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# Costa Rica: Volcanic Ash

## Early Action Protocol summary

 International Federation  
of Red Cross and Red Crescent Societies

### EAP approved

**June 2022**

### EAP number

**EAP2022CR01**

### Population to be assisted

**10,000 people (2,000 families)**

### Budget:

**383,103 Swiss francs**

### EAP timeframe

**5 Years**

### Early action timeframe

**3 Months**

The IFRC **Disaster Relief Emergency Fund (DREF)** has approved a total allocation of **CHF 383,103** from its **Forecast based Action (FbA)** mechanism for the **Costa Rican Red Cross**. The approved amount consists of an immediate allocation of **CHF 254,568 for readiness and pre-positioning** and **CHF 128,534** automatically allocated to **implement early actions** once the defined triggers are met.

The Forecast-Based Action Fund (FbA) part of the DREF is a funding mechanism managed by the DREF. Allocations for the FbA are made from the anticipatory pillar of the DREF. Unearmarked contributions to the fund are encouraged to ensure funding availability for the Early Action Protocols (EAPs) being developed.

## SUMMARY OF THE EARLY ACTION PROTOCOL

Costa Rica is a country exposed to various risks, mainly from seismic, hydrometeorological, geological, and volcanological events. The volcanological activity is permanent, highlighting a higher level of historical agitation mainly in 14 volcanoes that have left significant losses in human lives and property, and sporadic effects on the local and national economy. The balance of human losses in the period from 1953 to 2005 is 103 as noted by the Geological Journal of Central America written by Irene Aguilar and Guillermo Alvarado in 2014, also indicates that the economic losses from 1953 to 2016, by volcanic activity, is estimated around 193 million US dollars with present value to 2016, according to information collected for the research.

The Early Action Plan (EAP) for volcanic ash dispersion and fall developed by the Costa Rican Red Cross (CRRC) is an anticipation mechanism that seeks to guide the timely and effective execution of pre-identified early actions once the volcanological activity forecasts foresee reaching the thresholds defined in the activation mechanism of this plan. These thresholds are based on evidence of historical negative impacts on people and their livelihoods. The time available between the definition of the forecast and the impact opens a window of opportunity for the deployment of early actions to mitigate the effects in the potentially affected territories and avoid greater humanitarian crises in risk areas.

The coordinated execution between technical-scientific institutions, state entities, the CRRC and local governments will reduce the impact of volcanic ash dispersion and fall, reducing the risk of loss of human life and property and facilitating a faster and more timely recovery.

This plan has been designed with the technical contribution of the National Commission for Risk Prevention and Emergency Attention (CNE), the Costa Rican Vulcanological and Seismological Observatory of the National University (OVSICORI-UNA), and the Laboratory of Chemistry of the Atmosphere (LAQAT-UNA). All institutions participating in this plan have a fundamental role during the preparation and activation of the mechanism of Forecast based Action (FbA).

The Early Action Plan (EAP) describes the risk factors considered for the risk analysis, the menu of forecasts issued by OVSICORI-UNA, thresholds and triggers that make up the activation mechanism and the anticipated actions to be executed in a coordinated manner in the event of volcanic ash dispersion and fall by the CRRC and its strategic partners.

Humanitarian assistance to communities at risk is based on the Fundamental Principles of the Red Cross. The proposed activities will always address the criteria of Protection, Gender and Inclusion (PGI), preserving the dignity, access, participation and security of the affected population.

The forecasts used are detailed below:

Forecast	Sources	Forecast Type	Forecast Time	Forecast Skill
Ash dispersion	OVSICORI	<b>ASH3D</b> Numerical model based on GFS-NOAA 50 km and eruptive column data, predicts dispersion and ash deposition mainly.	1 to 8 hours after eruption	50% <sup>1</sup>
Ash dispersion	LAQAT	<b>ASH3D</b> Numerical model based on GFS-NOAA 50 km and eruptive column data, predicts dispersion and ash deposition mainly.	1 to 8 hours after eruption	Not determined
Ash dispersion	LAQAT	HYSPLIT-IMN (Aeromod)	1 to 8 hours after eruption	Not determined
Wind direction at different levels.	IMN	Wind direction forecast at different heights. Based on the GFS-NOAA Model. Resolution 50 km.	12 hours	Not determined
Wind direction	VAAC	Ash cloud direction forecast. NWP models. CIMSS.	Every 2 hours	Not determined

The forecast model to be used for trigger 2 will be the ASH3D model of OVSICORI, which forecasts dispersion and ash fall. This model is used operationally as a support for the emission of dispersion and ash fall and is officially recognized by the National Emergency Commission of Costa Rica.

Risk assumptions	
<p><b>Socioeconomic vulnerability</b></p> <p>The variables constitute the risk model and have been selected due to their reliability (veracity and traceability of the information), validation (they are official and accessible data) and representativeness (they reflect, as a whole and in an approximate way, a state of vulnerability). It is important to note that the "Dignified housing" indicator is an official INEC indicator and assesses the lack of families and their poverty status (it does not reflect a condition of structural fragility of housing).</p> <p>The variables of this risk factor are: Social Development Index, Unsatisfied Basic Needs (UBN), Families below the poverty and extreme poverty line, Dignified housing, Lack of goods and services. The vulnerable groups include persons under 5 years of age and persons over 65 years of age.</p>	<p><b>Lack of response capacity</b></p> <p>The capacity to respond to the hazard is a component that will help identify the most exposed and vulnerable territories with the greatest capacity to cope with hazards.</p> <p>The variables for this risk factor are:</p> <ul style="list-style-type: none"> <li>• <b>Institutional</b> (response capacity, governance)</li> <li>• <b>Infrastructure</b> (communication, physical infrastructure, access to education, access to basic services (water, sanitation and electricity))</li> </ul>

## The operational strategy – How the EAP will be implemented

### 1) Who will implement the EAP – The National Society

The EAP has been developed by several national institutions, including movement organizations, among which the German Red Cross has contributed financial and technical resources for its implementation and the IFRC

<sup>1</sup> [USGS.gov, Ash3d Volcanic Ash Dispersion Model](https://www.usgs.gov/ash3d-volcanic-ash-dispersion-model)

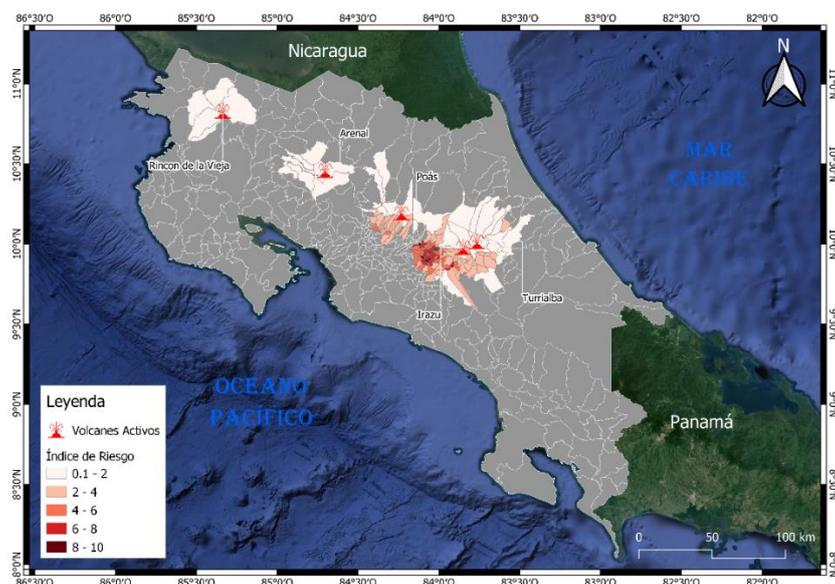
Climate Center has provided specific observations in the design process. Other national institutions with relevance in the design and operation of the anticipation mechanism are summarized below.

Key EAP national actors		
Name of organization	Description	Role within the EAP
National Commission for Risk Prevention and Emergency Attention (CNE)	The CNE is the governing body with a mandate for risk management and emergency response.	It is the national coordinator of emergencies and disasters in the country and its role is to generate information for liaison between institutions and decision making. It receives a special report from OVSICORI and will generate a notification to the CRRC for the potential activation of the EAP.
OVSICORI-UNA	University Research Institute dedicated to the investigation of volcanoes, earthquakes and other tectonic processes, with the purpose of finding useful applications for society that help mitigate the adverse effects of these phenomena on economic and social development.	It is the body that monitors the threat, generates the special report of behavioral change and transmits it to the CNE. In addition, it will share with the CRRC the models generated by ASH3D during the second trigger.
LAQAT-UNA	The Laboratory of Chemistry of the Atmosphere of the National University has as its field of study and research the physicochemical phenomena that take place in the atmosphere and that are generated by natural processes or by anthropogenic influence.	As part of the support system, it could eventually support the generation of the 3D ASH model. This entity is also setting up a network of volcano observers in the most affected areas that will allow collecting evidence of impacts particularly relevant for future revisions of the EAP.
Costa Rican Red Cross	It is an auxiliary organization of the state powers that has a role within the National Risk Management Plan as a responder to emergencies where human life is involved.	Responding institution in case of trigger activation. Manages funds for early response. Performs accountability of funds to communities, FbA and other partners.

## 2) How will the EAP be activated - The Trigger

### Risk Model

The following is the distribution of the risk index calculated for the threat of volcanic ash fall and dispersion for Costa Rica:



Districts near volcanoes are those with the highest risk index values, being those with the highest population density the ones with the highest values.

The risk index was assessed with the INFORM tool, which combined the data and values of the three dimensions: hazard and exposure, vulnerability and capacity value and their indicators, and calculated a risk equation, which is a geometric mean of the three risk dimensions with equal weighting factors.

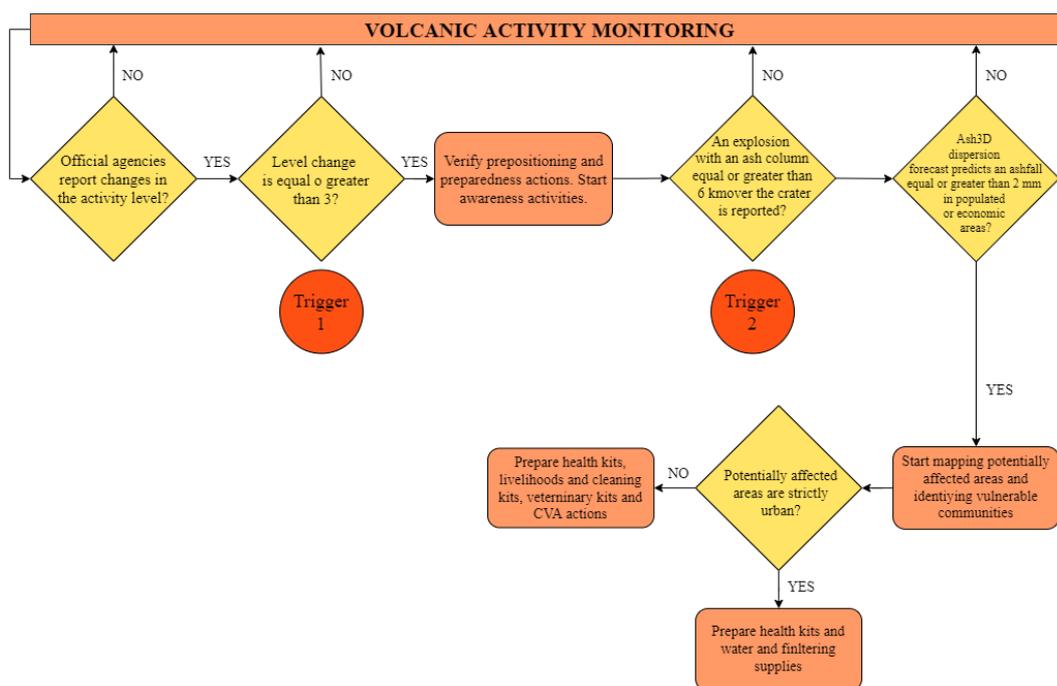
**Prioritized Impact**

In the analysis of the threat and vulnerability of communities near volcanoes at very high volcanic risk, the estimated prioritized impacts are:

- Respiratory and ocular affectations, produced by exposure to ash and ingestion of contaminated water and food.
- Impact on agriculture, in view of the large areas with crops and land dedicated to livestock production of meat and milk.
- Homes are affected by falling ash that accumulates on roofs, causing damage to infrastructure.
- Water could be contaminated, or its distribution could be interrupted, so it is important that they have a place to store the water distributed by the corresponding authorities.

**Activation model**

The activation model has been constructed and agreed upon by the stakeholders, defining the following activation scheme.



Activation declaration

Trigger 1:	When OVSICORI detects a change in the level of volcanological activity equal to or greater than 3, it generates a special report for the information of the Institutions.
Trigger 2:	When the OVSICORI reports an explosion with column height equal to or greater than 6 kms above crater level for a minimum time of one hour.

## Definition and Justification of the Impact Level

Each volcano has different eruptive scenarios. For the purposes of this EAP, the following impact thresholds have been defined according to the amount of volcanic ash deposited in historical eruptive events in the communities surrounding active volcanoes. Therefore, based on a field impact analysis and academic/empirical information, the following impact levels have been established for the activation of early actions.

The return period varies depending on each volcano; however, based on the conversations carried out with OVSICORI, volcanoes in Costa Rica could have an average return period of around 200 years. The table below details the impact or damage to people, crops and livestock due to ash fall, from which the criteria for defining the impact thresholds were obtained.

Description		No damage	Harvest interruption	Minor reduction in productivity: less than 50%	Major reduction in productivity, more than 50%. Remediation	Total crop loss. Remediation required.
Type of agriculture	Crops	0 mm	1 mm	5 mm	50 mm	100 mm
	Pasture	0 mm	3 mm	25 mm	60 mm	100 mm
Livestock	No damage	Contaminated water sources / limited forage	Lack of food, tooth wear and water supplies affected	Dehydration, can lead to intestinal obstructions	Serious damage to or death of livestock	
	0 mm	> 1 mm	> 10 mm	> 100 mm	> 300 mm	
Humans	No damage	Mild effects on eyes and respiratory tract	Eye and respiratory tract irritation / pain	Increased eye Pain and dryness, increased respiratory tract symptoms	Difficulty in breathing and corneal abrasion, skin irritation	
	0 mm	> 1 mm	> 10 mm	> 100 mm	> 300 mm	

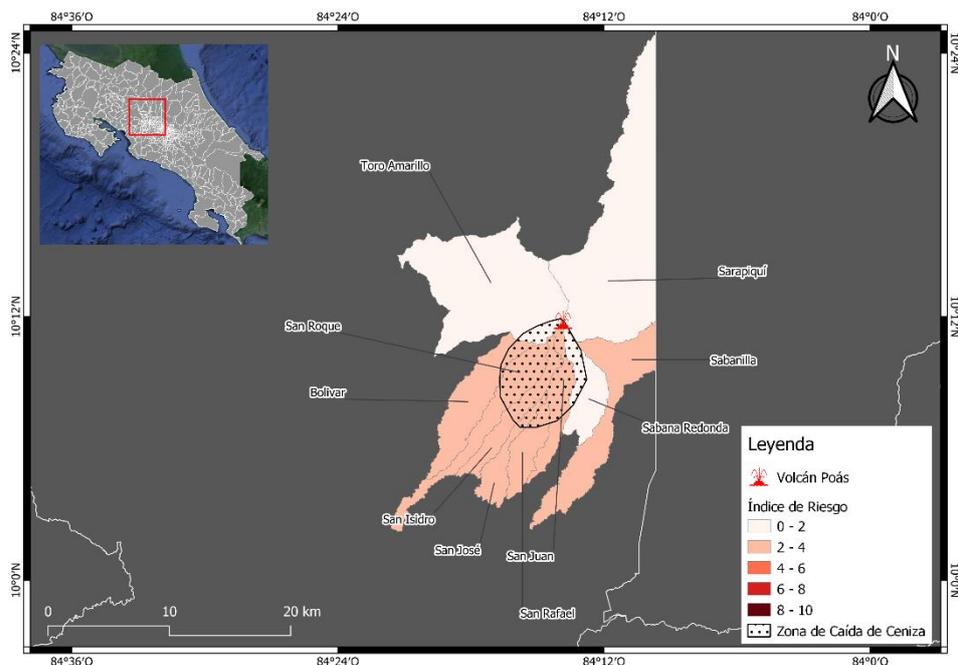
Based on the EAP for volcanic ash fall and following the analysis of the previous table, the impact levels were defined, standardizing the values for crops and animals as well as for humans. Thus, 3 levels of impact were clearly defined and useful for early action:

### Selected thresholds

- From 2 to 5mm
- From 5 to 10mm
- From 10 to 300mm

## Intervention area

Based on the forecast created using ASH3D, the area where volcanic ash falls and dispersion is expected is obtained, this information is crossed with the districts and here the districts that should be prioritized for intervention are prioritized based on the risk index. The following is an example of an intervention map for the Poás Volcano:



In the event that the EAP is activated, scientific information will be monitored, and adjustments will be made as appropriate to changes in an event that is generated.

### 3) How will the EAP reduce the impact on the population – The early actions

#### Early Action Selection Process

The selection of the early actions presented here are the result of the collective analysis of the National Society based on experiences of previous events, consultations with the different institutions that coordinate volcanic emergency events in the country, where the results of surveys carried out in different communities in the risk areas were also considered.

The process for the definition of these actions is summarized in the following figure:



The final selection of early actions was made based on the following criteria:

- National Society's experience in the execution of related actions.
- Capacity to execute the actions in the available time window (lead time).
- Potential to strengthen community resilience and mitigate possible impacts.
- Appropriateness and suitability of actions to local needs and contexts.

Specific objectives were defined to be addressed according to the historical experience of the Costa Rican Red Cross in dealing with this type of emergencies. Among the main points to be addressed, actions related to three sectors or focus areas were selected: Health, Livelihoods and Water, Sanitation and Hygiene (WaSH).

The CRRC has ample experience in Cash and Voucher Assistance (CVA) as a priority channel for providing humanitarian aid, since 2009 using different delivery mechanisms and areas of focus. For the selection of CVA as one of the actions of the EAP, a feasibility study and a baseline survey have been conducted to identify the capacities installed in the CRRC and points that require more attention to strengthen them. In addition, information from past events and identified needs have been considered. The studies have indicated CVA as a feasible early action and in accordance with the short timeframes required in the EAPs. Another key point for the selection was that CRRC has a framework agreement with a local bank for the issuance of humanitarian debit cards.

 <b>Livelihoods and basic needs</b>		
<b>Distribution of Unconditional Multipurpose Cash Transfer (/TMM)</b>		
Impact	Product	Result
Losses and damage to crops Losses and damage to livestock health Damage to homes	Smallholder and farmer households can take early livelihood and housing protection measures through the use of multipurpose cash transfers.	Vulnerable populations located in potentially exposed areas reduce by 50% the impacts derived from the loss of livelihoods and basic needs attributable to volcanic ash fall.
 <b>WaSH</b>		
<b>Distribution of water reservoirs</b>		
<b>Distribution of cleaning kits</b>		
Impact	Product	Result
Increase in gastrointestinal diseases due to the consumption of contaminated water. Deterioration of hygiene conditions in homes due to the accumulation of ashes.	2,000 families have access to a safe water storage system and cleaning supplies before the event, so they were able to have drinking water before and during the impact and to carry out house cleaning actions to reduce damage and potential roof collapse.	The percentage of the population affected by waterborne diseases and poor hygiene conditions is 50% lower than in the comparison communities.  The percentage of the population affected by waterborne diseases and poor hygiene conditions is 50% lower than in the comparison communities.

## Intervention Sectors



### Livelihoods and basic needs

**People targeted:** 2,000 people (400 families)

Male: 800 (40%)

Female: 1,200 (60%)

**Requirements (CHF) 157,067**

**Population to be assisted:** Population settled in areas of high exposure to volcanic ash fall that meet the pre-established criteria for their selection.

**Programme standards/benchmarks:** The intervention will be aimed at families that carry out subsistence farming activities and that are in an accentuated condition of vulnerability based on the pre-established variables in the risk analysis. The SN carries out a pre-registration of these populations, which should be verified when the second trigger is reached.

P&B Output Code	<b>Livelihoods Outcome 1: Communities in areas potentially affected by volcanic ash dispersion and fall strengthen the resilience and recovery capacity of their livelihoods.</b>	<i>400 families (2,000 people) supported with economic assistance for the protection and recovery of their livelihoods and basic needs</i>									
	<b>Livelihoods Output 1.1: The selected households receive multipurpose subsidies to meet their basic needs and strengthen their livelihoods.</b>										
	Activities planned	<b>Timeframe (semester)</b>									
	<b>Readiness activities</b>	1	2	3	4	5	6	7	8	9	10
AP008	Meetings with key actors for the coordination of early actions at regional, local and community levels.										
AP008	Community talks to socialize early actions at regional, local and community levels related to volcanic hazards.										
AP008	Per diem and meals for staff and volunteers										
	Activities planned	<b>Timeframe (semester)</b>									

<b>Pre-positioning activities</b>		1	2	3	4	5	6	7	8	9	10
AP008	Purchase of cards for cash transfer program (450)										
Activities planned		<b>Timeframe (semester)</b>									
<b>Early action activities</b>		1	2	3	4	5	6	7	8	9	10
AP008	Fuel and maintenance for the intervention (conditional on full activation of the TAP)										
AP008	Food and lodging for activation personnel (10 people for 4 activations)										
AP008	Cash Transfer Program, including bank charges, (estimated amount to be delivered per user is CHF 283.26 per family).										



## Health

**People targeted:** 10,000 (2,000 families)

Male: 4,000 (40%)

Female: 6,000 (60%)

**Requirements (CHF) 84,625**

**Population to be assisted:** Population settled in areas of high exposure to volcanic ash fall that meet the pre-established criteria for their selection.

**Programme standards/benchmarks:** The intervention will target the entire population of the selected human settlements exposed to volcanic ash. The intervention includes actions to raise awareness of the consequences of exposure on human health and the distribution of protection kits.

<b>P&amp;B Output Code</b>	<b>Health Outcome 1: Improved health and dignity of vulnerable people through better access to information and health supplies appropriate to the threat of volcanic ash exposure.</b>	<i>10,000 people provided with basic information and personal protection kits to prevent health effects of volcanic ashfall</i>									
	<b>Health Output 1.1: National Society provide exposed communities with services that enable them to identify and reduce health risks.</b>										
	Activities planned	<b>Timeframe (semester)</b>									
	<b>Readiness activities</b>	1	2	3	4	5	6	7	8	9	10

AP022	Preparation of direct communication and education campaigns in local and national media to prevent respiratory and gastrointestinal diseases caused by ash.											
	Activities planned	<b>Timeframe (semester)</b>										
	<b>Pre-positioning activities</b>	1	2	3	4	5	6	7	8	9	10	
AP022	Protective equipment for the population (mask KN-95 boxes of 20 units and goggles 5 per family)											
	Activities planned	<b>Timeframe (semester)</b>										
	<b>Early action activities</b>	1	2	3	4	5	6	7	8	9	10	
AP022	Distribution of protective equipment for the population (mask KN-95 boxes of 20 units and goggles 5 per family)											



## Water, sanitation and hygiene

**People targeted: 10,000 (2,000 families)**

Male: 4,000 (40%)

Female: 6,000 (60%)

**Requirements (CHF) 40,853**

**Population to be assisted:** Population settled in areas of high exposure to volcanic ash fall that meet the pre-established criteria for selection. Specifically families that are affected by the interruption of drinking water services or lack of access to safe water due to ash impacts.

**Programme standards/benchmarks:** The intervention will target families who are limited in their access to safe water by the impact of ash fall within the framework of the Sphere handbook minimum standards.

P&B Output Code	<b>WASH Outcome 1: Vulnerable people have increased access to adequate and sustainable water, sanitation and hygiene services.</b>	<i>10,000 people reached with Sphere-compliant water storage services. 10,000 people reached with cleaning supplies.</i>
	<b>WASH Output 1.1: National Society provides communities with improved access to safe water</b>	<i>2,000 families provided with drinking water reservoirs.</i>
	Activities planned	<b>Timeframe (semester)</b>

<b>Readiness activities</b>		1	2	3	4	5	6	7	8	9	10
AP026	Purchase of 5-gallon water reservoirs										
AP030	Purchase of materials for house cleaning										
Activities planned		<b>Timeframe (semester)</b>									
<b>Early action activities</b>		1	2	3	4	5	6	7	8	9	10
AP026	Distribution of 5 gallon water reservoirs										
AP030	Distribution of materials for house cleaning										

## Strategies for Implementation

Requirements (CHF): 65,913

<b>P&amp;B Output Code</b>	<b>SFI Outcome 1: S1.1: National Society organizational and capacity development objectives are provided to ensure that the National Society has the necessary legal, ethical and financial foundations, structures and systems, skills and capacities for development and planning.</b>	<i>1 NS in which organizational and capacity development objectives have been provided.</i>									
	<b>SFI Output 1.1: The National Society has the necessary resources to maintain the existing institutional infrastructure.</b>	<i># of monitoring visits conducted Lessons learned workshop conducted</i>									
	Activities planned	<b>Timeframe (semester)</b>									
	<b>Readiness activities</b>	1	2	3	4	5	6	7	8	9	10
AP039	Monitoring and evaluation										
AP042	Improvement of infrastructure and warehouses to be used at the regional and local levels.										
AP042	Office supplies										
AP042	Telephony and internet										
AP042	Fuel and vehicle maintenance										
AP042	Bank charges										
AP042	Project coordinator										

Activities planned		Timeframe (semester)									
<b>Pre-positioning activities</b>		1	2	3	4	5	6	7	8	9	10
AP040	Protective equipment for volunteer and permanent personnel (30 kits per auxiliary committee).										
AP040	Protective equipment against COVID for volunteer and permanent personnel (KN 95 masks in boxes of 20 units).										
Activities planned		Timeframe (semester)									
<b>Early action activities</b>		1	2	3	4	5	6	7	8	9	10
AP039	Lessons Learned Workshop										

# Budget

To implement the Early Action Protocol (EAP) 383.103 CHF have been allocated split between readiness\*, pre-positioning of stock and early action costs as per below summary by area of intervention.

<b>Budget by Area of Intervention</b>				
Area of Intervention	READINESS	PRE-POSITION STOCK	EARLY ACTION	EAP Budget CHF
AOF1 Disaster Risk Reduction				0
AOF2 Shelter				0
AOF3 Livelihoods and Basic Needs	34,652	1,313	121,101	157,067
AOF4 Health	4,377	80,248		84,625
AOF5 Water, Sanitation and Hygiene		40,853		40,853
AOF6 Inclusion, Gender and Protection				0
AOF7 Migration				0
SFI1 Strengthen NS Capacities	38,373	21,703	5,836	65,913
SFI2 Ensure effective int'l disaster mgmt	33,047		1,598	34,645
SFI3 Influence others as leading strategic partners				0
SFI4 Ensure a strong IFRC				0
<b>TOTAL</b>	<b>110,450</b>	<b>144,118</b>	<b>128,535</b>	<b>383,103</b>

\*The activities for readiness and pre-positioning of stock will be captured in the IFRC Country Operational Plan (COP), reporting on annual basis. In case of an Early Action trigger, the annual readiness funding allocation is terminated with a 12-month notice, allowing the National Society to conclude its 3rd party financial and legal commitments and liabilities under the Early Action Protocol.

## Contact information

Reference documents



Click here for:

- Full EAP

**For further information, specifically related to this Early Action Protocol please contact:**

### In the Costa Rican Red Cross

- **Jim Batres Rodriguez**, Risk Management Director, [jim.batres@cruzroja.or.cr](mailto:jim.batres@cruzroja.or.cr)
- **David Picado Luna**, Project Unit Coordinator, [david.picado@cruzroja.or.cr](mailto:david.picado@cruzroja.or.cr)

### In the IFRC

- **IFRC Regional Office for the Americas:**  
Nadia Ortega, Disaster Risk Management Senior Officer, [nadia.ortega@ifrc.org](mailto:nadia.ortega@ifrc.org)
- **IFRC Country Cluster Support Team for the Central America countries:**  
Gerardo Escalante, Disaster Management Coordinator, [gerardo.escalante@ifrc.org](mailto:gerardo.escalante@ifrc.org)

### In IFRC Geneva

- **Programme and Operations focal point:** Nazira Lacayo, Senior Officer DREF, Forecast-based Action, [nazira.lacayo@ifrc.org](mailto:nazira.lacayo@ifrc.org)

## How we work

All IFRC assistance seeks to adhere to the **Code of Conduct** for the International Red Cross and Red Crescent Movement and Non-Governmental Organizations (NGO's) in Disaster Relief and the **Humanitarian Charter and Minimum Standards in Humanitarian Response (Sphere)** in delivering assistance to the most vulnerable. The IFRC's vision is to inspire, **encourage, facilitate and promote at all times all forms of humanitarian activities** by National Societies, with a view to **preventing and alleviating human suffering**, and thereby contributing to the maintenance and promotion of human dignity and peace in the world.