the specific needs. Examples from Chile include drone missions conducted or planned for preparedness and environmental mappings, post-disaster assessments, support with real-time drone imagery during response, contingency planning and monitoring of annual religious pilgrimage, and radioactive monitoring.
- **Updating maps and providing baseline data.** With quick deployment, low costs and

interchangeable sensors, drones offer an alternative or supplement to traditional satellite and manned aircraft imagery, in particular for smaller scale and local disaster preparedness. In the preparedness phase, it was emphasized that drones can play a critical role in closing the gap of vulnerability and risk mapping. In particular an overview of vulnerabilities, risks and assets, such as essential infrastructure, in hazard-prone areas are considered to be lacking in some countries, such as Chile. In addition, drones offer a potential solution to currently outdated maps of hazard prone areas, in particular in local areas where resources are not available to obtain updated and high-resolution maps from satellite organisations or in areas of rapid urbanization, development or other landscape changes, e.g. due to recurring hazards, as traditionally obtained imagery gets quickly outdated in such areas. Here drones can replace traditional imagery and quickly deploy to ensure up-to-date situational awareness and assessments.

- **Resource management and planning in emergencies** Specifically highlighted by all interviewees were the potential of drones to improve resource management in emergencies. This includes improving maps, hazard monitoring, vulnerability assessments, contingency and evacuation planning in the preparedness phase, as well as for rapid needs and damage assessments in response. By providing access to high-resolution maps and vulnerability and risk assessments, drones may be a relevant tool in improving contingency planning and other preparedness activities, such as local capacity development, to increase evacuation, early warning and coping capacity of communities. In addition, in particular for response planning, such drone maps and assessments can improve resource management in the event of a hazard, as situational awareness is improved and knowledge of vulnerabilities and risks helps prioritize resource allocation and deployment, e.g. to areas identified as particularly vulnerable or at risk.
- **Local interventions.** The relevance of drones becomes particularly clear in local and remote or inaccessible areas, where assessments are not of priority for national disaster preparedness processes. Here preparedness planning and disaster risk reduction activities are sometimes based on outdated maps and thereby with limited overview of populated areas and community assets. Engaging drones through local actors, such as local authorities or

organisations, local communities will be equipped with essential knowledge to improve their disaster preparedness. In addition, drones offer a democratization of data collection by putting the power in the hands of the user, in terms of deciding areas of focus for preparedness efforts.

Addressing barriers for drones in local disaster preparedness

While the potential for drones to close existing gaps in local disaster preparedness in Chile is there, in particular in relation to updating maps, providing vulnerability and risk assessments and improving contingency planning, currently the enabling environment is not there. As such, in bringing drones to the local level in disaster preparedness existing barriers should be addressed. The study identified the following barriers and associated actions, which can be grouped in two:

Creating an Enabling Environment

Integrating drones into DRM frameworks and action plans at national and local level, ensuring appropriate engagement and coordination of drones in disaster preparedness, focusing perhaps on key areas of drone potential for initial integration. The entry points for the creation of an enabling environment for drones in local disaster preparedness seems to vary from country to country, depending not only on the existing level of the country's DRM framework, but also on the existing or non-existing legislation and regulations on drone use.

Mobilizing the needed resources to facilitate local implementation of drones, including through integration in DRM frameworks and action plans, and thereby allocation of resources for drones through national and local public budgets, and through engagement with the private sector. A current gap, consistently repeated by stakeholders in Chile and other countries, relates to the current lack of funding and government budget allocations for drone integration in DRM, and in particular for disaster preparedness efforts. In order to bring drones to the local level funding is necessary to support capacity building, certification processes, the procurement of relevant drones, batteries and sensors, and insurance.

While some local authorities, police and fire brigades in Chile have independently allocated budgets to

the integration of drones into their disaster preparedness or response activities, this is still on an

ad hoc basis. As there, due to the lack of formal integration into DRM frameworks, procedures and protocols, are no formal budget allocations for drones in disaster preparedness. Even with formal integration of drones, decentralization of responsibilities in DRM are often not matched with the appropriate transfer of financial resources to the local level, and as such it may be continuously necessary to identify other sources of funding for drones in local disaster preparedness. (UNISDR, 2018) Essential to this process will be to calculate and communicate clear costs and benefits of drones in DRM to external donor organisations. Linking the cost-benefits of drones in DRM with the international agenda on local engagement, through capacity development of local authorities, volunteers or communities, could be an entry point for mobilizing external resources. In addition, lessons learned from Nepal, Fiji and the Philippines, show successful collaboration with private sector entities through Corporate Social Responsibility (CSR) initiatives. In both Nepal and the Philippines, the Flying Labs cooperatives are hosted by or coordinated with the direct engagement of private sector entities, such as private drone operators.

Making drone use more accessible to local actors, including in relation to regulations and certifications. Regulations impact and shape the engagement by determining who, when and where drones may be used. Where drone regulations in Chile, similar to the Philippines and Fiji (through Australia), allow only certified drone pilots to operate drones with a permit for disaster preparedness with a processing time of approximately 15 days, other countries have less extensive drone regulations. In some countries, such as Nepal, drone certifications are given on the basis of only a written test and no proof of practical training or practical test, allowing for easier access to drones for local practitioners. These different levels of regulations determine the way drones are implemented at local level by organisations in a country. While organisations in countries with less restrictive regulations may focus on training local communities and students as local drone practitioners, other countries, like Chile, with more strict regulations, permits and certifications are limited to focusing on internal organisational capacities of the NGOs with professional pilots or volunteer pilot programmes and on building the capacity of local authorities and other public practitioners such as the police and

and on building the capacity of local authorities and other public practitioners, such as the police and fire brigade. As such, the different approaches to implementation of drones for local disaster preparedness, and DRM in general, from country to country can be seen as a result of the level of enabling environment in the country.

Bringing drone use to local disaster preparedness

While the enabling environment determines the formal integration of drones, the capacity and accessibility of the technology impact the practical implementation of drones for local disaster preparedness.

Providing broad capacity development to encompass drone flight training, GIS software and basic DRM training, as a holistic approach in training NGO volunteers and public actors. With continuously evolving technologies, capacity development becomes key to effective implementation. And as such, in order to bring drone use to local disaster preparedness, local capacities within drone technology, piloting and analysis software, such as GIS, need to be developed, as well as knowledge increased on the relevance of drones in disaster preparedness efforts. Holistic approaches to capacity development will allow for more effective integration of drones and reduce the amount of internal human resources needed in local institutions and organisations. For drones specifically, there is a need for drone practitioners at the local level to be trained not only as drone pilots, and certified, but to also be knowledgeable about DRM and disaster preparedness terminology, processes and strategies, as well as to know how to then conduct relevant and appropriate assessments and analysis through GIS tools. As such, in training local practitioners, focusing ensuring a broad range of capacities may address current barriers of split capacities and geographical coverage.

Expanding the drone practitioner network for appropriate geographical coverage, including ensuring engagement of local authorities and other public institutions, such as police and fire brigade, as well as increasing the network of volunteer pilots and analysts through NGOs and educational institutions. In the vision for drones in disaster preparedness in Chile, it is envisioned to have complete geographical coverage of the regions in Chile to ensure that drones are responding to local needs for

disaster preparedness. Broad capacity development, as described above, of not only volunteers of drone organisations, but also local institutions, such as local government, police and fire brigade, will expand the drone practitioner network in Chile. Addressing the barrier of geographical coverage in this way, may allow also for increased local contextual knowledge. In addition, “training of trainers” programs, currently being implemented by South Pacific Flying Labs in Fiji, may serve as successful practices for replication, as these programs allow for local capacities

to spread and for these to become stable resources in local institutions.

Finally, it is essential for the sustainability of the local capacity development that there is continued support from technical organisations, such as Chile Flying Labs and DroneSAR, to maintain and update capacities, in particular as drones and analysis software are continuously and rapidly evolving technologies.

Mitigating, whenever possible, technological limitations through engagement in technological developments and continued capacity development, including for technical maintenance of equipment. While technological limitations are current external barriers in bringing drones to local disaster preparedness, such as battery lifespan and processing, affecting quick and timely implementation of drones and analysis, and depending on the assessment requirements increasing implementation costs, these are less actionable areas of intervention for organisations and institutions in improving drone integration into DRM in Chile, as they are dependent on new technological developments.

Developing capacities for drone use at a local level is an essential step in bringing drones to local disaster preparedness, however the implementation of drones is also dependent on access to the technologies themselves, both drones and relevant GIS software. While financing was discussed above as a barrier for implementation of drones in local disaster preparedness, other barriers for technological access also exists, including maintenance of drones and equipment and continuously evolving software solutions. For the sustainability of drones in local disaster preparedness efforts, local drone practitioners will need access to guidance on maintenance of drones and spare parts. In relation

to both cost and maintenance, it may also be beneficial to consider this in the procurement of the drones themselves, ensuring that they can be maintained at local level with limited access to spare parts and limited technical knowledge.

With new software solutions emerging and providing solutions to current technological limitations, such as processing time, local drone practitioners will need to continuously develop capacity within new software, as well as engage in research to determine their applicability and relevance for local disaster preparedness and assessment needs. From a cost and sustainability perspective, open and

free software solutions are currently being widely used by drone organisations and private companies in Chile, Fiji, Nepal, the Philippines and by the American Red Cross. This is also an important component in addressing technological limitations. While some limitations may be dependent on external technological advancements, other limitations can be addressed locally through experiments with new technological solutions. An example of this from the American Red Cross is the use of local networks of “mini computers” for image processing, which have successfully reduced the processing time by half. Where 10,000 images may have taken two weeks of processing before, these local networks are now processing the same amount of drone images within one week.

Moving forward: Knowledge sharing and building on lessons learned

In summary, in addressing barriers, such as the ones identified above, building on lessons learned from different countries and contexts can offer key insights into structural and capacity development approaches, as well as potential technological solutions. While drone regulations and integration into DRM frameworks and action plans are still in development in most of the countries considered in this project, there are clear similarities between challenges experienced in Chile and these other countries. Some of these challenges have been mitigated in the other countries and can be leveraged as potential practices for enabling local integration of drones in Chile and other countries, including in overcoming processing time of drone imagery, making drone certification more accessible, mobilizing resources, such as through private sector engagement, and implementing different local capacity development

approaches.

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- DroneSAR Chile
- Oficina Nacional de Emergencia del Ministerio del Interior, Chile (ONEMI)
- Instituto Geográfico Militar Chile (IGM)
- American Red Cross
- Chile Flying Labs volunteers
- Naxa Pvt. Ltd (Coordinator of Nepal Flying Labs)
- The University of the South Pacific (Coordinator of South Pacific Flying Labs)
- Remote Area Medical Philippines (RAM-Ph) and SRDP CONSULTING INC (Coordinators of Philippines Flying Labs)

