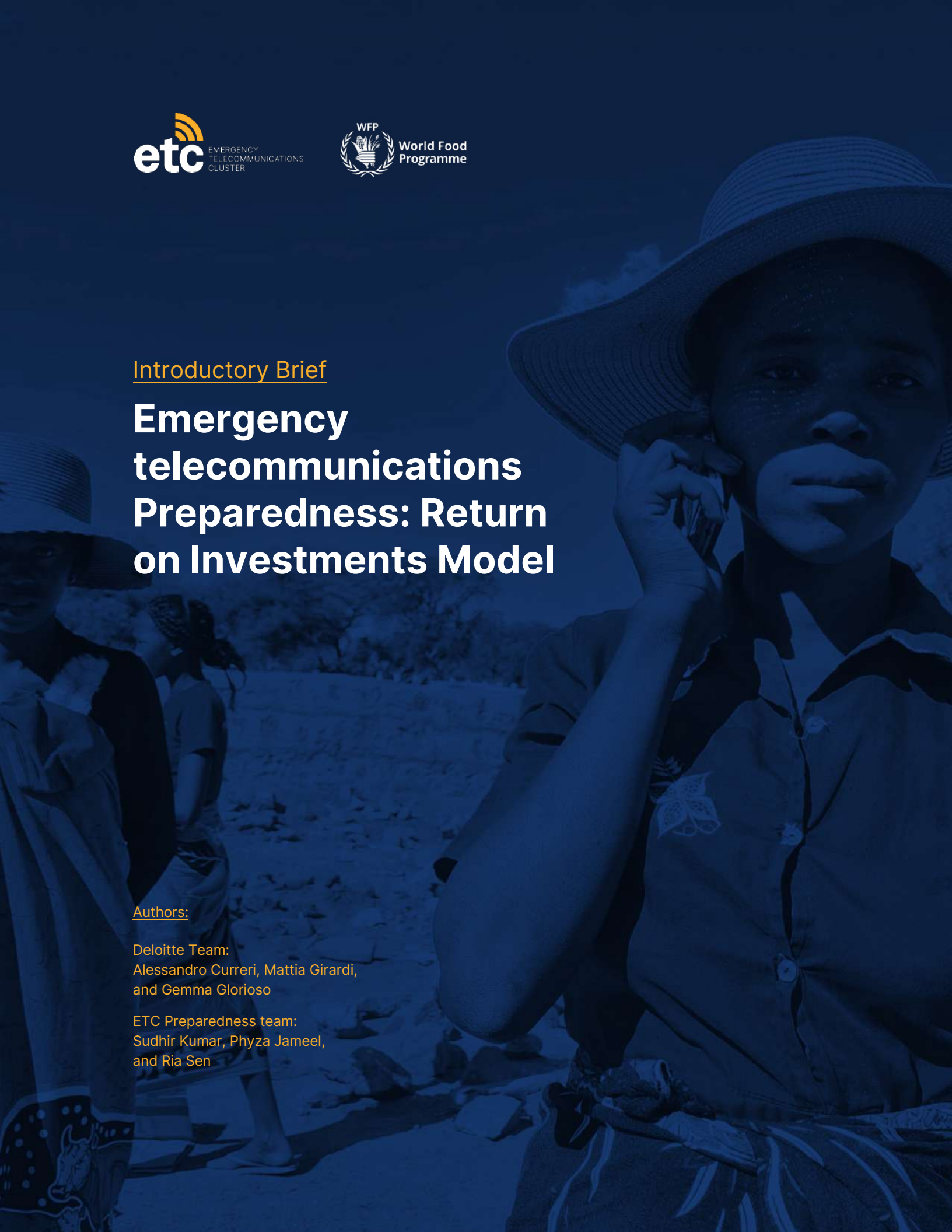

Introductory Brief

Emergency telecommunications Preparedness: Return on Investments Model

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Introduction

In a world increasingly characterized by uncertainty, emergency preparedness is a powerful way to improve the capacity of communities and countries to withstand disasters. Investment in emergency preparedness builds resilience, thereby limiting the loss of life and protecting infrastructure.

However, it is not always simple to identify the best interventions; tools and approaches must accurately reflect the context-specific challenges faced by each community to maximize the impact of investments.

Successful disaster management relies on resilient infrastructure, not least telecommunications. The Emergency Telecommunications Cluster (ETC), led by the World Food Programme (WFP), has developed a model for assessing the benefits of investment in emergency telecommunication preparedness, with the aim of generating empirical evidence and ultimately encouraging stakeholders to build disaster-resilient telecommunications.

The return on investment (ROI) model presented in this brief aims to quantify and qualify the benefits of investments in emergency telecommunications preparedness, particularly in terms of:

- Enabling processes and approaches that can reduce the impact of disasters.
- Improving the qualitative and quantitative analyses that feed into post-disaster assessment.
- Facilitating interoperable and continuous communications in support of disaster response and recovery efforts; and of response and recovery efforts.

Objective and scope of the model

This evidence-based model seeks to inform the decision-making of donors, government departments and other humanitarian actors, helping them to identify priority pre-emptive emergency telecommunication investments. The results of the model will indicate whether sustained investment in better stakeholder coordination, capacitation, and infrastructural readiness could improve the efficiency of disaster response and what forms such investment could take.

The ROI model is designed to be used by all humanitarian partners engaged in emergency telecommunications preparedness, including WFP. It is based on the practical emergency preparedness expertise and experiences of the ETC in different countries. All humanitarian partners involved in emergency preparedness, particularly within the emergency telecommunications sector, can readily apply the model using their own data.

Investment areas

The ROI model contains three categories of investment, which reflect the main emergency preparedness activities implemented by humanitarian agencies. The categories are aligned and harmonized with the **ETC-ITU Emergency Telecommunications Preparedness Checklist** (2019)***[1]***, a tool used by the ETC for emergency preparedness gap analysis. It also links with the **ETC Preparedness and Resilience Service Delivery Mode** (2021) ***[2]***, which guides ETC emergency preparedness and resilience activities. The categories are as follows:

National government and external coordination
Activities in this category relate to the creation of national information and communications technology (ICT) working groups that meet in person or remotely for workshops, regular planning/coordination meetings and other consultations.

Capacity development and training
Activities in this category involve organizing capacity development workshops on emergency telecommunications preparedness and simulation exercises delivered at the national or local levels.

Infrastructure and technology enhancement
Work under this area includes organizing and conducting on-site infrastructure inspections to assess infrastructural preparedness and determine capacity, needs and gaps. It could also cover investments in emergency telecommunications response equipment and, more generally, steps taken to improve the resilience of telecommunication infrastructure.

Risks

The ROI model considers three rapid-onset disasters: floods, cyclones and earthquakes. These have been selected based on the severity of their impact in countries where emergency telecommunications preparedness investments are typically undertaken.

Methodology

The model provides quantitative and qualitative evidence that can be used to enhance investment in emergency telecommunications preparedness. The quantitative analysis details the costs and benefits of preparedness investments. The qualitative analysis seeks to evaluate the non-quantifiable benefits stemming from preparedness investments.

Quantitative component

The quantitative evaluation of emergency telecommunications preparedness Investments is performed by analyzing the following elements:

Country risk profile

This is defined in terms of "multi-hazard scenario occurrence", in other words, the likelihood that a given disaster scenario arises based on a country's vulnerability to floods, earthquakes or cyclones. The model is flexible and can use all types of risk-related data.

Investments

These are considered in three categories based on the emergency preparedness experience of humanitarian agencies. A set of potential costs has been identified for each investment area, examples of which are outlined in figure 1.

National government and external coordination costs

- Setting up a national ICT working group
- Organizing national ICT working group meetings
- Organizing coordination meetings

Capacity development and training costs

- Developing and delivering emergency telecommunication preparedness training
- Participating in training

Technology and infrastructure enhancement

- Holding consultation and validation workshops to define national ICT preparedness action plans
- Pre-positioning emergency telecommunication equipment
- Repairing equipment

Figure 1 – Examples of investment element

Photo Credit: Emergency Telecommunications Cluster

Quantifiable benefits

These encompass benefits derived from investments that can be easily quantified in monetary terms. Benefits that are not easily quantifiable are covered through the qualitative model. Figure 2 provides examples of common benefits by investment area.

National government and external coordination

- No duplication of assessment costs
- No redundancy in information-sharing mechanisms
- More efficient post disaster coordination (in the response phase)

Capacity development and training

- Reduced need to mobilize international response experts in the event of a disaster
- Reduced need to mobilize international staff to manage emergency tele-communication equipment in the event of a disaster
- Better local staff capabilities for disaster response

Technology and infrastructure enhancement

- Savings derived from having emergency telecommunication equipment in country (regular operations)
- Savings derived from having emergency telecommunication equipment in country (for disaster response scenarios).
- Savings derived from repairing emergency tele-communication equipment

Figure 2 – Examples of benefit elements.

Quantitative ROI
for investments in emergency telecommunications preparedness is calculated through a standard ROI calculation formula (including the discount rate[1]):

$$ROI = \frac{\sum_{t=0}^{i} \frac{Expected\ benefits * depletion\ rate}{(1+r)^t}}{\sum_{t=0}^{i} \frac{Investments}{(1+r)^t}}$$

- The 'expected benefits' are the product between benefits[2] and the combined scenario occurrence(i.e., the combined probability of disasters occurring),
- The benefits depletion rate limits the degree to which benefits are realized over time,
- *"i"* represents the reference timeline for investments and benefits,
- *"r"* represents the predefined discount rate which quantifies the current value of expected future cash flows (either investments or benefits),
- *"t"* represents the time when either investments or benefits occur as part of the defined ROI timeline.

The proposed investments in emergency telecommunications preparedness should be pursued if the sum of discounted benefit cash flows is higher than the sum of discounted investments – in other words, when ROI ≥ 1. By contrast, an ROI < 1 means that investments outweigh quantifiable benefits, and the relevance of qualitative benefits should be carefully evaluated.

[1] The discount considers the time value of money: the ROI model considers the present value of future cash flows to allow users to compare the current and future valuation.

[2] The model considers benefits because in the non-profit sector, it is important to compare benefit and investments to see clearly how many multiples of the investment are generated as a benefit.

Qualitative component

The ROI model also assesses the impact of benefits that are not quantifiable in monetary terms. The qualitative benefits to be evaluated here should always derive from investments that have been quantitively estimated as described in the previous step. The model considers four categories of qualitative benefits:

Reduced response timings
Preparedness investments that improve the timeliness of interventions thanks to structured coordination mechanisms, faster deployment of responders and equipment, and other factors.

Reduced impacts to human lives
Preparedness investments that reduce the impact of disasters on the population, for example in terms of fewer injuries sustained and fewer deaths.

Reduced economic impacts
Preparedness investments that reduce event-related costs including through reduced infrastructural damage and fewer impacts on international trade.

Reduced social impacts
Preparedness investments that help improve (or restore) livelihoods in the event of a disaster.

Each investment area can generate high, medium, or low benefits within each of these categories based on the following aspects:

- The nature of the investment under evaluation and the direct and indirect linkages between the investment and each qualitative benefit category.
- A country's maturity in preventing, coping with, and containing a disaster and its impacts. Countries with less mature disaster management capabilities are expected to obtain higher benefits from a specific investment compared to more mature countries.

Users of the ROI model can input qualitative evaluations based on their knowledge of the country context and professional judgment derived from field experience.

ETC–WFP country team setting up a satellite dish.
Photo Credit: Emergency Telecommunications Cluster

Assumptions

The quantitative and qualitative ROI model outcomes rely on a set of assumptions:

- The ROI quantitative model focuses only on investments and benefits that are quantifiable from an economic standpoint. All other benefits stemming from investments in emergency telecommunications preparedness are evaluated using a qualitative approach.
- The model only considers risks related to three types of rapid onset, high-impact disasters.
- When evaluating the risk of a particular scenario occurring (while creating the country risk profile), the assumption is that each disaster event (be it cyclone, flood or earthquake) is independent of the others when the Emergency Events Database (EM-DAT)[3] *[3]* is used as a data source.
- Different global warming scenarios alter the likelihood of an event occurring considerably, introducing a high degree of volatility in the overall model. Therefore future-facing climate data is not directly factored into the model.

[3] EM-DAT contains core data on the occurrence and effects of over 22,000 mass disasters in the world from 1900 to the present day. The database is compiled from various sources including United Nations agencies, non-governmental organizations, insurance companies, research institutes and press agencies.

A case study: Mozambique

The ROI model has been piloted in Mozambique, where two tropical cyclones caused devastating floods in 2019 and displaced over 140,000 people (OCHA, 2019) *[4].* Infrastructure was badly damaged, main roads in the affected region were blocked and access bridges were washed away. Most of the telecommunication infrastructure in flooded areas was down, making it difficult to communicate and disseminate information.

Mozambique was selected as a pilot for the ROI model in part because of the ETC's recent response and preparedness interventions in the country.

Solar panel installation in Mozambique. Photo credit: ETC
Photo Credit: Emergency Telecommunications Cluster

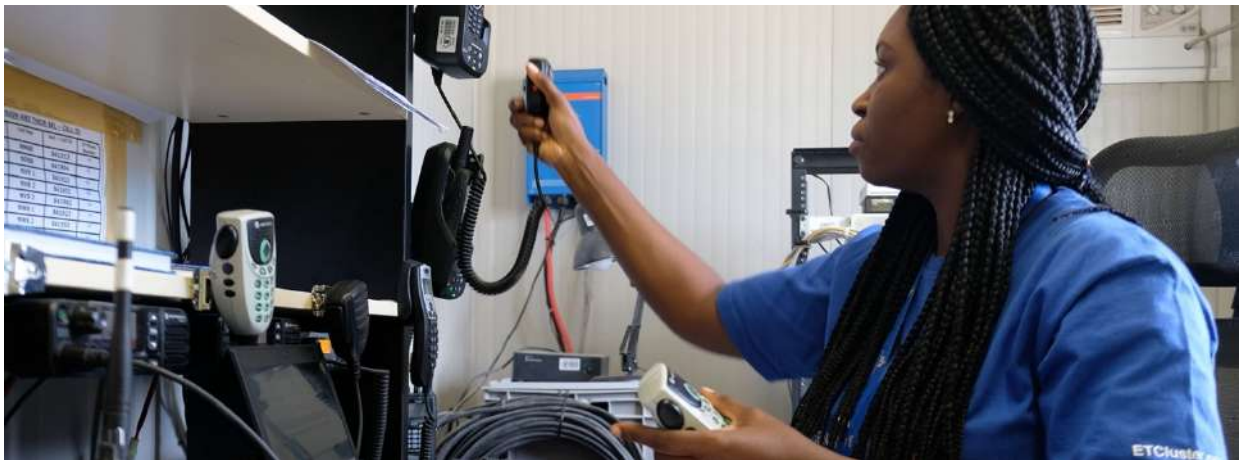

Photo Credit: Emergency Telecommunications Cluster

Quantitative outcomes

As part of the pilot, all the elements of the quantitative model were evaluated for Mozambique. The following key inputs and outcomes were identified:

Country risk profile

Was defined using historical data from the EM-DAT database. Risks relevant to the model for Mozambique are floods and cyclones. The occurrence of major events was calculated using EM-DAT data. Mozambique had 15 major floods events within 54 years, or an average of 1.4 floods every five years.

Investments

Were estimated across the three investment areas; the calculations also reflect the costs sustained by the ETC in its response to the 2019 cyclones. Figure 3 summarizes the resulting investment figures:

Recap of approximate investments for emergency telecommunications preparedness	Discounted investments
Section 1 – Total Investment required for National government & external coordination	USD 81.120
Section 2 – Total Investment required for Capacity Development & training	USD 45,429
Section 3 – Total Investment required for Infrastructure & technology	USD 85,630
Grand Total	**USD 212,179**

Figure 3 – Estimated investments for Mozambique.

Quantifiable benefits

Were estimated under the various benefit areas based on a set of assumptions. Minimum and maximum figures were used for the selected benefit elements to introduce a spectrum of variability within each benefit area, based on Mozambique's risk profile. Figure 4 presents the benefit figures for an averaged scenario (between the maximum and minimum values).

Recap of approximate benefits derived from investment In emergency telecommunications preparedness	**Total**
Section 1 – Total benefits of coordination efforts	$269,261
Section 2 – Total benefits of capacity development & training	$238,238
Section 3 – Total benefits of infrastructure & technology	$88,335
Grand Total	**$595,834**

Figure 4 – Estimated investment benefits for Mozambique

Quantitative ROI

Was calculated for Mozambique as shown in figure 5. The resulting ROI ≥ 1 indicates that the benefits outweigh costs and investments should be pursued.

	Average Results
Total Investments	**$212,179**
Section 1 – National government & external coordination	$81,120
Section 2 – Capacity development & training	$45,429
Section 3 – Infrastructure and technology – requirements, planning & maintenance	$85,630
Total Benefits	**$595,843**
Section 1 – Benefits of coordination efforts	$269,261
Section 2 – Benefits of capacity development & training efforts	$238,238
Section 3 – Benefits of infrastructure & technology efforts – requirements, planning and maintenance	$88,335
ROI	**2,81**

Figure 5 – ROI for Mozambique

The average ROI of 2.81 indicates that the invested resources would yield a monetary return of almost three times the value of the original investments (excluding qualitative benefits). The model therefore shows that investments in emergency telecommunications preparedness in Mozambique are prudent and can deliver financial benefits for the country.

Qualitative outcomes

The qualitative model has been applied based on the specific emergency preparedness and response activities undertaken by the ETC in Mozambique following the 2019 cyclones.

Through the model, the ROI in terms of reduced response time was assessed as high. In 2019, the ETC and its partners set up a mechanism that improved coordination, optimizing the available resources in the country.

By supporting pre-disaster planning, this kind of coordination mechanism can reduce the number of days required for emergency response.

The investments made by the ETC and its partners have sought to build basic capabilities, providing initial emergency preparedness skills training and operational training on deploying and using emergency telecommunications equipment. A high level of benefit is expected from these investments in terms of a reduction in the number of days required for emergency response.

ETC investments have also led to a national emergency telecommunications preparedness action plan (ETPAP), aimed at comprehensively enhancing emergency telecommunications readiness in terms of capacity, infrastructure, and policy. The implementation of the ETPAP will reduce the potential response time for disasters.

Benefits in terms of reducing impacts on human lives were assessed as medium. The investments made in Mozambique are strengthening emergency preparedness and response through better policies and quicker processes in emergency telecommunications preparedness. This supports a faster response, helping to save lives.

Currently, in the process of being adopted, the ETPAP ultimately seeks to contribute towards more resilient infrastructure and technology, with a similar potential benefit.

Disasters have adverse effects on the economy. The ETC contributes to policy-level actions that enhance emergency communications, supporting the deployment of optimal solutions while also improving capacity. In this respect, the benefits related to reduced economic impact were assessed as high.

A multisectoral national ICT working group has been convened in Mozambique, bringing together stakeholders from different domains including the private sector.

This provides a forum for systematic and sustained engagements on preparedness amongst critical players in the emergency telecommunications sector, otherwise difficult to achieve.

Benefits related to reduced social impact were assessed as high. The ETC supported the design of a draft plan on emergency communications preparedness, highly relevant in creating positive social impact.

The plan was designed to help establish regular training sessions to enhance national capacity in emergency telecommunications preparedness.

Complementing this, ETC activities on infrastructure readiness aim to increase resilience, thereby reducing the impacts of an emergency on the population.

Photo Credit: Emergency Telecommunications Cluster

Conclusions

The ROI model contributes to existing literature on emergency preparedness investment analysis and seeks to provide the humanitarian community with a simple, user-friendly tool. The model is the first of its kind, in that it accurately quantifies and qualifies investment–benefit returns in the emergency telecommunications preparedness sector.

It provides a robust evidence-based approach to demonstrate that emergency telecommunications preparedness investments effectively reduce the devastating impacts of disasters on human lives, infrastructure, and the economy. The model also demonstrates that it is prudent to invest in pre-disaster emergency telecommunications preparedness.

The model serves as a powerful decision-making tool to select and prioritize emergency telecommunications preparedness investments and to advocate for further sustained investments in this field. It can also be adapted to compute the rate of return on investment in other sectors of emergency preparedness such as power and transportation.

References

[1] Emergency Telecommunications Cluster and International Telecommunication Union Development Sector. 2019. **ETC-ITU Emergency Telecommunications Preparedness Checklist.**

[2] Emergency Telecommunications Cluster. 2021. **Preparedness and Resilience Service Delivery Model.**

[3] Centre for Research on the Epidemiology of Disasters. **EM-DAT: the international disasters database.** Data on Mozambique taken from EM-DAT.

[4] United Nations Office for the Coordination of Humanitarian Affairs (OCHA). 2019. **Mozambique Humanitarian Response Plan 2019.**