

# **Agile Competencies for Humanitarian Response Operations: Four Cases From Indian Subcontinent**

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*The purpose of this paper is to explore and identify competencies associated with supply chain agility during humanitarian response operations. The response operations under investigation was for disasters with sudden onsets such as cyclones and floods that typically affect islands and coastal regions. Using a case-based research method, we collected data from response operations of four cyclone / flood events. Multiple data collection methods such as semi-structured interviews, participant observation, and archival data was used to triangulate evidence. Analysis of the data revealed specific competencies associated with visibility, reactivity, velocity, volume flexibility, and delivery flexibility. A framework of competencies associated with supply chain agility was developed as part of this research.*

*Keywords: supply chain agility, agile competencies, humanitarian response, disaster management, case based research*

## **INTRODUCTION**

Humanitarian response is the most time-critical phase of disaster management operations wherein a large number of resources need to be activated and deployed in a very narrow time window. This is evident from the slope of the curve in the resource-time graph (Balci & Beamon, 2008), wherein the curve is steepest during the response phase. One peculiar feature of the response phase is its agile character that encompasses dynamic capabilities such as flexibility and responsiveness (Charles et al, 2010). But how do these capabilities manifest in real humanitarian response operations? What are the implications for humanitarian organizations in order to put these competencies in action? Lack of empirical research on the ‘what’ and ‘how’ aspects humanitarian response operations puts practitioners at a disadvantage. Despite being a time-critical activity, there isn’t much documented evidence from real-life operations on the physical manifestation of agile capabilities during the response phase. A recent state-of-the-art review paper (Gupta et al., 2016) that mapped the field of disaster management lists ‘response operations’ as an area which is under-researched as compared to other phases of disaster management such as preparatory phase or post-disaster recovery phase. This paper aims to address this gap through exploratory case-based research.

According to EM-DAT database of the Centre for Research on the Epidemiology of Disasters, water based disasters (storms and floods) accounted for the highest impact and economic damage of all disasters during 1995-2015 (CRED, 2015). From a theoretical standpoint, hurricanes and floods are classified as the most difficult (Apte et al., 2016) of all types of disasters (refer Figure 1) due to how quickly they evolve (Wassenhove, 2006) and the dispersed geographies such as coastal belts and islands, that they affect. Hence,

we carefully sample four case-studies to investigate agility of humanitarian operations during the response phase, which we define as our unit of analysis.

**FIGURE 1**  
**OPERATIONAL COMPLEXITY OF DISASTERS**

<b>Slow Onset Dispersed</b>	<b>Sudden Onset Dispersed</b>
<i>Climate Crisis</i>	<i>Hurricane</i>
<b>Slow Onset Localized</b>	<b>Sudden Onset Localized</b>
<i>Famine</i>	<i>Earthquake</i>

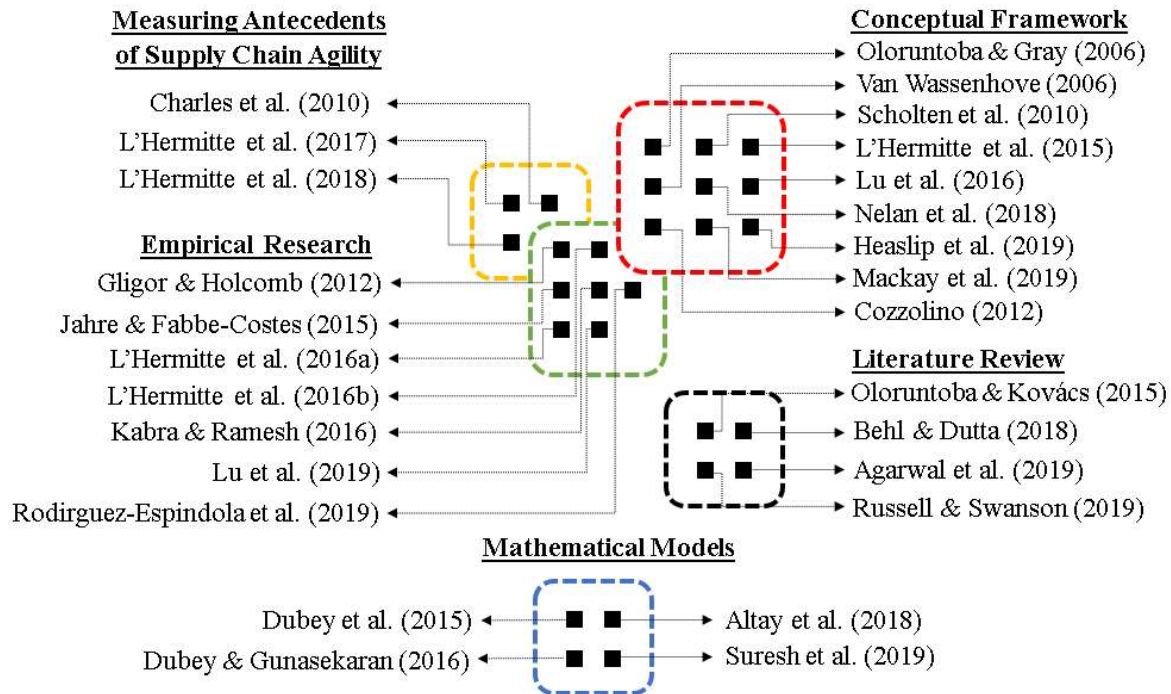
## LITERATURE REVIEW

We undertook a systematic review of research papers. Using EBSCO, Google Scholar, and research databases such as Scopus, and Web of Science, we identified papers under the sub-themes *Humanitarian Operations* and *Supply Chain Agility* (SCA) that were published during 2001-2019.

In the course of our review of literature, we identified scholarly articles on conceptual frameworks for agility (Li et al., 2008), measurement systems and scales (van Hoek et al., 2001, Swafford et al., 2006; Gligor et al., 2013) modeling agility of supply chains (Agarwal et al., 2007), relationships between agility, firm competencies and performance (Blome et al., 2013; Yang, 2014; Yusuf et al., 2014; Eckstein et al., 2015; Gligor et al., 2015; Chan et al., 2017; Roscoe et al., 2019), and, empirical investigations on agility in commercial contexts (Tse et al. 2016; Dubey et al., 2018).

Literature on humanitarian operations was found to be spread over varied sub-themes such as conceptual frameworks (Apte, 2010; Cozzolino, 2012; Jabbour et al., 2017), theory review and development (Kovács & Spens, 2011; Abidi et al., 2014; Goldschmidt & Kumar, 2016; Banomyong et al., 2017), planning and preparedness (Kunz et al., 2014; Perry, 2007), OR models (Altay & Green, 2006; Holguín-Veras et al., 2013; Ransikarbum & Mason, 2016), network design & analysis (Ahmadi et al., 2015; Tofighi et al., 2016), facility location (Balcik & Beamon, 2008; Boonmee et al., 2017), inventory management (Beamon & Kotleba, 2006), logistics and fleet management (Gatignon et al., 2010; Holguín-Veras et al., 2012), servitization (Heaslip, 2013), skills and performance measurement (Beamon & Balcik, 2008; Kovács & Tatham, 2010; Dubey et al., 2015), critical success factors (Pettit & Beresford, 2009), coordination and partnerships (Pettit & Beresford, 2005; Wassenhove, 2006; Tomasini & Van Wassenhove, 2009; Tatham & Kovács, 2010), empirical studies (Pedraza-Martinez et al., 2011), issues and challenges (Day et al., 2012; John & Ramesh, 2012; Pedraza-Martinez & Van Wassenhove, 2012;). However, discounting few exceptions, these papers largely focused on post-disaster recovery or pre-disaster preparedness. Empirical evidence was scarce for the ‘agile - response phase’ of disasters. In Figure 2, we present the intersection of literature on ‘Humanitarian Operations’ and ‘Supply Chain Agility’ that is of interest to use, classified into sub-themes.

**FIGURE 2**  
**INTERSECTION OF LITERATURE ON HUMANITARIAN OPERATIONS AND SUPPLY CHAIN AGILITY**



With reference to the unit of analysis, investigations on agility of response operations during water based disasters, which has a high global impact, as was referred to in the introductory section, is rather limited. In this research, we aim to plug this gap, and therefore state the following research question:

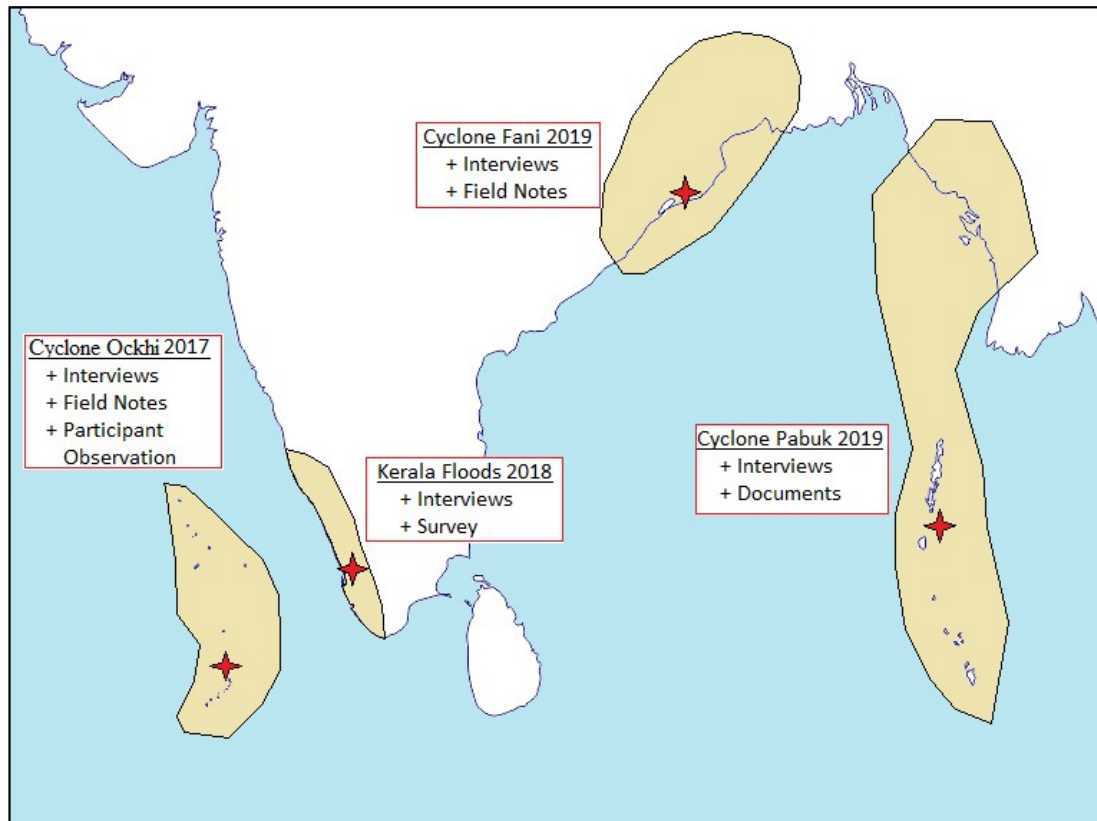
**RQ:** *What are the organizational competencies associated with agile capabilities of humanitarian response? How do these capabilities manifest in real-life response operations?*

## METHODOLOGY

Following the recommendation of Meredith (1998), Edmondson & McManus (2007), we use empirical case-studies and field research for this exploratory study. In the early stages of this study, we validated this topic as a potential area of research with practitioners during Humanitarian Assistance and Disaster Relief (HADR) meetings and conferences. As part of the research work, we covered four cases: (1) Cyclone Ockhi, (2) Kerala Floods, (3) Cylone Pabuk, (4) Cylone Fani, and collected data using qualitative techniques (Glaser & Strauss, 1967). Multiple data collection methods (Eisenhardt, 1989) such as semi-structured interviews, participant observation, and archival data was used to triangulate evidence. The case locations and types of data collected are represented in Figure 3. We conducted 142 interviews with personnel involved in disaster response operations from December 2017 to Nov 2019. On an average, an interview took about 45 minutes. The brief profile of respondents and the interview questions are included in the Appendix. Multiple project associates were involved in the data collection and coding process. We followed strict protocols for data collection and storage recommended (Eisenhardt, 1989) such as: (1) following the 24-hour rule, compiling the interview notes within a day of the interview, (2) daily debrief sessions, and cross-referencing notes, and (3) refining the questions for next round of interviews. The data was coded concurrently with reference to the SCA construct under investigation. The process of humanitarian response operations was developed from the case data. For generalizability and replicability of logic, data was

compared across cases for SCA capabilities. A framework capturing managerial implications for each SCA capability was developed. The implications from this research for humanitarian response organizations was discussed with practitioners.

**FIGURE 3**  
**CASE LOCATIONS AND TYPE OF DATA COLLECTED**



### CASE DESCRIPTIONS & ANALYSIS

In this section, we provide brief descriptions for each case (refer Boxes 1-4) and cross-case analysis. Detailed case descriptions for each case, and a ‘Teaching Case study’ of distribution operations (John et al., 2020) are available from the corresponding author.

**BOX 1**  
**CYCLONE OCKHI (2017)**

Cyclone Ockhi developed as a Category-3 hurricane in the Northern Indian Ocean (Arabian Sea) basin in early December 2017. Predictions by meteorological department on the development of depression to a cyclone was inaccurate. Evacuation efforts suffered delays due to ineffective dissemination of information to the public, inadequate in-station logistical support in Lakshadweep, and coastal belt of south Kerala. During the cyclone, telecom infra was damaged in Lakshadweep islands severing communication networks. The distribution of relief material suffered shortcomings due to the following reasons: One, vessels had to be rerouted from hubs as far as Mumbai port resulting in delays. Two, inadequacy of cyclone resilient infrastructure that could be quickly activated to act as relief distribution centers. Three, due to problems in forecasting, and dependence from mainland, supplies weren't pre-stocked in islands for local distribution. Four, insufficient last-mile transport for ferrying relief materials between islands with shallow drafts. Five, local forces faced difficulties in evaluating response scenarios, as they weren't trained to handle disaster-specific operations. Ockhi caused \$ 5 billion in economic damages, with 245 casualties and 661 people missing.

**BOX 2**  
**KERALA FLOODS (2018)**

Kerala Floods in August 2018 was the most severe of all floods that hit the state in a 100 years. In first week of August 2018, Indian Meteorological Department (IMD) had issued warnings (Orange Alert on Aug 6, and Red Alert on Aug 8) of extremely heavy rains for the second week in Kerala. However, state officials were expecting a tapering of southwest monsoons, and kept dam reservoirs full, at almost 90% capacity for electricity generation and irrigation. But, in the second week of August, the state received almost 3.5 times normal rainfall. The gates of 34 major dams in the state were opened, amid fears of water spilling over and structural integrity of the dams, resulting in flashfloods and a state-wide deluge.

The flood response operations were delayed. According to survey of 1997 households in North Paravur, only 53% of the residents reported of having received assistance for early evacuation. Logistical infrastructure for the evacuation was deficient. The state government did not have any helicopters or sufficient number of motorboats for response in inundated regions. Deployment of 40 choppers from other locations by the union government suffered time lags. However, the local fishermen community partially covered the missing last-mile connect by taking out 650 fishing boats for the rescue and relief efforts. Community volunteers and youth organizations set-up ad-hoc technology based platforms to track and coordinate supply-demand of relief materials. However, activation of distribution centers in several inundated regions faced problems due to issues of logistical access, and intermodal transfer that was necessary. Some flexibility in sourcing materials was possible due to arrangement with multiple suppliers that were connected via different access routes. The Kerala Floods of 2018 also raised concerns on competencies of local forces to respond to such events. It caused \$ 5.3 billion in economic damages, and claimed 483 lives.

**BOX 3**  
**CYCLONE PABUK (2019)**

Cyclone Pabuk hit Andaman and Nicobar Islands (A&N) on 6<sup>th</sup> January, 2019. After 2005 Tsunami, Disaster Management Authority (DMA) had instituted protocol for disaster response. Based on cyclone forecast from IMD, INCOIS and JTWC, on 4<sup>th</sup> January SMS alerts were issued to 70% of island residents through BSNL, and 2 NDRF battalions were airlifted from the mainland. DMA coordinated with local response teams from A&N Administration, Police Force, Fire & Rescue Services, Public Works Department (PWD), Motor Transport Department (MTD), Directorate of Shipping Services (DSS), Health Department etc., who used to do disaster simulations & drills periodically, and competent to execute. Communication was centrally coordinated by DMA using satellite phones in 40 islands. The police force led the evacuation operations in high risk zones, low lying areas and isolated islands. For this, they requisitioned transport from MTD and DSS. A fleet of 284 vehicles were kept on standby by MTD for deployment in larger islands. The DSS redeployed its fleet of boats and amphibious transport for evacuation operations. ‘*Apada Mitra*’ – a Volunteer Disaster Response Force developed over the years by DMA coordinated community level activities by deploying a group of 200 trained volunteers at each *taluk* (community) level. Distribution centers were activated and had supplies pre-stocked for 2-3 weeks without need to depend on mainland. Stocks of medicines for preventive, clinical and emergency care were available for 3 months. Cyclone Pabuk caused \$150 million of economic damage. There were no casualties reported in A&N.

**BOX 4**  
**CYCLONE FANI (2019)**

Cyclone Fani in May 2019, was the strongest Category-4 event that hit coastal Odisha since the super-cyclone of 1999 that claimed over ten thousand lives. However, significant improvement in response efforts limited the fatality associated with Fani to 64, although the economic damage was of the order of \$ 8 billion. Based on alerts from IMD, information about trajectory, timing and intensity of landfall was disseminated to people regions at least 2-3 days prior to the event. Over 65% of people were evacuated from high risk, low lying coastal zones at least a day before the landfall. 45 police platoons, 23 National Disaster Response Force (NDRF) teams, 9 Odisha Disaster Rapid Action Force (ODRAF) teams, 52 Fire Service Units, 50 Public Work Department (PWD) teams with 300 vehicles, 450 JCB excavators and heavy machinery, 25 rural development teams and 45 medical teams were pre-positioned in state for the disaster response effort. The government coordinated the evacuation effort based on pre-defined logistical arrangements using: (a) govt. vehicles, (b) private vehicles on lease. Ships and aircrafts were pre-positioned by the navy in the nearby bases for rescue and relief operations. The state government also readied 300 motor boats and 2 helicopters at field stations to meet the logistical requirements in coastal areas. Patient loads in hospitals were reconfigured, to meet exigencies during cyclone response. The cyclone lasted for 3 hours on May 3<sup>rd</sup>, 2018. People were evacuated to 60 shelter homes (schools, auditoriums and community halls that were cyclone resilient) were supplied food and essentials for 7 days. “Free kitchens” set up by the district administration provided cooked food for a period of 15 days. For *Cyclone Fani*, reduction in human casualty by 99% as compared to previous cyclone of such magnitude was a high point.

Charles et al. (2010) defines SCA along the dimensions of Flexibility, Responsiveness and Effectiveness. The sub-components of each of these dimensions of SCA capabilities and their characteristics are listed in Table 1.

**TABLE 1**  
**SCA CAPABILITIES AND CHARACTERISTICS**

<i>SCA Capability</i>	<i>Characterized by</i>	<i>Reference</i>
<b><i>Flexibility</i></b>		
<i>Volume Flexibility</i>	Ability to change level of aggregated output	(Slack, 2005)
<i>Delivery Flexibility</i>	Ability to change planned / assumed delivery dates	(Slack, 2005)
<i>Mix Flexibility</i>	Ability to change range of products made / delivered	(Slack, 2005)
<i>Product Flexibility</i>	Ability to introduce novel products	(Slack, 2005)
<b><i>Responsiveness</i></b>		
<i>Visibility</i>	Ability to track entities transiting the supply chain	(Francis, 2008)
<i>Reactivity</i>	Ability to evaluate, take needs into account quickly	Kisperska - Moron et al. (2009)
<i>Velocity</i>	Ability to cover needs quickly	Van Hoek et al. (2001)
<b><i>Effectiveness</i></b>		
<i>Reliability</i>	Ability to deliver correct product to user in correct time, place, condition, packaging, and records	(Supply Chain Council, 2006)
<i>Completeness</i>	Ability to realize the goals	Okongwu et al. (2008)

Using the case data and coded transcripts, we identified how SCA capabilities were associated with case interventions. The evidence of interventions (or lack thereof) that contributed to, responsiveness, flexibility and effectiveness and mapped in Tables 2, 3 and 4 respectively. It may be noted that select statements representative of each case were included in the table, the essence of which were often conveyed or repeated by other respondents as we reached theoretical saturation in due course of the field work.

**TABLE 2**  
**RESPONSIVENESS DIMENSION – EVIDENCE**

<b><i>Visibility</i></b>	<p><i>“All response units were connected from the Control Room. Response leads in other islands were connect by satellite sets” – DMA (Cyclone Pabuk)</i></p> <p><i>“Information on cyclone trajectory, time of landfall, and intensity were provided in advance to 70% of population by SMS alerts” – AGM, BSNL (Pabuk)</i></p> <p><i>“The precautionary safety measures to be taken during cyclone, provided by the district administration were broadcasted periodically” – All India Radio (Fani)</i></p> <p><i>“Communication to inundated zones in Pathanamthitta and Idukki districts were stalled due to network failure. We didn’t know their specific requirements for packing relief materials” – Community Volunteer (Kerala Floods)</i></p> <p><i>“After the cyclone landfall in Lakshadweep, only one telecom network was functioning with limited connectivity.” – Island resident (Ockhi volunteer)</i></p>
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<b>Reactivity</b>	<p>“After 2005 Tsunami, with the competency upgrades, and periodic drills, local forces in A&amp;N are perhaps most prepared in the country for handling any exigencies” – Director of Shipping Services (Pabuk)</p> <p>“The fishermen community are used to working in high risk environments. Their skills to respond in such scenarios was reflected in their performance during rescue and distribution of relief supplies.” – Police (Kerala Floods)</p> <p>“Disaster specific training should be imparted for forces stationed in the islands. Community involvement will lead to better response.” – Naval Officer (Ockhi)</p> <p>“We have one of the largest locally trained reserve force - ODRAF [Odisha Disaster Rapid Action Force] in the country. Investment in training and logistics have reaped dividends. We have come a long way since super-cyclone of 1999.” – Dy. Superintendent of Police, Puri (Fani)</p> <p>“When our logistics are handled by volunteers from retail firms, with knowledge of logistics such as for home deliveries, our delivery performance is better. But personnel with such skills are not easy to come by during the crisis situation” - DC Coordinator (Kerala Floods)</p>
<b>Velocity</b>	<p>“45 police platoons, 23 National Disaster Response Force (NDRF) teams, 9 Odisha Disaster Rapid Action Force (ODRAF) teams, 52 Fire Service Units, 50 Public Work Department (PWD) teams with 300 vehicles, 450 JCB excavators and heavy machinery, 25 rural development teams and 45 medical teams were pre-positioned in state for the disaster response effort.” – District Admin (Fani)</p> <p>“The state had no helicopters and inadequate number of boats necessary for the distribution of relief materials” – Community Leader (Kerala Floods)</p> <p>“Vessels had to be re-routed from mainland for disaster response. For logistics between islands, we require boats with low drafts.” – Naval Officer (Ockhi)</p> <p>“Two helicopters and 300 motorboats were positioned to cover logistical requirements in coastal areas” – Dy. District Collector, Puri (Fani)</p> <p>“The integrated Defense Staff command that is strategically located in Andaman Islands, which houses the army, navy, and air force, swift military intervention during extreme hurricanes is therefore possible.” – MMD, Andaman (Pabuk)</p>

**TABLE 3**  
**FLEXIBILITY DIMENSION – EVIDENCE**

<b>Volume Flexibility</b>	<p>“Small volume of materials were coming to the distribution center on the first day of operations. But we had to ramp up to a few hundred tons of output in a few days.” – Coordinator (Kerala Floods)</p> <p>“Arrangements were made by the district administration with Food Corporation of India to source supplies for the shelter homes during crisis.” – Representative of Odisha Weaver’s Association (Volunteer for Cyclone Fani)</p> <p>“Food supplies was sourced from alternate suppliers with access from northern side, as eastern side was cut off due to inundation.” – NGO (Kerala Floods)</p> <p>“Food and essentials were pre-stocked and available for 2-3 weeks without having to depend on supplies from mainland.” – DMA (Cyclone Pabuk)</p>
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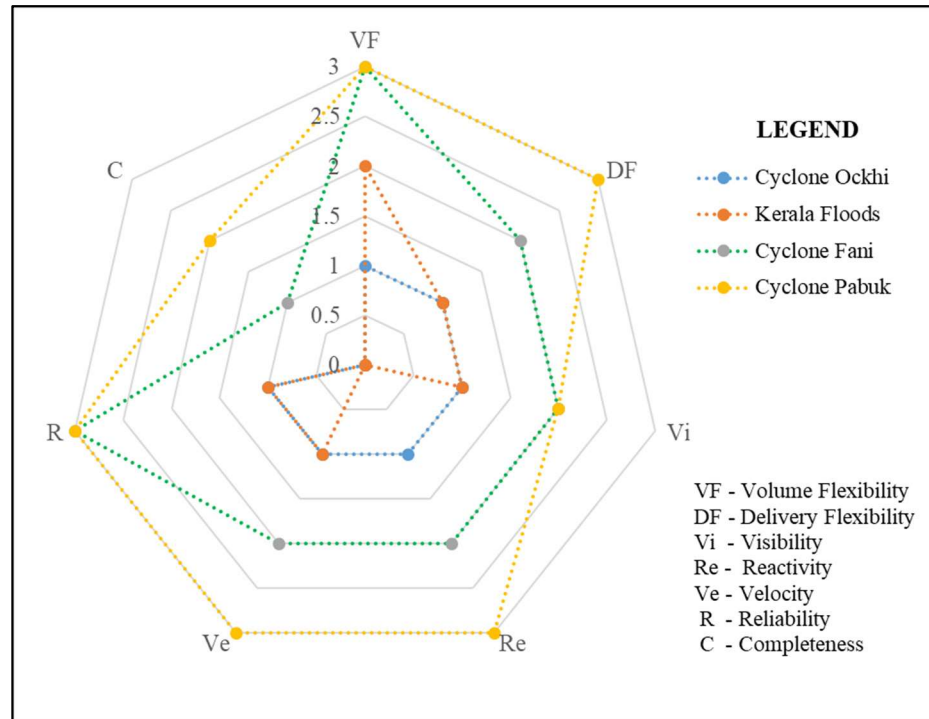
<b>Delivery Flexibility</b>	<p>“Inadequacy of small boats with low draft requirements affected last-mile connect &amp; distribution of materials to different islands.” – Naval Officer (Ockhi)</p> <p>“Intermodal transfer was a problem. Truck with relief supplies were stuck due to floods. The fishermen community pitched in, taking out their boats for distribution of the relief material in inundated regions.” – Police (Kerala Floods)</p> <p>“Based on risk assessment, A&amp;N were divided into zones with earmarked shelter and distribution facilities for residents.” – PWD (Pabuk)</p> <p>“The stocks required were available, but we have to improve our distribution mechanism for accommodating dynamic requests.” – Volunteer (Fani)</p>
<b>Mix Flexibility</b>	<p>“We supplied full packs to inundated zones where communication was cut off, but to other locations such as relief camps, we packed relief materials based on specific requirements that were raised” – Community Leader (Kerala Floods)</p>
<b>Product Flexibility</b>	<p>[No information was captured on new products during the response from cases]</p>

**TABLE 4**  
**EFFECTIVENESS DIMENSION – EVIDENCE**

<b>Reliability</b>	<p>“This was a new disaster. We were not prepared.” – Police (Kerala Floods)</p> <p>“The forces stationed in the islands had limited competencies in tackling such events. We had to send in experts to handle the situation.” – Navy (Ockhi)</p> <p>“We have disaster management protocols that are reviewed and upgraded from time to time.” – Doctor, GB Pant Hospital, A&amp;N (Pabuk)</p>
<b>Completeness</b>	<p>“Demand from relief camps could be only partially covered in time” – Academic (Kerala Floods)</p> <p>“A&amp;N islands are fully prepared to meet disaster exigencies, without having to depend on mainland supplies. All needs were covered.” – DMA (Pabuk)</p> <p>“Access to islands, and logistical issues caused time delays” – Navy (Ockhi) “Most of the demand from shelter homes could be covered. There were temporary shortages for certain items, but we recovered from these issues quickly.” – Rest House Manager, Puri (Fani)</p>

Based on agility measurement metrics (Charles et al., 2010) we evaluated the cases to determine SCA capability levels that were demonstrable from the case data. The components of agile capabilities that were replicable across cases based on evidence are presented in Figure 4. It may be noted that evidence for mix-flexibility and product-flexibility was not observed across cases, and not included. Cyclones Fani and Pabuk loaded higher on the flexibility, responsiveness and effectiveness dimensions. Despite being a cyclone of much higher intensity, casualties from Cyclone Fani was lesser than during Cyclone Ockhi and Kerala Floods.

**FIGURE 4  
CROSS CASE COMPARISON**



**DISCUSSION**

SCA is an important element of humanitarian response operations. This is evident from cross-case comparison and the differential performance in cases based on the agile capabilities. However, it would be of interest to practitioners and humanitarian organizations what infrastructure, equipments, processes or systemic competencies contribute to specific agile capabilities? For instance, what are the implications for organizations to improve supply chain visibility or volume flexibility? For this, we analyze the data from the cases, and present our findings that are generalizable across cases in Table 5. It may be noted that the effectiveness dimension has components of reliability and completeness. From our observation of the interpretation of definitions of these components (Charles et al., 2010), capabilities in the effectiveness dimension have an indirect bearing on flexibility and responsiveness dimension. Hence, to avoid repetition, we limit the framework of competencies to the dimensions of flexibility and responsiveness.

**TABLE 5  
FRAMEWORK OF COMPETENCIES CONTRIBUTING TO SCA**

<i>SCA Capability</i>	<i>Contributed by</i>
<i>Visibility</i>	Accurate forecasting & information dissemination Integrated communication systems network Resilience of communications network and devices Data democratization involving multiple stakeholders Infrastructure to access, track and store real-time data

<i>Reactivity</i>	Simulations and mock-drills conducted periodically Disaster specific training for local / in-station forces Learning curve from experiences of previous events Partnerships between response force and community
<i>Velocity</i>	Logistical resources for last-mile connectivity Integrated multi-modal transport network Less org. hierarchies enabling quick decision making Pre-agreements on public-private resource utilization In-station logistics positioned in-situ before disaster
<i>Volume Flexibility</i>	Earmarked cyclone resilient infrastructure for zones Logistical access and ease of activation of DCs Multi-supplier agreements for network redundancy Flexible production systems to ramp up volume
<i>Delivery Flexibility</i>	Fleet Management and route optimization expertise Skills for distribution in high risk environment System controls for delivery transfers in distribution Unique modes of transport for last-mile connectivity

This research, to the best of our knowledge, is the first to map specific competencies to SCA capabilities. However, there are some limitations of this study. Although mix-flexibility was observed in specific case scenarios, it could not be generalized. Future research studies may consider contribution of mix and product flexibility in the context of humanitarian response operations. Similarly, during analysis of case data, we observed possible inter-relationships between dimensional capabilities of SCA. In an extension of this work, we plan to study the interdimensional relationships between SCA capabilities. Further confirmatory studies may also be undertaken using quantitative data to analyze effect of SCA capability on performance of humanitarian response. While this study, analyzes disasters with sudden onsets such as cyclones and floods affecting dispersed geographies, future studies can validate the implications of agility disaster response for other events such as earthquakes or volcanic eruptions.

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**APPENDIX A**  
**BASE QUESTIONNAIRE USED FOR SEMI-STRUCTURED INTERVIEWS**

I. Event Description

- Can you describe the recent cyclone/ flood that affected your area?
- What were the actions taken during the early phase of the operations?
- How were you / your organization involved?

II. Information Management

- Did you receive early warning signal?
- How long before landfall did you receive the warning?
- What were the sources / channels or through which early warning was disseminated?
- Was the early warning effective? Did it reach the end user?
- What were the details you received as part of the early warning?

III. Evacuation and Logistics

- Can you describe the evacuation process? How was it carried out? Localities evacuated?
- What was the transportation mechanism? Type of vehicles used?
- Were there enough number of vehicles? Who owned / operated these vehicles?
- Were government vehicles sufficient for evacuation? Were additional vehicles / private arrangements needed?
- Were there any partnership agreements for evacuation operations

IV. Shelter Homes & Distribution Mechanism

- Where were the evacuated people sheltered? How was setting up of shelter homes decided?
- What were the supplies provided as part of relief requirements for shelter homes?
- How was the distribution of supplies done?
- Were there any problems in stock levels, inventory management and distribution process?
- What were the level of preparedness for emergency items such as medical supplies, health & sanitation kits?

V. Systemic Competencies

- How was the communications visibility (information access & sharing between stakeholders) during disaster?
- Was it possible to accurately evaluate the needs during disaster?
- How did you manage the volume requirements, and delivery of relief materials during response phase?
- Were there any challenges for last mile delivery? Or ramping up volume of relief material?
- What was the size and type of vehicles available in the locally positioned fleet?

VI. Partnerships and Training

- What is the type and level of disaster that you / your organization can handle?
- Do you have any partnerships with stakeholders (government, NGOs, private org., community volunteers)?
- What is your preparation and training to respond to disasters? How do you organize it?
- What are the different skills required to respond to different types and intensities of disasters?
- Do you have a mechanism to measure and differentiate the skills required response operations?
- Can you reflect on the assessment and response operations during the recent cyclone/ flood?
- How would you evaluate the operations? What are the areas for improvement?



**APPENDIX B**  
**BRIEF PROFILE OF INTERVIEWEES**

Cyclone Ockhi (Lakshadweep) – 35 Interviews					Kerala Floods – 34 Interviews				
#	Interviewee - Organization	SL	ML	JL	#	Interviewee - Organization	SL	ML	JL
1	Naval Officer	3	8	1	1	Community Leaders		8	
2	Communications Engineer			1	2	Doordarshan (National TV) Office			1
3	Engineer - Logistics			1	3	Fire & Rescue Department		3	2
4	Deepwater Divers			2	4	Hospital Administration	2	3	
5	Island – Resident Volunteers			2	5	Police Department	2	2	1
6	Army Medic			2	6	Meteorological Department	1		
7	Laboratory Specialist			1	7	Educational Institution		1	
8	NDRF Officer			2	8	District Administration	1	1	2
9	Meteorological Department			2	9	NGO	1		1
10	Fire & Rescue Department		1		10	Distribution Center Coordinator	2		
11	Coastal Police		1						
12	Coast Guard Officer			1					
13	Navy Meteorology Department			1					
14	NGO Coordinator		1						
15	Govt. Hospital Administrator		1						
16	Drone Service Provider		1						
17	Private Meteorological Agency		1						
18	State Informatics Center		1						
19	Civil Surgeon	1							
Cyclone Fani (Odisha) – 43 Interviews					Cyclone Pabuk (Andaman) – 30 Interviews				
#	Interviewee - Organization	SL	ML	JL	#	Interviewee - Organization	SL	ML	JL
1	District Administration	2	1		1	Disaster Management Authority		2	
2	Police Department	3	1	4	2	Police Department	1	1	
3	Private Transport Agency		4		3	Communications Officer	2	1	
4	Odisha Tourism Department		1		4	Tourism Department		3	
5	All India Radio	1			5	Public Works Department		3	
6	Doordarshan (National TV)		1		6	Motor Transport Department	3		
7	Odisha Weavers Association		1		7	Electricity Dept. (Utilities)		2	
8	Railway Station Officer		1		8	Ambulatory Services		1	
9	Railway Police			2	9	Doctors / Hospital Managers	1		
10	Doctors / Hospital Managers	2	3		10	Fisheries Dept.	1		
11	Fire Station		2		11	Mercantile Marine Dept.	1		
12	Community Parish Priest, Puri	1			12	District Control Room		1	
13	Hotel / Rest-House Manager	1	3		13	Harbor Works Dept.		1	
14	Communications Officer		1		14	Hotel & Transport Agency		1	1
15	Driver			1	15	Fire Station	1	1	1
16	IT Professional		1		16	Directorate of Shipping Services	1		
17	Retail Business		3						
18	Medical Store / Pharmacist	1	2						

*Note:* The aggregated list of persons interviewed for the research study is represented in the table above, categorized on the basis of the organization they represent and their position in the organization [SL – Sr. Level, ML – Middle Level, JL – Operational or Junior Level].