Exercises

Final Report and Recommendations

PARTNERSHIP

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Table of Contents

Executive Summary

The COVALEX project (Community of Valued Experts in Hydrometeorological and Technological Multi-hazards) introduced an innovative framework for enhancing disaster preparedness and response through Knowledge Network Exercises. These exercises aimed to test, validate, and refine good practices, ensuring their scalability, replicability, and integration into emergency management frameworks. Spanning four exercises—Spain, RedLex in northern Italy, Greece, and Apulia24 in southern Italy—COVALEX demonstrated the value of collaborative, evidence-based approaches to addressing complex emergencies.

Each exercise was tailored to specific themes and challenges:

- Spain: Focused on hydrometeorological emergencies, testing interagency interoperability during flood responses and dam breaches.
- RedLex: Emphasized cross-border collaboration between Italy and France in response to a Medicane, integrating advanced digital tools and predictive models.
- Greece: Simulated wildfire evacuation, prioritizing community engagement, temporary shelter management, and the use of predictive fire behavior tools.
- Apulia24: Concentrated on logistical operations, deploying key assets such as Emergency Response Units (ERUs) and testing civil-military cooperation.

The exercises revealed critical lessons:

- Focused objectives enhance exercise impact by enabling precise evaluations and facilitating integration of practices into operational frameworks.
- Interoperability and collaboration, both within and across borders, are central to effective disaster response.
- Advanced technologies like predictive models and real-time data platforms are transformative for situational awareness and decision-making.
- Thematic exercises provide complementary insights, enhancing broader disaster management strategies.
- Specialized training and community engagement strengthen resilience and preparedness.

Based on these insights, the report provides actionable recommendations, including institutionalizing the Knowledge Network Exercise framework, expanding cross-border collaboration, enhancing technological integration, and prioritizing inclusivity in disaster management. By fostering a culture of innovation and continuous learning, COVALEX has set a benchmark for future exercises, highlighting the importance of adaptable and scalable approaches to disaster risk reduction.

COVALEX's legacy lies in its ability to bridge scientific knowledge, operational practices, and strategic planning, creating a foundation for more resilient and effective global disaster preparedness. The project's outcomes demonstrate the critical role of collaboration and innovation in addressing the challenges of an increasingly complex risk landscape.

Acronyms

COVALEX: Community of Valued Experts in Hydrometeorological and Technological Multi-hazards

GSCP: General Secretariat for Civil Protection

CRI: Italian Red Cross (Croce Rossa Italiana)

FRC: French Red Cross

INUNGAL: Galician Flood Emergency Plan (Plan de Inundación de Galicia)

EXCON: Exercise Control

SDI: Spatial Data Infrastructure

DSS: Decision Support System

VGI: Volunteered Geographic Information

ERU: Emergency Response Unit

CBRN: Chemical, Biological, Radiological, and Nuclear

MSEL: Master Scenario Events List

GIS: Geographic Information Systems

UNHRD: United Nations Humanitarian Response Depot

HIAC: Humanitarian Information Analysis Course

ENAP: Emergency Needs Assessment Programme

MASAI: Maps for Damage Assessments with Satellite Artificial Intelligence

AXEGA: Galician Emergency Agency (Axencia Galega de Emerxencias)

NGO: Non-Governmental Organization

SOP: Standard Operating Procedure

Introduction

The COVALEX Project

The COVALEX project (Community of Valued Experts in Hydrometeorological and Technological Multi-hazards) is an initiative focused on building a network of experts to enhance responses to hydrometeorological and technological disasters. By utilizing the collective experience and diverse sectoral expertise of its members, COVALEX aims to streamline evidence-based risk governance and improve communication interoperability among decision-makers, rescue teams, and humanitarian actors. The project emphasizes integrating practical scientific knowledge into disaster prevention, preparation, and response.

COVALEX prioritizes simplifying complex phenomena for decision-makers and crisis managers to support effective prevention and preparedness strategies. With a community-building approach, the project involves six partnerships across ten countries, bringing together academia, practitioners, and policymakers in a cross-sectoral collaboration. Its work focuses on applying scientific insights to disaster risk management (DRM) practices, particularly in addressing challenges posed by hydrometeorological and technological disasters.

Key initiatives under COVALEX include the development of knowledge network exercise guidelines and the implementation of four tabletop or full-scale exercises. These exercises were designed to test and validate the guidelines while fostering collaboration among diverse stakeholders. The project also facilitated the participation of experts in these exercises to ensure practical insights informed the outcomes. By engaging decision-makers, public service providers, NGOs, and media representatives, the initiative aimed to bridge scientific knowledge with operational practice, contributing to the refinement of disaster risk management strategies and tools.

Knowledge Network Exercises

Knowledge Network Exercises are designed with a dual objective. First, they enable the testing of good practices within the country or region where they were developed. This approach focuses on translating these practices into Standard Operating Procedures (SOPs) and integrating them into emergency response plans to enhance their effectiveness. Second, Knowledge Network Exercises offer the opportunity to test good practices that have proven successful in one context in other countries or regions. This allows for assessing their scalability, replicability, and sustainability in different operational environments.

The Knowledge Network Exercise Guidelines provided the foundational framework for designing and implementing the exercises. By outlining structured methodologies for scenario development, stakeholder engagement, and evaluation, the guidelines ensured consistency across all exercises. This enabled a systematic approach to both testing good practices in their original context and adapting them for different environments.

Insights from these exercises, gathered through participant feedback, evaluation reports, and post-exercise reviews, will inform the refinement of the Knowledge Network Exercise Guidelines. This iterative process ensures that the guidelines are dynamic, capable of addressing emerging challenges, and supportive of broader scalability efforts.

Each exercise tackled unique challenges while contributing to the shared goal of improving disaster management. Spain focused on refining local interoperability during floods, RedLex

emphasized cross-border coordination for medicane scenarios, Greece honed evacuation and temporary housing protocols, and Apulia24 explored civil-military coordination for complex emergencies. Together, these exercises highlight the complementary nature of the Knowledge Network Exercises, demonstrating their value in enhancing disaster preparedness and response across diverse contexts.

Spain: UDC Exercise

Exercise Design and Scenario Development

The operations-based exercise conducted in Spain focused on hydrometeorological hazards and risks derived from climate change, employing a well-structured, three-stage scenario. The scenario simulated escalating events caused by heavy rainfall that led to severe flooding. The stages included urban rescue in Xuvia, river rescue operations along the Xuvia River, and the activation of regional emergency plans such as INUNGAL and municipal action plans for Narón and Neda.

The exercise emphasized realistic conditions, such as debris accumulation causing a dam breach, to challenge participants and test response mechanisms. Around 130 participants, including emergency responders, students, and local authorities, collaborated to navigate the dynamic, high-pressure scenario. This multi-agency effort demonstrated an effective integration of resources, technical expertise, and coordination to manage complex emergencies.

Area of Operations

Technical means, including rescue boats and specialized river rescue equipment, were deployed, while various entities played critical roles. The Galician Emergency Agency (AXEGA) provided oversight at the command post, while local police managed traffic and assisted the public. Civil protection volunteers offered logistical and operational support, and emergency medical services (061) ensured care for simulated victims. Additionally, maritime rescue operations complemented the on-ground efforts.

Exercise Execution and Implementation

The exercise conducted in Spain unfolded with meticulous execution and dynamic implementation, bringing together multiple agencies to respond to a simulated hydrometeorological emergency. Spanning three stages, the exercise began with urban rescue operations in Xuvia, where participants addressed the immediate impacts of severe flooding in residential and public areas. The second stage shifted to river rescue efforts along the Xuvia River, requiring the deployment of specialized equipment such as rescue boats and technical tools for water-based operations. Finally, the third stage involved a large-scale coordination effort to manage the aftermath of a simulated dam breach at Rei Dam, leading to an uncontrolled outflow of water.

Over 130 participants, including emergency responders, university students, and local authorities, engaged in real-time decision-making and operational activities. The activation of regional emergency plans such as INUNGAL and municipal response frameworks for Narón and Neda added layers of complexity to the simulation. Command posts, staffed by the Galician Emergency Agency (AXEGA), coordinated the multi-agency response, while local police managed traffic and public safety. Civil protection volunteers provided logistical support, and emergency medical services (061) ensured simulated victims received timely care.

Body/ Entity	Means requested
AXEGA	Participation in the command post
LOCAL POLICE NEDA/NARÓN	Staff and resources for traffic control and assistance to the public.
AVPC	Personnel and means for logistical and support tasks.
061	Health care for victims
MARITIME RESCUE	To be determined

Operational Stakeholders

The exercise seamlessly integrated technical expertise, field operations, and collaborative decision-making, providing participants with a realistic and high-pressure environment to test their skills and procedures. The use of planned scenario "injects" maintained momentum and challenged participants to adapt to evolving conditions, highlighting the importance of inter-agency coordination in managing complex emergencies.

Good Practices Tested

Interoperability Between Agencies

The exercise in Spain showcased and tested exemplary practices in fostering interoperability between multiple agencies during a complex hydrometeorological emergency. Key to the exercise's success was the coordinated effort among diverse organizations, including the Galician Emergency Agency (AXEGA), local police forces, civil protection volunteers, maritime rescue teams, and emergency medical services (061). Each agency brought distinct expertise and resources, working in concert under a unified command structure to address the challenges posed by severe flooding and a simulated dam breach.

Inter-agency collaboration was facilitated by shared communication channels and a centralized command post managed by AXEGA. This ensured real-time information sharing and effective decision-making. The local police managed public safety and traffic control, while civil protection volunteers provided logistical support, including resource distribution and on-site coordination. Emergency medical services responded to simulated injuries, integrating seamlessly with search and rescue operations conducted by specialized river and maritime units.

The simulation also tested the ability of agencies to synchronize their roles within regional emergency frameworks, such as the activation of INUNGAL and municipal response plans. This interoperability was particularly evident during complex rescue operations, where technical expertise and rapid coordination were required to manage water rescues and the safe evacuation of affected populations. By demonstrating effective collaboration across organizational boundaries, the exercise highlighted the importance of integrated planning, resource sharing, and joint decision-making in achieving a unified and efficient emergency response.

Engaging Students Through a Hackathon

An innovative good practice tested during the exercise in Spain was the integration of a hackathon involving university students to foster creative problem-solving and community engagement. Prior to the exercise execution, over 50 students participated in the hackathon, where they were challenged to develop practical solutions to potential emergencies aligned with the exercise scenario, such as flooding and dam breaches. The hackathon encouraged interdisciplinary collaboration and allowed students to explore cutting-edge approaches to emergency management.

The students' solutions were presented to a panel of experts, including participants from the exercise's execution and implementation phases. This provided an opportunity for the students to receive professional feedback and for the experts to assess the feasibility and innovativeness of the proposed ideas. The inclusion of this activity not only promoted a culture of innovation but also served as a platform to identify novel strategies that could be integrated into future emergency plans. By bridging academic perspectives with professional expertise, the hackathon underscored the value of engaging the next generation in real-world problem-solving while enhancing the overall learning outcomes of the exercise.

Norther Italy: RedLex Exercise

Exercise Design and Scenario Development

The RedLex 2024 exercise was designed to simulate a cross-border hydrogeological emergency triggered by a Medicane (Mediterranean hurricane). The scenario featured multiple cascading effects, including flash floods, landslides, debris flows, and severe infrastructural damage across operational areas in Italy (Lombardy, Piedmont, and Liguria) and France (Roya Valley). This evolving crisis provided a realistic and dynamic environment to test cross-border collaboration, situational awareness, and operational response under high-pressure conditions.

The design of the exercise was grounded in a comprehensive planning process led by the Italian Red Cross' International Emergencies Unit, with significant input from French and Italian civil protection authorities, Red Cross societies, and scientific institutions such as the National

Research Council (CNR) and Bureau de Recherches Géologiques et Minières (BRGM). The Master Scenario Events List (MSEL) guided the exercise, outlining key events, injects, and challenges to ensure a logical and progressive flow. Injects included simulated meteorological reports, hazard maps, and real-time data updates, reflecting the unpredictability and complexity of real-world emergencies.
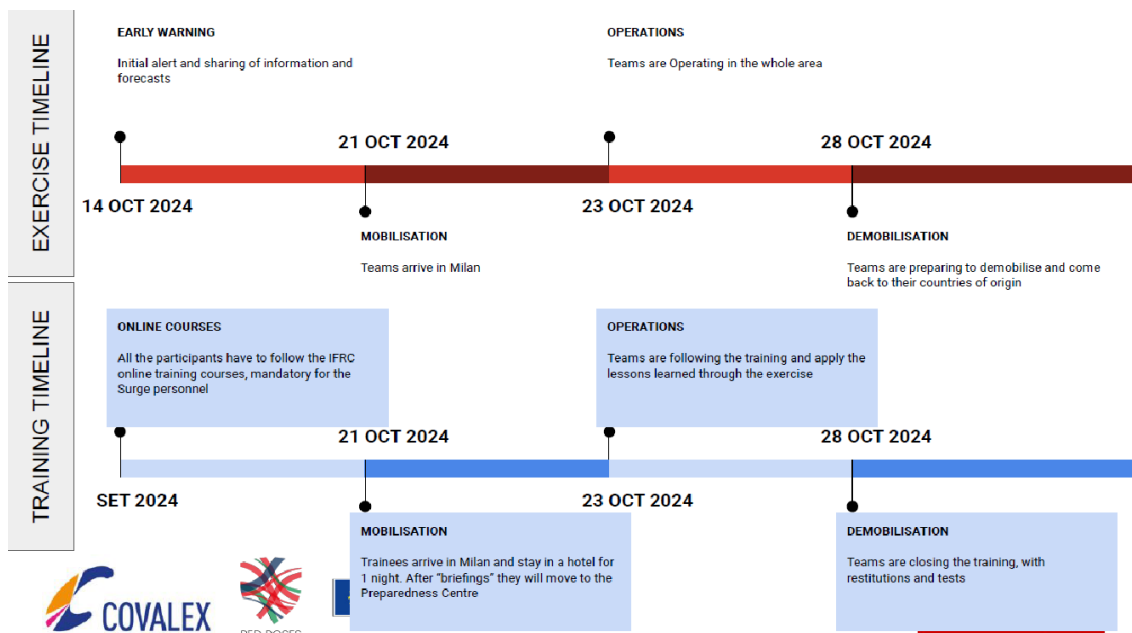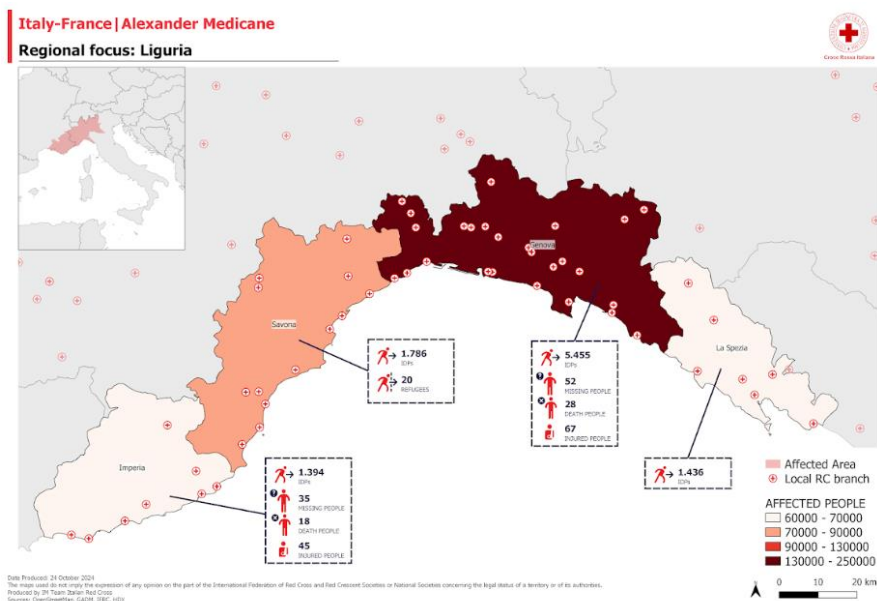

Exercice Timeline

A standout feature of the scenario development was the integration of the RED ROSES Spatial Data Infrastructure (SDI), which provided cutting-edge tools for hazard monitoring, risk analysis, and decision support. Modules such as Volunteered Geographic Information (VGI) and Decision Support Systems (DSS) enabled participants to gather and analyze data in real time, enhancing the realism and operational relevance of the exercise.
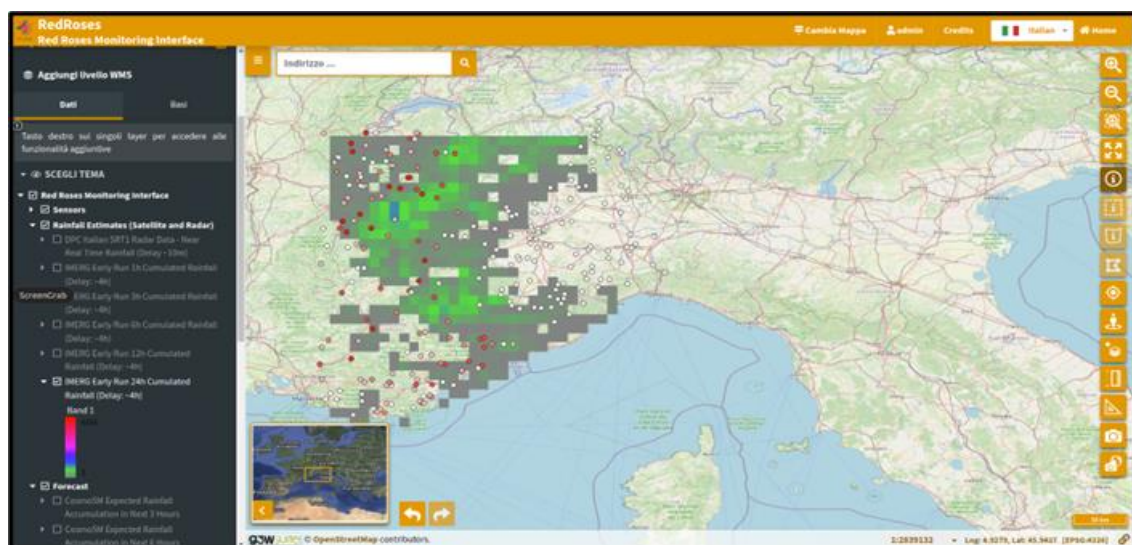
Screenshot from the RedRoses geo data portal

To ensure realism, the scenario was supported by detailed background materials, including local newspapers, flash updates from simulated international organizations, and region-specific

reports. These materials replicated real-world information flows, challenging participants to interpret and respond to evolving conditions dynamically. The inclusion of both local and cross-border stakeholders enriched the scenario by fostering collaborative decision-making and testing harmonized protocols between French and Italian agencies.

Example of a fake map created for the exercise

Example of a fake media outlet created to suppor the scenario

Exercise Execution and Implementation

The RedLex 2024 exercise was conducted as a multi-phased, cross-border simulation spanning operational areas in Italy (Lombardy, Piedmont, Liguria) and France (Roya Valley). Managed by the Italian Red Cross (CRI) in collaboration with the French Red Cross (FRC), civil protection authorities, and scientific institutions, the exercise combined field operations with advanced digital tools to create a realistic and immersive experience. Activities were monitored and guided by the Exercise Control (EXCON) team, which used real-time data systems to ensure seamless coordination and oversight.

Screenshot of the Exercice MSEL

The exercise was divided into three distinct phases:

- ◆ Alert Phase: This phase began with the dissemination of simulated meteorological bulletins and hazard maps to prepare participants for the approaching Medicane. Teams were activated and briefed on their roles, emphasizing coordination across national boundaries.
- ◆ Critical Phase: This was the most intensive phase, featuring complex scenarios such as flood response, debris removal, evacuation of affected populations, and cross-border coordination between Italian and French teams. Participants conducted field assessments, managed resource distribution, and used drones for real-time geospatial data collection.
- ◆ Stabilization Phase: In this phase, emergency activities were scaled down, with a focus on recovery and restoration efforts. Data collected during the critical phase was analyzed to plan further interventions and assess long-term impacts.
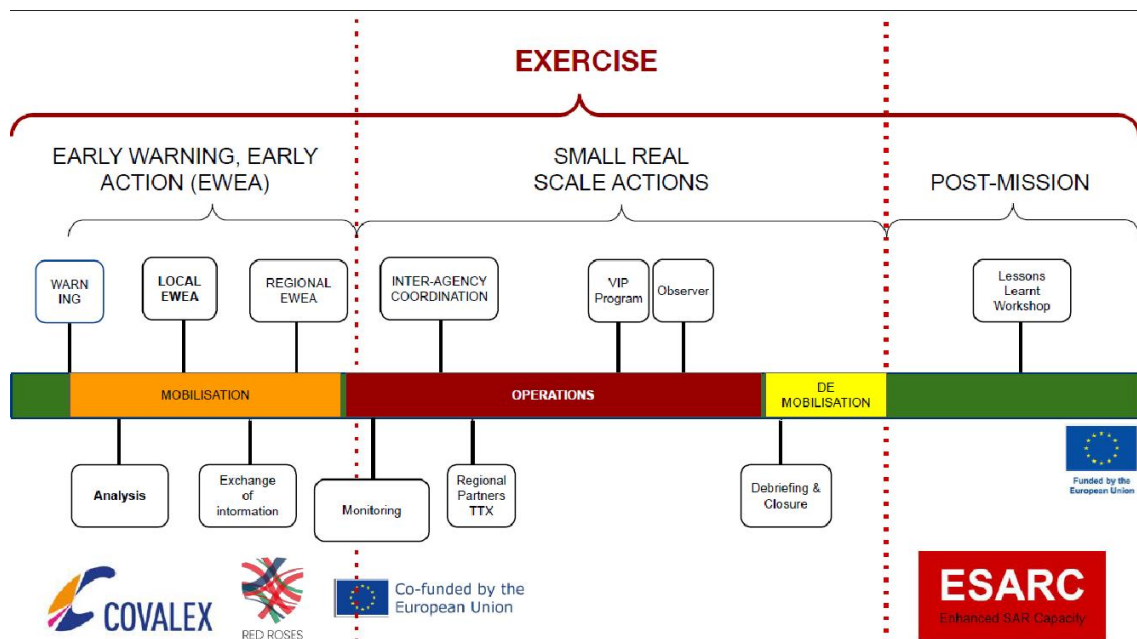
Exercise Phases

Field operations were carried out in four main areas, each managed by a dedicated local team supported by centralized command and control systems. The Italian Red Cross National Operations Centre served as the primary coordination hub, backed by a secondary unit to ensure operational continuity. EXCON, with teams in both Italy and France, managed the exercise's flow using the Master Scenario Events List (MSEL) and integrated information management tools such as Kobo Toolbox and RED ROSES SDI.

Key operational activities included:

♦ Flood and Landslide Assessments: Teams conducted on-site evaluations of affected areas, gathering critical data on the extent of damage and resource needs.
♦ Evacuation Operations: Participants managed the relocation of affected populations, ensuring safe evacuation routes and the provision of basic necessities at temporary shelters.
♦ Cross-Border Communication: Coordinated briefings and shared protocols facilitated effective collaboration between French and Italian teams, particularly for resource allocation and synchronized interventions.
♦ Use of Technology: Digital tools such as GIS platforms, VGI modules, and drone imagery provided real-time situational awareness, enabling participants to make informed decisions under dynamic conditions.

The safety of participants was a top priority, with certified rescue operators from CRI overseeing field activities. Drones and GPS systems were used to monitor team locations, while a centralized dashboard provided EXCON with real-time data on inject responses, team performance, and scenario progression. This system allowed EXCON to adjust the intensity and frequency of injects based on team stress levels and operational needs.

A key feature of the exercise was its emphasis on collaboration across borders and agencies. Joint operations between Italian and French teams demonstrated the importance of harmonized protocols and effective communication. Training sessions, integrated with field activities, enabled participants to apply theoretical knowledge to practical scenarios. The "learning by

doing" approach ensured that participants not only practiced operational tasks but also reflected on their effectiveness, gaining insights for future applications.

The exercise concluded with a debriefing session, where participants reviewed performance, shared feedback, and discussed lessons learned. This comprehensive implementation approach underscored the critical role of preparedness, interoperability, and real-time data integration in managing complex, multi-jurisdictional emergencies.

Good Practices Tested

The RedLex 2024 exercise provided a comprehensive platform for testing and validating a range of good practices that are critical for effective cross-border disaster preparedness and response. These practices focused on interoperability, technological integration, and collaborative decision-making, with a notable emphasis on leveraging scientific expertise.

Cross-Border Coordination

One of the primary goals of RedLex 2024 was to assess and enhance the interoperability of emergency response frameworks between Italy and France. Through joint briefings, shared operational plans, and synchronized interventions, the exercise highlighted the importance of harmonized protocols for effective communication and resource-sharing across borders. This collaboration demonstrated the ability to streamline complex operations through unified response strategies.

Collaboration with Scientific Institutions

The exercise showcased the critical role of scientific institutions, such as the National Research Council (CNR) and the Bureau de Recherches Géologiques et Minières (BRGM), in developing realistic and data-driven scenarios. These institutions contributed hazard models, meteorological simulations, and risk analyses that informed the exercise's design and ensured its alignment with real-world challenges. This collaboration enhanced the accuracy and operational relevance of the scenario, providing participants with a scientifically robust environment for testing their skills.

Use of Advanced Digital Tools

The RED ROSES Spatial Data Infrastructure (SDI) played a pivotal role in the exercise, offering tools such as Volunteered Geographic Information (VGI), Decision Support Systems (DSS), and a Geoportal for real-time data visualization and analysis. These tools allowed participants to gather and interpret geospatial data, enhancing situational awareness and enabling informed decision-making. The integration of drones for geospatial mapping further supported operational efficiency by providing accurate and timely insights into affected areas. Additionally, the MASAI platform (maps for damage assessments with satellite artificial intelligence) was integrated in the platform and tested by the participants. First, a demo of the platform was conducted during the first theoretical days of the exercise, and the participants received an inject to use the platform and analyze scenario data to make evidence-based decisions.
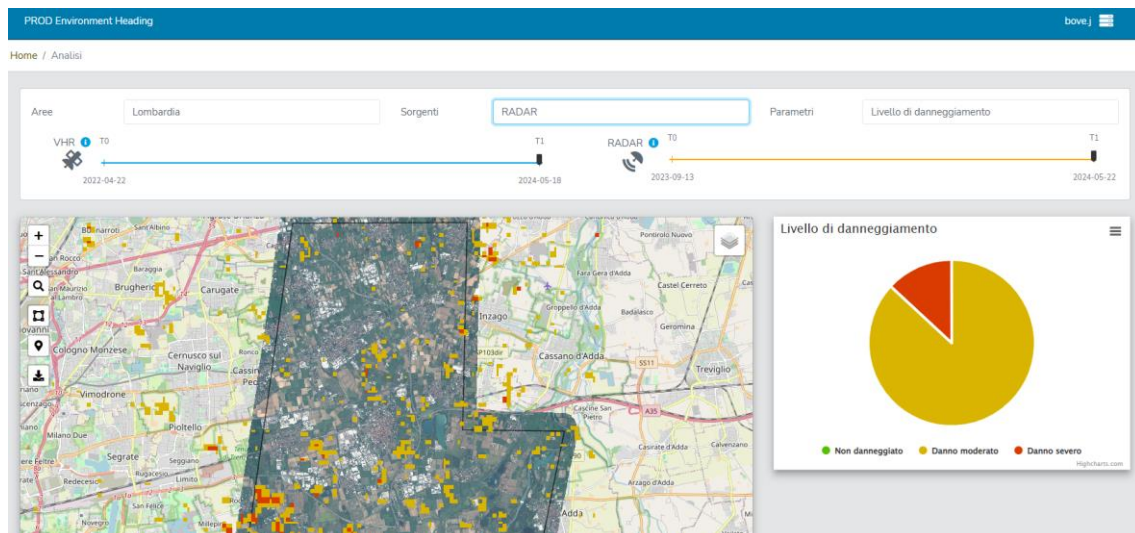
Screenshot from the MASAI platform with scenario information for Lombardia and fake flooded areas

Data-Driven Decision-Making

Participants relied on structured data collection methodologies and digital platforms like Kobo Toolbox to process and analyze information during field operations. This data-driven approach ensured that decision-making was grounded in real-time, evidence-based insights, reducing response times and improving the accuracy of resource allocation. The use of Immediate Needs Assessment forms further streamlined the prioritization of interventions based on specific requirements.

Interagency Collaboration

The exercise highlighted the importance of interagency collaboration, involving civil protection authorities, Red Cross societies, scientific institutions, and local governments. This multi-stakeholder approach demonstrated how shared goals, combined expertise, and defined roles can enhance operational effectiveness while reducing redundancies. The diversity of expertise within the teams enriched decision-making and operational planning.

Real-Time Monitoring and Adaptive Management

The integration of centralized dashboards and GPS tracking systems enabled EXCON to monitor team performance and adjust injects dynamically. This adaptive management approach maintained the exercise's realism and intensity, providing participants with meaningful challenges that mirrored real-world conditions. The use of real-time monitoring tools also enhanced operational oversight and situational awareness.

Screenshot from the Excon Redlex dahsboard

Community and Stakeholder Engagement

Local authorities and civil protection agencies played an active role in the exercise, providing realistic feedback and ensuring that the simulated operations aligned with regional needs. This engagement reinforced the importance of including community perspectives in disaster preparedness efforts, ensuring that response strategies address local vulnerabilities effectively.

Training and Knowledge Exchange

Participants benefited from integrated training sessions such as the Emergency Needs Assessment Programme (ENAP) and Humanitarian Information Analysis Course (HIAC). These sessions were paired with field activities, allowing participants to apply theoretical knowledge to practical scenarios. The exercise also facilitated cross-border knowledge exchange, enriching participants' understanding of diverse methodologies and fostering a culture of continuous improvement.

By incorporating these good practices, RedLex 2024 successfully demonstrated the importance of integrating scientific expertise, advanced technology, and interagency collaboration into disaster response frameworks. These insights serve as valuable benchmarks for refining emergency preparedness strategies and enhancing resilience to cross-border emergencies.

Greece: GSCP Exercise

Exercise Design and Scenario Development

The full-scale exercise conducted in Greece focused on testing the organized preventive evacuation of citizens due to a large-scale forest fire in the Loutraki region. This scenario was designed to replicate real-world challenges posed by high-risk fire conditions, with the aim of evaluating and refining local emergency response plans. The Exercise Design Team (EDT), comprising representatives from the General Secretariat for Civil Protection (GSCP), the municipality of Loutraki, local fire brigade, police, and health services, led the design process. They held four comprehensive planning meetings—both virtual and in-person—and conducted multiple site visits in the affected area to ensure the scenario's alignment with the region's unique geographical and demographic characteristics.

The exercise scenario was divided into progressive stages, beginning with fire detection and escalating to the evacuation of settlements, management of temporary shelters, and search-and-rescue operations. Specific tools, such as predictive models for fire behavior provided by CIMA, were integrated into the design to enhance situational awareness and inform decision-making. The EDT also coordinated closely with international partners, including the Italian Red Cross, to incorporate best practices and ensure that the scenario tested both local and cross-border interoperability. By including diverse stakeholders and prioritizing realism, the design ensured the exercise would provide actionable insights into the region's preparedness and response capabilities.
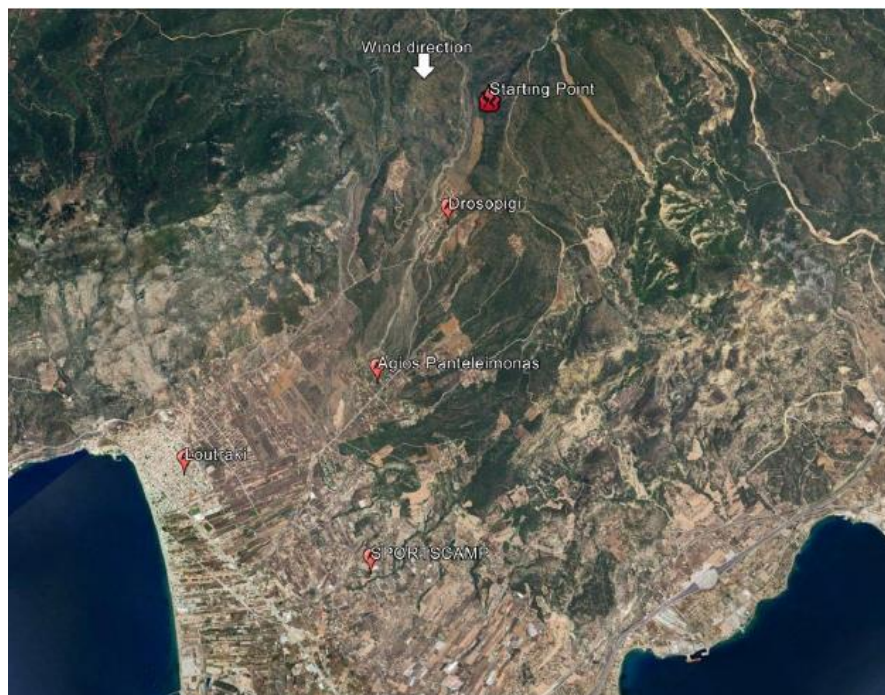
Area of Operations and Fire Ignition Points

Exercise Execution and Implementation

The execution of the exercise unfolded in six stages across multiple locations in Loutraki, beginning with a briefing session at the Club Hotel Casino Loutraki. During this session, the Mayor of Loutraki and representatives from the GSCP outlined the framework and objectives of

the exercise. A presentation by CIMA introduced predictive tools for fire spread, setting the stage for informed decision-making throughout the simulation. Distinguished attendees included representatives from the Italian Red Cross, local authorities, and academic institutions, emphasizing the collaborative nature of the event.

The operational phase began at 11:00 AM, with field activities conducted at five pre-identified locations, each representing key elements of the response effort:

- Incident Command Setup: Local authorities established an incident command post, where decision-makers gathered to assess the fire's progression, coordinate resources, and issue evacuation orders.
- Evacuation of Settlements: The exercise involved the preventive evacuation of citizens from four settlements—Pefkia, Kallithea, Poussi Maidani (Agios Panteleimonas), and Irini—guided by municipal plans. Police managed traffic and ensured the safety of evacuation routes, while volunteers and municipal personnel assisted citizens in reaching buses for transportation to shelters.
- Search-and-Rescue Operations: A simulated rescue scenario involved locating and evacuating two hikers stranded near the fire zone. Emergency calls provided coordinates, and responders used GPS devices and drones to pinpoint the victims and deliver medical assistance.
- Temporary Shelter Management: Evacuees, including 100 children from a local sports camp, were accommodated in pre-designated shelters. Municipal staff, supported by the Italian Red Cross, managed registration, provided meals, and ensured the needs of vulnerable groups were met.
- Monitoring and Media Engagement: Drones captured live footage of the evacuation and shelter operations, while local media documented the exercise, fostering transparency and public awareness.

The exercise concluded with a debriefing session at the original venue, where representatives from all participating agencies reviewed performance, identified challenges, and shared observations to inform future improvements.

Search and Rescue Activities

Good Practices Tested

The exercise in Greece highlighted and tested several critical good practices in disaster management, focusing on coordination, technology integration, and community engagement:

Predictive Fire Behavior Tools

The use of CIMA's predictive models allowed decision-makers to assess fire spread in real-time, enabling timely evacuation orders. This tool proved instrumental in enhancing situational awareness and ensuring resources were allocated efficiently.

Interagency Coordination

The collaboration between local authorities, fire services, police, health services, and the Italian Red Cross showcased effective interagency interoperability. Key actions, such as establishing an incident command post and coordinating evacuation logistics, demonstrated how clear communication and defined roles streamline complex operations.

Shelter Management and Vulnerable Group Support

Temporary shelters were managed collaboratively by municipal staff and the Italian Red Cross, incorporating practices for efficient registration, meal distribution, and accommodations for diverse needs, including children, individuals with disabilities, and pet owners.

Search-and-Rescue Efficiency

The integration of GPS systems and drone technology expedited the search-and-rescue operation for stranded hikers, illustrating the importance of modern tools in responding to emergencies.

Community Education and Engagement

The involvement of local schoolchildren in evacuation scenarios and pre-exercise educational sessions underscored the value of fostering disaster awareness among younger populations. These activities enhanced community preparedness and provided a hands-on learning experience.

Use of Technology for Monitoring

Drone footage provided an overview of operations, allowing evaluators to monitor activities in real time and identify areas for improvement. This also ensured safety and accountability throughout the exercise.

Assessment Tools

The Italian Red Cross (CRI) participated as a key partner, bringing its well-established expertise in emergency management. Specifically, on this occasion CRI presented its operational procedure for registering temporarily evacuated populations using a team composed by a coordinator and a nurse, and two highly specialized volunteers from the Surge Team to apply the procedure within the exercise at local level.

The activity is based on the Immediate Needs Assessment Form, which is a key tool developed to address the needs of the most vulnerable individuals affected by emergencies. Introduced following the 2009 earthquake in Abruzzo, the form was designed to meet the immediate needs

of those requiring specific assistance in emergency situations. Its first implementation in the field occurred during the response to the Central Italy Earthquake, where it was adopted by the Lazio, Marche, Umbria, and Abruzzo regions. These experiences confirmed the effectiveness of the tool.

This Form enables civil protection systems to categorize individuals receiving assistance, prioritize interventions, and assess specific needs, as well as identify the most suitable accommodation facilities. The tool is composed of two parts and aims to identify the particular needs of individuals who are already receiving general assistance.

Introduced by the Directive of the Prime Minister dated January 7, 2019, it was designed as an objective instrument to identify specific needs among displaced populations already assisted in waiting and reception areas. Its goal is to ensure no one is left behind, particularly those belonging to vulnerable groups such as the elderly, children, persons with disabilities, socially marginalized individuals, pregnant women, and others whose vulnerabilities depend on the context. For instance, an elderly person who is self-sufficient in their home environment may face significant challenges in a displaced setting where routines and support systems are disrupted.

The form is utilised to carry out the assessment with standardised methodology:

- the objective assessment of the socio-health needs of the population assisted in the event;
- the division of subjects assisted by the civil protection system into categories that require the use of different socio-health supports;
- the identification of priority criteria for assistance interventions;
- the evaluation of specific needs and the most suitable accommodation facilities.

By combining predictive tools, collaborative frameworks, and practical community-focused measures, the exercise provided a comprehensive evaluation of the region's capacity to manage wildfire emergencies effectively. These tested practices offer valuable insights for both local and international disaster preparedness initiatives.

Southern Italy: Apulia24 Exercise

Exercise Execution and Implementation

The Apulia24 exercise was unique in its focus on testing and deploying operational assets rather than following a traditional scenario-driven approach. Conducted at the United Nations Humanitarian Response Depot (UNHRD) in Brindisi, Italy, the exercise centered on logistical operations to evaluate the deployability, functionality, and interoperability of critical modules and resources used in emergency response.

Unlike other exercises that rely on intricate scenario development, Apulia24 was structured as a logistical exercise, with no simulated disaster scenario. Instead, it focused on the deployment, setup, and operational testing of various assets, including:

- The Emergency Response Unit (ERU) Base Camp
- The Deceased Bodies Management Module
- Advanced Medical Posts

- Water Purification Units
- CBRN (Chemical, Biological, Radiological, and Nuclear) Decontamination Modules
- Field Hospitals and Command Posts

This approach allowed for a targeted evaluation of the equipment and teams in operational conditions without introducing the complexity of a simulated emergency. The absence of a narrative scenario was compensated by detailed operational phases, including deployment, setup, full operational testing, and final demonstrations to stakeholders and VIP observers.

Red Cross's Auxiliary Corps to the Armed Forces Base Camp

Field Hospital Set Up

The exercise's design emphasized interoperability, particularly between the Italian Red Cross's Auxiliary Corps to the Armed Forces and civilian emergency units. Additionally, joint training sessions with international teams ensured a cohesive environment for collaboration, operational learning, and feedback collection. This logistics-focused framework provided valuable insights into the efficiency and practicality of asset deployment under controlled conditions, directly supporting the objectives of improving readiness and operational efficiency.

Good Practices Tested

The Apulia24 exercise offered a valuable opportunity to test and refine several critical good practices, particularly in the areas of civil-military cooperation and specialized training for emergency responders. By focusing on the deployment and integration of operational assets, the exercise underscored the importance of effective collaboration and preparedness in complex emergency scenarios.

Civil-Military Cooperation

A key focus of Apulia24 was to evaluate the interoperability between the Italian Red Cross's Auxiliary Corps to the Armed Forces and civilian emergency units. This collaboration was tested during the deployment of logistical and medical assets, including the Emergency Response Unit (ERU) Base Camp, Advanced Medical Posts, and the Deceased Bodies Management Module. Joint operations highlighted the value of clear communication channels, shared protocols, and integrated resource management. The exercise demonstrated how civil and military entities can efficiently work together to establish and operate facilities, ensuring seamless coordination in emergency contexts.

The ability to synchronize efforts across different organizational structures was further enhanced by the participation of international teams, which provided diverse perspectives and practices. This multi-stakeholder approach reinforced the importance of harmonized planning and execution, particularly when managing specialized assets such as CBRN Decontamination Modules and Field Hospitals.

First Aid Training in Hostile Environments

Another significant aspect of Apulia24 was the inclusion of specialized training for participants, particularly on providing first aid in hostile environments. This training addressed the challenges responders may face when delivering medical care in high-risk situations, such as conflict zones or areas affected by chemical, biological, radiological, or nuclear incidents. Participants were trained on techniques for ensuring personal safety while effectively triaging and treating casualties under adverse conditions.

This training component not only enhanced the skills and confidence of the responders but also contributed to the exercise's broader goal of improving readiness for complex emergencies. The combination of theoretical instruction and practical application provided participants with a robust understanding of how to adapt to challenging operational environments, aligning with international best practices in emergency response.

Integrated Asset Deployment

The exercise also highlighted the importance of efficient deployment and operation of emergency response assets. Teams practiced setting up and testing critical facilities, including water purification units and public health modules, ensuring they met operational standards.

These efforts demonstrated the practical steps required to quickly mobilize resources and deliver life-saving support in emergencies.

By focusing on these good practices, Apulia24 successfully reinforced the principles of collaboration, adaptability, and preparedness. The exercise provided valuable insights into the dynamics of civil-military coordination and the critical role of specialized training in enhancing responder capabilities. These lessons contribute to the ongoing refinement of emergency response frameworks and the strengthening of disaster readiness at national and international levels.

Lessons Learned and Recommendations

The COVALEX project's Knowledge Network Exercises offered a unique framework for testing and validating good practices in disaster preparedness and response across diverse scenarios. This concept emphasized a targeted approach to exercises, focusing on the scalability, replicability, and integration of successful practices into operational frameworks. The four exercises—Spain, RedLex, Greece, and Apulia24—provided a rich environment for testing diverse practices, each tailored to distinct challenges. The cumulative insights from these exercises have underscored the value of collaborative learning and provided actionable recommendations for enhancing future initiatives.

The four Exercises introduced an innovative framework for disaster preparedness and response, prioritizing the testing and validation of good practices. Across four distinct exercises—Spain, RedLex, Greece, and Apulia24—the project revealed key insights into the effectiveness of targeted approaches. A central takeaway was the importance of focusing on specific objectives, such as interoperability, technology integration, and specialized training, to enhance the practical applicability of good practices. These exercises underscored the critical role of collaboration, both within and across borders, and the value of engaging diverse stakeholders in a structured learning environment.

Lessons Learned

Focused Objectives Enhance Exercise Impact:

Unlike traditional scenario-driven exercises, the Knowledge Network Exercises prioritized testing specific good practices, such as interoperability, predictive tools, and asset deployment. This focus allowed for more precise evaluations and a better understanding of how these practices can be integrated into Standard Operating Procedures (SOPs) or adapted for use in different contexts.

Interoperability is Central to Effective Response

Across all exercises, interagency and cross-border collaboration emerged as a critical factor for success. Whether it was managing the integration of local and regional agencies in Spain, coordinating cross-border teams during RedLex, or fostering civil-military cooperation during Apulia24, the ability to align roles, resources, and communication protocols proved essential.

Technology is a Game-Changer for Decision-Making

The integration of advanced tools, such as predictive models (CIMA in Greece) and real-time data platforms (RED ROSES in RedLex), highlighted the transformative role of technology. These tools enhanced situational awareness, informed decisions, and improved operational efficiency, underscoring the need for their wider adoption in disaster management.

An important lesson learned was the necessity of providing participants with comprehensive training on digital platforms prior to the operational phase of the exercise. Familiarizing participants with tools like predictive models, GIS platforms, and real-time data systems ensures they can utilize these technologies effectively under dynamic conditions. For example, the MASAI platform in RedLex required users to interpret geospatial data and integrate it into decision-making processes rapidly. Without prior training, participants may struggle to leverage the full capabilities of these platforms, potentially compromising the efficiency of operations. Training sessions conducted before the exercise also allow for troubleshooting, ensuring that participants enter the operational phase confident in their ability to navigate the technology, thereby maximizing its impact on overall performance. This approach highlights the importance of preparedness not only in physical logistics but also in the digital tools that underpin modern disaster response.

Thematic Focus Strengthens Learning

Each exercise offered a thematic focus—hydrometeorological emergencies in Spain, cross-border coordination in RedLex, wildfire evacuation in Greece, and logistical operations in Apulia24. This diversity provided complementary insights, showcasing how targeted exercises can address specific risks while contributing to a broader understanding of disaster response.

A key factor in the success of these thematic exercises was the scientific approach to scenario design. Engaging scientific institutions from the earliest stages of planning ensured that the scenarios were grounded in accurate data and real-world conditions. Scientific involvement also brought specialized expertise, such as hazard mapping and risk analysis, which enriched the scenario's relevance and operational value. By integrating a scientific perspective into scenario design, exercises can better reflect the intricacies of modern disaster environments, offering participants an authentic and meaningful experience that enhances both learning and

preparedness. This underscores the importance of building partnerships with scientific organizations as a foundational step in designing effective disaster management exercises.

Specialized Training Builds Resilience

The inclusion of training modules, such as first aid in hostile environments during Apulia24 and evacuation protocols for vulnerable populations in Greece, reinforced the value of integrating capacity-building components into exercises. These sessions ensured participants not only tested practices but also gained new skills to enhance their preparedness.

Community Engagement Fosters Sustainable Preparedness

Exercises like Greece and Spain demonstrated the importance of involving communities in preparedness efforts. Engaging local populations through evacuation drills or educational activities created awareness and empowered communities to respond effectively in emergencies.

Recommendations

Institutionalize the Knowledge Network Exercise Framework

Codify the methodologies and best practices identified during COVALEX exercises into a standardized framework. This can serve as a reference for designing targeted exercises that test and refine good practices in diverse contexts.

Expand Cross-Border Collaboration

Build on the successes of RedLex by encouraging more transnational exercises. These should include standardized protocols, shared resources, and joint training to address complex, multi-country disasters effectively.

Enhance Technological Integration

Prioritize the adoption of data management platforms and real-time monitoring systems. Provide training for participants to ensure they can effectively utilize these technologies during operations.

Focus on Inclusivity in Disaster Management

Develop exercises that address the needs of diverse populations, including vulnerable groups such as children, elderly individuals, and persons with disabilities. This can ensure that disaster preparedness plans are equitable and comprehensive.

Promote Continuous Learning and Feedback

Establish mechanisms for systematically collecting feedback and lessons learned from exercises. Use this information to update and improve SOPs, guidelines, and future exercise designs.

Strengthen Civil-Military Cooperation

Build on the outcomes of Apulia24 by formalizing civil-military coordination protocols. This includes clarifying roles, responsibilities, and processes for deploying shared resources in complex emergencies.

Foster a Culture of Innovation

Encourage exercises to include components like hackathons or training on emerging risks, as seen in the Greece and Spain exercises. These initiatives can drive innovative solutions and enhance the relevance of disaster management strategies.

Develop Regional and International Databanks

Create and maintain comprehensive databases of tested good practices, assets, and expertise. This can facilitate knowledge sharing and quick access to resources during crises.

Conclusion

The COVALEX project has demonstrated the transformative potential of Knowledge Network Exercises in advancing disaster preparedness and response. By focusing on the testing and validation of good practices through targeted exercises, the project introduced an innovative framework that bridges operational realities with strategic planning. Each exercise—Spain, RedLex, Greece, and Apulia24—offered unique insights, addressing specific challenges while contributing to a cohesive understanding of disaster management.

The lessons learned from these exercises underscore the importance of interoperability, the integration of advanced technologies, and the value of collaboration among diverse stakeholders. Whether enhancing cross-border coordination during RedLex or refining civil-military cooperation in Apulia24, the exercises highlighted the critical role of tailored approaches in addressing complex emergencies. Thematic focuses, such as wildfire evacuation in Greece or hydrometeorological emergencies in Spain, provided complementary perspectives that enriched the collective knowledge base.

Looking ahead, the recommendations derived from the project provide a clear pathway for refining and institutionalizing the Knowledge Network Exercise framework. From fostering inclusivity and promoting technological integration to strengthening civil-military partnerships and expanding cross-border collaborations, these next steps aim to ensure the scalability and adaptability of this approach. By codifying methodologies and creating regional and international databanks, the project's outcomes can serve as a benchmark for future initiatives.

Ultimately, the COVALEX project highlights the importance of continuous learning and innovation in disaster management. Through its commitment to testing good practices and engaging a broad spectrum of stakeholders, it sets a strong foundation for building resilience and enhancing global preparedness for increasingly complex emergencies.

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