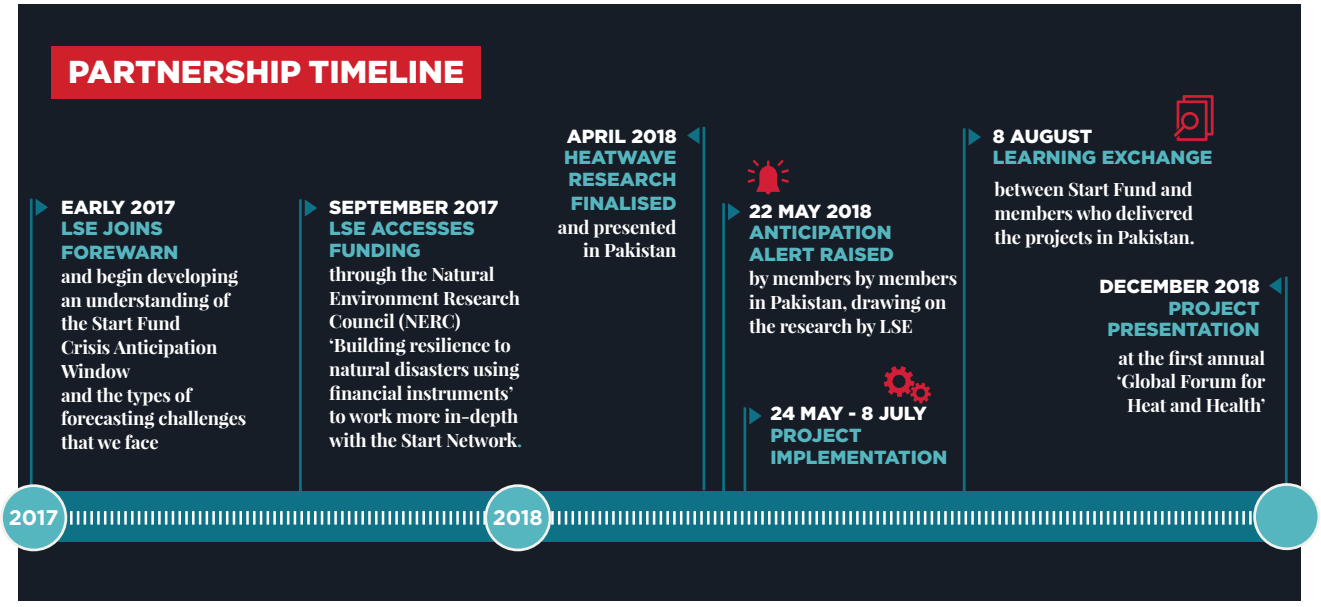
Forecasting Extreme Heat in Pakistan

Case Study

Start Network is made up of more than 40 aid agencies across five continents, ranging from large international organisations to national NGOs. Together, our aim is to deliver more effective emergency aid, harnessing the power & knowledge of the network to help people affected by crises. We advocate for radical change in the system so that the world can deal better with the humanitarian challenges of today, and of the future.

The Start Fund is the first global pooled humanitarian fund to be made accessible using forecasts. The Crisis Anticipation Window enables Start Network members to access funds when they see a crisis escalating, to reduce the risk of harm and loss at the community level. This ground-breaking work is accomplished by brokering forecasting information on behalf of Start Network members, and supporting them to access, interpret and develop programmes based on these forecasts. Accessing forecasting information on behalf of our members contributes to greater efficiency in the humanitarian system, preventing each member from needing to develop their own, individual relationships with forecasters. In 2019, we will focus on developing crisis anticipation at the national level, catalysing local risk analysis and forecast based action groups, composed of Start Network members and national meteorological and risk analysis experts.



Introduction

Heatwaves are a major hazard in Pakistan and they impact the most vulnerable. In 2015, in just 3 days, a heatwave killed more than 1200 people in Karachi alone [1]. In addition to the health impacts, the knock-on effects from heatwaves can be severe: increased power needs can lead to blackouts and water shortages, affecting hospitals, transport, and communication. The overall risk of heat-related illness or death has climbed steadily since 1980: 30% of the world's population now live in places where temperatures can become fatal for at least 20 days a year.

The Start Network first responded to heatwaves in Pakistan April 2016. The Start Fund released £40,000, to support awareness and mitigation measures in Sindh province, for particularly vulnerable community members. The following year, a severe heatwave with temperatures as high as 50°C hit Pakistan, breaking temperature records across the country.

On 18 April 2017, Start Members in Pakistan submitted a heatwave anticipation alert to the Start Fund. Although decision makers felt that there was clear need, and the heatwave proved fatal, they decided not to activate the alert. Temperatures had already begun to spike and they felt that the alert was submitted too late to implement anticipatory action.

This case study summarises the implementation and impact of the May 2018 anticipation alert, and the ground-breaking forecasting analysis which enabled it. It draws on documents created through the development of the project and interviews with Start members who were involved in implementing the work.

KEY LEARNING POINTS

Risk analysis and designing anticipatory projects is not about having lots of information, it's about have the right information at the right time, and knowing if it is good quality.

Co-development of forecasting products between diverse teams can ensure the information is scientifically robust, while being accessible to humanitarians on the ground. Here the Start central team, London School of Economics and Start members in country collaborated to create a product which enabled earlier triggering of the Start Fund for heatwaves in Pakistan.

CHILDREN'S COMMUNITY MEETING, TO SHARE EDUCATIONAL MATERIALS ON HEATWAVE IN WEST KARACHI

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FORECASTING HEATWAVES

Forecasting heatwaves isn't easy. It can be difficult to know where to look to get quality forecasts. Start members note that it's easy to get overwhelmed by the data and the amount of forecasts available; it can be confusing knowing where to get good forecasts and what to do once you've got them. It's a delicate balance between being close enough to the spike of the heatwave- when we've got a higher level of certainty about the forecast, but far enough away from the heatwave to take anticipatory action.

Forecasting heatwaves

SMS MESSAGE RECEIVED BY RACHID ALI, A DRIVER IN KARACHI, GIVING TIPS FOR AVOIDING NEGATIVE EFFECTS OF HEAT.

© MUHAMMAD ALI, MUSLIM AID

IMPROVING THE QUALITY OF OUR FORECASTS

Building from this experience, the Start Fund began to collaborate with the London School of Economics (LSE) through a Natural Environment Research Council (NERC) funded project on improving weather information for disaster anticipation. The project aimed to improve the practical use of forecasts to support anticipatory humanitarian action. The research first focused on forecasting heatwaves in Pakistan and aimed to answer the following questions:

- **How can we define extreme heat?**
- **What forecasts are available?**
- **Where should we be looking for the best forecasts?**
- **How reliable are the forecasts at different lead-times?**
- **How and when should we be implementing anticipatory action?**

Dr. Erica Thompson from LSE's Centre for the Analysis of Time Series (CATS) used statistical methods to analyse the reliability of forecasting sources for heatwaves in Pakistan at different lead-times. The goal was to help humanitarians on the ground make sense of the forecasts that they have. Through the project, LSE and the Start Network produced guidance that members in Pakistan could use to forecast and mitigate the impacts of heatwaves.

FINDINGS FROM THE HEATWAVES STUDY

- **Forecast information on heatwaves should signal the possibility of a heat wave 7-10 days before the event, which gives time to raise an anticipatory alert**
- **Humanitarian impacts of heat are not just highest temperatures; high night time temperatures, duration of heat and high humidity all reduce people's ability to cope with extreme heat.**
- **Pakistan Government published Heat Action plans (Eg. Karachi) are a useful reference for the impact of different heat related events.**
- **Where extreme heat looks to be developing, more detailed forecasts can be found 8-10 days in advance. The most accessible are from the Pakistan Meteorological Department.**
- **There are no reliable forecasts over 10 days lead time. Seasonal forecasts can give a tentative indication of increased or decreased likelihood of extreme heat.**

The research was shared and discussed with Start Members through a webinar on April 19th 2018. A survey was shared in advance with Start members to gather information about their work and knowledge related to heatwaves, and better understand any gaps and issues. This ensured the study and webinar were appropriately tailored.

WHY USE FORECASTS, WHEN EVERY SUMMER IS HOT IN PAKISTAN?

Heatwaves in Pakistan are seasonal and occur increasingly frequently. Interview respondents were asked why, in this context, is it useful to use forecasts instead of simply implementing prevention activities every year.

Two key points were highlighted:

- **While heatwaves are a seasonal risk, they do not occur every year. Using forecasts to predict extreme events can help ensure limited humanitarian funds are used prudently.**
- **Heatwaves have only recently come to be seen as a crisis risk in Pakistan. By promoting the use of forecasts and providing information about when heatwaves will occur, the Start Network raises awareness about heatwaves and galvanises support for addressing the risks they pose.**

Taking action using a forecast

APRIL 2017

3 APRIL
Some indication of extreme heat, but not reaching 45 degrees

6 APRIL
Clear indication of extreme heat in forecast, temperatures forecast to hit 45 degrees for several days in a row

45°+

9 APRIL
Clear indication of extreme heat in forecast, temperatures at 45 degrees for several days and night times high too

12 APRIL
Clear indication of extreme heat in forecast, temparatures over over 45 degrees for several days and night time highs too

15 APRIL
Extreme heat expected to end around 22 April

18 APRIL
Alert raised

22 APRIL
Cooler weather returning

MAY 2018

15 MAY
Temperatures expected to be hot for time of year but not extreme

18 MAY
Clear indication of extreme heat in forecast, temperatures exceeding 45C

45°+

21 MAY
Clear indication of extreme heat in forecast, temperatures up to 50C for several days and high night-time temperatures as well

22 MAY
Alert raised

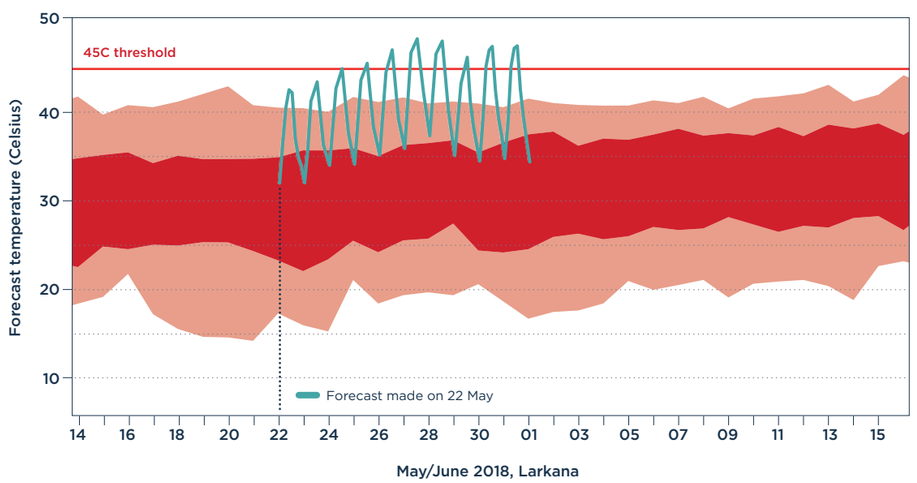
23 MAY
Alert activated

24 MAY
Clear indication of prolonged extreme heat in forecast for several days and nights

27 MAY
Extreme heat expected to continue for some days

The two timelines show that Start members activated the Start Fund nine days earlier in 2018, compared to 2017 before the forecasting analysis had taken place. This time difference is critical for heatwaves, where the lead time and duration of the event is short. Start Network members reported they chose similar activities to a later heatwave project, focused on mitigating the health impacts of extreme heat. By disseminating information earlier, communities are better able to take actions to avoid the most serious health problems caused by heatwaves.

FORECAST FOR LARKANA (SINDH PROVINCE) MADE ON 22ND MAY 2018 - THE DAY THE ALERT NOTE WAS ISSUED.



The **dark red** area indicates the normal temperature range for the time of year, while the **blue** line shows the forecast which predicted temperatures significantly higher than the seasonal average.

Taking action using a forecast

TRIGGERING THE ALERT

Start members began monitoring for heatwaves after the April webinar. For the first time, they had a shared understanding of where they should look for quality heatwave forecasts, how far in advance they could accurately predict a heatwave, and how to use the data that's available.

Action Against Hunger led the process and brought Start members together in May, when they identified a heatwave was forecast to occur. The alert note was co-developed by Start members in country and was raised on May 22nd.

DECISION MAKING

Decision makers unanimously agreed to allocate £75,000 when the alert was raised. Twenty of the twenty-two Start Network member agencies who responded to the Start member survey supported the alert note. These surveys are taken for each alert, to rapidly gauge support for Start Fund alert notes from across the network.

The fact that the heatwaves coincided with Ramadan and therefore that the population would be more vulnerable to dehydration from heat was a key consideration, as was the high levels of malnutrition identified in the alert note.

PROJECT SELECTION AND DESIGN

Of the five proposals submitted, a Consortium project was chosen led my Muslim aid, in cooperation with ACTED, Action Against Hunger and Trocaire.

The project focused providing a range of information, communication and education materials, targeted at different sectors of the population. Heatwave camps providing water, shade, seating and education materials were also provided in addition to demonstrations for community members on first aid related to heat stroke.

Activities were decided through conversations with the National and Provisional disaster management agencies, drawing on learning from an Oxfam heatwave intervention which took place in 2015. This led to a consortium which combined members technical strengths increased the Networks through which the project worked; Muslim Aid designed and translated the communication materials, Action Against Hunger coordinated with National and Provincial Disaster management agencies and ACTED and Trocaire implemented with local communities. This approach enabled effective reach to a wide range of stakeholders at different levels, in a short timeframe.

DISPLAY OF AWARENESS BANNER AT MAIN MARKET CHOWK. A TOTAL OF 20 PUBLIC BANNERS WERE DISPLAYED IN PROMINENT LOCATIONS OF THE MIRPURKHAS DISTRICT.

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"It helped us, we were well positioned, we had a better understanding. Last year, there was a lot of confusion, this year we could understand and calculate the timing ahead of time, with information from the PMD"

SHANAWAZ KHAN, PROGRAMME MANAGER – HUMANITARIAN, MUSLIM AID.

The project

PHOTOS © MR. SHAKEEL AHMED ICR HAND

"Before this campaign we did not know about the precautions about heatwave, so we used to go in sunlight without any care. Now we are following the precautions, and make ourselves safe from the heat wave."

ABDUL RAZAQUE, SENIOR CITIZEN SOCIAL ACTIVIST, KARACHI, JULY 1ST 2018

"This campaign was useful in preventing the harmful effects of high temperatures because now we are not leaving our homes at critical times. Children are not allowed to leave home in the afternoon, if in an emergency go out from our home, we take water with us to drink"

ABDUL AZIZ, SHOPKEEPER, LIYARI, JULY 2018.

GOOD PRACTICE IN FOCUS

The project used a wide variety of communication channels and materials to ensure they reached a wide range of groups. These included posters, leaflets, radio shows, SMS messages, cable ticker messaging, messages in local newspapers. Materials were delivered in local languages and reflected feedback gathered from factory workers in Karachi. This approach maximised the chances that communities would receive the information in an appropriate manner, even in places with low literacy levels, while reaching as many people as possible.

PROJECT IMPACTS

Health messages helped communities to adopt protective measures against the negative health impacts of heatwaves. Through the project, communities were made aware of symptoms of heat exhaustion and measures to reduce its likelihood. A wide cross section of the community in Karachi reported implementing the health messages provided, including shopkeepers, drivers, students and mechanics.

The information provided on heatwaves eliminated the confusion and uncertainty faced by members around which forecasts to use, which enabled them to raise alerts earlier than previous alerts in 2015 and 2017. The webinar also facilitated collaboration on the alert process and resulting project, by providing a shared understanding of the risks and how to address them.

START NETWORK

Bringing Start Network members together to co-create information products helped agencies come together around risk analysis.

KEY LEARNING POINTS

TIMING

While the anticipation alert enabled Start members to conduct a timely intervention, interview respondents reported that the alert could still have been raised earlier. Heatwave deaths were being widely reported in the press by the time the alert was raised. While the provision of guidance helps galvanise action, more work is needed to improve the link between risk analysis and timely action.

LEADERSHIP IS KEY

While the collaboration in this project was key to its success, leadership was required to ensure risks were monitored and the funds were requested. Action Against Hunger took responsibility for monitoring the forecasts and bringing members together in a timely fashion. Without this, the alert would not have occurred.

CO-DEVELOPMENT CAN MAKE TECHNICAL DATA EASY TO INTERPRET

Bringing academics and humanitarians together to translate technical forecasting information ensures that the guidance will be practical. The Start Network have a key role in brokering these partnerships on behalf of the Start Network.

INFORMATION, COMMUNICATION AND EDUCATION MATERIALS

and the channels through which they are delivered, should account for the characteristics of different groups. For example, in Pakistan, Start members took into account women's reduced engagement in the public sphere, ensuring they reached women's groups and female health workers. This is especially key considering their key role as carers and in the functioning of households.

START NETWORK

Start Network Members:

Start Fund Donors:

Crisis Anticipation Window Partners:

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