Disaster Response

Nepal Earthquake Response and Recovery Overview

OCTOBER 2015

The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 250 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and Internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai and the Mobile 360 Series conferences.

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This report has benefited from contributions from the respective teams at Ncell, Nepal Telecom, the Nepal Telecommunication Authority and the Emergency Telecommunications Cluster. We also thank Tamer Demir for his insights.

Key resources:
Humanitarian Connectivity Charter
Regulatory Guidelines

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Glossary

ARPU	Average Revenue Per User
BCM	Business Continuity Management
BTS	Base Transceiver Station
CMT	Crisis Management Team
COWs	Cell on Wheels
COLT	Cell on Light Truck
ETC	Emergency Telecommunications Cluster
GSMA	GSM Association
IFRC	International Federation of the Red Cross
MNO	Mobile Network Operator
MOIC	Ministry of Information and Communication
MSB	Swedish Civil Contingencies Agency
NGO	Non-Governmental Organisation
NRRC	Nepal Risk Reduction Consortium
NSET	National Society for Earthquake Technology
NTA	Nepal Telecommunication Authority
NTC	Nepal Telecom
NPR	Nepalese Rupee (1.00 NPR = 0.01 GBP)
SMS	Short Messaging Service
TSF	Telecom Sans Frontiers
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
WFP	World Food Programme

Introduction

On Saturday April 25th 2015, Nepal experienced a 7.8 magnitude earthquake, which impacted millions of people throughout the country. It is now estimated that more than 8,800 people lost their lives and that 2.8 million people require humanitarian assistance as a result of the disaster.[1]

The Kathmandu valley is recognized as one of the most vulnerable areas in the world to earthquakes.[2] Kathmandu itself has regularly been ranked as one of the most vulnerable cities in the world, with both high risk of disaster and high predicted scales of impact. A landlocked country with only one international airport (Tribhuvan International Airport), Nepal faces multiple access challenges. Once inside the country these challenges are not over, with difficult, mountainous terrain and 81% of the population of 23 million people living in rural areas. Many remote villages are accessible only by foot and can take several days to reach.

MAP OF NEPAL

1. UNOCHA 'Nepal Earthquake: Humanitarian Snapshot (as of 07 July 2015)'
2. Global Earthquake Safety Initiative (GESI) Report, GeoHazards International

Access to mobile connectivity has been rapidly increasing in Nepal with mobile penetration estimated at 39%, and a unique subscriber base of 11.2 million.[3] Nepal has an annual subscriber growth rate of 9.3% and an ARPU per subscriber of £3.40.[4] This competitive mobile market has five operators, with the bulk of the market dominated by Mobile Network Operators (MNOs) Ncell (at time of writing, majority owned by TeliaSonera group) and Nepal Telecom (Nepal Doorsanchar company Limited), with 44.2% and 47.3% market share respectively. The remaining market share is held by by Nepal Satellite Telecom, United Telecom and Smart Cell.

The earthquake had a major impact upon the country. The tragic loss of human life and destruction of livelihoods, infrastructure and important environmental and cultural symbols have had profound implications for Nepal. The resilience and solidarity shown in Nepal and in the response around the world have been remarkable. Despite the earthquake presenting a catastrophic large-scale emergency, from a mobile communications and infrastructure perspective, many agree that interruption and destruction could have been much worse, underscoring the need to prepare for worst-case scenarios.

A week prior to the first earthquake, as part of its preparedness work the GSMA Disaster Response programme convened over 70 representatives from Government agencies, Non-governmental Organisations (NGO's), vendors and MNOs from Nepal and overseas. These stakeholders were brought together to share strategies on earthquake resilience and effective partnerships.

The event was intended to highlight where and how MNOs could positively contribute to earthquake preparedness within Nepal, and how they and other organisations can partner together to improve collective resilience. MNOs Ncell, Nepal Telecom and Nepal Satellite Telecom were joined by among others, the Nepal Telecommunication Authority and the National Society for Earthquake Technology, as well as representatives from the Emergency Telecommunications Cluster, National NGOs, and MNOs with earthquake experience from Turkey and the Philippines.

Whilst the proximity of the workshop to the subsequent and almost immediate earthquake meant that there had not been sufficient time to implement many of the actions and recommendations discussed, workshop participants interviewed as part of this assessment highlighted the value in having best practices fresh to mind, and new partnerships having been created or strengthened, enabling a more effective response.

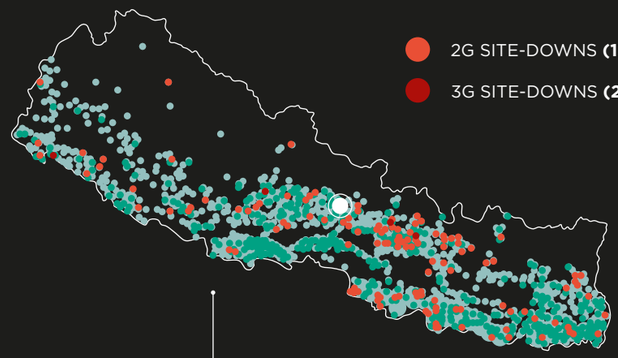
This assessment aims to capture some of the key actions taken by GSMA members and their partners responding to the earthquake. It highlights areas of innovation, identifies challenges and gaps and outlines high-level recommendations from lessons learned in the hope that these will assist other GSMA members in preparing for earthquakes and other emergencies. Mobile Operators in Nepal, and the wider GSMA community know how critical the mobile network can be in an emergency- access to mobile communications can be a lifeline for critical information, reconnecting families and reaching out for help.

Mobile Operators in Nepal, and the wider GSMA community know how critical the mobile network can be in an emergency. Access to mobile communications can be a lifeline for critical information, reconnecting families and reaching out for help.

3. GSMA Intelligence
4. GSMA Intelligence

Timeline of earthquake impact and key MNO activity

Whilst some damage was sustained and this was undoubtedly a challenging and busy time for the MNOs, they coped extremely well and based on predictions, the network was minimally disrupted.



7.8 magnitude earthquake hits Nepal at **11.56am** local time. Powerful aftershocks continue to rock the country.
2G sites down 16.75%
3G sites down 23.23%

April 25th

Ncell:

Crisis team activated

Priority activity: Identifying safety and status of employees

Creation of list of areas in which hospitals and public gathering areas were located. These locations were prioritized for maintenance and continuous network coverage where possible.

20 NPR credit and 50 free SMS added to subscribers accounts to help facilitate communication. SMS provided over additional credit to reduce network congestion, as well as encouraging 'text not talk' through social media

NTC:

Emergency central corporation meeting convened

Provision of free SMS, data, and voice services for following 6 days (Note: Traffic through the network increased by 5 times resulting in high levels of network congestion. Maximum operating capacity required to manage traffic)

Provision of diesel generators to hospitals/government areas to prioritise service restoration

April 26th

MNO recovery teams deployed to affected regions. Data on 2G/3G sites down unavailable due to rapidly changing environment.

NTC & **Ncell** recovery teams deployed to affected regions

Ncell provided Sim cards and credit to some rescue teams and some of the local and foreign broadcasting and news agencies

April 27th

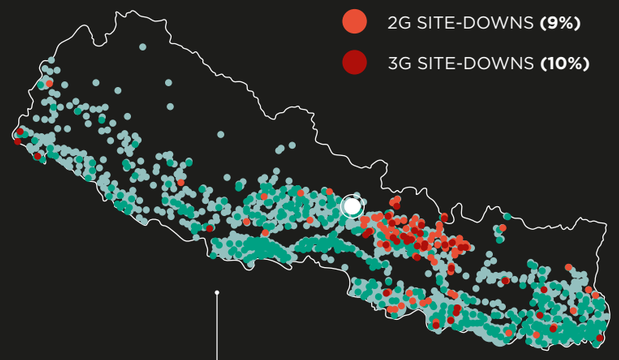
Ncell reports 700-800 (43 – 50 %) cell sites to be malfunctioning or down out of 2600 across the country (Five days before the earthquake, on 20th April, %13 2G and 1% 3G sites were down on a normal operational day.)

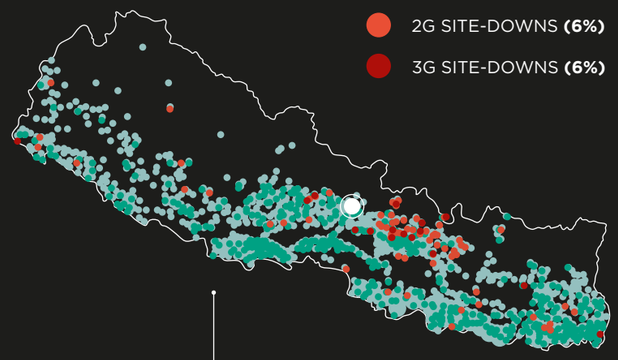
Teliasonera sends a plane with supplies and experts to support recovery efforts

Calls and SMS between many MNOs around the world and Nepal are subsidised or free of charge

Significant numbers of base stations begin to go down 48 hours following the earthquake; (300 down out of 500 in Kathmandu for **NTC**). This is due to lack of commercial power and exhaustion of back up fuel supplies. Commercial power is disrupted both because of damage to power infrastructure and also due to power companies switching off power to reduce danger of fire or injury caused by downed power lines

> "The impact of the earthquake in Nepal has been a human disaster, rather than a technical disaster." (Employee, Mobile Network Operator, Nepal)





April 30th

Ncell:

90% cell sites reported up and running through deployment of mobile generators (217 2G cell sites still reported down)

Continued crediting of accounts for those whose balance drops to less than 10 NPR and provision of free SMS for subscribers

Improvised coverage solutions developed; makeshift Cells On Wheels, essentially pickup trucks loaded with active cell equipment, are driven to areas where rescue workers are based and displaced people are gathering

Except for Ncell Centres at New Baneshwor, Kalanki, Banepa and Gorkha, all Ncell Centres are in operation as of 30th April. Customers have access to emergency services, such as the provision of replacement SIM cards from Ncell centres

NTC:

NTC work with Huawei to distribute portable generators to downed sites

Continue to provide free services to subscribers

TeliaSonera communicates:

"Most of Ncell's mobile network in Nepal is running, although several hundred sites are still having power supply problems. Out of Ncell's 2618 cell sites in Nepal there were problems with approximately 400 on Thursday, compared to 600 on Monday (4 days earlier)"

May 2nd

Ncell:

137 2G sites still down, 33 of them in Kathmandu

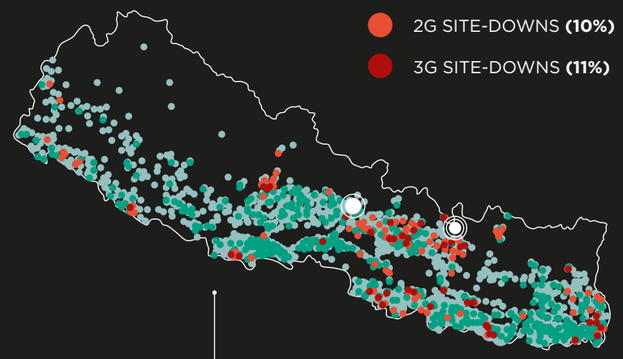
Teliasonera/Ncell cooperate with MSB (Swedish Civil Contingencies Agency) around building assessments of key sites

NTA approves an extra 4 MHz frequency from the EGSM band for both Ncell and **NTC** to operate with during the emergency and to support the fiber communication outages and congestion. This is authorised for one month.

NTC:

Only 40 out of 500 BTS still down in Kathmandu

May 4th



Ncell:

94% of sites restored

NTC:

100 wifi hotspots operated at NTC sites in Kathmandu

Improvised Cell on Wheels (COWS) dispatched to areas very badly affected

Teliasonera provides medical team to support staff/families

May 5th

97% of Ncell sites are operational. Ncell credits a balance of Rs 30 to affected subscribers and ensured 50 SMS to customers in need, in the 13 affected worst districts

May 10th

May 12th

Second major earthquake (**magnitude 7.3**) strikes Nepal

NTC and Ncell must reaccess damage to networks and re-restore previously operational sites

Ncell:

Mobile generators and 8 locally improvised COWs are deployed to 15 worst affected areas as well as immediate technical repairs undertaken to ease communication disruption

May 21th

Ncell:

2G Network 96% restored, having dropped to 90% following the second earthquake on the 12th May, and 94% 3G network restored

As restoration efforts continue for both MNOs, attention also turns to preparing the network for the upcoming monsoon season

CONTACTING NEPAL:

For Nepalese citizens living overseas, being able to contact relatives and loved ones in Nepal would have been a priority following the earthquake on the 25th of April. In response to this a number of MNOs around the world zero-rated calls and SMS to Nepal. A number of over-the-top communications providers, such as WhatsApp and Viber, also provided free services. Whilst these actions reduced the cost barrier of contacting Nepal, reports indicate that they may have unintentionally contributed to an increase in traffic and a resulting congestion overload on the Nepalese gateway.

As best practise, MNOs operating in the affected country could be notified by overseas MNOs or OTTs of the intent to zero-rate or subsidise communications which may impact congestion levels.

Source: Taken from available MNO restoration data. Location data is only visualised when available.

Key lessons and recommendations based on the Nepal Earthquake Experience

Six weeks following the first earthquake, the Head of GSMA's Disaster Response Programme travelled to Nepal to conduct an assessment of what had happened and to capture key lessons for other mobile-industry stakeholders. The focus of this assessment was foremost on the experiences of Ncell, followed by Nepal Telecom, the regulatory body Nepal Telecom Authority (NTA), and humanitarian partners (UN OCHA, Telecom Sans Frontiers, and the Emergency Telecommunications Cluster). Many of the challenges and recommendations identified below are relevant to Mobile Operators and other actors preparing for a diverse set of risks and business-continuity scenarios.

Mobilizing staff after a sudden-onset emergency

One of the first actions taken by MNOs after emergencies is to account for the safety and wellbeing of their staff and then to mobilize those deemed to perform critical functions to report in to their appointed locations. However employees may be affected, traumatised, hurt, out of their normal place of residence or attending to the safety and wellbeing of family and friends. The first earthquake struck at noon on April 25th, a Saturday, when the majority of MNO employees were not in the office and some were out of Kathmandu on holiday.

That so many people were outside buildings and structures on a weekend afternoon potentially lessened the number of those trapped inside collapsed buildings, however the spread and lack of location-based information on staff whereabouts added an additional level of difficultly in accounting for employees and in getting essential staff to where they were needed in an efficient way.

As part of a business continuity and disaster response plan, clear protocols should be established ahead of time so employees know what to do and when in the event of a sudden-onset emergency. Employees should be trained in how to check in and communicate their safety and availability as well as be aware of the primary channel for outreach to staff (i.e. SMS) and the back up methods (satellite phone, physical location rally points, emergency "situation" locations, other). These plans should be practiced and reviewed. Staff should also be aware of their responsibilities and how to follow these protocols if an emergency takes place on a non-work day (weekend or holiday). **Recommended protocols:**

- The crisis management team (CMT) should consist of key executives, essential key supporting players and heads of departments, each with pre-defined roles and responsibilities for implementing the Crisis Management Plan. They should have clear instructions on where to report to, as well as where secondary back up sites are located
- Critical functions should have back up personnel and communication channels identified and well-trialed procedures with clearly defined roles and responsibilities, authorization and decision making authority and escalation points where necessary
- Employees who will need to report to sites should be aware of what identification is required for access and what transportation options are available
- In the event that employees need to report in to work, clarity should be provided around provisions made for their families (i.e. if they need to come in to work, can they bring their families) and a store of emergencyshelter and provisions should be pre-positioned for field staff and critical staff members
- Critical employees need to be well trained and tested in simulation or other exercises to determine their ability to cope in difficult environments - it should not be assumed that because someone is a strong performer in normal circumstances, they will be the most effective in emergency situations
- Equally there should be clear instructions for non-critical staff on how they can contribute during emergencies. This may be in an indirect support role to critical staff but clarity will ensure they don't inadvertently drain resources at these times

Access and guidelines for field staff

Network engineers and other staff deployed to evaluate and restore damaged sites may not have direct-experience working in emergency environments. Whilst they may be able to determine how to fix damaged equipment, they may not be able to evaluate the riskiness of sites to their own personal safety. Relying on a common-sense approach and individual decision-making about what equipment to salvage and what sites to enter is not sufficient. MNOs should have training and guidelines for field-staff to help navigate through these decision-making processes in high-stress environments. Staff pre-identified as field-restoration teams should also have psycho-social training to support their work in emergency zones. This may be an opportunity to draw on expertise from the humanitarian sector where field-staff regularly work in challenging human and environmental conditions.

- Those identified as part of a CMT should be rigorously selected based on: business function, leadership skills, ability to work in high-pressure environments and skill-sets and aware of expectations of the role when activated. There should be a clear hierarchy of decision making as well as deputies identified should the first Point of Contact (PoC) not be available

- The CEO of Ncell was out of country at the time of the earthquake but remained in touch with the Ncell team. Whilst the CEO retained a leadership role, the deputy was granted the local execution rights two hours after the disaster. Such contingencies and delegation plans should be considered.

- Some challenges were identified around the coordination, approvals and enforcement of interconnection capacity across networks. Ncell increased their interconnection capacity but this was not mirrored across other MNOs due to a number of challenges. Pre-planning of such requirements should be outlined and agreed by stakeholders ahead of time, including relevant Ministries and authorities and all MNOs operational in-country

- Some sites that required helicopter access to service remained down for days due to a lack of access to helicopters. Authorities should ensure that they create a level playing field for all MNOs in-country in terms of the resources and access provided, or risk creating an uneven response capacity with a knock on impact for subscribers. In these cases there should be no differentiation in assistance provided to service providers. The governmental capability should be provided to sector players with non-discrimination and with public safety at the fore.

- The use of location-based services (such as that used in Turkey)[5] and CDR analysis may be a useful tool in emergency situations to help inform the whereabouts of staff and assist rescue services

- Where external resources (vendors, Group/industry personnel, experts) are needed in-country to support the response, clear communication, expectations and facilitation should be undertaken and any immigration requirements should be addressed beforehand as part of the planning process

- Practice and testing through simulation is key. It is extremely challenging to translate BCM and disaster management plans on paper to reality in a sudden-onset emergency, however trialing a number of scenarios and bringing partners together under pressurized situations can help identify gaps and reinforce processes

Pre-determined critical sites and Identification of New Priority Sites

Mobile Network Operators will recover sites based on a variety of criteria including accessibility, feasibility, transportation options (both for equipment and personnel), equipment availability, population density and humanitarian need. Following the earthquake, mobile operators focused on ensuring that search and rescue teams had access to the network and that hospitals and key government sites were able to communicate. However, an assessment of vulnerable sites likely to be impacted which was undertaken before the earthquake was not reflective of those sites damaged during the earthquake, underscoring the need for accurate real-time data gathering and decision-making informed by on the ground situational awareness.

Assessments of overall network functionality and site operations can be gleaned from the Network Operations Centre (NOC) (assuming that it has not been impacted), however this may not provide a full picture of the extent of damage or the restoration actions necessary, which can only be done following an on-site assessment of the BTS and other equipment. Equally key network facilities (such as the NOC) should be put through simulation tests both to help controllers understand how information will be presented in various scenarios and how it can be best interpreted to the reality on the ground. This will also help the controllers to tune the NOC systems to make sure the most important information is highlighted and that

5. GSMA report: 'Preparing for Disaster: An Analysis of Turkcell's Disaster Management System'

"noise" is correctly filtered (e.g. when elements of the network are affected this could lead to a "storm" of alerts, which could obscure other critical information).

Additionally, whilst damage to core network infrastructure may not have occurred, commercial power outages or a lack of fuel/battery back up may interrupt the functioning of a site. In Nepal, after the first EQ, for Ncell 220 sites were initially offline, however after the first 24 hours elapsed, this rose to 600+ due to the exhaustion of back-up power supplies, the failure of the grid and the lack of diesel/transport and access. Mobile networks to a degree can only be as resilient as the networks they themselves depend upon. The earthquake affected 14 districts out of 75 across Kathmandu Valley and to the East and West of the country. In some instances, local teams or MNO employees in affected areas would be pressured by the populations to restore service which was then passed to head-quarters, however this is not the most effective way of prioritising decisions.

In order for mobile operators to understand which sites to prioritize, a pre-determined list of critical sites (i.e. hospitals, key government facilities, humanitarian staging areas, pre-identified evacuation/gathering hubs) should be researched, identified and provided **ahead of time**

Prioritization Decisions on Site Recovery for affected population **during an emergency** - there should be key focal points and communication flow plans established between concerned government agencies (for example Ministries of Communication or telecom regulatory bodies), mobile operators and humanitarian agencies to identify areas where affected populations are in order to prioritize restoration of mobile services to those sites where possible

Interdependencies: Key to any effective response is identifying the MNOs interdependencies:

- In large scale disaster scenarios the importance of cascading business continuity plans (BCP) which extend throughout the supply chain e.g. utilities (especially power), fuel distribution, transport services, etc. is key to improving restoration time. For example if the restoration metric for the MNO is 12 hours but the restoration metric for grid power is not matched and/or fuel supply lead times are longer this in effect will void the MNOs restoration efforts.
- As mentioned above mobile networks are dependent on commercial power suppliers so MNO / power supplier BCPs need to be aligned to improve restoration and ongoing service availability. Whilst MNOs can provide short term power generation for key equipment support, the longer this needs to be supported gives rise to a number of difficulties, including fuel supply, battery weight, cost, etc.
- Whilst internal MNO BCPs focus on internal roles, responsibilities and direct dependencies in scenarios of national disasters this has to be aligned with government and NGO plans e.g. Single points of contacts, roles, responsibilities and communication across MNOs Government Ministries, Regulatory Bodies and NGOs
- MNOs are also highly dependent on equipment and systems vendors, so it is key that these vendors have plans in place which meet the requirements of the MNO BCPs e.g. vendors having local in country agents and equipment inventories and staff expertise.

Procurement, Emergency Approvals and Customs

Mobile Operators in Nepal faced challenges getting equipment into the country following the earthquake. Whilst most agree that mobile networks are critical infrastructure, a "green-channel" to expedite vital equipment may not be provided, leading to delays in restoration. Many different players may be involved in decision making (for example the Telecom Regulators, Government Ministries). In an ideal scenario, many of the key pieces of equipment would be in country and pre-positioned for emergency as part of a disaster response and business continuity plan. For Ncell, a direct channel of communication with the Chairman of the NTA

allowed for quick decision making and approvals where appropriate for emergency actions, such as boosting network capacity in some instances, with formalized processes such as lengthy paper work being postponed until after the situation had normalised. This common-sense and collaborative approach has been identified as enabling a more swift response by both parties.[6]

Suppliers, vendors and other partners should be aware of expectations, priorities, and procedures. However, disasters and their impacts can be unpredictable, and the level of preparedness varies from operator to market. Many different parties may be involved in the procurement process to support an emergency response both within an operator and within government. There may be processes that are appropriate for day-to-day situations, however these cannot be assumed to be sufficient for a disaster situation. Having business-units input into a list of pre-defined back-up and key equipment, where inventory exists (in MNO warehouses, in-country through vendor or other supplier, in another country and where, who the vendors are, what the timeframes for delivery are and contingency plans are) can then be passed on to relevant government ministries, regulatory bodies and customs authorities for pre-approval and fast-tracking under defined emergency circumstances. This can help expedite the delivery of critical equipment to support restoration efforts, ultimately enabling a faster normalization of operations.

Additionally, identifying new/non-traditional partners for improving transport and access should be considered. Where an international response is activated and mobile networks are declared as priority infrastructure, identifying where and under what circumstances water and air transport assets (for example boats, helicopters etc. held by members of the humanitarian community or logistics experts) should be further explored. Whilst informants from Nepal Telecom highlighted that bridge and road infrastructure in the country were largely unharmed, the threat of landslides and the natural geography of getting to remote areas in non-emergency times present unique challenges. Delays in accessing these types of transportation options has been cited in emergencies such as Nepal and the Philippines as leading to delays in restoring services.

Top-Management Buy-in, Approvals and Financing

It is recognized that every dollar invested in preparedness saves 7 dollars in response spending.[7] However, making the case for investing and planning for disasters can be difficult. How do you plan for the unexpected? While you may be aware of the risks and vulnerabilities, many natural disasters are sudden-onset and can have varying degrees of severity and impact. With a focus on short-term revenue generation and investment in new technologies to provide optimum consumer experience, departments within MNOs tasked to develop disaster preparedness and response plans may be faced with difficulties when trying to unlock the funds (also the higher the degree of resilience the more exponential costs become as they often include a high level of redundancy and excess capacity) to support these plans. Without Executive and Finance Committee buy-in, it will be difficult for these teams to make the improvements and investments required to build up resiliency. Whilst the trend has been to under-invest in BCM and DR, as soon as disaster does strike, a peak of financing and investment tends to flow for a period immediately after, where many of those steps that could have protected operations, revenue and staff could have been done ahead of time.

Flexible and Clear Regulatory Environment

As previously noted, a number of regulatory issues can be faced during a response. The GSMA Disaster Response Team held a regulatory round-table with MNOs, ISP's and the telecoms regulator the week prior to the earthquake to discuss areas of priority and concern- at that time, there was not yet a set of agreed guidelines for mobile operators outlining parameters around disaster preparedness and response, however NTA was soliciting input and developing these guidelines. In the absence of clear rules and guidelines, questions around boosting capacity,

6. http://www.gsma.com/mobilefordevelopment/industry-position-emergency-telecoms-regulation
7. UNDP 'Act now, save later' http://www.undp.org/content/undp/en/home/ourwork/get_involved/ActNow.html

temporary special authorizations (for example for siting or spectrum), import of equipment, re-activation of suspended accounts or free/subsidized services) can take time due to bureaucracy or confusion. Fortunately, in the case of the Nepal earthquake, following global best-practice advice, the NTA and its Chairman provided a direct line to MNO leadership whereby temporary authorization and permissions were given over the phone to enable quick action, with paperwork and formalities done post-fact.

COMMUNICATING WITH CUSTOMERS

Communicating with customers during disasters is an important element role for MNOs. However there are a number of key best practices which should be observed.

- Customer advisories should be pre-agreed between government, MNOs and NGOs on preparing a communication plan (i.e. what to expect, closing apps to reduce pressure on battery, back up charger, storing key phone numbers, making use of relevant informational services, etc.)
- Although of limited use in earthquakes, early warning systems will help prepare populations for foreseeable disasters, which will require predefined mechanisms for message delivery and content accreditation
- Advisories on network restoration updates and MNO emergency services available to subscribers keep affected populations informed. Information shared via social media accounts on Twitter and Facebook by the Nepalese MNOs helped to maintain transparency and keep subscribers up to date

Congestion management

High levels of network congestion can be experienced following disaster events as large numbers of people attempt to communicate with one another. This can be compounded if the network has been damaged and capacity reduced. As well as the technical management of network congestion, a number of subscriber facing actions can assist;

- Advocating ‘text not talk’ campaigns can help raise awareness of congestion among subscribers, which if successful can both reduce network congestion as well as increase subscribers chances of effectively communicating. MNOs Smart Communications and Globe Telecom in the Philippines have both run successful campaigns of this nature.
- Balancing the demand for free or subsidized top-up and services with expected impact upon network congestion e.g. giving subscribers unfettered voice calls for free will inevitably drive up usage beyond normal capacity planning levels leading to higher levels of congestion on the network. – this needs to be communicated clearly to subscribers
- Use of data based voice “messaging” such as NTT DoCoMo, emergency messaging service. As data transmission does not need to be real-time it means messages can be delivered as when resources on the network are available.

Nepal response case studies

Emergency top-up vs network congestion

Ncell and NTC took different approaches to the provision of free or subsidized services in the wake of the earthquake. Whilst Ncell made provision for customers with low balances to receive regular credit top ups during the days and weeks following the earthquake, NTC opted to zero-rate all services. This resulted in NTC experiencing 5 times the usual levels of traffic, and needing to operate at full capacity to try and manage network congestion. Whilst Ncell suffered network congestion due to the nature of the event, levels were controlled. The difference in the provision of these services exposed both MNOs to subscriber backlash. In an ideal situation MNOs would adopt a unified market approach to such actions. The demand for such services need to be balanced with the ability to manage resulting congestion levels and quality of service.

Innovation and creativity

In recognition of the risks posed by earthquakes in Nepal, NCell had identified a need to procure and pre-position back-up equipment such as COW's (Cell-on-wheels) and COLT's (Cell-on-lite-transport). However there had not been time to implement this plan at the time of the earthquake and as such, did not have access to any COWs or COLTs when disaster-struck. Nepal Telecom had 13, however continuous diesel was a challenge, and getting them to the locations where they were most needed was difficult due to a) access to helicopters/transport in remote areas and b) swift receipt of information about areas to prioritize for their deployment. Nepal Telecom was able to deploy warehoused equipment planned for their future network rollout as well. Ncell, to meet this gap, relied on the innovation of key team members to re-purpose active equipment, which was then placed on the back of pick-up trucks, creating 9 ad-hoc home-grown deployed COWs while they awaited the delivery of other back-up equipment.

Coordination between mnos and existing or new partners

Within Nepal, a local Emergency Telecommunications Cluster (ETC) Working Group had been established and was running in the country prior to the earthquake. Mobile Operators, the World Food Programme (WFP) and the Ministry of Information and Communication (MOIC) (co-leads) participated in addition to other NGOs. The ETC also activates at the global level as part of the UN Cluster system in the case of L3 emergencies (the global humanitarian system's classification for the response to the most severe, large-scale humanitarian

crises). This too is co-chaired by the WFP and the MOIC in Nepal. That there was already an existing ETC group within Nepal, with familiarity between the main participants, was very positive. The ETC took part in the GSMA preparedness event in the week prior to the earthquake, again with positive implications for the following response. The levels of coordination between the ETC and the MNOs meant that a number of issues were dealt with rapidly, from support for MNO building assessments, as well as the provision by Ncell of free connectivity for humanitarian workers at the Ncell offices. Where local ETC WG's exist, it is important that MNOs participate and can be a productive forum for the prevention of duplication, information sharing and collaboration. On the Part of the ETC, clear protocols should be in place to ensure that immediately following disaster, whilst a decision is made on whether to activate the global cluster cell, a clear decision making and information process is in place for local / national partners. Clear expectations and roles should be set at the local level as well as with the global cluster, to ensure that those on the ground locally can take decisions swiftly and act while international colleagues are travelling into the zone. Another challenge is to ensure that at national and regional levels of Government there is an understanding of both the ETC and of the connected roles and responsibilities for relevant government personnel.

Case study: flowminder

Flowminder.org, a non-profit organization based in Sweden, pioneered the analysis of mobile network data to support responses to natural disasters and epidemics. Shortly before the earthquake on the 25th of April, Flowminder and Ncell announced a partnership to establish how this same method could be used to analyse population movement in Nepal. When the earthquake struck, Flowminder and Ncell were able to quickly work together, developing national mobility estimates for Nepal in an effort to assist government and UN agencies in the earthquake relief efforts.

Population movement estimates are calculated by combining de-identified data on SIM card movements with available population data. Changes in mobility pattern are identified by comparing SIM card movements before and after the earthquake to normal pre-earthquake movements. The results are visual population flows across the country, initially showing an exodus from Kathmandu city and the most affected regions.

Greater insight into mobility flows can help organisations working on the ground more accurately coordinate relief and recovery efforts. Having already agreed on the partnership ahead of the earthquake, Flowminder were able to work with Ncell quickly to analyse the data and provide insight on population movements in Nepal, highlighting the benefit of defining and establishing partnerships in advance of crisis and emergency situations.

TSF and assessments of the future?

Telecom San Frontier (TSF) is an international NGO with a focus on telecommunications. The key responsibilities of TSF are;

1. Provision of telecommunications and Internet support to first responders such as search-and-rescue teams, local governments, NGOs, and UN agencies
2. Conduct free-calling programs for cut-off populations and refugee camps
3. Participation in assessments of the telecommunications infrastructure in conjunction with local MNOs, GSMA, and the UN's UNDAC teams

TSF works to provide service only where local MNOs do not have a network, or where the network is temporarily unavailable. When commercial service becomes available in an area, TSF withdraws. TSF's ability to accurately understand where commercial service is available, and where it is not available, therefore is critical to its effectiveness and efficiency.

When MNOs agree to share information on network status with TSG, through the GSMA, TSF is able to target the right communities, and ensure it does not provide service where commercial service is available. This means TSF can do its job better, and avoid overlap with commercial services. Following the earthquake in Nepal, based on information provided by local MNOs and the GSMA, TSF first-hand assessments, and interviews with the population, TSF chose villages where commercial service was disrupted and deployed teams to each location. Here the TSF teams conducted free calling operations with satellite equipment and conducted needs assessments.

As part of their deployment, TSF teams visit many remote areas, cut-off communities, and temporary camps throughout an emergency area, where they gather information about damage, casualties, and network availability. In the future, if MNOs explain what information they need, TSF may be able to gather information in the field and report it back to the MNOs. For example, TSF could add questions to its assessment questionnaire about coverage for individual MNOs, signal strength, or even, with the right applications loaded on phones, which frequency bands or towers are visible in different locations in an emergency.

There is potential for this type of mutually beneficial information exchange to form the basis of future recovery and response assessments.

The need for simulations

Simulations are a critical part of preparedness planning. These exercises should access whether business continuity or emergency response plans that have been prepared are effective and fit for purpose. Simulations allow these plans to be tested in a secure and safe environment, to both identify gaps in planning and test the 'human element'; that those individuals who carry responsibility in these plans understand their role. Simulations can be as simple as table-top exercises involving an individual team discussing what their actions would be in response to a certain set of scenarios. A slightly more time consuming but detailed exercise may take the form of a technical simulation where certain conditions are generated for a group to rectify. A simulation could also be as complex as a practical, real time, multi-agency, multi-MNO exercise spanning a number of days.

Each method has its benefits and restrictions, and whilst none may fully prepare staff for the experience of a real emergency, a combination of simulations conducted at regular intervals will at least have provided a framework for response. Multi-agency simulations, whilst more time consuming and costly have the added benefit of establishing how different organisations respond in emergencies and will provide greater insight into how these organisations need to coordinate their plans. Simulations can also be held with little or no notice for the staff involved, to more accurately evaluate response under pressured environments.

Following simulation exercises a full debrief should be conducted to ensure that any outcomes can be incorporated into plans, or additional focus given to elements such as staff training. It is important to remember that the development of business continuity and emergency response planning should be an agile process, constantly evolving. These plans should be revaluated and tested through simulation when the risk levels or business environment changes, as well as following critical personnel change within the organisation. It is critical that once developed, business continuity and emergency response plans remain a key business resource, actively tested and updated.

Secondary Challenges

Although the acute response and recovery period may be over and a transition back to "business as usual" underway, mobile operators and other actors may encounter unexpected or "secondary" challenges. These can take many forms, for example reputational or public-relations issues or on-going technical or maintenance requirements. In the case of Nepal, two primary "second-wave" challenges have emerged for mobile operators.

Community fear and perceptions around mobile infrastructure

In Nepal, over 95% of BTS are located on top of buildings and may range on average from 15-35 meters. Most often, batteries and other key equipment will be located on rooftops with the BTS, but occasionally batteries may be on the ground with connecting cables running to the BTS. These buildings can range from commercial properties, personal residences or basic adobo structures. Whilst efforts have been made both by MNOs and other authorities to adhere to building codes, Nepal as a whole has very vulnerable buildings and dwellings with the National Society for Earthquake Technology having estimated that up to 60% of building could have been destroyed in an earthquake of the magnitude experienced on the 25th of April. Following the earthquake, fears ran high about building collapse, and members of the community began demanding that MNOs remove BTS from buildings where they had lease-agreement sites, believing that the BTS might contribute to building damage or collapse in the event of aftershocks or another quake. These requests escalated to the point of members of the public protesting at MNO HQ and to the regulator, and in some cases, dismantling or interfering with equipment leading to service interruptions. The Association of Civil and Structural Engineers of Nepal was assigned to assess the integrity of the sites with the hopes of identifying those vulnerable requiring dismantling and those that were safe. At the time of writing, MNOs and the NTA were determining the best course of action, however re-siting of sites on sound structures is extremely costly, and reputational damage from community misperception remain key concerns.

Equipment Shelters

An additional challenge has been to re-house relocated sites and equipment to protect them from the elements. A number of pre-fabricated shelters were owned by the MNOs, but in many cases tents have had to be used as an immediate fix. Durable solutions were required over the following 2 – 4 months to ensure equipment was properly protected from wind and rain as more permanent structures can be built. These shelters need to be temperature controlled, with the equipment, including the batteries, requiring cool temperatures to operate in. The need here was critical as the monsoon season in Nepal falls between June and August. It was never anticipated that such a great number of emergency shelters would be required, and both NTC have worked with vendor Huawei to explore temporary solutions as well as purchasing additional shelters from India. With the monsoon has come the risk of flooding and landslides, both potentially causing damage to infrastructure and reducing access to sites still in need of restoration.

Conclusions

PLANNING FOR THE NEXT DISASTER; KEY QUESTIONS:

- How can MNOs and local and global Emergency Telecoms response groups, for example TSF or the ETC, coordinate ahead of time and in emergencies?
- How can Governments, the Humanitarian community and MNOs come together ahead of time to build consensus around issues of prioritization?
- How can regulators and other relevant authority's best ensure and enforce a level-playing field for MNOs responding to crisis?
- What models of pre-agreements around flexible spectrum in emergency exist and how should they be structured for efficiency?
- How can business continuity plans be created to be disaster focused and agile enough to enable them to be useful for unpredictable events?

Preparing for the Unpredictable

In Nepal, the mobile network infrastructure faced limited damage from the earthquake itself. Rather, a combination of interrupted power supply, human capacity limitations and process challenges contributed to failures across the chain where they occurred. Despite the diversity of obstacles and dependencies, mobile operators demonstrated an impressive capacity to adapt, innovate and create solutions to ensure that their customers and those supporting the humanitarian response were able to communicate.

Even the best prepared organisations can be adversely impacted by natural disasters, many of which by their nature, are unpredictable. It is difficult to ascertain exactly when the next earthquake might strike, or what the strength and path of a cyclone or typhoon may be. In some cases, this ambiguity can be a barrier to actions and investments that support resilience and preparedness. Balancing the allocation of financial, human and infrastructural resources against the likelihood, timing and level of impact is not straightforward, and each Mobile Operator may take different decisions based on a mix of geographic, regulatory and commercial factors. However in all cases, key to building resilience is a comprehensive awareness of risks, vulnerabilities and dependencies accompanied by clear plans that are practiced to mitigate these. Mobile networks are not an island and as they become increasingly critical to relief and recovery efforts for those impacted, new models of coordination and collaboration must be developed. There is an opportunity for the wider mobile industry and other concerned partners to learn from the successes and challenges that have emerged from the earthquake in Nepal and consider these against existing preparedness plans. While no two natural disasters will be the same, there are common lessons and actions that if adopted by the mobile industry, will lead to a more effective and efficient response when the next one strikes.

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