

Strengthening Disaster Risk Reduction
Across the Americas Summit -
Simulated Exercise Engineering
Report

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OGC Engineering Report

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Chapter 1. Summary

Disasters are responsible for major socioeconomic damages. Global initiatives call for the improvement of information technology infrastructure to better share data and advance multinational collaboration.

The *"Strengthening Disaster Risk Reduction Across the Americas: A Regional Summit on the Contributions of Earth Observations"* held on September 3-8 in 2017 in Buenos Aires, Argentina strengthened the collective ability to share the many challenges of disaster risk reduction in Latin America and the Caribbean (LAC) while promoting the awareness and better use of earth observations (EO).

A simulation exercise took place during the summit. The exercise brought together government, emergency managers, earth observation data providers, academics, non-governmental organizations, and commercial companies. The participants assessed the capabilities and needs of policymakers, regional and on-the-ground decision makers, and learned what information products can be produced, and when and how such products are available.

This ER describes the description and results of the simulated scenario including the post-exercise activity that captured the lessons learned from the participants.

1.1. Key Findings

The overall evaluation results from the exercise confirmed that the following objectives were met.

- Demonstrate how the international EO community can support emergency management, response, and disaster risk reduction by providing timely, actionable, and relevant products and tools to improve decision making.
- Foster collaboration and learning between all stakeholders.
- Simulate a disaster scenario to test participants' ability to adapt to rapidly changing conditions.

Most of the participants were satisfied with the exercise, found it helpful for identifying areas of collaboration, and found that the exercise demonstrated how EO data sources support Emergency Managers and other groups in Disaster Risk Deduction.

About 130 persons participated in the scenario. The exercise developed well, with the initial chaos expected due to the nature and method employed for the exercise, where groups had to find a way to organize themselves. Participants suggested the need to advance better collaboration and communication mechanisms and better discovery and access of data.

1.2. Importance of this work for Working Group, OGC, and the Community?

The Emergency & Disaster Management Domain Working Group (DWG) can use the approach described in this report to foster collaboration across different stakeholders, identify gaps in data, and assess particular interfaces and encodings.

A simulation exercise will also benefit other OGC Working Groups. Development of stories and a detailed list of events to exercise a technology will allow the community to better understand the potential and gaps in capabilities being exercised. Most of the OGC Innovation Program (IP) initiatives use a "scenario" approach to drive a solution or demonstrate the work done in the initiative. The structure of the simulated scenario presented in this report can be useful for plugfests and hackathons.

Organizations involved in disaster risk reduction can take the lessons learned from this report and improve their processes, data, and materials to advance collaboration among stakeholders.

1.3. OGC Next Steps

The Evaluations Sections ([Evaluation of the Exercise by Participants](#) and [Evaluation of the Exercise by Sector](#)) provide recommendations from the participants about next steps. Participants suggested the need to advance better collaboration and communication mechanisms and better discovery and access of data.

OGC as a lead consortium can help advance these ideas by:

- Publishing this report as a Public Engineering Report that will be accessible to anyone in the world;
- Presenting the findings of this report in the Emergency & Disaster Management DWG;
- Developing the idea of a pilot to better advance the discovery and access of data when a disaster occurs; and
- Running and supporting future exercises to further advance cross-collaboration among communities involved in disaster preparation and response.

1.4. Document Contributor Contact Points

All questions regarding this document should be directed to the editor or the contributors:

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1.5. Foreword

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Chapter 2. Overview

Disasters are responsible for major socioeconomic damages. In 1970, the Huascarán disaster in Peru killed 20,000 people. Annual losses in Venezuela due to landslides are estimated at US\$ 62 Million. In Colombia in 1985, el Nevado del Ruiz erupted and triggered a catastrophic debris and mudflow killing more than 22,000 people and causing US\$ 339 million in property damages. Most recently in April 2017 in Mocoa, Colombia, a high-intensity rainfall event triggered mudflows killing more than 300 people.

The United Nations (UN) Sendai Framework for Disaster Risk Reduction (UN-SDR) 2015-2030, the UN Sustainable Development Goals (SDGs), and the Group on Earth Observations (GEO) advance the ability to share data rapidly, to produce indicators, and to improve collaboration to manage disasters. The three initiatives provide goals, priorities, guidance, data, and best practices for sharing information designed to reduce disaster risk, loss of lives, and damage to infrastructure. Since disasters in Latin America and the Caribbean (LAC) often affect multiple countries, these initiatives foster multinational cooperation that can improve the disaster response capabilities in a region.

The "Strengthening Disaster Risk Reduction Across the Americas: A Regional Summit on the Contributions of Earth Observations" held September 3-8 in 2017 in Buenos Aires, Argentina strengthened the collective ability to share the many challenges of disaster risk reduction in LAC while promoting the awareness and better use of earth observations. Bringing together disaster data providers with end users/practitioners helped identify best practices and information needs between stakeholders on both the provider and user side.

The Summit was co-organized by the NASA Applied Sciences Disasters Program, Comisión Nacional de Actividades Espaciales (CONAE), Committee on Earth Observation Satellites (CEOS), Group on Earth Observations (GEO), Global Flood Partnership (GFP), and the Open Geospatial Consortium (OGC).

During the Summit a simulated disaster management exercise took place that evaluated and validated the collaboration of organizations in the region to support Disaster Risk Reduction. It engaged all participants through two fictional scenarios including pre-event monitoring and preparedness, early warning and initial response, and recovery and restoration.

The objectives of the exercise were to:

- Demonstrate how the international EO community can support emergency management, response and disaster risk reduction by providing timely, actionable and relevant products and tools to improve decision making;
- Foster collaboration and learning between all stakeholders; and
- Simulate a disaster scenario to test participants' ability to adapt to rapidly changing conditions.

Stakeholders from the following groups participated in the exercise: government, emergency managers, earth observation data providers, academics, non-governmental organizations, and commercial companies. Each participant had the opportunity to experience the unique role each group plays, discover interdependencies, test collaboration, validate assumptions, and expose gaps.

The scenarios provided were relevant to regional interest, requiring global to local responses. Two scenarios were exercised. The first one was related to storm landfall and flooding. The second one was based on a volcanic eruption, landslide, and related cascading events. The exercise brought together Earth Observation (EO) data providers and end users, and helped identify the available data needs, shortcomings, and gaps.

Chapter 3. Evaluation of the Exercise by Participants

Participants were provided with a survey at the end of the exercise to provide feedback on the overall exercise. The analysis of the results are provided in this section.

3.1. Question 1 - Usefulness of Products

Q1: The products demonstrated in this exercise would be useful during an actual disaster.

Most of the participants responded agree that the data products shared during the exercise were useful. The section that provides information about sector reports (see Section *Evaluation of the Exercise by Sector*) and the injects discussion (See appendix [Injects](#)) reflect this conclusion.

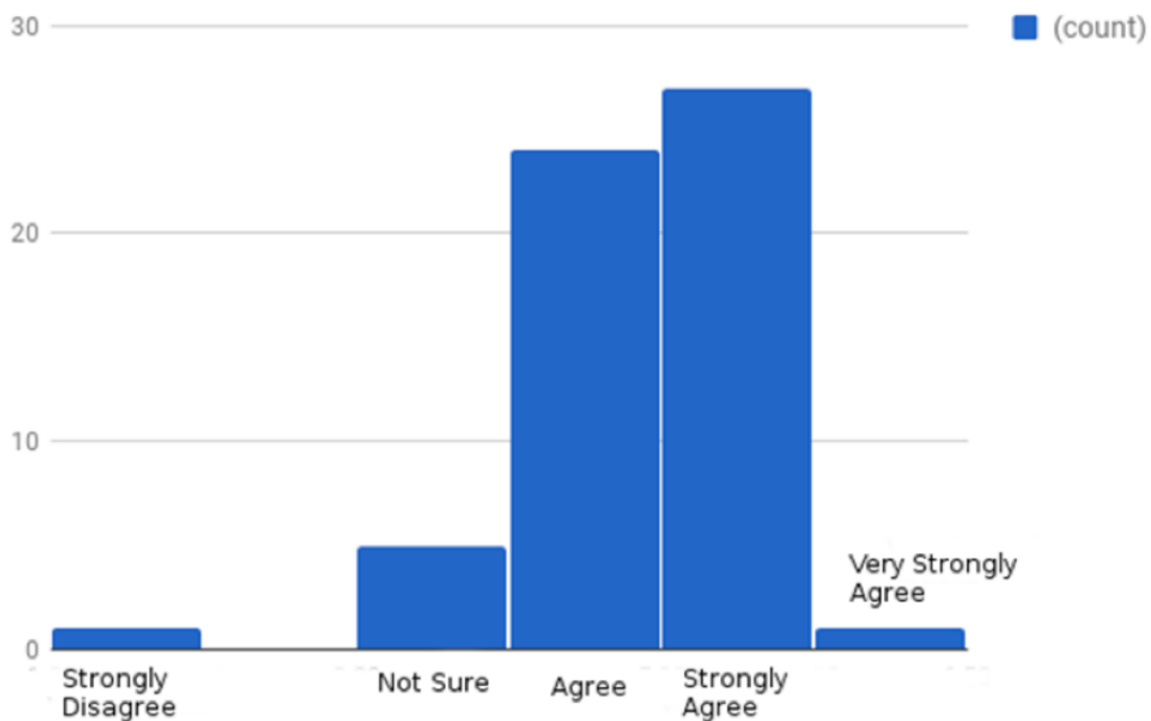


Figure 1. TitleImage

3.2. Question 2 - Collaboration

Q2. The exercise was helpful in identifying areas of collaboration between agencies during a disaster.

More than 80% of the participants indicated that the exercise was helpful in identifying areas of collaboration. Question 3 provided more details about the areas of collaboration that need to be advanced.

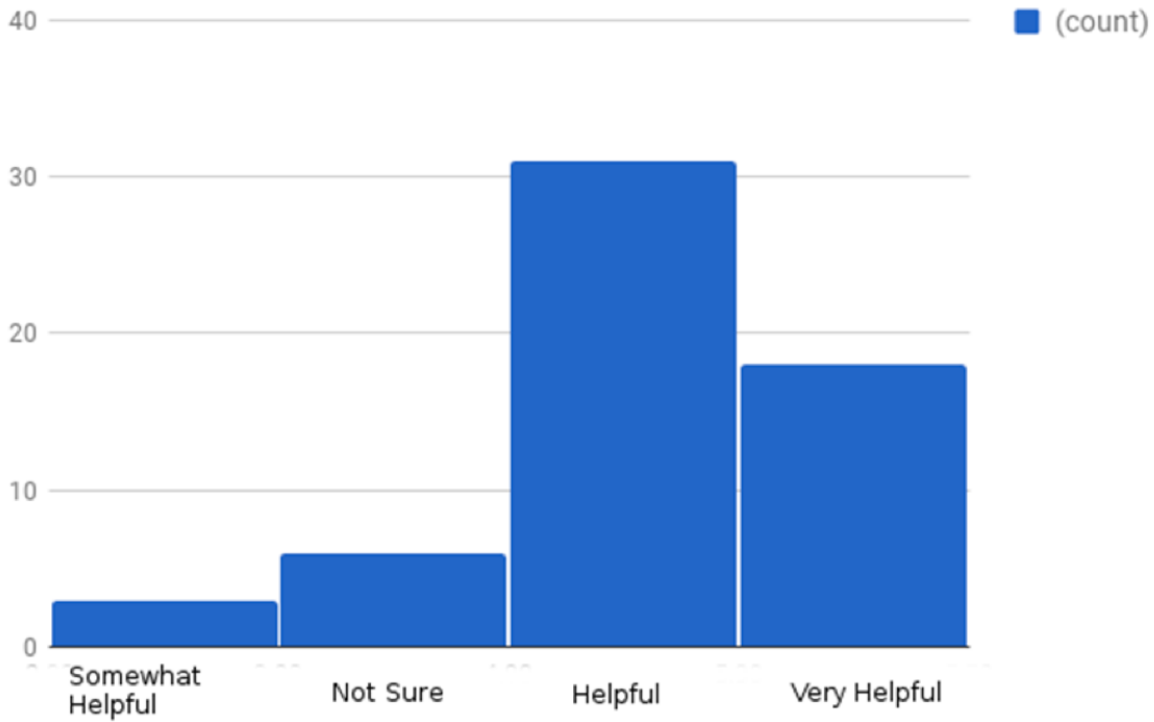


Figure 2. Q2 Responses

3.3. Question 3 - Addition Needs

Q3. What additional information or support would help your agency access and use Earth Observations during a disaster?

Twenty three participants responded to this question. The two main concerns were **Better Access and discovery of Data** and further **Improve Collaboration**. Better access to data, include access to raw data, auxiliary maps, and notifications for new products. Improve Collaboration includes: sharing information at all levels of an organization, developing communication centers, channels and protocols, developing working groups, and providing better coordination tools.

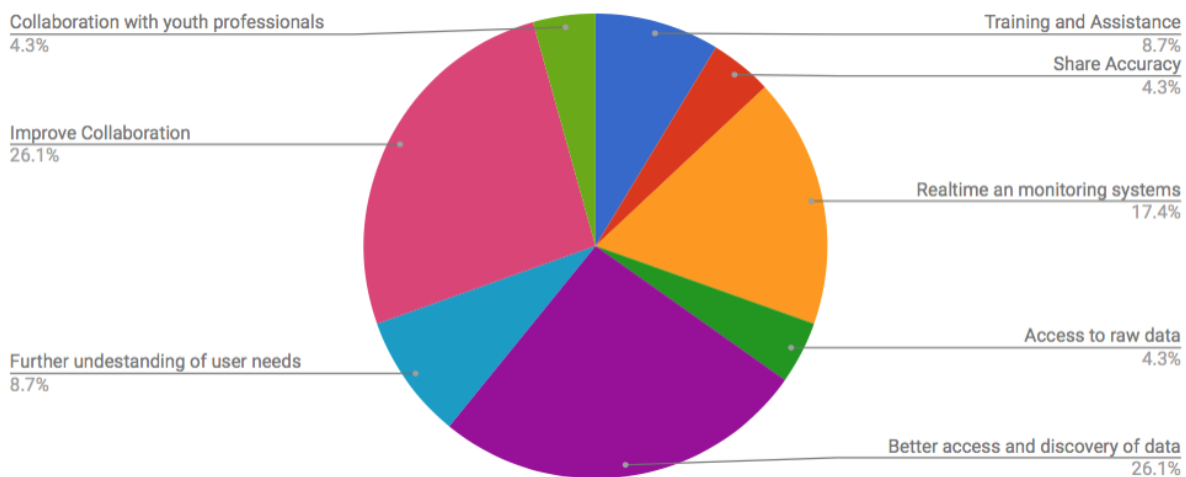


Figure 3. Q3 Responses

Raw responses are as follows.

- Information must be understood by all levels of decision makers. Much elaborated EO products. Case of useful examples. Training on EO products for DRR. It is important to share the level of

accuracy of given products to decision makers to accurately represent/decide upon its weight in each decision-making process.

- We need products obtained in real time.
- Researchers need more support on different EO products like SAR for emergencies. Researchers need raw data instead of PDF, and a database access to all available data.
- We (data producers) need to have access to references (like the presentations shown in these talks) to make better products. We need to understand much better what kind of product is needed by DRR managers.
- Access to different kind of auxiliary maps
- We need communication centers and communication protocols.
- Inform the availability of new products by using newsfeed.
- We need disaster (hazards) monitoring systems.
- We need specific working groups and research institutes on different disasters types.
- We need products and data catalogs about DRR and how to contact data producers. Information available on the Internet is very helpful and reduces searching times. Information Interoperability is another desirable option. In the case where the data is available on websites, navigation, searching or other tools must be incorporated/improved. Some countries like Guyana need assistance to develop and enhance those tools.
- Group collaboration between experts and youth professionals must be encouraged to promote the effective knowledge and experience sharing and correct use of data.
- A method about how to collaborate more effectively with agencies that work in the same fields of development. We need coordination tools and much better organization between DRR players.
- We need to know if it is possible to update DRR information during the event. Have a communication channel with EO data producers to request more specific products.
- We need vulnerability maps and potential hazards to prepare contingency and evacuation plans. Temporal series studies are important. Auxiliary information like population distribution, economic activities, biodiversity to evaluate precisely the vulnerability.
- We need historical data, statistics to improve data surveying.

3.4. Question 4 - EO products support for DRR

Question 4. The goal of the Summit and exercise is to demonstrate how international EO data sources and products can support Emergency Management/Emergency Response/Disaster Risk Reduction by providing timely, actionable and relevant information. Do you feel that this is the case? Why or not?

Yes

- This summit accomplished its goal and helped to bring ideas, share knowledge, best practices and make partnerships that will help to solve problems in LAC. We discovered new collaboration options.

- The availability of basic and standard information promotes the generation of a common language among different disciplines.
- It had some real-life lessons embedded in the simulation.
- As an organization that works with flood mapping, we better understand the urgency and reliability that these EO solutions should be for DRR.
- We experienced the problems of chaos and communication during an emergency process. We learned how to overcome those difficulties.
- Data was really useful.
- I learned that specific products for hotspot detection, volcanic ash monitoring, vegetation health and others exist.
- We learned how to work with other groups.
- We could understand the pro and cons of each EO products. It was really important to collaborate with each other without restrictions.

Maybe

- Sometimes information didn't reach us on time or was only seen on screens. It is very difficult to start the activation protocols. Not all data were available.
- Lots of information but not easy to access.
- Sometimes hazard managers do not understand or misuse EO data and products.
- As an EO provider, I know the data that people need during a disaster event is not always available.
- Depends if managers know what kind data they need to request.

Needs

- Better communication between data producers and users is a priority. During an emergency, event communication must be clear.
- Understand necessities by having a better communication with users and stakeholders.
- Improve delivery of data on time. Coordinate time of data obtained, production, delivery, and procedures.
- Data useful for DRR must be opened and made available, which is not the case in some countries of LAC.

3.5. Question 5 - Overall Satisfaction

Q5. Please rate your overall satisfaction with this exercise.

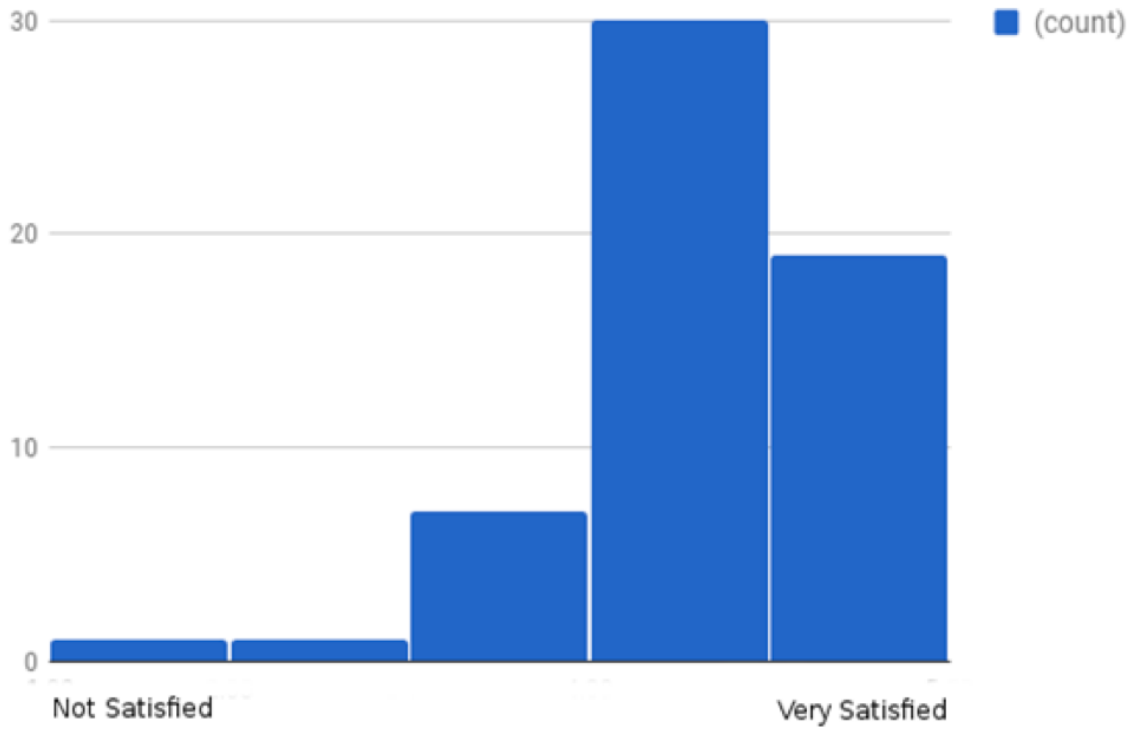


Figure 4. Q5 Responses

Chapter 4. Evaluation of the Exercise by Sector

4.1. Emergency Manager Group

- Most of the participants were willing to help others in the assigned task and they thought that they had the opportunity to share an important amount of knowledge.
- The beginning of the exercise was somewhat chaotic. The participants suggest to have more information at the beginning of the activity. The participants were not aware of their individual capabilities and they failed to develop a management method for the data incoming from other groups.
- The participants had management problems because one person (the leader) was not able to oversee all the activities occurring in the group.

4.2. Earth Observation Group

- The beginning of the exercise was confusing, the participants had some problems with understanding their own roles.
- The participants had issues understanding the difference between how to submit products (e.g. data) and how to ask for products.
- The participants experienced communication difficulties due to the size of the group.
- Due to the extension in time of the exercise, people began to superimpose tasks without intention.
- The participants found that the sector leader must know the nature of the disaster event and the area because without that knowledge it will be very difficult to know what kind of EO product will be useful to provide.
- During the process, the participants understood other groups' difficulties and acted upon those difficulties (i.e., when there was excessive cloud cover).
- What helped the most for this group was the shared common technical language, a willingness to collaborate each other, and good communication among different spoken languages and cultural behaviors.

4.3. Researchers Group

- The beginning of the activity was chaotic but the participants were able to organize themselves into different thematic groups by type of disaster.
- The group dynamics were good. The participants quickly adapted to different procedures and requirements under high pressure.
- The participants were successful working as a real team. They had good communication and traction to the proposed activities.
- The weakest point was the lack of skills mainly in social science and disasters that in some

occasions precluded the participants to anticipate emerging problems and plan appropriately.

- The participants found that communication among groups must be improved.
- The participants expressed the importance of a central data repository where they could put their data and products to increase efficiency and response time.

4.4. Humanitarian Group

- The group found it hard to manage incoming messages because most of the messages arrived out of time.
- The participants invested too much time checking the validity of incoming messages.
- In general, the interaction with other sectors was difficult.
- Cooperation could be much better if there are more precise "rules of play."
- At the beginning, the participants experienced some difficulties trying to understand their own rules as a humanitarian group.
- The participants remarked that the exercise was long in time which resulted, as the simulation progressed, in a lack of focus on their own aims.
- The positive experience was that the participants felt they worked in harmony and they could understand each other due to the use of common vocabulary.

4.5. Ad-Hoc Humanitarian International Group

- At the beginning of the exercise, the participants had some coordination problems, but as the simulation progressed, each member of this group adapted and found their own role and task. Consequently, the participants worked in synchrony and the directions were executed dynamically.
- The negative part was that it took too much time for the participants to do their task and deliver the requested products, due to the group expending too much effort trying to provide a perfect product.
- The participants had some communication problems with the SimCell and other groups.
- Sometimes the participants did not know what kind of products or services could be requested.
- The participants experienced some delay when they requested primary information from other groups.

4.6. Commercial Group

- The participants worked mainly with the humanitarian group.
- At the beginning of the exercise, it was a complete chaos.
- The participants noted the need for better protocols and the lack of enough primary information.
- The participants had communication problems within the group and they saw that sometimes that the assigned roles were not always respected.

- The participants incorporated some extra technology like WhatsApp improving the communications.

4.7. Government Group

- Most of the time, this group followed the exercise without information being provided from the other groups since the groups forgot to send reports to the executive group regularly.
- The “president” remarked that a subgroup proposed to deal with social upheaval by a means of a military coup (as she stated, but probably was a misinterpretation of declaration of a state of siege, a task that was performed without consulting the government).

Chapter 5. Exercise Description

Simulation Exercises (SE) are designed to evaluate and validate organizational capabilities. SEs are typically focused on exercising plans, policies, procedures, and staff members involved in management, direction, command, and control functions. SEs are organized in scenarios encapsulating events that mimic a realistic, real-time environment.

5.1. Scenario

The scenarios simulated at the Summit were relevant to regional interest, requiring global to local response. The scenarios focused on storm landfall and flooding (stage I) and volcano, landslide, and cascading events (stage II). The exercise brought together EO data providers and end users, and helped identify the available data needs, shortcomings, and gaps.

The scenario used a fictitious region named Disastrov. The region had a coastline, high mountains with a volcano, and rivers. It was composed of a large urban center, a small urban center, and rural settlements. Infrastructure features were depicted such as an airport, port, dams, levees, highways, rail, and bridges.

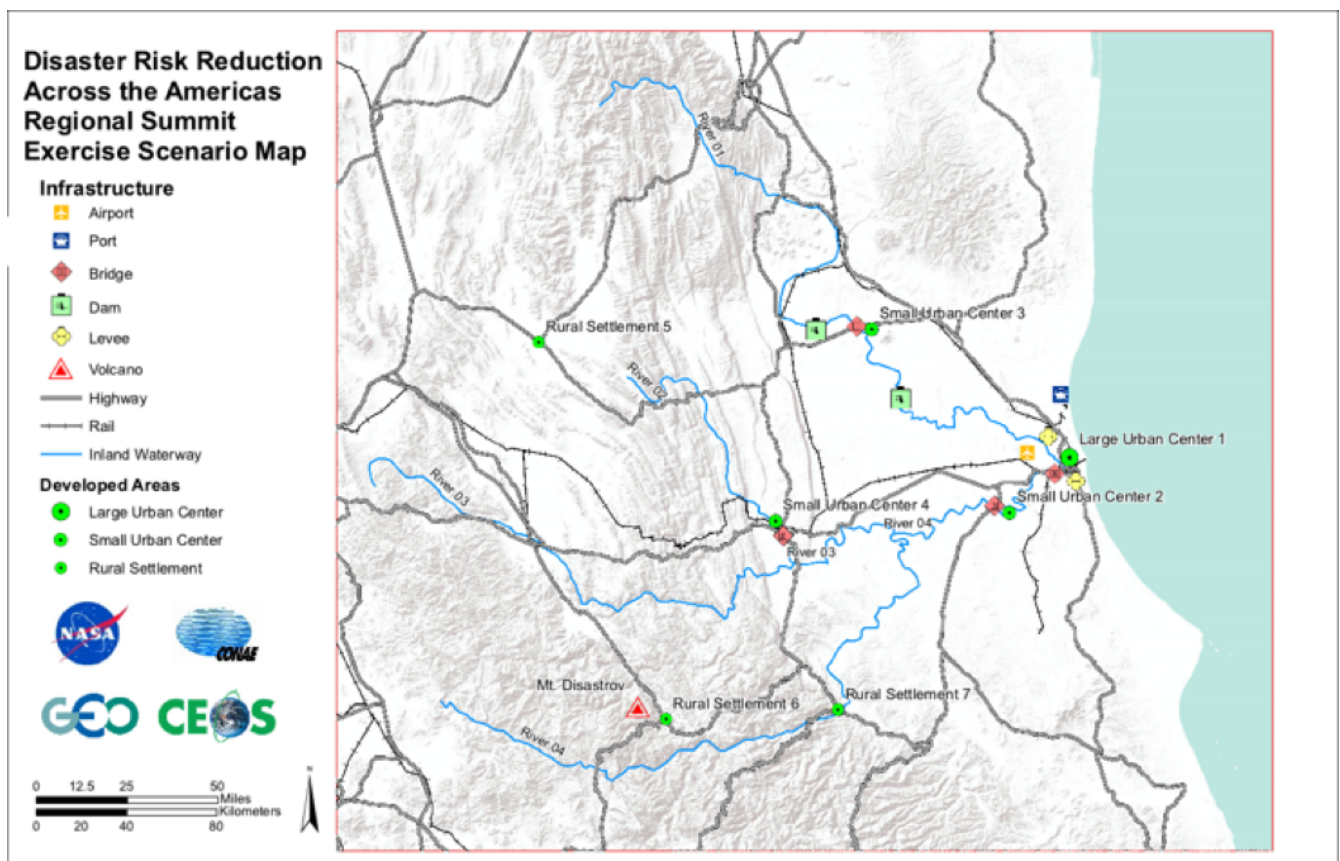


Figure 5. Scenario Map

5.1.1. Weather Background for Stage 1

A persistent heat wave across the region had continued for 3 months due to a high pressure front stalled over the region. Day-time high temperatures in the valleys had frequently exceeded 38 degrees with isolated locations surpassing 45 degrees. Numerous excessive heat warnings and heat advisories had been in effect along the coastal plains where no precipitation was recorded and less

than 4mm accumulation of rain fell in the mountains for 25 weeks. Disastrov had expected the monsoon season to start about a month after the beginning of the stage.

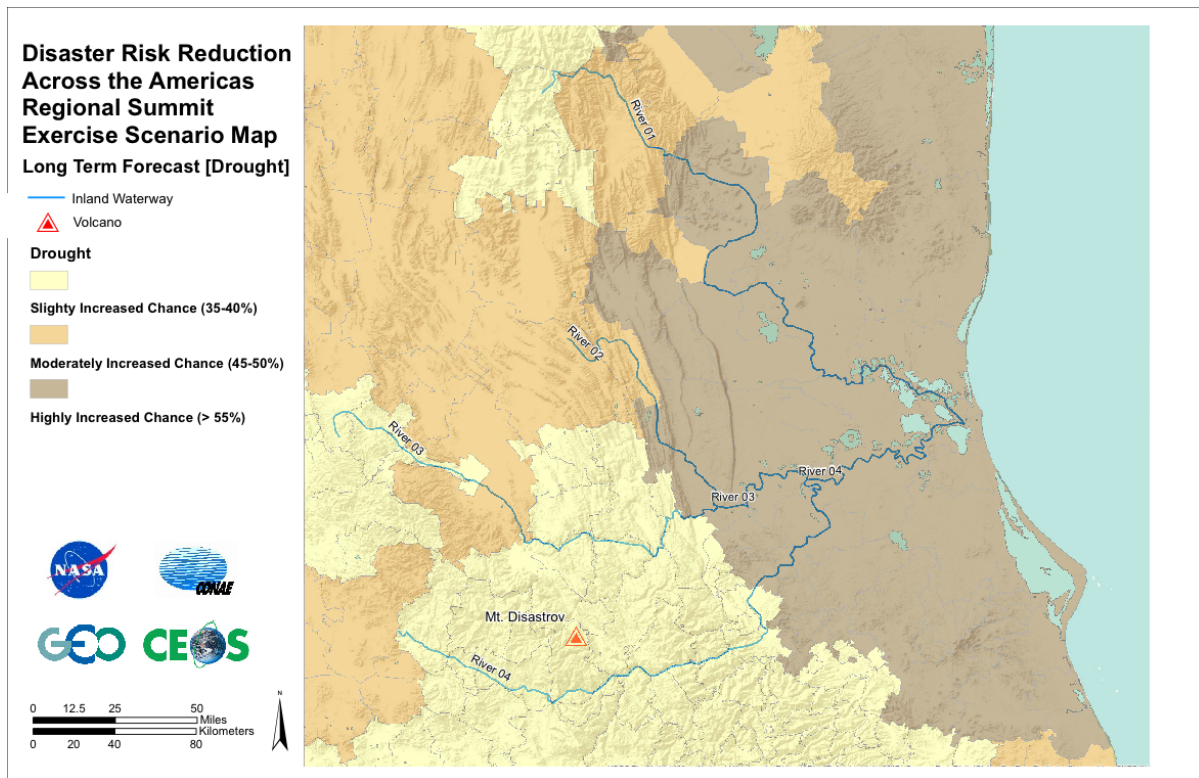


Figure 6. Weather Background

A high-pressure system sat over the western mountainous portion of Disastrov and thus acted to create drought and dry forest fuels conditions. An extreme fire developed that burned a large forested area of Disastrov. The forest was burned down to mineral soil, which created the ideal conditions for landslides and debris flows to develop in the event of storms.

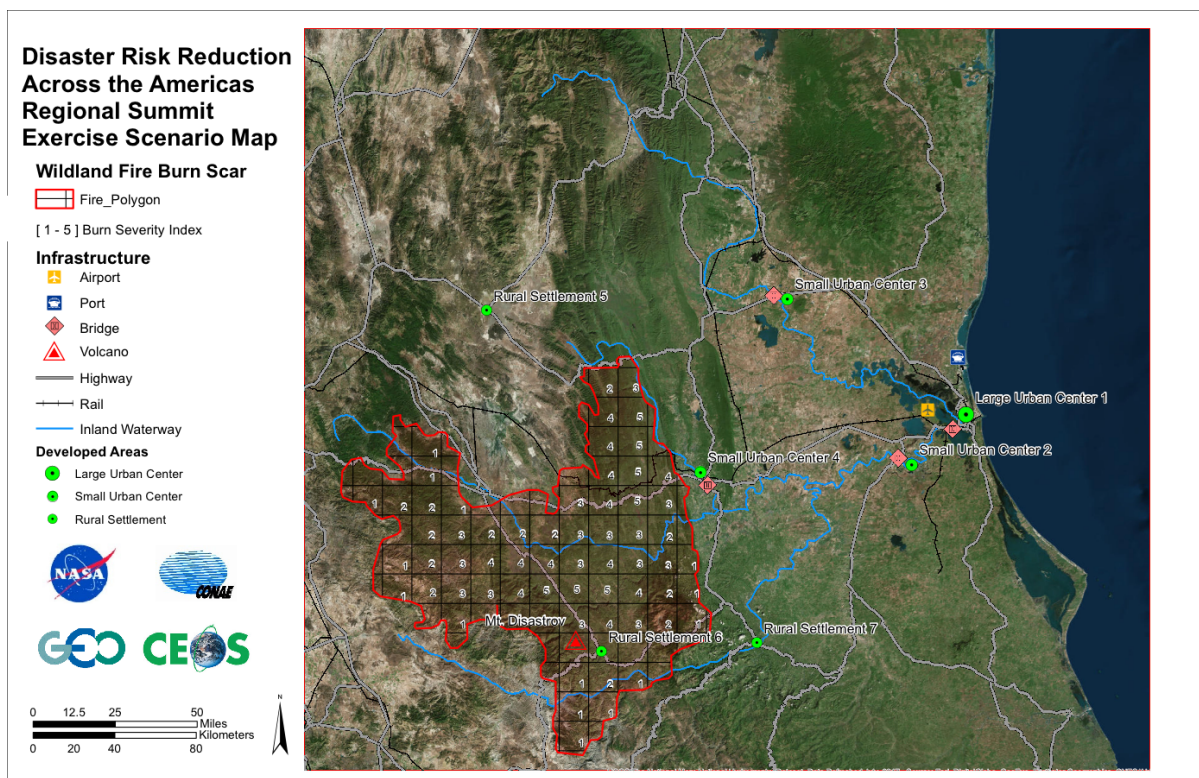


Figure 7. Fires

A tropical depression redeveloped off-shore and was forecasted to grow to a tropical storm affecting parts of the coastal region later that week. "We are anticipating that the depression will be a tropical storm at landfall," the National Weather Center stated. It is expected that coastal regions will be flooded in some areas up to 400 meters inland due to a potential 3-meter storm surge. If a 3-meter storm surge develops, then this tropical storm will cause life-threatening flooding across the coastal region.

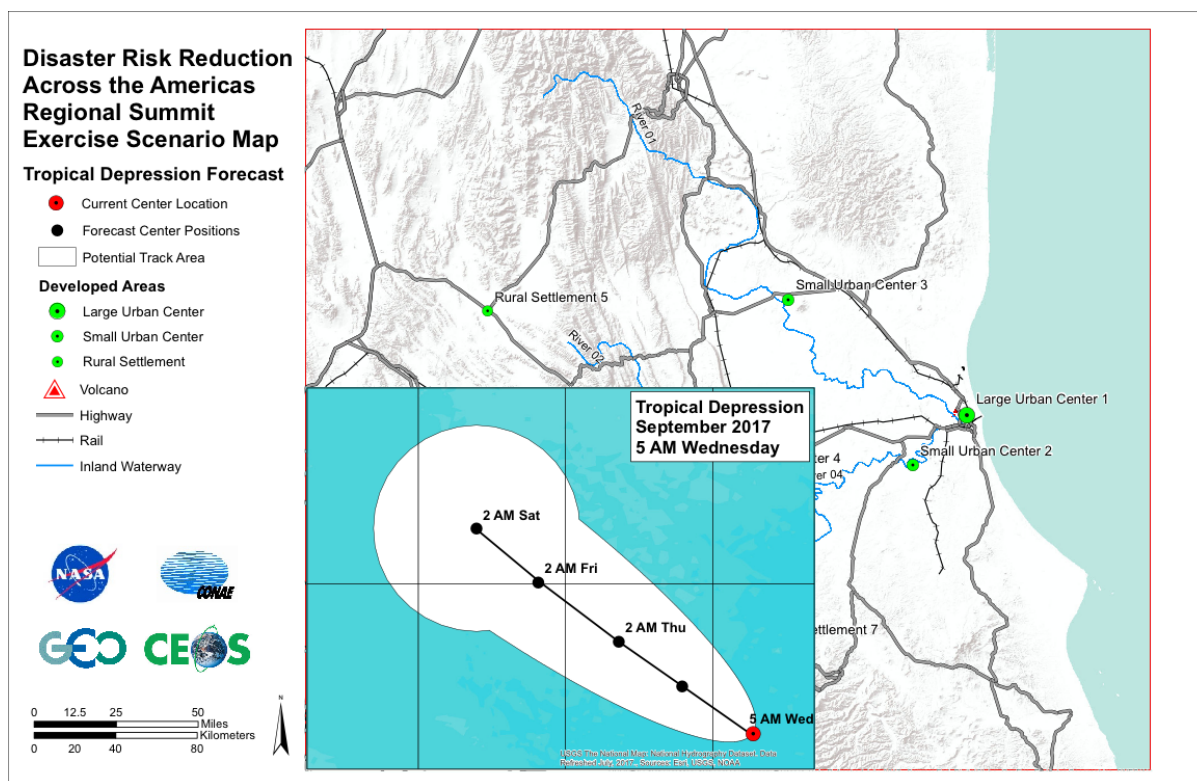


Figure 8. Tropical Storm

The forecast of the monsoon seasonal rainfall was issued by the weather service. The long-term forecast called for excessive rain. The short-term forecast called for widespread rainfall totals of 75 to 150 mm across the region with local amounts over 250 mm. An additional 80 to 180 mm with locally higher amounts was expected and threatened to further inundate parts of the region. More downpours were expected to follow.

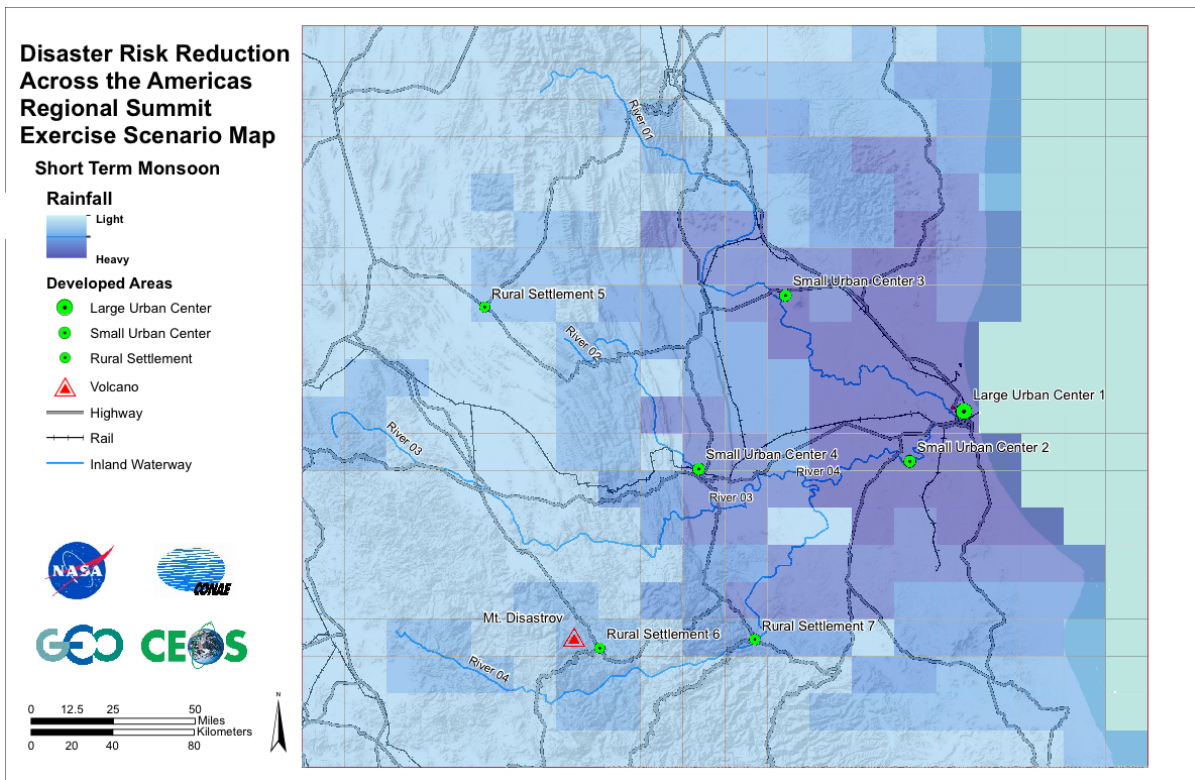


Figure 9. Monsoon Forecast

5.1.2. Volcano Activity Background for Stage 2

Mount Disastrov west of rural settlement 6 last erupted about 500 years ago. There was evidence of tuff (ancient ash deposits) in the valleys below the mountain. Both rural settlements 6 and 7 were built on ancient volcanic deposits. Mount Disastrov had been completely dormant for as long as anyone could remember. Seismic activity had been reported and the volcanic observatory had issued an alert.

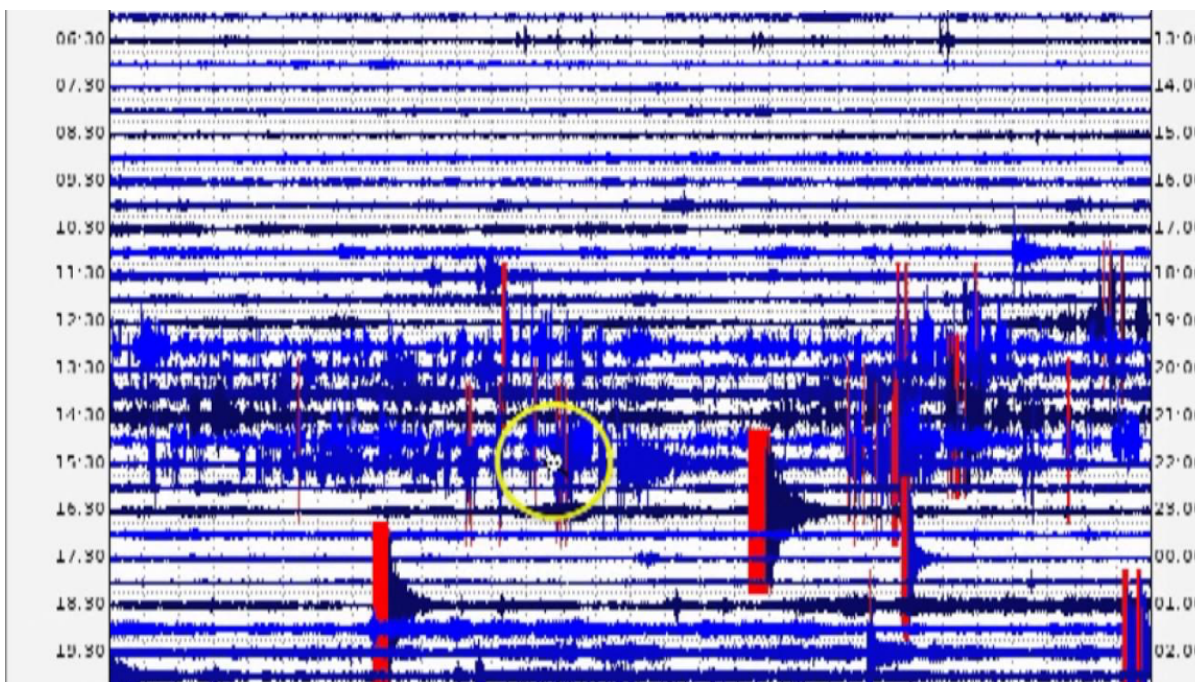


Figure 10. Seismic Activity

5.2. Participants Roles

Participants in the exercise were organized by supporting (or “player”) roles as follows:

- Government (Executive)
- Disaster Managers (DM)
- Earth Observations (EO)
- Researchers (RES)
- Humanitarian (HUM)
- Commercial Companies (COM)

The exercise brought together 130 participants, most of them data providers. Researchers and EO data providers accounted for 50%, Humanitarian and Commercial companies accounted for 11%, while Data Managers accounted for 29%.

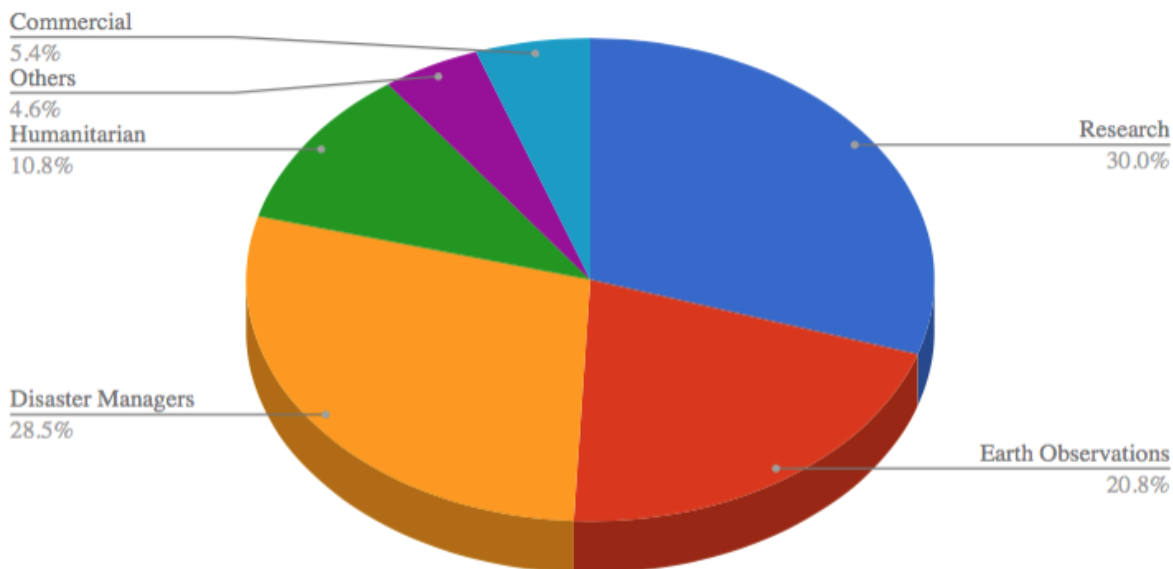


Figure 11. Distribution of Players by Sector

Players had an active role in preventing, responding to, or recovering from the risks and hazards presented in the scenario by either discussing or performing their selected roles and responsibilities. Players initiated actions that responded to and mitigated against events in the simulated emergency.

Players self-selected which group to join and were invited to self-organize to determine their role/sub-role within each group. Each sector designated:

- A **lead** that coordinated how they sector group responded during the exercise;
- A **note** taker connected to the internet who observed the exercise play and recorded major decisions and how they were resolved;
- A **point** of contact for all communications in and out of the group; and
- A **representative** to report key decisions to the Executive.

Supporting roles helped coordinate the overall exercise and facilitated the interactions within a group. The interaction of the roles within a sector group is presented in the Figure [Roles Interaction](#).

Supporting roles include the following.

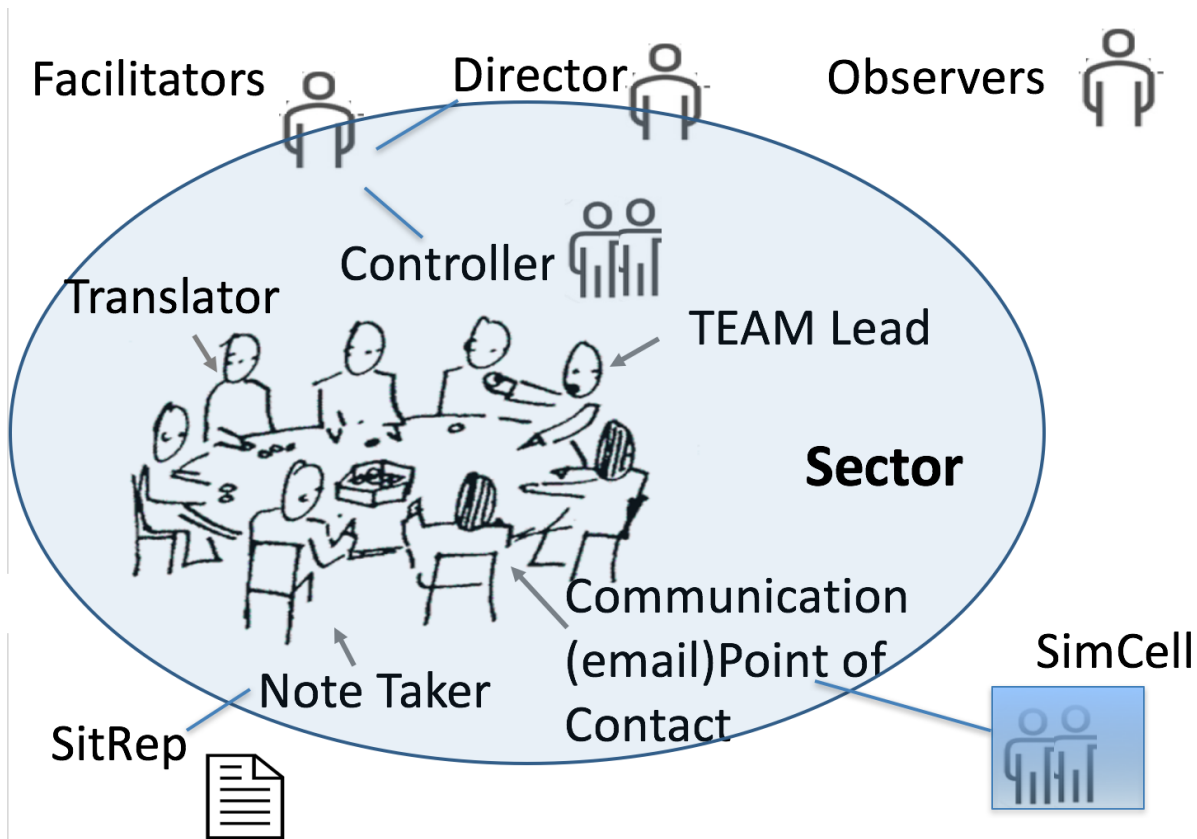


Figure 12. Roles Interaction

- The **Director** oversaw the conduct of the exercise (from setup to clean up), maintained contact with Controllers and Evaluators, and debriefed Controllers and Evaluators following the exercise.
- **Evaluators** documented observations, captured unresolved issues, and analyzed exercise results. Evaluators did not interfere with exercise flow. Chosen based on their expertise in the specific functional areas.
- **Facilitators** were responsible for keeping participant discussions on track with exercise objectives and ensuring all issues were explored as thoroughly as possible within the time constraints. They assisted and raised any issues to the Exercise Director, and controlled the flow of scenario injects. Facilitators communicate with Controllers and ensure that all SE player roles run as smoothly as possible.
- **Controllers** directed the pace of exercise play, provided key data to players, and prompted or initiated certain player actions to ensure exercise continuity. Controllers issued exercise materials to players as required, monitored the exercise timeline, and supervised the safety of all exercise participants. Two Controllers were available for each sector. Controllers were responsible for ensuring that Injects (see below) were acted upon by players. Controllers communicated with the Facilitators and Exercise Director to resolve any problems.
- **Observers** supported the development of player responses to the situation by asking relevant questions, delivering messages, or providing background references where required. Observers

did not directly participate in the exercise. They observed selected segments of the exercise as it unfolded while remaining separated from player activities. Observers viewed the exercise from a designated observation area and are were to remain within the observation area during the exercise.

- The **Simulation Cell (SimCell)** provided communications between players and a wide variety of simulated external agencies (e.g., first responders). The SimCell provided realistic, real-time, two-way communications (email for this exercise) between players and simulated response and support agencies. The SimCell controlled the flow of injects (e.g., timing of events related to the simulated disaster) to specific sectors and answered any requests directed to them by the players. The SimCell was physically separated from the main group of players.
- The **Situation Reporting Cell (SitRepCell)** coordinated with the Controllers and the sector leads and note takers to keep a running report of sector progress through the scenario during exercise play. The SitRepCell monitored the note taker via shared documents (GoogleDocs in this case), SimCell emails, and queried sector Controllers, as necessary, to maintain the reports. They did not engage in exercise play.

5.3. Scenario Events Management

The Master Scenario Event List (MSEL) was a chronological listing of scripted events and other activities that typically drive operations-based exercise play. Controllers used the MSEL to keep track of exercise activities and ensure that necessary events occur to support players achieving the exercise objectives.

The MSEL consisted of three primary types of items; contextual injects, contingency injects, and expected player actions. Each of these is described below.

- The **Contextual Injects** simulated activities that prompted players to demonstrate capabilities required to achieve the objectives. Contextual Injects included events, requests, directives, and decisions made by non-playing and simulated entities. The injects drove exercise play towards the achievement of objectives and helped build the exercise operating environment. Each inject had a set of naturally expected actions that players initiated in response to the simulation.
- The **Contingency Injects** were implemented after a player has had adequate time to demonstrate an action, but was not observed carrying out this action. The contingency injects ensured that play moved forward and that expected actions occurred.
- The **Expected Player Actions** indicated to Controllers and Evaluators when certain significant player actions should have happened naturally, without being prompted by a Contextual inject. Failure for an expected action to occur was communicated to the players via a contingency inject.

5.4. Schedule and Exercise

The exercise occurred on **September 7th, 2017** at the InterContinental Hotel, in Buenos Aires, Argentina. The detailed schedule was as follows.

Pre-Exercise

8:00 am – 8:30 am	Registration
8:30 am – 8:45 am	Participants and controllers arrive in room; materials distributed
8:45 am – 9:00 am	Introductory remarks
9:00 am – 9:20 am	Player briefing

Exercise

9:20 am	Exercise start
9:20 am – 11:05 am	Stage 1 - Storm landfall, flooding
11:05 am – 11:30 am	Sector report out
11:05 am – 1:05 pm	Stage 2 - Volcano, landslide, cascading events
1:05 pm – 1:30 pm	Sector report out
1:30 pm	End Exercise
1:30 pm – 2:00 pm	Break

Post-Exercise

2:00 pm – 3:30 pm	Hotwash
3:30 pm – 3:45 pm	Break
3:45 pm – 6:30 pm	After action analysis and planning

Chapter 6. Sector Reports

At the end of each of the two stages, participants were tasked with providing a short report on activities by sector. A summary of these reports by stage is provided in this section.

6.1. Stage 1 - Storm Landfall, Flooding

Disaster Managers Group

The group decided to evacuate the people threatened by a dam break. Nobody was hurt thanks to the early evacuation. The Cholera outbreak was managed, thanks to timely access to medical supplies. Good use was made of the food supplies to feed the population affected with a focus on the evacuation of the people. A request was made to the Researchers group for information on the status of the urban population. A flowchart was submitted describing the recovery process to help the Disaster Managers and all agencies involved to understand the needs and help guide future work. Once the storm calmed, the “Return home” protocol was prepared.

Earth Observations Group

Access to data was the focus of the work of the group. Optical and radar imagery was important. A request was made for activation of the Disaster Management Charter. The efforts of the group focused on accessing free-data first, followed by commercial data. There was a problem with cloud cover, which affected the use of optical satellite imagery. There was difficulty in determining who was doing what. The process was somewhat chaotic. The information products needed to be validated.

Humanitarian Group

The group needed to determine the areas of high risk related to the Cholera outbreak. They successfully disseminated relief supplies to populations (tents, 1 million pills for water purification). There was confusion and lack of coordination with the Emergency Managers about the location of the safe areas and refuge locations.

Commercial Group

Pills for chlorinating water and vaccines were provided. There was considerable discussion of accessing cars, trucks, helicopters, and vehicles for transport and how the private sector could contribute.

Ad-hoc International Humanitarian Group

This group requested resources from international donors and the Commercial sector. There was no confirmation of whether these requests were honored, but this was the group’s high priority task.

Ad-hoc National Security Group

The Army and police were activated and the military purchased emergency supplies and created a web page for posting information. Trucks for the transport of evacuees were accessed to move people to evacuation centers. The process of recuperation and reconstruction planning was started while people were in the shelters.

6.2. Stage 2 - Volcano, Landslide, Cascading Events

Disaster Managers Group

As a result of the technical report provided by this group, all the people in area 6 were evacuated. Priorities were given to individuals with reduced mobility. When the ash appeared, people who did not want to leave were forcibly evacuated. People with respiratory problems were sent out of the area. The Army checked the need for fuel and the State tested the health of the livestock once it was relocated. The airport was closed for reasons of security and safety.

Earth Observations Group

The group approached and requested contextual and historical information on the volcano from the Research community. A request was made for new algorithms for processing imagery for the generation of new information products to monitor the volcano, including the spatial and temporal characteristics of the ash plume.

Research Group

Requested a dynamic map for pyroclastic materials monitoring.

Humanitarian Group

The group divided their activities into three phases: before, during, and after. During the third phase, 20% of the population needed evacuation, which was completed by a request for assistance of the Army.

Ad-hoc International Humanitarian Group

Requested food assistance for more than 5,000 people for 2 weeks, which included 2,500 children and 2,000 elderly people.

Commercial Group

The stakeholders in the commercial sector provided multiple supplies, including fodder for cattle, gas masks, and potable water for the human population. Before the eruption, this group received a request from the Humanitarian group for the provisions of transport trucks.

Appendix A: Supporting Groups

Roles

Exercise Director	Maggi Glasscoe (NASA)
Exercise Facilitators	Jessica Seepersad (NASA), Luis Bermudez (OGC), Gabriel Asato (OGC and Geological and Mining Survey of Argentina)
Exercise Observer	Pablo Suarez (Red Cross Red Crescent Climate Centre)
Exercise Evaluators	Susana Adamo (CIESIN), Andrés Lighezzolo (CONAE)

Exercise Controllers

Earth Observation	Albert Kettner (Dartmouth Flood Observatory), Guillermo Toyos (CONAE)
Emergency Managers	Amanda Smith (FEMA), Trevor Taylor (OGC)
Humanitarian	Andrew Kruczkiewicz (Columbia University)
Researchers	Sandra Torrusio (CONAE), Erika Podest (NASA), Jamie Favors (NASA)
Commercial	Miguel Roman (NASA)
SimCell	Carver Struve (NASA), Isabel James, Lori Schulz (NASA), Aldana Bini (CONAE), Michael Goodman (NASA), Rashied Amini (NASA)
SitRep	Tim Stough (NASA), Cindy Schmidt (NASA), Amber Soja (NASA), Don Sullivan (NASA), Juan Torres (NASA), Fernando Echavarria (Foreign Affairs Officer at US Department of State)
Situational Awareness	Humanitarian OpenStreetMap Team (HOT) Executive Table, "David Green (NASA), Sandra Kaufman, Ana Medico (CONAE)

Appendix B: Scenario Summary

Pre-First Stage Event + Injects – Storm landfall, flooding

Weather forecasts indicate a major tropical storm, increasing in intensity and 3 days out before landfall.

First Stage Event . Injects – Storm landfall, flooding

Tropical storm becomes a Category 3 Hurricane and made landfall.

1. Storm surge flooded coastal areas up to 800 m. inland.
2. Levees of a major river that flows through the megacity are overtopping as sea water levels have risen, so river water can less effectively reach the ocean. City is flooded by 20%.
3. It starts to rain intensively (25mm an hour) at the coastal areas and pump stations are unable to keep up causing pluvial flooding in parts of megacity.

Post-First Stage Event + Injects – flooding

1st day after Tropical storm/Hurricane made landfall.

1. Levee failure causes major flooding in city and urban area, cuts of 80% of transport (roads, railways, metro). 40% city is flooded.
2. City water treatment plants are destroyed, meanwhile two man made reservoirs upstream in the main channel start to overtop.
3. Irrigation channels of reservoirs cannot effectively transport the amount of water and become blocked by debris leading to flooding of farmland around the mega-city into the suburbs.
4. Rain intensity decreased to 15 mm an hour.

Second Stage Event – Volcano, Landslide, cascading events (1 MONTH LATER)

Water treatment plants are provisionally restored. Flooding is contained, pumps are working again, but levees are not repaired yet. However, water levels have gone down to normal flood levels again, and no more water is leaving through the levees. Water in the dams behind the reservoirs could not be released and therefore are still entirely full. THEN: Earthquake happens.

1. The lower of the two reservoirs collapses causing direct flooding downstream of farmland and rural villages upstream; the upper reservoir is damaged, over-topping but not collapsed so far.
2. It starts raining again with an intensity of 10 mm an hour, which has triggered flash floods in the mountains that cut of many roads (landslides and washed away roads), There is uncertainty in what has happened to mountain villages.
3. Landslides have blocked a tributary to the main river, starting to form a huge lake behind it.
4. As levees are not repaired due to the collapse of the lower reservoir, water starts to spill into the city that is just starting to recover from first flooding.
5. Airport had to close as power plants are down and generator room is flooded.

Appendix C: Injects

Stage 1 Injects - Storm Landfall, Flooding

Inject #6 9:30 - Seasonal Climate Forecast

From

Fictitious World Meteorological Organization Climate Outlook Forum

To

Whole Room (Briefing)

Colleagues,

This statement gives outlook for the next three months. This may be important for potential early warnings issued to various weather sensitive sectors such as Agriculture and food security, Livestock and wildlife, Natural Resources and Tourism, Energy and water, Local Authorities, Health and Disaster Management. The Outlook indicates that there is increased chance of drought in the region. There are different levels of increased risk.

-- World Meteorological Organization regional delegation

Inject #8 - Situational awareness

From

Fictitious Weather Service

To

Whole Room

EMERGENCY ALERT!

Storm expected landfall: Storm surge 3 m height (400 m inland expectation).

Inject #9 - EVENT

From

RES (SIMCELL)

To

EM

Forecasted storm surge is beginning to reach low lying areas.

Inject #10 - EVENT

From

Sim Cell (Fictitious Emergency Management)

To

HUM/RES/EM

Levees of major river that flows through the Megacity are overtopping as sea water levels have risen, so river water can less effectively reach the ocean. 20% of the City's land area is flooded.

Inject #11 - Uncertainty

From

HUM

To

Whole Room (EMAIL)

Colleagues,
In order to gauge the potential impact of the event, the humanitarian community needs to understand the confidence in the forecast for a severe event. Is there a 100% chance of a disaster? Or is there uncertainty?
Thank you in advance,
-- Humanitarian Regional Disaster Consortium

Inject # 12 - REPLY - Uncertainty

From

National Weather Service;

From

Whole Room (EMAIL)

Colleagues,
The probability of hazard occurrence somewhere in the area of interest is very high, maybe 100%, but there are still questions about the spatiotemporal distribution of magnitude.
Good luck,
-- National Weather Service

Inject #13 - EVENT:

From

Sim Cell (Fictitious Weather Service)

To

HUM/RES/EM

It starts to rain intensely (25mm an hour) at the coastal areas and pump stations are unable to keep up causing pluvial flooding in parts of Megacity.

Inject #14 - 9:43 - Situational awareness

From

National Emergency Management;

To

Whole Room (EMAIL)

FORMAL REQUEST TO SUPPORT SITUATIONAL AWARENESS

To support situational awareness for Civil Protection, critical, validated information (products, maps, images, etc.) is needed in order to know the real situation on the ground.

Best,

-- Emergency Management Director

Inject #15 - 9:45 - REPLY - Situational awareness

From

HUM

To

EM (EMAIL)

Dear Emergency Management Director,

An assessment of food resources indicates a 5 day supply. Fortunately, the warehouses were not flooded. It will take 1 week to get more food resources, so need to use this 5-day supply wisely.

Regards,

Humanitarian Regional Disaster Consortium

Inject #16 - EVENT

From

Sim Cell (Fictitious Emergency Management)

To

HUM/RES/EM

Levee failure causes major flooding in city and urban area, cuts off 80% of transport (roads, railways, metro). 40% city is flooded.

Inject #17 - 9:50 - Maps

From

HUM

To

Whole Room (EMAIL)

URGENT

Are there any maps available that show the following: 1. What areas are currently under water and 2. What areas are forecast to be impacted by the flood? HUM needs to know where to set up shelter, but also where to avoid if future risk is present

Regards,

Humanitarian Regional Disaster Consortium

Inject #18 - -EVENT

From

Sim Cell (News report/Room)

To

HUM/RES/EM

Intermittent power failure in Megacity and surrounding environs; Telecommunications towers go offline sporadically

Inject #19 - - EVENT

From

Sim Cell (Fictitious Emergency Management)

To

HUM/RES/EM/COM

City water treatment plants are inundated and completely offline, meanwhile two man-made reservoirs upstream in the main channel start to overtop at their dams.

Inject #20 - EVENT

From

Sim Cell (Fictitious Emergency Management)

To

HUM/RES/EM/COM

Irrigation channels of reservoirs cannot effectively transport the amount of water anymore. In addition to the water volume they are blocked by debris. This causes flooding of farmland around the megacity into the suburbs.

Inject #21 - Prompt

From

Research (Sim Cell)

To

Research/EM

Landslide susceptibility/potential maps

Inject #22 - EVENT

From

EM/HUM

To

EM/COM

Main transportation corridor to provide aid to remote villages is cut off by major landslide due to high rainfall intensities

Inject #23 - Prompt

From

RES

To

EO

International Charter Activation request

Inject #24 - Prompt

From

International Charter Activation request

To

Research/EO

AOI REQUEST

Inject #25 - 10:32 - Tents

From

HUM

To

Whole Room (Email)

Operational Note:

The supply of shelter tents has just run out. It will take 5 days until new tents can be acquired from a neighboring country.

Regards,

Humanitarian Regional Disaster Consortium

Inject #26 - 10:40 - Satellite Track Info

From

EO

To

Whole Room (Announcement)

Colleagues responding to Storm,

Attached is a map of upcoming satellite ground track for use in planning/requesting Earth observations.

-EO Sim Cell

Inject #27b - 10:41 - ISS data request

From

ISS Imaging Team

To

EO

Colleagues responding to Storm,

Thank you for the information. We were able to image the requested area and the georeferenced data along with context map are attached below and delivered to HDDS.

Sincerely,

Dr. Jane Ficticia, ISS Operations Team

Inject #28 - Prompt

From

Regional EM (Sim Cell)

To

EM

Request for airborne assets by regional EM or gov't.

Inject #29 - Prompt

From

EO PM (David)

To

EO

Request for airborne assets over impacted region

Inject #30 - 10:47 - Request for EO data to produce flood data product From::: RES Univ X To::: RES/EO

Colleagues responding to Storm,

Our flood mapping system can ingest either optical imagery or radar reflectances to produce inundation mapping. Would you be able to provide imagery from ALOS-2 orbit x, granule y-z? Worldview images xxxx-yyyy would also be useful if relatively cloud free

Thanks,

Dr. John Dampshoes, Flood Observatory

Inject #31 - 10:50 - Delivery of data to USGS HDDS or direct to in-country contacts

From

EO Response Coordinator

To

EO, EM(?)

Colleagues responding to Storm,

The International Charter has been activated and packages of remotely sensed data are being delivered to the HDDS site for this event. We will also send data direct to in-country participants if needed.

Sincerely,

Josie, EO Disaster Coordinator

Inject #32 - Prompt

From

EM

To

Research/EO

EM reports back that they have received products, however the information, context and confidence levels have not been clearly conveyed, diminishing the product's usefulness for for decision making.

Inject #32a - - Bulletin

From

SIMCELL

To

Whole Room

Please be advised that the FWS of Disastov reports that rain intensity has decreased to 15 mm/hr.

Inject #33

From COM to EM (Day 2)

To

Fictitious Civil Defense, Emergency Managers, and Mayor of Large Urban Center:

Disastrov Telecom would like to inform you that 70% of our towers have come back online, with expectation of full network capability by end of week.

Thank you,
Chief Supervisor Charlie Nexus

Inject #33A

To

Room

From

Large Urban Center 1 Seismic Monitoring Center

<<ALERT>>

A M4.3 earthquake has been detected with an epicenter 33 km SSW from Large Urban Center #1 at a depth of 8 km. No significant damage has been reported.

This earthquake follows a series of multiple earthquakes of <M4.0 along the Terrible Fault of increasing frequency. We will continue to issue alerts for earthquakes >M4.0.

Inject #34 - Briefing

To

Whole Room

Ground truth: 1 week later (Water treatment plants are restored provisionally. Flooding is contained, pumps are working again but levees not repaired yet. However, water level has gone down to normal flood levels again, and no more water is leaving through the levees. However water in the dams behind the reservoirs could not be released and therefore are entirely full still)

Inject #35 - 11:10

From

Media (SIMCELL)

To

Hand deliver to EM (this could be coordinated with Commercial)

This is Nattie Hound from local news station FWRS and we understand that there are reports that the dams on River 2 may have been damaged by the storm. We cannot confirm this information and need get this out to our viewers! I would like to set up an interview with someone in your office as soon as possible to find out what is going on! We cannot keep the people in the dark about this!

Please contact me as soon as possible.

Inject #36 - Cholera outbreak – social media

From

Social Media

To

Whole Room (Email)

<display the image>

Inject #37 - 11:17

From

Fictitious Public Works Department

To

EM/HUM

The lower of the two retention structure (dam) collapsed causing direct flooding downstream of farmland 40 km upstream; the upper dam is damaged, overtopping but not collapsed so far.

Inject #38 - 11:20

From

Guillermo Borges, First Response Field Worker

To

HUM

I'm very sorry to report that Rural Settlement #7 has been lost. The earthen blockage that had retained water was eroded and caused a release of water. It wiped away the village before it could be evacuated. We are attempting to address survivors as safely as possible.

Damage is reported to habitation and infrastructure downstream, as well.

Please pray for Rural Settlement #6 and us. Only God can help us help now.

Inject #39 - 11:25 - Flood types

From

HUM

To

Whole Room (Email)

Colleagues,
The Humanitarian sector has been responding to riverine floods, with many resources allocated to areas near riverbanks. Is there a risk for flash floods in the coming days? This would require allocation of other types of equipment in different areas. We would like to take forecast based action, but not sure of the best information to act on.

Regards,
Humanitarian Regional Disaster Consortium

Inject #40 - 11:55

From

Fictitious Weather Service

To

Whole Room

Rain at intensity of 10mm an hour has triggered flash floods in the mountains that cut off many roads (landslides & washed away roads), cannot communicate with or access mountain villages.

Inject #41 - 11:33 - Cholera outbreak – official brief

From

National Ministry of Health

To

Whole Room (Email)

<display the image>

Inject #42 - 11:36 - Tasking drone or satellite imagery to check on situation

From

EM

To

EO

Earth Observers,
Please collect optical satellite or drone imagery over the following areas:
Settlement X, Y, and Z. Of particular interest is the damage caused by the storm
as well as other impacts on the inhabitants.

Thanks,
Head EM Operations

Inject #43 - 11:40 - Helicopter or Satellite imagery Analysis

From

EO

To

EM

Responders,
Our analysis shows that villages cutoff by the flooding have also incurred
significant crop loss. This indicates both economic damage and the need for
additional relief since some of the lost crops were food crops.

Sincerely,
Dr. Geoff Wisecrowd, Ad Hoc Image Analysis Team

Inject #44 - 11:43 - Landslide

From

EM (SIMCELL)

To

Whole Room

A landslide has blocked a tributary stream channel above rural settlement 7. The
landslide is 100 m deep, 300 m wide, and 500 m long. The landslide is blocking
the stream and a temporary lake is filling. Eyewitness accounts indicate the lake
is currently several kilometers long.

Inject #45 - 11:45 - Vulnerability information

From

HUM

To

RES/EM

Colleagues,
Humanitarian organizations request data on vulnerability to support identification of the most vulnerable. We need to prioritize where to take action first.
Regards,
Humanitarian Regional Disaster Consortium

Inject #46 - Event

From

COM

To

Whole Room

Airport had to close as power plants are down and generator room is flooded

Inject #47 - Event

From

EM

To

Whole Room

As levees are not repaired, due to the collapse of the lower reservoir, water starts to spill into the city that is just starting to recover from first flooding.

Inject #48 - 11:52 - Media request

From

MEDIA

To

EM

The population of the region is stressed and worried about the current situation. There are rumors of civil unrest due to lack of knowledge on the situation. What is the updated official message?
Regards,
National Media

Inject #49 - Event

From

Media (SIMCELL)

To

EM/HUM/NGO

Media is demanding an explanation of how the disaster response funding is being allocated. Some vulnerable areas are claiming they are being ignored for the richer areas that are 'donating' to the response.

Inject #50 - 11:55 - Continuation of ongoing charter activation

From

EO

To

Whole Room

Responders,
The Charter activation continues with updated imagery and data products available through the USGS HDDS website. If you have specific needs or new AOI's, please contact me with the info.
Thanks,
Josie, EO Disaster Coordinator

51 END OF STAGE 1

[52, 53, 54, 55, 56] REPORT OUT

STAGE 2 - Volcano, Landslide, Cascading Events

Inject #57 - Briefing - Stage 2 Ground Truth

To

Whole Room

A volcanic observatory has reported seismic activity in the vicinity of the volcano. Cloudy weather continues due to monsoon season.

Inject #58 - EVENT

From

Media

To

Whole Room

Seismic activity has been reported in the vicinity of the formerly dormant volcano.

Inject #59

From

Res

To

RES/EM

Nearby seismometers observe "tornillos" indicating magma intrusion.

Inject #60

From

Nearest VO?

To

Whole Room

VO bulletin identifies activity issues advisory.

Inject #61

From

VACC

To

Whole Room

Volcano instrumented by (VDAP / in-country org) with seismometers and GNSS receivers.

Inject #62 - 12:43

From

Central Emergency Manager

To

Regional Emergency Managers

Fellow emergency managers,
Would there be value in requesting VDAP assistance from USA USGS? Please let me know so we can reach out for their support.
Gracias,
Anon. Y. Mous

Inject #63 - 12:45 - Volcano instrumented

From

VO/VDAP Team

To

Whole Room

Announcement: The volcano has been completely instrumented with portable seismometers and GNSS receivers with real-time data connectivity to the newly commissioned Disastrov Volcano Observatory (DVO). In situ monitoring stations also include tilt-meters, gas monitors, and web-cams.

Inject #64 - 12:47 - AP News Wire Bulletin

NATURAL GAS EMISSIONS KILL LIVESTOCK AS VOLCANO ACTIVITY INCREASES Regional emergency managers have reported the sudden death of livestock near Rural Settlement 6 as the nation braces itself for more activity from Mt. Disastrov. Camila Torres, a regional emergency manager, announced that volcanic activity has resulted in the release of toxic levels of methane gas. "Our responders in the field have received reports from farmers that sheep and cows have been found dead in the morning with no physical signs of attack. Gas readings in the area indicate toxic levels of methane, which are directly attributable to volcanic activity. We will continue to monitor the area and help those in Rural Settlement 6 adapt to changing conditions and evacuate as needed." "I'm in shock. Shock. We lost over 30 of our cows, I don't know what we'll do now." said farmer Matias Perez after discovering the results of the gas emission this morning.

Inject #65

From

RES

To

EO

International Disaster Charter activation request submitted
Inject #66 - 12:53 -Reuters News Wire

EVACUATIONS ORDERED IN THE SHADOW OF MT. DISASTROV

Over the past two days, evacuations in the vicinity of Mt. Disastrov have seen the displacement of over 30,000 people. Camila Torres, regional emergency manager of the region announced “We are proud to announce that all individuals in areas expected to be impacted by further Mt. Disastrov activity have been evacuated from harm’s way except for those choosing to stay. Although evacuations affect the lives and livelihood of those leaving their homes, we are confident that this decision will best prepare us for anticipated activity from Mt. Disastrov.”

“This evacuation is nonsense. We are fine and everyone is fine. I have lived here for my whole life and we are strong,” stated Lautaro Marcel, a logistics business owner who followed the evacuation order. “Each day my drivers aren’t working, I am losing money. The reckless emergency managers should be preparing to pay me for my lost profit because nothing is happening with the volcano.”

Matias Perez, a farmer who had lost livestock in a recent gas eruption related to Mt. Disastrov, says he will not evacuate. “I have already lost so much, I don’t know what we will do anymore. I am staying and make sure my family does not lose more.” Perez’s family has evacuated.

Inject #67

From

RES

To

EM

Deformations related to magma movement (InSAR/GNSS)

Inject #68

From

RES

To

EM

In situ/satellite observations - temp, gas, hyperspectral, radar, etc show temperature changes in the caldera

Inject #69 - 1:05 - EFE News Wire

EVACUEES IMPATIENT AS MT. DISASTROV RUMBLES

Six days following a general mandatory evacuation order in the area surrounded Mt. Disastrov, evacuees have started to protest. "We don't understand why we cannot go home." says Antonia Souza, a homemaker who had been ordered to evacuate days ago. "They haven't told us when we can return and my seven year old daughter is constantly crying. We're all anxious."

Others have been more impatient. Lautaro Marcel, a small business owner, claims he will personally bill the regional emergency manager, "Ten thousand pesos! If we return to our homes today I will only bill 10,000 pesos! The government must answer to the people for their irresponsibility and stupidity!"

"We are working hard to monitor the situation and cannot assure the safety of those who remain in the evacuated regions" stated emergency manager Camila Torres. She did not comment on the bill from Marcel.

Inject #70 - 1:05 - Requests for pre-eruption data collection (IR, optical, SAR)

From

EO

To

EM/RES

Responders,
The Charter Activation continues. We are monitoring Mt. Disastrov on every orbital opportunity with both optical sensors, clouds permitting, and SAR. Collected data will be collected at the USGS HDDS website. If your observational needs change, or there are particularly high priority observations, please do not hesitate to contact us.

Thanks,
Josie, E0 Disaster Coordinator

Inject #71 - Briefing

To

Whole Room

Ground Truth: Dramatic Pause - Activity continues with ups and downs.

Inject #72

From

RES

To

EM

Gas releases cease on the flanks of the volcano.

Inject #73

From

RES

To

Emergency Managers

Emergency managers,

We have been tracking increased seismic activities recorded by seismometers placed near Mt. Disastrov. Surveyors and data from satellite observations show rapid dome growth. Both observations consistently indicate that pressure is rapidly building and an eruption is imminent.

Via con dios,

Dr. Malus Noticias

Inject #74

From

RES

To

Whole Room

Eruption begins with large ash release up to 11,000 ft; see:
DRRA_Scenario_Map_Geohazards1_20170830.pdf

Inject #75

From

RES

To

EM

VO bulletin identifies eruption start time, height, ash volumetric rate, stop time, etc.

Inject #76**From**

VAAC

To

Whole Room

Buenos Aires VAAC issues Volcanic Ash Alert & Volcanic Ash SIGMET identifying plume injection height, area and trajectory.

Inject #77 -- Post-eruption ISS data request**From**

EO

To

EM/RES

Responders,

The attached optical imagery has been collected by the ISS of your high priority AOIs. Plume aerosol information has also been collected by the CATS instrument. All data has been uploaded to HDDS.

Sincerely,
Dr. Jane Ficticia, ISS Operations Team

Inject #78**From**

Res

To

EM

Ash begins depositing within 80km of summit

Inject #79**From**

SIMCELL

To

Fictitious Emergency Management

The Governor asks EM for information regarding evacuation. Wants to know who needs to evacuate, along which routes, and to where?

Please provide for us:

Which areas are under new evacuation orders?

For each area/region, identify evacuation routes.

Where are evacuation centers for each route? Are they able to support the populations under evacuation?

Inject #80 - Reuters News Wire

MT. DISASTROV RAINS ASH IN REGION

Over the past two days, ash from erupting Mt. Disastrov is impacting the lives of thousands in the area along with air traffic. In addition to reducing visibility, which hampers emergency operations, ash can harm airplane jet engines and cause crashes. Dr. James Jefferies, a volcanologist at USGS, summarizes, "There are several severe risks from volcanic ash and people in affected regions should follow the advice of government officials in reducing these risks."

But not everyone is concerned. Andrea Souza, an evacuated seven year old, takes pleasure in seeing falling ash, "At first I was afraid but my mom said this is like a vacation. It looks like snow falling in the winter but it's warm outside. Everyone is so busy and so worried - I wish the adults can pause and enjoy the beauty with me."

Inject #81 - Post eruption requests for data collection by other orbital assets

From

EO

To

EM/RES

Responders,
Data has been collected from optical, RADAR, sounder instruments, and OMI/OMPS. We are seeing ash injected at an altitude of 11,000 ft and spreading in approximate radius of 80km as shown on the attached map.
Sincerely,
Josie, EO Disaster Coordinator

Inject #82

From

RES/EO

Increased ash output with injection fo 27,000ft

Inject #83

[VAC WARNING]

ADVISED:

Inject #84 - AP News Wire

MT. DISASTROV ASH RAINS ON LARGE URBAN CENTER #1

Following the eruption of Mt. Diastrov eight days ago, volcanic ash has begun to rain over Large Urban Center #1 (LAC1). The mayor of LAC1 stated on the steps of city hall to a large crowd "We LAC1ers are strong people – not only will we preserve but we will help our neighbors who have evacuated stay safe and rebuild. We are all one and we will remain strong."

Residents are generally calm although reduced visibility has an increase in traffic accidents. Lautaro Marcel, who had left under mandatory evacuation, was the victim of such an accident. "This is the fault of the reckless and lazy emergency managers. They are personally responsible for my destroyed car! If they had not evacuated, this accident would not have happened." Marcel had driven his new Mercedes S500 into a drainage ditch near LAC1, claiming ash had caused him to not see the edge of the road.

Meanwhile travelers are stuck at LAC1's Vesuvio International Airport with flights that have been delayed and cancelled owing to ash which threatens air traffic. American backpacker Herbie Toker says he's not worried "This delay is coming at the end of a very long trip. Even though things are stressful at the airport, I'm managing to stay relaxed." He had just been to Mt. Disastrov while traveling through the country. "I was just hiking Mt. Diastrov weeks ago. It's insane to think about what's going on."

Inject #85

From

Media

To

Whole Room

Ash begins to fall as far west as Large Urban Center 1

Inject #86

From

Office of the Governor

Please provide for us:

- Which areas are under new evacuation orders?
- For each area/region, identify evacuation routes.
- Where are evacuation centers for each route? Are they able to support the populations under evacuation?

Inject #87

From

Res

To

Whole Room

Eruption ceases

Inject #88 - Building Back Better

From

HUM

To

RES

The discussion of building back better has started. Is this disaster attributable to Climate change? if so, if we build back to the current standards, will they be sufficient? How can we review the building/zoning standards?

Regards,
Humanitarian Regional Disaster Consortium

89 END OF STAGE 2

[90, 91, 92, 93, 94] REPORT OUT

95 END OF EXERCISE

Appendix D: Revision History

Table 2. Revision History

Date	Release	Editor	Primary clauses modified	Descriptions
Oct 1	0.1	Luis Bermudez	All	Outline and Section 1
Oct 10	0.2	Gabriel Asato	All	First Draft ER
Oct 17	0.3	Trevor Taylor	All	Proof reading
Oct 19	0.4	Luis Bermudez	All	Formatted in OGC ER, Proof reading
Dec 13	r1	Luis Bermudez	Title, Summary and Overview	Updated title