Forecast based Financing

The FbF experience in high Andean communities in Peru

Cold waves and snowfall

Changing the paradigm to act faster

Cruz Roja Peruana

German Red Cross

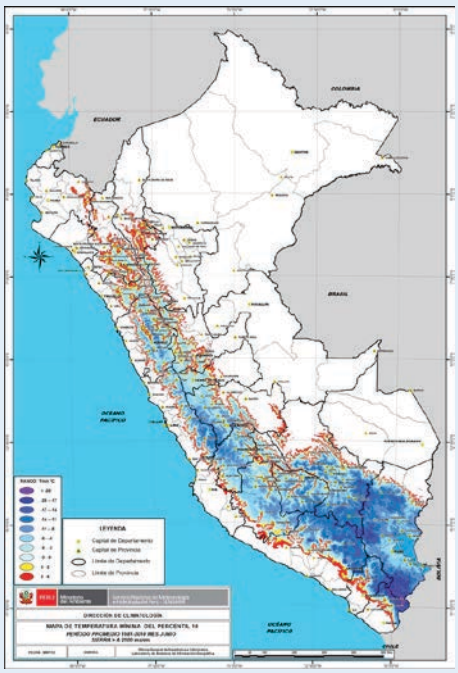
german humanitarian assistance
DEUTSCHE HUMANITÄRE HILFE

RED CROSS/RED CRESCENT CLIMATE CENTRE

International Federation of Red Cross and Red Crescent Societies

The Netherlands Red Cross

COLD WAVES AND SNOWFALL IN THE PERUVIAN HIGH ANDES



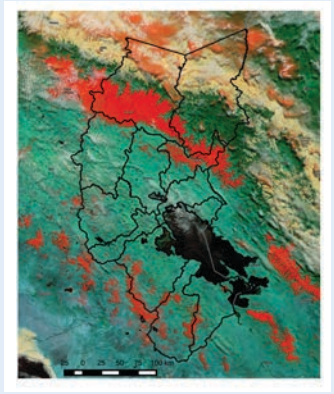
Temperature map of percentile 10 - SENAMHI.

Every year during the winter months (June - September), cold waves and snowfall hit various regions in the Peruvian high Andes. However, these events can be more extreme in some years. In these cases, they cause damage and loss, especially in terms of health and livelihoods. These extreme events have the most severe impact on populations in a highly vulnerable situation, either due to their social condition (poverty) or their geographical location.

The map shows the areas with the greatest amount of extreme low-temperature events. These events are most frequent in the high Andean area which is part of the area of intervention of the FbF project.

In the last 15 years, the biggest disasters were registered in 2002, 2012, 2013 and 2015. For example, August 2013 was characterized by heavy snowfall and cold waves affecting people, livestock, housing, communication routes and basic services, especially in the provinces of Carabaya, Lampa and San Antonio de Putina. In July 2015, snowfall and cold waves affected mostly families and livelihoods like alpaca livestock in the provinces of San Antonio de Putina and Lampa.

Impact of cold waves and snowfall in Puno[1]



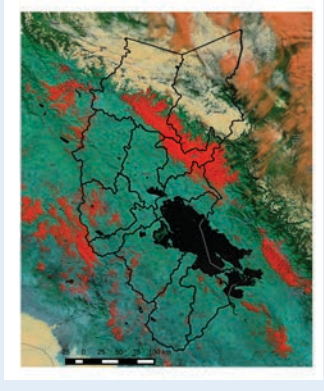
2013 Impact

Families affected: **12,310**

Inhabitable homes: **738**

Livestock lost: **17,288**

Satellite image (NASA) of Puno, snowfall in August 2013 (snow highlighted in red)



2015 Impact

Families affected: **44,612**

Inhabitable homes: **300**

Livestock lost: **99,650**

Satellite image (NASA) of Puno, snowfall in July 2015 (snow highlighted in red)

1 Source: INDECI

THE CONCEPT OF 'FORECAST-BASED FINANCING' (FbF)

Forecast-based Financing develops new processes and methodologies to make preparation and response more effective and efficient. It is based on national and international hydro-meteorological forecasts, establishes danger levels and predefines early action. These actions are activated when a forecast exceeds a certain danger level in the area of intervention (for example, an amount of snow which doesn't allow alpacas to find grass for several days). This way, action can be taken before the disaster occurs, thus increasing resilience, both of institutions and communities.

The implementation of FbF in Peru in 2016 demonstrates that it is possible to establish a forecast-based early action activation system using funds which are liberated automatically when there is an 'activating forecast' exceeding a certain danger level. Thus, early action prepares vulnerable families, and humanitarian institutions can face an extreme event better.

Why does FbF focus on communities on the *Altiplano?*

Historic data on climate and its impact show that extreme cold waves and snowfall events, for example in 2002, 2012, 2013 and 2015 had a severe impact on high Andean communities. Acting beforehand, early action can improve the resilience of the communities, thus providing protection to the most vulnerable people (especially children and elderly persons) and their livelihoods (alpacas).

Early Action: Distribution

FROM RISK ANALYSIS TO DANGER LEVELS

To establish danger levels, historic climate data about cold waves and extreme snowfall ('percentile 10[2]) were taken into account as well as historic data about impact and vulnerability in the area. In the case of cold waves, the analysis demonstrated that 4 or more consecutive days of cold waves severely affect the population. In terms of snow, it was determined together with the local communities and other players involved that a snow level of 40cm or a situation in which the snow freezes and remains for at least 4 days is dangerous. Based on these findings, 3 specific thresholds were established for each district.

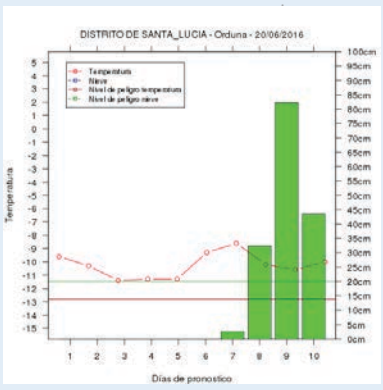
District	Community	Danger level A	Danger level B	Danger level C
Santa Lucía	Orduña	20 cm of snow and -12.8°C during 3 consecutive days	-12.8°C during 4 consecutive days	40 cm of snow on one day
Putina	Ticani y Tarucani	20 cm of snow and -7.6°C during 3 consecutive days	-7.6°C during 4 consecutive days	40 cm of snow on one day
Potoni	Cullco Belen y Llaulli	20 cm of snow and -10°C during 3 consecutive days	-10°C during 4 consecutive days	40 cm of snow on one day
Macusani	Ccatacancha y Ninahuisa	20 cm of snow and -10°C during 3 consecutive days	-10°C during 4 consecutive days	40 cm of snow on one day

Danger thresholds defined for each district in the area of intervention of the FbF Project in Puno, 2016.

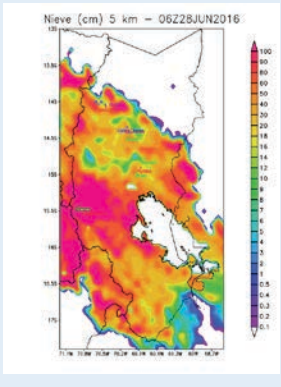
Implementation of meteorological models

The FbF Project and SENAMHI have implemented a meteorological model called 'Weather Range Forecast' (WRF). It features a high resolution of 10km for temperature and 5km for snow. It was verified with daily temperature data from the last 5 years to check the reliability of the forecast. Additionally, the model was calibrated through post-processing (adjustment of the model) using data observed for the temperature variable. For snow, the verification and post-processing was complicated due to a lack of observation data. SENAMHI will continue using the model, so that it will be possible to calibrate it in the future and achieve greater precision of the snow forecasts.

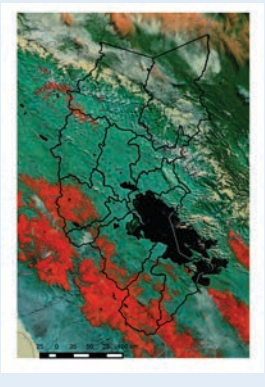
Satellite map for the observation of snowfall.



Forecast meteogram for temperature and snowfall.



Snow forecast map.



Satellite map for the observation of snowfall.

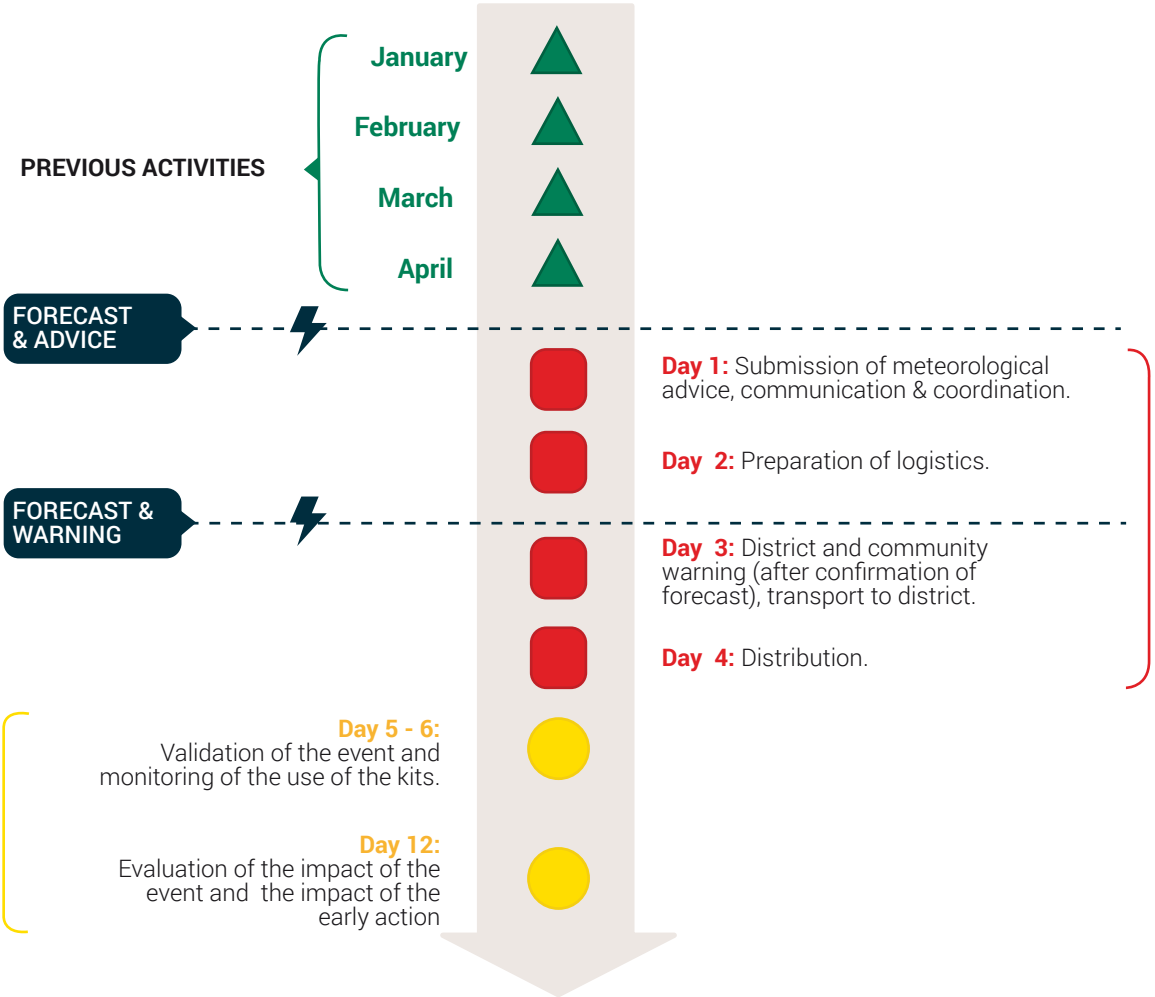
2. Percentile: Is a measure widely used in statistics. They are 99 values that divide the set of ordered data into one hundred equal parts. For example, the order 15 percentile leaves below 15% of the observations, and above 85% remains.

THE EARLY ACTION PROTOCOL ('SOP')

Once the forecasts exceed the threshold, early action as pre-established in the early action protocol (SOP) is activated. The period of time for early action (between the forecast and the possible event) amounts to only 5 days. The protocol specifies previous activities, procedures in case of activation, distribution plans, security guidelines, budgets for each activity, and contact data, among others.

How does the FbF mechanism work?

The forecasts of snowfall and cold waves are used to activate early action within a period of 5 days. On day 1, an advice is emitted, and the Red Cross starts coordinating, communicating and preparing the logistics. On day 3, if the forecast is confirmed, a warning is emitted, and transport, distribution and the livestock vaccination campaigns are activated.



Previous activities, January: Planning, human resource management.
Previous activities, February: Logistic processes, development of FbF capacities, revision of contact list.
Previous activities, March: District diagnostics; coordination with key players; elaboration of distribution plan (including budgets) and safety plan.
Previous activities, April: Development of capacities of early warning and early action; coordination meeting for preparation of SOP deployment; pre-positioning.

Activation period: FbF Puno.

Monitoring and evaluation period: FbF Puno.

Forecast exceeds the danger level for the FbF project in Puno.

EARLY WARNING TO EARLY ACTION

Software as a tool of the mechanism and the National Early Warning Network

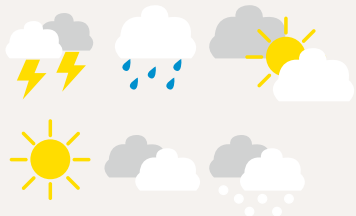
The Red Cross and INDECI[3] have developed **an automatic early warning dissemination mechanism and a software to make it operational.** The software works automatically, generates warnings and immediately sends emails and text messages to all players involved.

The software is designed to be an effective tool of the RNAT (National Early Warning Network) in Peru. It is also conceived for use at a multi-hazard countrywide scale. It is a unique tool to **facilitate anticipatory decision-making and to quickly activate early action protocols.**

In the course of the year 2016, the mechanism, as well as the software, were already implemented experimentally in Puno in the context of the **Forecast-based Financing** project of the Red Cross. The software runs on the INDECI servers and is ready to be used on a larger scale and for a variety of hazards.

Automatic submission

1. The **technical-scientific entities** gather and generate scientific data on a particular geographical area



2. Based on this work, the data are processed to generate files with forecasts and information.

Automatic detection

3. At **INDECI**, the software is permanently capturing the files it receives from the diverse scientific entities.

4. ...until it detects data which coincide with the danger levels (critical thresholds) previously established and entered into the software.

3. The technical work was done with the support of HERSE Consultores.

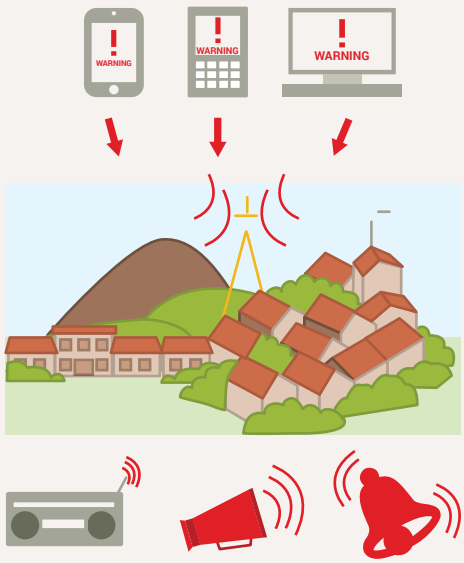
How does the software work?

The technical-scientific organization (SENAMHI) makes the information on the forecasts directly available to the software without any need to draw up a report. The software verifies whether the thresholds are exceeded. If this is the case, it **automatically sends an advice or a warning by email, and a text message** to the players involved (Civil Defense, humanitarian players, local governments and the population of the area) so they activate their early action protocols. They can also increase the resilience of the community before a disaster occurs, thus diminishing the impact of the event.

In order for the software to work correctly, it is necessary to first establish the **danger levels** (or critical thresholds). They can vary from institution to institution or from one geographical area to another, and they can warn at a macro or a micro level. Besides, the software allows the inclusion of field observations, for example the water level in the upper basin of a river, to be able to warn the communities in the lower basin.

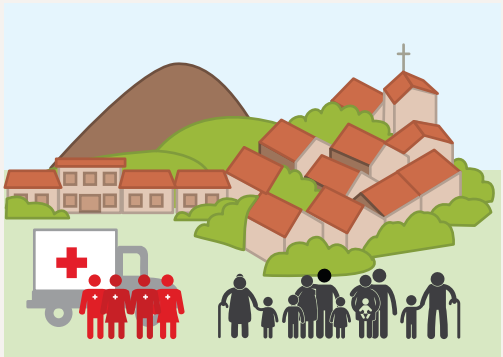
Automatic dissemination

5 Now is the moment that the **early warning entities** (COEN, regional government, COER, regional INDECI office, Red Cross, mayors, local EWS and community leaders) are notified via text message and email.



Activation of action protocols

6 When they receive the messages, **the entities involved and the population** in general activate their (early) action protocols in order to increase institutional and community resilience and reduce the impact of the event.



THE INTERVENTION
SNOWFALL AND COLD WAVES

WHY INTERVENE IN THE EVENT OF SNOWFALL AND COLD WAVES IN PUNO?

- Although these climate events are recurrent, the level of preparation and action in the communities is still very low.
- When implemented beforehand, early action can improve the resilience of the communities, thus providing protection to the most vulnerable inhabitants (especially children and elderly persons) and their livelihoods (alpacas).

440 families approx.

4 districts

WORK PRIOR TO EARLY ACTION

25 volunteers from the Putina local office of the Red Cross trained.

7 community brigades trained in early warning and first aid.

20 diagnostics and 7 AVC* carried out.

440 veterinary kids pre-positioned.

440 health and winter gear kits distributed.

7 first-aid kits (1 for each community).

*Analysis of Vulnerability and Capacities (AVC)

FORECAST:

5 DAYS Danger level was exceeded in Lampa (snowfall), Potoni (cold waves) and Putina (snowfall).

Action implemented:

Disseminate warning, activate action protocol and community EWS.

333 winter gear and veterinary kits distributed in the community.

16,650 alpacas receive emergency food for 10 days.

16,650 animals vaccinated.

Continue follow-up and monitoring of the use of the kits.


KIT VETERINA


Cruz Roja Peruana


Cruz Roja Peruana


TALLER
SALUD y PRIMEROS AUXILIOS COMUNITARIOS
(SPAC)

CONCLUSIONS

Focusing on extreme events
Puno was severely affected by cold waves and snowfall in 2002, 2012, 2013 and 2015. Historic data regarding impact and socioeconomic vulnerability were used to define the level of extreme danger in the communities.

Seeking a balance between preparation time and reliability of the forecast
The forecasts of cold waves and snowfall in Peru are usually emitted by SENAMHI with about 48 hours of lead time. The FbF project uses a longer lead time (5 days) to have more time to prepare the field work. However, there is also a 'cost' to working with a longer lead time, as the level of reliability of the forecast is challenged more. The project demonstrated that the Red Cross is able to get to the communities in the period of time the forecast allows for, as long as there is a solid early action protocol (SOP).

Introducing a 'forecast confirmation mechanism'
The Red Cross has elaborated a mechanism which activates early action based on 2 forecasts: The first one with 5 days of lead time, based on which an advice is emitted, and another one with 3 days of lead time which confirms the first forecast. In the field, this means that low-cost activities such as coordination, communication and the preparation of logistics are carried out in the first two days, whereas high-cost activities like transport and distribution are due once the forecast is confirmed with greater certainty. This mechanism provides the opportunity to stop the activities in the process and limit futile interventions.

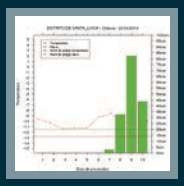
The challenge of the snowfall forecast
The forecast of snowfall in Peru based on the current model tends to overestimate the values. Currently, there is no observation data on snowfall, which is why it is difficult to calibrate the model. The project demonstrates that a snowfall observation network is necessary in the area.

Broadening the field of action
For the moment, the FbF mechanism is part of a pilot project whose experiences might be replicated in a wider area of intervention, like for example the entire southern Andes. The FbF mechanism allows for a focus on the most vulnerable districts based on a risk scenario, carrying out early action only where extreme events occur. At an institutional level, it is important to have a 'National Preparation and Response Team' either at the Red Cross, Civil Defense or other humanitarian organizations.

Focusing on other hazards
Cold waves in Puno during growing season also causes impacts on people's livelihoods. Also, drought in the Andean region could be an opportunity for the FbF Project, considering that it is possible to work with long-term forecasts and longer preparation periods.

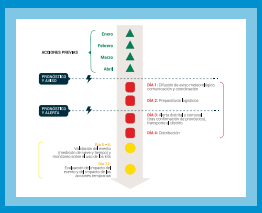
From early warning to early action
For a warning to be effective, it must quickly trigger action. This 'early action' is ideally consolidated in an action protocol (SOP). To improve the effectiveness of the warnings, a software for the early warning system was developed which automatically sends emails and text messages, saving time on the submission of weather advice and warnings. Besides, thresholds can be used which vary for each district, basin or community.

KEY ASPECTS OF THE FbF EXPERIENCE IN PUNO



Using and monitoring hydro-meteorological information on cold waves and snowfall with 5 days of lead time, applying a high-resolution model.

Timely and automatic warnings through an early warning software, informing all actors and communities involved.



Effective preparation for an extreme event through Early Action Protocols (SOP)

Rapid distribution and livestock vaccination before an extreme event occurs.

Cruz Roja Peruana

German Red Cross

german humanitarian assistance
DEUTSCHE HUMANITÄRE HILFE

RED CROSS/RED CRESCENT CLIMATE CENTRE

International Federation of Red Cross and Red Crescent Societies

The Netherlands Red Cross

TECHNICAL, SCIENTIFIC AND COORDINATION TEAM

German Red Cross
Mathieu Destrooper
m.destrooper@drkamericas.de

Peruvian Red Cross
Marcia Puell
direccion.ejecutiva@cruzroja.org.pe

Climate Centre
Juan Bazo
Bazo@climatecentre.org

Peruvian Red Cross
Juan Carlos Melgar
eni001@cruzroja.org.pe

Communication Coordinator: Arlene Villanueva

Design and layout: Javier Domínguez | Juan José Vásquez