Humanitarian Response Without Humans: How can we help, when we can't get there?

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***Abstract*—COVID19 has made the global humanitarian context more vulnerable and complex than ever. In particular, it has already resulted in the situation where response to significant disasters, such as Cyclone Harold in Vanuatu, has been greatly impaired by the reduced ability to safely and responsibly deploy humanitarian responders when and where they are needed. These are, however, not new problems: COVID19 has only served to amplify the existing problems.**

In this paper, we explore how careful and strategic use of existing and emerging technologies can be used to mitigate this problem, by analyzing the humanitarian roles and functions that need to be provided, and then creating technology packages that can both meet those needs, and be boot-strapped in country, without the need for any personnel to deploy into the disaster zone. Or perhaps more realistically, how the need for deploying personnel can be simultaneously minimized, and be primarily met from personnel already in-situ.

Among other contributions, we identify that technologies designed for remote support injection into disaster zones should embody self-evident function and value, self-sufficiency, self-configuration and self-regulation, to ensure rapid, effective and maintainable delivery of humanitarian assistance from afar.

I. Introduction

The first few months of 2020 have brought with them considerable global and societal change, as the COVID19 pandemic has spread throughout the world. We are facing problems new to our generation, and to the modern globalized world, as well as seeing many existing problems amplified in their effect. For example, when Cyclone Harold impacted Vanuatu as a Category 4 Cyclone, the international humanitarian sector was largely unable to mobilize to respond, because Vanuatu had closed its borders to keep COVID19 out [1]. This is creating challenges that are new to our generation.

Perhaps the only consolation is that COVID19 did not arrive in 2012. Unfortunately, while the Mayan-calendar apocalypse and 5G COVID19 conspiracy theories are merely distracting fictions, the impacts of the COVID19 pandemic itself are very real, and will require transformation and innovation in the humanitarian sector.

For the humanitarian sector, the primary effect of COVID19 is to amplify many of the recurring logistical challenges that arise when delivering humanitarian aid when and where it is needed. For example, following the Great Haiti Earthquake of 2010, damage to transportation and communications infrastructure greatly limited the ability for aid and responders to arrive [2]. Likewise there have been chronic challenges to delivering aid to, for example, Syria, South Sudan and Somalia [3]–[5]. Those challenges have little to do with pandemic or disasters, but rather are primarily due to human-generated problems [5] – but nonetheless make it both difficult and dangerous for responders to deploy into these areas.

However, COVID19 does present us with an opportunity where global attention and innovation is suddenly focused on solving how to deliver various services, without requiring face-to-face contact. For example, Australia has recently agreed for the national public health system to include tele-health services for all Australians [6]. Simultaneously, even the most conservative businesses are discovering that remote work is in fact possible in many more cases than they had been previously willing to accept [7].

This creates hope that similar innovation can be applied to the humanitarian sector, to discover ways to undertake humanitarian tasks from a distance, that were previously believed to require the in-person attendance of a humanitarian responder.

The opportunities that COVID19 creates must be pursued, if we are to maintain humanitarian response capacity, as what is also clear is that it has other side-effects, such as reducing the funds and resources available, e.g., for preventing, mitigating and responding to events, emergencies and disasters.

This paper explores this potential, and attempts to extract actionable guidance for creating systems and processes that would enable effective remotely-mediated humanitarian response, with a focus on the communications needs of doing so.

A. Contributions

The contributions of this paper are:

1) The recognition that the COVID19 pandemic provides a unprecedented opportunity – and new challenges – to address the logistical challenges of humanitarian response, through the application of the same "remote work" transformation that businesses around the globe are being forced to innovate on.
2) A brief exploration of opportunities and challenges for empowering "remote response" in the humanitarian sector.
3) A reiteration of the criticality of planning ahead for telecommunication requirements in humanitarian re-

sponse, and guidance on designing appropriate communications solutions, according to the four principles of self-evidence, self-sufficiency, self-configuration and self-regulation.
4) A reiteration of the criticality of relief agencies making the necessary relationships with national agencies, so that response can be sufficiently rapid, and that beneficiary nations and affected communities can be supported in their current and future actions.

B. Structure of this paper

The remainder of this paper begins by examining the importance of enumerating and breaking down humanitarian interventions into fine-grained roles (Section II), from which functional requirements for remote humanitarian support can be extracted (Section III). We then explain how such functional requirements can be used to determine the technical requirements for intervention, and how those can be met (Section IV), before also discussing the important of, and opportunities for addressing the human factors involved (Section V), and making concluding remarks (Section VI).

II. Breaking Down Humanitarian Response into Individual Capabilities

A key challenge to replicating humanitarian interventions is that a wide variety of roles and functions are typically involved [8]. These are not always unambiguously defined [9]. Without knowing the roles and functions of the people delivering an intervention, it is not possible to determine to what extent, and by what means, such an intervention may be possible, if it is not possible to deliver the appropriate people into the situation. Thus this stands a first order problem for responding agencies: If they have not already done so, they must begin thinking about what the various roles that they may need to inject into various locations may be, so that solutions can be found if it isn't possible to inject personnel with expertise in these roles. The existing UN Cluster system [10] can be an effective tool for considering the enumeration of the required roles.

Once the gamut of roles have been identified, it is then possible to break down what their functions and skill and equipment requirements are. Careful analysis of such data can then be used to consider how each capability can be delivered into each potential target country or region, or what barriers might exist to delivering each capability in this context. It is only by breaking this problem down that the natural reaction to "but we need Person/Role X on the ground!"

For example, a complex role, such as "Health Professional" or "ICT Specialist" is broken down into specific capabilities, such as "Deliver primary health," "Provide 2nd level medical/surgical care," "Establish VSAT communications link," or "trouble-shoot network problems," that it becomes feasible to find solutions for many of them, that do not require the injection of personnel.

In many cases, once broken down, it will be possible to find people who can fulfill each "mini-role," thus providing a potential solution. However, it is accepted that this will not always be the case, and that some complex roles may require skills that cannot be found locally in sufficient quantity or qualification.

For example, "Deliver primary healthcare" might be possible to deliver via a combination of tele-health and a local nurse or health practitioner, who with the support of a remotely connected expert, can deliver a higher level of care than they otherwise might be able to [11]–[15]. Even if they cannot perform the full range of functions within this capability, they may be able to more effectively triage cases, so that the local health care system can more adequately fill this function, or in hybrid situations where some personnel are able to be injected, that their time can be more effectively focused on those tasks that only they can complete.

ICT services could be treated similarly: There are probably people already in many humanitarian contexts who are capable to deploy a VSAT terminal – at least if they have an expert on the other end of a phone or video-conference link, and that such a link is possible. This also raises an important point: In many cases, there are perfectly capable people in a disaster zone, but they may lack the confidence to act alone, or may simply be overwhelmed, and thus unable to function independently in their usual manner. In both cases, providing local personnel with access to an external "support partner" and to funds has the potential to be a highly effective intervention.

A. Neglect and Heightened Criticality of Communications

What the previous examples highlight, however, is that telecommunications becomes even more critical to the humanitarian response than it already is: Without telecommunications, it is not possible to effectively leverage remote expertise or support or coordination. Moreover, there is a problem when it comes to providing remote support for local personnel attempting to (re)establish communications: Without telecommunications you can't provide the necessary remote support. As establishing telecommunications systems may require expert remote support, this creates a catch-22, where some kind of communications is needed as the starting point, so that more advanced forms of communications can be attained.

Nonetheless, we see a distressing sustained lack of attention to tele-communications within the upper management of NGOs and donor organizations as part of the broader range of policy-dysfunctions to which the humanitarian sector is prone [16]. One observed pattern is that of lamenting the lack of telecommunications during responses, while effectively ignoring proposals to remedy this.

Another and related observed pattern is the adding of telecommunications as "an afterthought" to various projects and initiatives. Often projects progress significantly before the intrinsic telecommunications problems become apparent, by which time it can be too late – or too expensive – to achieve the mission objectives of the projects. We could provide concrete examples for each of these, but refrain out of respect for the parties involved.

That is, we see a pattern where the restoration of communications is given priority and attention during a disaster, but little attention is given between disasters to designing response technologies that can better operate in the absence of functioning telecommunications infrastructure, or where telecommunications infrastructure is degraded and/or overwhelmed.

The following sections will consider what the communications needs are for remotely delivered humanitarian assistance, followed by approaches for mitigating the effects of this reality, considering both technical and human factors. This includes both the need for remotely delivered assistance as as well as remotely delivered support for establishing communications.

III. Communications Requirements

The communications requirements for supporting remote delivery of humanitarian aid can be separated into two key aspects: (1) The means of providing communications in the response theater; and (2) The form of communications that are provided. That is, we need to consider both the practical aspects of how to deliver communication to the on-site personnel, as well as to provide appropriate forms of communications, whether text, voice, image, video, general purpose internet, or some combination of these and/or others. We consider these two aspects now in turn.

A. Means of Communications

The first part of the problem is simply that of how to get communications into these situations, and in such a way that it is immediately usable. Since we are considering the challenges of response without physical human presence, it must be assumed that it will not be possible to deploy IT/ICT experts with the communications equipment. This is the key difference in thinking to previous response activities.

Therefore there is a need for communications devices – and their effective deployment – that can be deployed and used without either none or minimized requirement for local expertise. Such communications devices must be self-sufficient, self-evident, self-configuring and self-regulating to the maximum extent possible:

1) Self-Evident: When we say that a device must be self-evident, we mean that it must be obvious on delivery what its function is [17]–[19], and how it is should be used. Certain classes of device fit this category more readily than others. For example, the ubiquity of smart-phones means that such devices will tend to be recognized, and are likely to elicit an attempt to engage with it. In contrast, a complex rack-mounted communications system is much less likely to elicit a useful form of engagement.

Self-evidency is vitally important when equipment is first deployed, as there needs to be some way for the on-site personnel to be able to recognize it as useful, and thus to engage with it, and hopefully, derive utility from it. That is, the on-boarding process must be as simple and barrier-free as possible [20]–[22]. If this hurdle fails, then the equipment will have been sent in vain, and will have wasted precious delivery logistics and attention of the on-site personnel.

It is possible to achieve self-sufficiency in a multi-stage process. That is, a shipment may contain a mix of devices, but that is packed such that the devices that will be first unpacked will be obvious, attractive and productive to engage with. This could, for example, be something approximating a satellite telephone, that allows the receiver to communicate with the supplying organization, who can then guide them through the process of making use of the rest of the equipment – and equally important, how to involve others in the process, so that the most effective use of local personnel can be made. This allows moving on from the high usage cost and limited capabilities that satellite phones entail.

For example, a pallet of communications equipment could come in a format that is very clearly labeled in terms of what its contents and possible uses are, together with a very simple means of getting started. This could include building a sufficiently robust telephone-like device into the exterior of the packaging, with very clear markings indicating that the first action should be to pick up the telephone and talk to the remote support. This would also require addressing any customs related issues related to the telephone-like device, although this would in itself be aided by its presence, e.g., for facilitating paying of any duties, and negotiating permission for importation, if it had not already been obtained.

That telephone would be satellite-enabled, so that it can operate anywhere without depending on local communications infrastructure. The NGO who supplied it would operate a call-center staffed with experts on the use of the equipment shipped. The telephone would be configured such that it can only call this call-center. The staff at t he call-center would guide the recipient(s) through the use of the equipment in the package.

This might, for example, include unpacking a portable VSAT terminal, and setting it up, so that they can move from the limited and expensive mode of communications that satellite telephones are, onto a more effective and cost-efficient medium, such as satellite internet. This could then allow the local personnel to switch from the satellite telephone to a smart-phone with video calling, thus increasing the level of support that can be provided, an the complexity of the tasks that can be performed by the local staff. This might then lead to a 3rd stage, where they setup a number of WiFi repeaters to provide a larger area with internet access.

This is only one possible example. Such shipments could contain all manner of forms of aid, for example, public health and damage assessment devices and resources, whose use is explained by the expert remote support.

The common thread in all cases, is an effective boot-strapping method, and the careful preparation of the remotely-deploying organizations so that this whole process can proceed smoothly.The requires extensive design and testing, including field testing with representative recipients, so that likely problems can be anticipated, and avoided to the maximum extent possible. Failure modes must be examined and anticipated, so that the remote support personnel are not surprised by common problems, and that both their training and the equipment provide effective means of recovery from such situations. This will also require redundancy of equipment and communications channels.

2) Self-Sufficient: Closely related to the above, such equipment must also be self-sufficient, so far as this is possible, so that it can be usefully applied in the disaster theater [23]–[26]. Ideally the key pair of communications and energy infrastructure independence must be provided, so that the equipment and remotely-delivered support can be effectively used. Self-sufficiency also includes making technologies sufficiently robust, so that they can survive extended periods of use under hostile conditions.

Communications infrastructure independence is commonly provided by means of satellite communications technologies, as terrestrial disasters typically do not disrupt this medium. However, other options may be appropriate, depending on the circumstances. For example, hand-held VHF or portable HF radios might make sense in an area that is known to have robust communications networks based on these technologies. This is also the case where resilience against disasters that might affect the space-segment is required. This might be due to deployment into regions where satellite access is denied, or so restricted as to be de facto denied, e.g., in some war zones [27], [28].

Lower probability risks that are generally applicable are solar flares [29]–[32] and the Kessler Syndrome [33], [34]. However, for most NGOs, these are unlikely to be scenarios for which they plan, or for which they expect that they are events following which they would continue to be able to provide humanitarian aid.

Energy independence is more difficult to achieve. The typical options of solar, battery, fuel-fed generators, wind, manual generation and using existing local energy supplies all have strengths and weaknesses, as we have previously explained [35], [36]:

1) Solar works only during day-time, and is typically greatly compromised during cyclones, when cloud cover may reduce incident light levels to as little as 1% of normal intensity.
2) Batteries are problematic to transport, due to the reluctance of air freight to carry high-capacity lithium or low-cost sealed-lead-acid batteries. Even safer Lithium chemistries are problematic, as international air regulations and aircraft operators typically do not make this distinction [37], [38]. This limits the use of potentially safe Lithium chemistries such as LiFePO4 or LiTi, until these socio-regulatory challenges can be overcome. Lead-based batteries also have weight and longevity problems. This may require reverting to older battery chemistries such as NiMH. While these are inferior to Lithium-based batteries in terms of capacity, weight and energy density, they have the considerable advantage that they are generally unrestricted for transport by air.
3) Fuel-fed generators are also difficult to ship by air. The engine must typically be completely dry, with an official certification that it has been made safe for air transport, e.g., [39]. This requires that local personnel be guided through the process of not only fueling the generator, but also any oil or other fluids the engine requires to safely operate. Some newer fuel-cell units may be able to reduce these problems, but they tend to be very expensive and have limited power output [40], [41]. Also, for most deployments these flammable fluids must also be supplied with the equipment, as a local supply cannot be assumed. This further complicates the freighting of such equipment: Either the fluids are supplied in the same consignment, in which case it is possible that the whole consignment not arrive, or in separate consignments, in which case the generator and fuel may arrive at different places and/or times.
4) Wind generators are typically only effective for a relatively narrow range of wind velocities, and must safely shutdown at other times [42], [43]. Like solar, the energy supply is also highly variable, and may not be available at all, depending on the weather conditions. Also, like solar, because of this, wind generation will almost certainly require some kind of energy storage, typically batteries.
5) Manual generation device, such as pedal generators, have become rather rare due to the alternatives listed above being much more cost-effective, efficient and effective in typical (non-disaster) deployments. However, in a disaster situation, they have the ability to provide a modest energy supply that is totally independent of all supporting infrastructure [44]–[46]. With suitable flywheel sizing and a ready supply of local labor, it is possible to provide such an energy supply on a pseudo-continuous basis, without even requiring batteries.
6) Ability to use local energy supplies where available. While contingencies must be made for when there is no local energy supply, it is also sensible to make provision for when there is. This might take the form of 120V/240V 50/60Hz mains – which may or may not be operating at these nominal voltages and frequencies, and which may brownout, spike and/or blackout at random intervals [47]. It might also take the form of 12V/24V vehicle accessory or battery supply, or local solar installations of almost any voltage and current supply capacity.

A robust system would incorporate multiple forms of energy generation, storage and/or access, and ideally automatically use whatever energy source it was supplied with.

3) Self-Configuring: The concept of self-configuring is not limited to only making effective use of available resources – although this is an important element of it – but rather includes all aspects of operation. In this regard, mobile phones are good examples of this: A simple mobile phone, once provisioned with a SIM card, simply works. That is, no complex support or commissioning is required by the end user.

However, not all systems have been designed or refined to this degree of simplicity or intuitiveness [48]–[50]. For example, IP-based networks contain considerable internal complexity, that is typically not completely concealed from the user/installer. This requires the user/installer to potentially possess considerable expert knowledge, and possess and apply considerable specialized trouble-shooting skills, which may not be available.

A related problem is that of recovering from configuration errors, or equivalently, evolving the configuration of a system to accommodate topology changes, varied usage patterns or other challenges. It is highly desirable if these functions can be performed remotely, so that such systems can be easily installed, monitored and maintained following delivery.

4) Self-Regulating: Finally, such systems should be self-regulating [51]. That is, they should contain the means of self-monitoring, and ensuring that they are and remain appropriately deployed and used. For example, this may include ensuring that an internet connection or satellite phone is not being misused. For a satellite telephone, this could mean restricting it so that only certain telephone numbers can be called. For satellite internet, it may involve quality of service (QoS) management, traffic shaping and the design of the system so that usage cost remain fixed or within certain bounds.

Achieving this may involve measures such as restricted calling plans, the inclusion of GPS or other location tracking capabilities, so that the physical location and use of devices can be monitored, so that sufficient situational awareness can be maintained, with the ultimate objective of ensuring the most effective response possible. This monitoring would be performed by the humanitarian response organization who have supplied the equipment, and who would have ordinarily have injected personnel with it. Care would be required with restricted call-plans to adequately address and socio-political implications that this might introduce, depending on the circumstances.

B. Form of Communications

There are many forms of communications that can be employed in a remotely-supported disaster situation. Many of the issues described above already influence the appropriateness of communications means. A key factor is to address the boot-strap problem, i.e, ensuring that there is a communications means that can be used to access sufficient support so as to boot-strap the next more flexible and/or powerful communications means. Thus in many cases, a chain of communications forms will be required, e.g., satellite phone, BGAN satellite internet terminal, VSAT terminal, Wi-Fi internet distribution.

1) Co-Equality of Humanitarian Requirements and Boot-Strapping: However these chains of technologies should not be chosen in a random or arbitrary manner. Rather, the decomposition of the humanitarian response roles that need to be provided should be the starting point, co-equal with the need to satisfy the boot-strapping problem. This is for the simple reason that there is no point providing a communications suite that is not fit for purpose, or conversely, devising an otherwise suitable communication suite, that cannot be boot-strapped in the field. Thus failure to address either or both of these elements will result in mission failure.

That is, the goal should be to determine the set of communications capabilities required, when in the response process they will be required, and in what quantity. This represents the humanitarian demand part of the equation.

The analysis of feasible boot-strapping sequences forms the technical demand part of the equation, i.e., an understanding of which communications capabilities are required to boot-strap other communications capabilities, and the resources required, both time and materials.

Together, these two sets of data can be used to determine what can (and cannot) be provided, and thus inform the design and contents of a remote-delivered aid package that can support the local provision of the identified set of humanitarian roles.

2) Understanding Communications Requirements: For each role, the particular communications requirements should be determined. Care should be taken to understand what the fundamental communications requirements are for the role, as well as what is required in current practice. The latter is key when designing solutions to be deployed immediately. However, using existing technological solutions may result in substantially higher communications needs than is truly necessary.

For example, many situation awareness tools currently require high-speed internet to function, but the key information to be communicated can be reduced to the point where satellite-based text-messaging is sufficient. This can result in a dramatic reduction in operating cost, e.g., satellite internet charges, as well as hardware, e.g., using a small low-cost satellite short-burst data (SBD) module instead of a BGAN or VSAT terminal, and that can be used with much greater freedom and quantity in the disaster theater, for exactly the same reasons.

Where a significant difference between what current tools and practice requires compared with the assessed fundamental communications requirements, this is an indication that investment in optimized tools and practice may be required, so that those cost savings and mission effectiveness improvements can be realized. Succinct Data and ETC Lali are two examples of such next-generation solutions being designed to dramatically reduce communications costs and technology requirements, and thus result in increased cost and mission effectiveness, and thus scalability.

3) Vendor and Channel Agnosticism: A key trap for humanitarian practice is being trapped into using the products from a single supplier. Past experience has shown that this has the potential to result in increased costs due to monopoly power, and/or the loss of capability if the vendor loses interest in the humanitarian use-case of their product.

For this reasons, systems should be designed to be as open as possible, and with it being as easy as possible to replace or upgrade elements and components of the design. This is especially true for systems intended for use in a disaster, so as to avoid Apollo-13 style problems where the lack of ability to obtain in-situ support endangers life and/or property [52].

IV. Technical Mitigations

In the previous sections we have discussed a number of the factors that should influence the design of remote humanitarian response support systems. We now consider what an example of such a system might look like, and what technological advances might enable the improvement and deployment of such systems. We take a pragmatic view, to focus first on what is deployable today, before considering the medium to long term future options.

If we were to attempt to generalize typical needs for providing remote humanitarian support, we would consider the following set of escalating communications capabilities:

1) The ability to talk by telephone or similar with a remote expert for extended periods of time, up to 1 hour per call.
2) The ability to take photographs and upload them (and other modest sized files) to a remote expert, and to similarly receive and access such materials sent by the remote expert.
3) The ability to create a high-definition video call with a remote expert, with sufficient resolution to enable effective remote support of tasks such as IT support or primary-health care.
4) The ability to access the internet, so as to obtain arbitrary on-line resources.

These capabilities could be provided by a kit that included the following:

1) A satellite phone on an unlimited access plan, but that has a restricted out-bound call list managed by the deploying NGO. This allows the recipient to call as often as they need, and for as long as they need, but not to mis-use it. The deploying NGO could modify the restricted call-list as required, should the need arise to allow calls to other parties, or they could instigate a 3-way call. Ideally, this satellite phone should include GPS tracking capability, so that the location of the device can be monitored.
2) Clear, concise and simple instructional material that instructs the recipient to make a call to the deploying NGO using the above satellite phone.
3) One or more portable BGAN-style satellite internet terminals with built-in traffic shaping and management facilities, so that access to unapproved internet sites or services will first require approval by the deploying NGO's remote expert. This is to prevent excessive usage charges, as BGAN terminals can cost 50 cents per second, when used at full speed. If the deploying NGO has networking experts monitoring these traffic exceptions, they can dynamically manage the rules to ensure mission and cost-effectiveness. These terminals should include pre-configured Wi-Fi capability.
4) One or more smart-phone or tablet devices, with a firmware image that ensures the device is locked down, uses GPS tracking to monitor its location and utilization, and that includes pre-configured video conferencing and file-exchange software, and with all network configuration already in place to enable automatic connection to the BGAN and VSAT terminal equipment.
5) One or more portal VSAT satellite internet terminals, with similar management capabilities as proposed for the BGAN-style terminal(s).

This chain uses the satellite phone as the primary bootstrap, and then enables quickly proceeding to BGAN and/or VSAT internet access, using the satellite phone as the means of receiving support to setup the BGAN, and then using the BGAN and video conferencing capabilities that it and the tablets provide, to help provide the necessary support for remotely establishing and maintaining the lower-cost higher-bandwidth VSAT internet terminal.

In the medium to long term, such a system could be improved by replacing the satellite phone and smart-phone/tablet with a single custom-designed device that includes energy self-sufficiency in the form of a large battery that can run for several days of active use, together with a large high-performance solar panel. Such a device can be readily made to include the location and usage monitoring measured described above. Also, as LEO internet constellations are deployed, such a design could include a terminal module for those, thus allowing access to much lower-cost and higher-bandwidth internet than is currently possible via either BGAN or VSAT.

Such a device should be an open-hardware design, and use commodity processing modules, such as a Raspberry Pi Compute Module, so that the maintenance of the Android mobile operating system need not be undertaken by the deploying organizations. The same approach should be used to create modular communications bays, that expose a flexible interface that can accept a wide range of commodity communications modules from a wide variety of modules. This also allows the device to continuously evolve, and substantially leverage existing economies of scale. Such a device could be manufactured in modest quantities for around US$1,000 – when fitted with satellite text/data and cellular communications modules. That is, it could be both cheaper and more capable as a humanitarian response communications device than an existing satellite phone or smart-phone/tablet [53].

V. Human/Social Mitigations

While the usage plans for the satellite phone, BGAN and VSAT can represent considerable daily expenses for the deploying NGO, this can potentially be offset by the cost savings of not having to deploy staff into the disaster zone, including the logistical costs associated with that. The cost of deploying personnel into a disaster zone can easily cost several hundred dollars per day, thus creating considerable cost savings that can be used to cover the cost of the equipment and associated usage charges. That is, this model of remote humanitarian support need not be more expensive than current practice, and may in fact be more cost effective.

A secondary benefit of this approach is that it results in local personnel being more directly engaged, and gaining technical skills that can be of use to them and their communities into the future. It also helps to build relationships between the humanitarian organizations and the local responders, regardless of their level in local government, local NGOs or otherwise.

This matter of building relationships is not merely incidental: It is a key enabler of effectiveness and success. Especially in smaller Pacific nations, the ability to connect with the correct person, and to be trusted by them to help support them in their functions and responsibilities can have a profound impact on mission effectiveness, and on building capacity and capability in these nations in support of their own self-identified development pathways. Once developed, these relationships have been empirically observed to greatly reduce delays during humanitarian responses, as well as aiding in improving alignment and coordination with the respective government departments.

VI. Conclusion and Future Directions

This paper has briefly explored the challenges and opportunities that COVID19 has created for the humanitarian sector. We have argued in support of the need to adopt a remote humanitarian response model that can continue to provide effective assistance following disasters and other disruptive events. In doing so, we believe that we have demonstrated that this is possible using existing technologies, and that it need not be less effective or more expensive than current approaches.

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