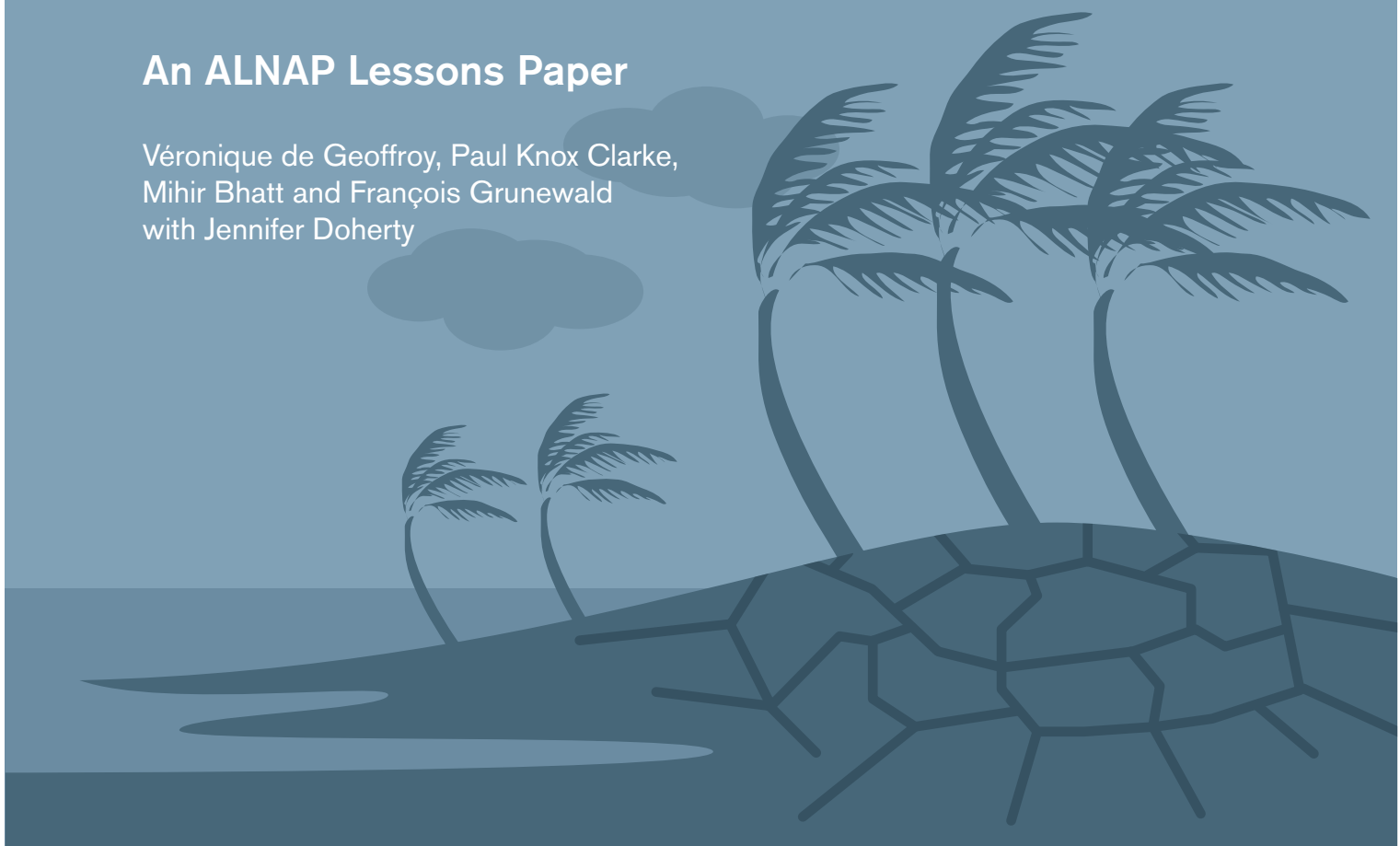


# Adapting humanitarian action to the effects of climate change

An ALNAP Lessons Paper

Véronique de Geoffroy, Paul Knox Clarke,  
Mihir Bhatt and François Grunewald  
with Jennifer Doherty



**LESSONS PAPER**

 **ALNAP**

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ALNAP is a global network of NGOs, UN agencies, members of the Red Cross/ Crescent Movement, donors, academics, networks and consultants dedicated to learning how to improve response to humanitarian crises.

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# Contents

<b>List of Lessons</b>	<b>1</b>
<b>Abbreviations and acronyms</b>	<b>5</b>
<b>Summary</b>	<b>6</b>
<b>Introduction</b>	<b>7</b>
<b>Methodology</b>	<b>16</b>
<hr/>	
<b>Lessons learnt</b>	<b>20</b>
A // General lessons on humanitarian action and climate change	20
B // Lessons from imperfectly understood disasters: tropical storms behaving in new ways	37
C // Lessons from new weather events: heatwaves	48
<b>Authors' reflections on the evidence</b>	<b>57</b>
<b>Endnotes</b>	<b>60</b>
<b>Bibliography</b>	<b>61</b>

# List of Lessons

---

## A // General lessons on humanitarian action and climate change 20

---

### Lessons related to organisational strategy, focus and resource allocation

Lesson 1: Humanitarian actors should develop their ability to design and implement a range of programme types – resilience, disaster risk reduction, anticipation and response – to ensure an effective and joined up response 20

Lesson 2: Humanitarian actors should respond to the uncertainty of the climate crisis by developing their ability to work flexibly and adaptively at individual, programmatic and organisational levels 21

Lesson 3: Humanitarian actors should consider the impact of climate change in regions experiencing armed conflict and find ways to work with development actors and governments to deliver climate-related programming in conflict areas 22

Lesson 4: Humanitarian actors should improve their ability to evaluate and learn from resilience building activities, climate-related adaptation and anticipatory and preparedness efforts in order to focus resources on the most effective approaches 23

---

### Lessons related to organisational structure

Lesson 5: 'Dual-mandate' humanitarian organisations should address internal silos by undertaking joint analysis, creating cross-sectoral teams and restructuring where necessary 24

Lesson 6: Development and humanitarian actors should decentralise decision-making to create programmes that fit the context and can overcome sectoral silos 25

---

### Lessons related to partnerships and working with others

Lesson 7: Humanitarian actors should partner with development and climate actors, using joint analysis and common standards 26

Lesson 8: Humanitarian actors should co-design climate change programmes with vulnerable people and groups, ensuring that they understand and can discuss climate change, its effects and the potential impact on their lives and livelihoods 27

---

### Lessons related to programme design

Lesson 9: Humanitarian actors should design climate programmes with an understanding of how vulnerability occurs in that context, making sure that activities are relevant and accessible to marginalised groups in terms of resources, capacities and social networks 28

Lesson 10: Humanitarian actors should build on existing structures as the default approach to all climate-related activities, looking for local systems of administration and welfare systems that can take the lead where central government is weak or engaged in conflict 29

Lesson 11: Humanitarian actors and their partners should 'climate-proof' existing resilience, disaster risk reduction and preparedness activities and ensure that they do not make people more vulnerable to the effects of climate change in the longer term 30

---

### **Lessons related to resilience planning and adaptation**

Lesson 12: Humanitarian actors and their partners should acknowledge the scale of the resilience challenge, being realistic about what can be achieved and clear about the limits of their respective capacities to contribute to resilience 31

Lesson 13: Humanitarian actors and their partners should not conflate income with resilience; rather they should also consider other paths, particularly health and community empowerment 32

---

### **Lessons related to early warning and early action, anticipation, preparedness and response programming**

Lesson 14: Humanitarian actors and their partners should ensure that forecasting and early warning systems are reviewed after each disaster event, and routinely at fixed intervals over the longer term 33

Lesson 15: Designers of early warning, early action and anticipatory activities should build in flexibility 33

Lesson 16: Humanitarian actors and their partners should ensure that planned early actions are realistic, with implementation systems ready in place 34

Lesson 17: Early warning and early action systems will not be effective every time. Humanitarian actors and their partners should clarify what levels of uncertainty they are prepared to accept and plan to respond to disasters that were unanticipated or on a larger scale than expected 35

Lesson 18: Humanitarian actors and their partners should enhance preparedness for climate-related crises by pre-positioning emergency stocks and supplies, building capacity and providing information 35

---

### **B // Lessons from imperfectly understood disasters: tropical storms behaving in new ways 37**

---

#### **Lesson about the changing nature of tropical storms**

Lesson 19: Tropical storms increasingly present new or unexpected patterns and can catch the population or responding institutions off guard; understanding the new risks entailed is central to preparing and responding 37

---

---

## Lessons about resilience and adaptation

- Lesson 20: Humanitarian actors and their partners, including affected populations, should improve disaster risk reduction in view of the increasing risks of tropical storm-related disasters in coastal and densely inhabited delta areas 38
- 

## Lessons about preparedness

- Lesson 21: Humanitarian agencies need to reflect on the past, learn from the present and actively imagine the near, increasingly threatening future 40
- Lesson 22: Humanitarian actors and their partners should ensure that disaster responses to tropical storms should take account of potential secondary effects, such as flash floods, landslides and disease 41
- Lesson 23: Humanitarian actors, their partners and affected communities should invest in new types of alarm and alert systems, giving priority to systems that transmit information and making use of all available options 42
- Lesson 24: Humanitarian actors should listen to affected people and communities, recognise the importance of their anticipatory capacity and champion further research on how traditional knowledge can inform us about risks and potential disasters 43
- 

## Lessons about responses

- Lesson 25: Humanitarian actors, their partners and affected communities should invest in new information and communication technologies, from dedicated tools to user-generated data systems 44
- Lesson 26: Local authorities, working with humanitarian actors and other partners, should develop alternative shelter and evacuation systems in regions that are not typically disaster zones, but which could be affected by tropical storms in future 45
- Lesson 27: The likelihood of new forms of extreme climate effects and weather events caused by climate change necessitates improved dialogue and coordination between government and civil society on how to respond to and manage them 45
- Lesson 28: Humanitarian actors and partners – especially at local level – should recognise and support immediately following a disaster any effective informal first-response networks or citizen-led responses 46
- Lesson 29: Women are key actors in managing unknown risks and should be properly supported and empowered in preparing and responding to new dynamics of tropical storms 47
-

---

**C // Lessons from new weather events: heatwaves** 48

---

**Lessons about the nature of heatwaves**

- Lesson 30: Humanitarian actors and their partners should formulate programmatic responses to the challenges presented by extreme heat and heatwaves 48
- 

**Lessons about resilience and adaptation**

- Lesson 31: Humanitarian and other actors should focus support to communities and socioeconomic groups that are particularly exposed to the harmful effects of heatwaves as the threat of them increases 49

- Lesson 32: Humanitarian actors should support efforts to secure reliable access to sustainable energy, which is needed for effective strategies for adapting to increasing heatwaves 50

- Lesson 33: Humanitarian actors should develop their understanding of the complex impact of extreme heat on livelihoods 51

- Lesson 34: Partnership between humanitarian actors and government can support social protection to vulnerable groups in the event of extremely high temperatures or heatwaves 51
- 

**Lessons about preparedness and response**

- Lesson 35: Humanitarian actors should support and play their part in multisectoral approaches across shelter, urban planning, WASH and public health to help communities improve their capacity to withstand and respond to the effects of heatwaves 52

- Lesson 36: Governments, researchers and humanitarian actors should share the financial burden of mitigation activities 53

- Lesson 37: Humanitarian actors should contribute to awareness-building among groups who do not understand the dangers of extremely high temperatures or heatwaves 54
- 

**Lessons in anticipation**

- Lesson 38: Advocate for greater investment into early warning against heatwaves 55

- Lesson 39: Humanitarian and other donors should invest more time and resources in better risk assessment and improved monitoring and evaluation of heatwave preparedness and adaptation programmes and activities 55

- Lesson 40: Humanitarian and other actors should design their interventions in ways that engage affected communities in heatwave mitigation plans and programmes 56
-

# Abbreviations and acronyms

<b>ALNAP</b>	Active Learning Network for Accountability and Performance in Humanitarian Action
<b>CERF</b>	Central Emergency Response Fund
<b>CHC</b>	Climate and Humanitarian Crisis Initiative
<b>CO<sub>2</sub></b>	carbon dioxide
<b>ICT</b>	information and communications technology
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>NGO</b>	non-governmental organisation
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>US</b>	United States
<b>UN</b>	United Nations
<b>UNDRR</b>	United Nations Office for Disaster Risk Reduction
<b>UNISDR</b>	United Nations International Strategy for Disaster Reduction
<b>WASH</b>	water, sanitation and hygiene
<b>WFP</b>	World Food Programme
<b>WHO</b>	World Health Organization
<b>WMO</b>	World Meteorological Organization



# Summary

## **Adapting humanitarian action to the effects of climate change: an ALNAP lessons paper**

Humanitarian agencies need to reflect on the past, learn from the present and actively imagine the (near and increasingly threatening) future. Humanitarian actors, working on the ground to deal with the effects of climate-related disasters, are well placed to observe the intensification of the effects of climate change, and the increasing complexity of the weather events, often extreme, they cause in all regions of the world, including regions where such events were previously rare or unknown. Humanitarian actors can confirm that in the context of the climate crisis we are heading into the unknown. Lessons from previous experience will help mitigate some of the disasters that result from extreme weather events, some of which continue to follow familiar patterns, but new guidance - new lessons - are needed in the face of inevitably more complex disasters, some of them not yet imagined, much less understood.

# Introduction

## The climate crisis and changing patterns of disasters

**From excessive consumption to the over-exploitation of natural resources, polluting activities to large-scale deforestation, humans have already dramatically changed the Earth's climate and environment. In 2014, the Intergovernmental Panel on Climate Change concluded that 'Human influence on the climate system is clear' (IPCC, 2014: 2). The first words of the latest IPCC report provide a much starker warning: 'It is unequivocal that human influence has warmed the atmosphere, ocean and land' (IPCC, 2021: 5).**

In 2020, average global temperatures reached levels not seen for several thousand years (IPCC, 2021: 5). This global heating affects climate systems significantly, in ways that are well documented – changing the circulation of air masses, raising the temperatures of the oceans and creating new patterns of thermodynamic exchange between oceans and global atmosphere (Josey et al., 2013; Sutton et al., 2007). Sea levels are rising due to a volumetric increase of water caused by global heating and because of increased flows from melting ice – particularly from the Earth's poles.

As a result of these climactic and environmental changes, we are experiencing more frequent and more intense weather events, including droughts, flooding and tropical storms. And these events are forecast to increase in the next 10 to 20 years (World Bank and United Nations, 2010; Royal Society, 2014; IPCC, 2021). Urban areas will suffer from severe flooding (Shukla et al., 2019); longer, more widespread droughts will exacerbate regional and global food insecurity (Shukla et al., 2019; Watts et al., 2019); cyclones and other tropical storms will be more powerful (Shukla et al., 2019); wildfires will be more extensive; periods of hot extremes including heatwaves will be longer and more intense (Hoegh-Guldberg et al., 2018; Watts et al., 2019).

The humanitarian consequences of these extreme weather events – whether slow onset or rapid onset – are major. Droughts, flooding and tropical storms cause death, disease, destruction and large-scale population displacement. Public health emergencies are already increasing because of these changes. Conflicts and conflict situations may increase, as may the resulting human migration and displacement (Allen et al., 2012; IPCC, 2014; Bronen et al., 2018; Norwegian Red Cross, 2019).

There is a sizeable body of knowledge on how to minimise the human impact of many of these events. Through risk-informed development processes, including resilience work and disaster risk reduction (DRR), international capacity to cope with disasters has improved. However, as future disasters related to climate change get bigger, happen faster and affect more people, our existing knowledge and capacity for response may not be enough. These new, more complex types of disaster may call for new modalities of humanitarian action.

ALNAP commissioned a review of evidence from previous humanitarian interventions to identify lessons and examples of best practice that might be applied when designing humanitarian action in response to future climate-related disasters. Based on both academic and grey literature (such as evaluations and meeting reports) and supplemented by expert opinion, this lessons paper aims to be of use to those designing and implementing humanitarian programmes and projects in low- and middle-income countries. The lessons also have relevance for policymakers focused on improving humanitarian responses to climate-related disasters.

## A typology of climate-related disasters for humanitarians

The term ‘climate-related disasters’ is unhelpfully broad. This lessons paper proposes a basic typology based on our familiarity with and understanding of different disaster patterns – and therefore the extent to which lessons from previous experience may be useful and relevant in particular responses. The three types are:

1. **‘Known disasters’** – those of which we already have extensive experience and understanding but with new characteristics
2. **‘Imperfectly understood disasters’** – those that in some respects develop along familiar lines while in others present new, unexpected features that are difficult to predict
3. **‘The unknowns’** – Unprecedented, cascading or ‘new’ disasters, of which we have little or no understanding

Lessons learnt from humanitarian action can be expected to hold good for known disasters (1), but are likely to be less reliable or useful for imperfectly understood disasters (2) and certainly ‘the unknowns’ (3).

It is important to emphasise that these three types are not absolute: boundaries between them are approximate and observers may disagree on whether a given disaster should be classified as one type rather than another. Nonetheless, this broad distinction helps to clarify the variety of disasters related to climate change and enables us to assess the degree to which past lessons and experience may be used to guide future action.

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The three types are:

<b>KNOWN DISASTERS</b>	<b>IMPERFECTLY UNDERSTOOD DISASTERS</b>	<b>THE UNKNOWNs</b>
Those of which we already have extensive experience and understanding but with new characteristics	Those that in some respects develop along familiar lines while in others present new, unexpected features that are difficult to predict	Unprecedented, cascading or 'new' disasters, of which we have little or no understanding

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## Known disasters

In the current state of climate change, weather-related disasters are likely to retain the characteristics with which we are already familiar while gaining in intensity. These disasters may be greater in scale or more frequent than they were previously, or may affect different geographical areas, but will still follow a recognisable pattern (e.g. that of a tropical storm).

Humanitarian agencies have the structures and the programmes needed to respond to these types of disasters but may need to modify them to account for changes in intensity or distribution, namely:

- Greater scale. Disasters occur with greater force, affecting larger areas and/or more people: for example, extensive flooding in Mozambique following Cyclone Idai. Community resilience and organisations tasked with responding may be overwhelmed. However, existing disaster risk reduction and preparedness planning is likely to contribute to an effective response along tried and tested lines.
- Greater frequency. Disasters that were considered unusual or rare occur with greater frequency: for example, intensifying cycles of drought in the Sahel or the Horn of Africa. Previously infrequent weather events or unusual weather conditions may now become the 'new normal'. These events pose a challenge to community resilience and people's ability to continually rebuild their lives with ever-diminishing resources. Humanitarian responses to short-term disasters or emergencies are usually ill-adapted to chronic situations.
- Altered geographical scope or incidence. Climate-related disasters occur in new areas, or in areas where they were previously very rare: for example, the 2020 bushfires in some of Australia's more densely populated areas. Lacking experience of these events, neither affected communities nor local or national institutions are ready to respond. In some cases, however, international humanitarian actors may be able to propose solutions or responses that they have successfully tried elsewhere.
- Concurrent disasters. Some climate-related disasters that individually might be manageable, increasingly occur concurrently or in quick succession: for example, flooding in a drought-affected area, as in the

Sahel or the Horn of Africa. As in the case of disasters happening on a greater scale, concurrent disasters can overwhelm local resilience and response capacity. In these situations, accepted best practice in responding to each event e.g. flooding, remains relevant, unless the disasters occur on a scale beyond the scope of previously tried and tested responses.

- ‘Clusters’ of small disasters. Climate change may cause multiple smaller, unusual weather events that affect a single area. These ‘clusters’ will attract little attention internationally but can be devastating to the communities affected: for example, the increased incidence of landslides and flash floods in mountainous areas of Asia, Central and South America as well as in small island states with mountainous relief.

### ‘Imperfectly understood’ disasters

In the current state of climate change, weather events that were considered ‘known’ may behave in new, unexpected ways or follow different patterns. There is evidence, for example, that cyclones and hurricanes are developing much faster than previously (Marciano et al., 2015) or changing their trajectory unpredictably – as was the case with Hurricane Matthew in Haiti in 2016 (Grunewald and Schneckenberg, 2016; Zhang et al., 2018) ([Box 1](#)). Evidence also suggests that droughts, which have tended to be seasonal, may be increasingly protracted (Held et al., 2005; Allen et al., 2012). While a seasonal drought will affect livelihoods, food security and water, sanitation and hygiene (WASH), a protracted drought over several seasons may provoke longer-term changes in human migration patterns, disrupt the sowing cycle and limit the scope for crop diversity and variable land-use. Faced with these ‘imperfectly understood’ disasters, best-practice responses drawn from previous experience – such as programmes to maintain livestock health during periods of drought – may no longer be practical, appropriate or effective.

### **Box 1: New patterns of tropical storms**

Tropical storms – cyclones, hurricanes and typhoons – are some of the most devastating extreme weather events and there is a growing body of evidence that climate change is significantly modifying their behaviour of tropical storms. They are more violent – and in some areas more frequent – than they were historically, with storm seasons becoming increasingly unpredictable and storms themselves following new trajectories.

Disaster mitigation strategies for tropical storms – especially adaptation, prevention and preparedness – are typically based on predictive models that combine evidence from previous experience and ongoing observation (including increasingly reliable meteorological data). These models enable the calculation of the likely incidence and frequency of storms and the establishment of early warning systems.

Indications from 50 years of observation and record-keeping are that Atlantic hurricane activity and Indian Ocean cyclonic activity have increased. Meanwhile the Bay of Bengal and the disputed South China Sea territories have also seen intensified tropical storm activity. The East Coast of North America has similarly been affected by the trend towards stronger, more frequent storms; higher-income countries are as likely as lower-income countries to be affected by extreme weather events for which they are ill-prepared.

Interaction between the Earth's atmosphere and the oceans, including differential heating, influences the development of winds and tropical storms. In most areas typically considered vulnerable to tropical storms, recent hurricane seasons have illustrated how climate change is making storms more powerful, with devastating results for affected populations. For example, in the Caribbean and Central American region, and in the Gulf of Florida, wetter, slower-moving hurricanes have tended to become stronger, with exceptionally heavy precipitation, as they make landfall in densely populated areas (Tuhkanen et al., 2018).

Climate-related changes have also resulted in weather events that were once limited to the Caribbean and South Asia now occurring in the Indian Ocean. These events therefore now also affect Eastern Africa, where the resulting winds are often called El Niño or La Niña (although completely distinct from the El Niño Southern Oscillation that affects the Southern Pacific).

## ‘Unknown’ disasters

There are two types of unknown disasters: those that are unprecedented and those that, because of their scale and complexity, do not match previous experience, are difficult to forecast reliably and their development and probable effects are unpredictable.

### 1. Unprecedented disasters

Extreme heatwaves exemplify this type of disaster. While heatwaves as a hazard are not new, they have not typically become disasters that require humanitarian intervention to protect people’s lives and livelihoods. This is now changing. But knowledge of how to approach these disasters is limited among humanitarian actors as there are very few documented heatwave disasters– and a very limited number of lessons from which to draw.

Other examples include large urban areas sustaining sudden total loss of water such as during the Cape Town’s 2018 water crisis; or the collapse of structures, including areas of human habitation, built on zones of permafrost.

#### **Box 2: Heatwaves and unprecedented hot extremes**

For the present paper, heatwaves are broadly defined as prolonged periods when abnormally hot weather poses a threat to human health and well-being.

Instances of heatwaves are multiplying globally. According to the World Meteorological Organization’s analysis of the five leading meteorological data, 2020 was one of the three warmest years on record, ‘rivalling 2016 for the top spot’ (WMO, 2021). La Niña – a naturally occurring cooling system – mitigated the high temperatures towards the end of 2020, but not enough to affect the overall average.

In his ‘State of the Planet’ speech in December 2020, UN Secretary-General António Guterres summarised global heating predictions:

‘Today, we are at 1.2 degrees of warming and already witnessing unprecedented climate extremes ... in every region and on every continent. We are headed for a thundering temperature rise of 3 to 5 degrees Celsius this century. ... Making peace with nature is the defining task of the 21st century. It must be the top priority for everyone, everywhere.’ (Guterres, 2020)

This dramatic temperature rise is attributable to human-induced climate change and responsible for many new and complex disasters (IPCC, 2021: 11). Heatwaves, for example, are more frequent, longer and more intense, and are happening in places where they were previously unknown (and where systems are therefore less prepared to cope). In 2021, North America experienced an extreme heatwave that saw temperatures reach unprecedented heights in a number of cities across the US and Canada.

For regions that experience seasonal heatwaves, the number and severity of these events are increasing. India and Bangladesh, for example, which already experience high baseline temperatures, are set to experience more days of heatwave ahead of monsoon season. In coastal and delta regions across South Asia, these heatwaves will be all the more deadly as they combine with high levels of humidity, as we saw in Andhra Pradesh and Telangana in 2015. The human body loses heat through moisture, but for that to happen, humidity in the air has to be low enough. This combined effect of heat and humidity is measured by the Wet Bulb Index. Even populations that have adapted to high temperatures find it challenging to operate at 'wet-bulb' temperatures of 32°C.

Heatwaves are likely to be a key element in future complex disasters and there is an urgent need to set up preparedness mechanisms and to take anticipatory action, in both urban and rural areas. Around the world, 5 billion people live in regions where heatwaves are seasonal and predictable – where climate adaptation investments may reduce the risks facing the most vulnerable populations (de Perez et al., 2018). Humanitarian agencies have a key role to play in promoting adaptation strategies and preparedness, and in strengthening resilience in the face of inevitable future heatwaves.

## **2. Cascading disasters**

Finally, climate change may lead to complex disasters that have unpredictable 'cascading' effects across economic and social structures and infrastructure, even in cases where the weather event that catalyses the disaster may be well understood. Sometimes this unpredictability of cascading effects may be a function of increasing scale. The COVID-19 pandemic is an example of a cascading disaster, wherein countries failed to use the lessons learnt from previous coronavirus epidemics (events that are well understood) to contain the disease, which led to a global disaster with a plethora of socioeconomic consequences.

The world has not yet experienced a comparable climate-related cascading crisis. However, it is increasingly likely that the effects of simultaneous events that cause extensive infrastructural damage and crop failure will be magnified through political and market responses and intensified by large-scale population displacement that would likely follow, as we see more frequent and extreme weather, happening concurrently in more places around the world.



## About this lessons paper

This lessons paper seeks to answer the following research question:

*‘On the basis of documentary evidence and expert knowledge, what changes are required in humanitarian action – policy, institutional structures, operations and programmes – to take account of the effects of climate change?’*

The framing of this question was informed by interviews with 13 humanitarian practitioners – a sample of intended end-users of the lessons – and a focus group discussion with 16 farmers in India, who are particularly affected by, and are the first responders to, climate-related disasters.

The primary audience of ALNAP lessons papers are humanitarian practitioners (including technical and country leads). This present paper aims to be most useful to practitioners who design and implement humanitarian projects in low- and middle-income countries and who want to understand how best to take climate change into account at operational and programmatic levels. The secondary audience for this lessons paper is humanitarian policymakers who can help practitioners to make necessary changes.

The effects of climate change require humanitarian action to adapt in various ways and to cover them all would be a mammoth task. To make best use of available resources, this paper therefore focuses on lessons that can be learnt from changing/emerging climate-related disasters where humanitarian best practice based on previous experience may now be out of date given the extent of climate change.

The paper is divided into three sections:

[A // General lessons on humanitarian action and climate change](#)

[B // Lessons from imperfectly understood disasters](#)

[C // Lessons from ‘unknown’ disasters](#)

For the second and third sections, the research team selected a single example of the two disaster types: tropical storms (‘imperfectly understood’) and heatwaves (‘unknown’). Both of these sections propose new or emerging lessons and set these, where applicable, within the context of the general lessons explored in the first section of the paper.

The general lessons relate to organisational structures and strategies, programme design and implementation. These emerged from a review of literature on humanitarian action and climate change, augmented by reviews of literature on specific types of humanitarian programming (resilience and anticipatory programming) that key humanitarian policy documents have identified as being of particular interest in responding to the humanitarian threat of climate change.

Due to the breadth of this review, there are a number of important areas (notably health, human migration and the complex relationships between climate and conflict) that the present paper covers only briefly or not at all. Similarly, the general review does not address sector-specific lessons;

emerging lessons around water, sanitation and hygiene (WASH), shelter and settlement and nutrition, for example, require more in-depth study.

## About the lessons

The lessons identified in this paper apply to a wide range of both humanitarian and development activities – from early warning and anticipatory action to disaster risk reduction and preparedness; resilience building and climate change adaptation to response programming. The terms describing different activities are used variously. There is limited agreement on the definitions of these terms, both between humanitarians and actors in other sectors, and among humanitarians themselves over what (Allen et al., 2012; Taylor et al., 2017; UNEG Humanitarian Evaluation Interest Group, 2018; Dalrymple and Swithern, 2019; Turnbull et al., 2020). In the evidence reviewed for this research, the same type of activity might be described in different sources as ‘resilience’, ‘disaster risk reduction’ or ‘adaptation’.

Much of the emerging humanitarian policy relating to climate change calls for a comprehensive shift towards pre-disaster or pre-crisis activities; many of the lessons proposed in this paper therefore pertain to activities undertaken before a humanitarian response is initiated. These fall broadly into two categories:

1. Activities that aim to reduce the vulnerability of populations and communities, by promoting actions to reduce poverty and marginalisation, or to mitigate health impacts and limit the loss of lives and livelihoods in the event of specific disasters (e.g. flooding).
2. Activities that aim to improve the effectiveness and efficiency of emergency responses through preparation and planning. This includes establishing early warning mechanisms (which might also be included in the first category), anticipatory action systems (also known as ‘early warning’ or ‘early action’) and forecast-based financing or risk-based financing (which ‘can be distinguished from other humanitarian, disaster risk reduction and preparedness practices as they rely on weather and other forecasts to trigger funding for concrete, pre-determined actions prior to a shock or before acute impacts are felt’ (Weingärtner et al., 2020: 8)).

# Methodology

This lessons paper is the result of a structured review of available literature, with searches conducted during May 2021. The research used the methodology set out in the upcoming 'ALNAP Lessons Papers: A Methods Note 2021' and referred to previous ALNAP lessons papers (using [the earlier methodology developed by the ALNAP Secretariat](#)) as models. Annex 1 provides a full account of the methodology.

**The review draws on a wide variety of literature** (including academic articles and grey literature such as evaluations and research reports) that cover disasters in low- and middle-income countries across Africa, Asia, the Americas and the Pacific and were developed or published between 2010 and 2021. Where the evidence-base in low- and middle-income countries was scant or insufficient, the paper also draws from the experiences of higher-income countries that offer transferrable lessons. The grey literature reviewed included both published and unpublished materials, produced by national and international organisations including UN agencies, the International Red Cross and Red Crescent Movement, private sector actors, think tanks and governments.

**To identify relevant literature**, the authors conducted two rounds of searches for each of the three separate focus areas: general lessons on humanitarian action and climate-change related disasters; tropical storms ('imperfectly unknown' disasters); and heatwaves ('unknown' disasters). The first search round drew on academic databases and the second on the websites of humanitarian organisations. Annex 1 lists search strings and databases in full.

The literature review followed a rigorous screening process to determine which documents were eligible. Using search strings defined in relation to the research question, the authors identified a total of 43,481 records from a list of relevant databases. The authors began screening this list of records based on their titles and abstracts and stopped when they had selected 2,465 studies relevant to the research question. Resources did not enable them to screen the full 43,481 records.

The authors screened the full texts of these documents, excluding those that were out of scope or discussed climate change too widely, did not include response actors (development or humanitarian organisations, national or international ones, civil protection, local authorities, etc.) or failed to offer concrete recommendations. They included 207 studies that were recorded in the reference management software Zotero, and another 28 documents were added through backward citation searches of the included documents or those shared by experts.

The quality of these 235 documents was appraised according to a set of criteria that looked at their accuracy, representativeness and attribution, after which the authors extracted and coded relevant information using a shared coding system (see Annex 1 for the quality appraisal tool and the data extraction tools used).

**Table 1 Focus area**

	Focus area			Total
	General	Tropical storms	Heatwaves	
<b>Search</b>	21,419	3,961	18,101	<b>43,481</b>
<b>1st screening (abstracts and titles)</b>	604	661	1,200	<b>2,465</b>
<b>2nd screening (full text)</b>	78	80	49	<b>207</b>
<b>Included</b>				

The authors analysed this data to frame lessons relating to the three search streams. Findings and recommendations were triangulated and used as the basis of lessons. These lessons were presented to a group of 17 experts from the humanitarian sector, who were invited to evaluate the importance of the lessons proposed, as well as to identify evidence gaps in the underlying analysis.

The research team then integrated comments from experts and developed a confidence rating system that is displayed for each included lesson. There are three components to the confidence scores: the importance of lessons based on ratings provided by a group of experts; the frequency with which they emerged from the data; and the quality of the documented evidence that support them. Annex 1 sets out scoring methodology, the expert review and the quality appraisal tool in detail.

## Confidence rating

### Importance

The expert panel were asked to rank the importance of each lesson on a scale from 1 to 5. The average score was then calculated for each lesson.

**NO IMPORTANCE: 0**



**LOW IMPORTANCE: >0 AND ≤ 2**



**MEDIUM IMPORTANCE: >2 AND ≤ 3**



**HIGH IMPORTANCE: >3 AND ≤ 4**



**VERY HIGH IMPORTANCE: > 4 AND ≤ 5**



### Relative frequency

The average frequency score for all lessons is 11. A relative frequency score enables the reader to compare the frequency with which a lesson is cited against others in the paper. The scale was established using the quartiles of the dataset of the frequencies for all lessons.

**NO FREQUENCY: 0**



**LOW RELATIVE FREQUENCY: 1–7**



**MEDIUM RELATIVE FREQUENCY: 8–10**



**HIGH RELATIVE FREQUENCY: 11–13**



**VERY HIGH RELATIVE FREQUENCY: 14–28**



## Quality

The research team appraised the quality of each document used for the study. They were assessed based on three main criteria: accuracy, representativeness and attribution. The average quality score of all 235 documents is 75%. The scale to present the quality of each lesson was established based on the grades that each document received (see Section 1.8 of Annex 1).

<b>VERY LOW QUALITY: 0–17</b>	●
<b>LOW QUALITY: 18–33</b>	●
<b>MEDIUM QUALITY: 34–67</b>	●
<b>HIGH QUALITY: 68–84</b>	●
<b>VERY HIGH QUALITY: 85–100</b>	●

# Lessons learnt

## A // General lessons on humanitarian action and climate change

The following lessons relate to organisational structures and strategies, programme design and implementation. They emerged from the review of literature on humanitarian action and climate change, as well as on specific types of humanitarian programming. Some of these lessons may also be relevant to tropical storms or heatwaves but the lessons emerged from the 'general' literature review and are therefore presented here.

### Organisational strategy, focus and resource allocation

#### LESSON 1

**Humanitarian actors should develop their ability to design and implement a range of programme types – resilience, disaster risk reduction, anticipation and response – to ensure an effective and joined up response**

HIGH IMPORTANCE: 3.85 average expert rating



HIGH RELATIVE FREQUENCY: 13 papers



QUALITY: ● 8 medium quality ● 3 high quality ● 2 very high quality

Humanitarian policy towards climate change emphasises a shift from post-disaster or post-crisis response activities to more proactive pre-disaster activities, including support to adaptation and resilience, disaster risk reduction, disaster preparedness and anticipatory action (Eriksen

et al., 2017; UNDRR, 2019; IFRC, 2020a; ICRC, 2020, 2021; IASC, 2021). As organisations develop capacity in these areas, they should be mindful that no single approach is a ‘magic bullet’; an effective response to the effects of climate change requires that the various approaches be used together, in conjunction with response activities (Allen et al., 2012; RCCC, 2018; Jaime and Harris, 2019; Tanner et al., 2019; Dicker et al., 2021). The importance of different approaches, and the ways in which they relate to and reinforce each other, will depend largely on context and the systems and structures already in place. Where social safety nets exist, for example, early warning systems can complement them by triggering support to larger numbers of people before a disaster occurs (DFID, 2011; FAO, 2021).

At the same time, it is important not to default to a particular response just because the infrastructure is there; the choice of approach should also be determined by the nature of the climate change threat. In situations where there is a strong likelihood of disasters or crises, and where these are more likely to affect livelihoods than to cause large-scale mortality, it may be more cost effective to enrol larger numbers of people in social protection programmes on an ongoing basis rather than to establish early warning or early action systems (Tanner et al., 2019). And in places where social safety nets are in place, more ‘traditional’ emergency responses for rapid onset disasters may still be needed, if the social protection system cannot guarantee a rapid response (O’Brien, 2020).

## LESSON 2

### Humanitarian actors should respond to the uncertainty of the climate crisis by developing their ability to work flexibly and adaptively at individual, programmatic and organisational levels

VERY HIGH IMPORTANCE: 4.05 average expert rating



VERY HIGH RELATIVE FREQUENCY: 18 papers



QUALITY: ● 6 medium quality ● 7 high quality ● 5 very high quality

Uncertainty surrounds the effects of climate change. At a global or national level, or as part of a specific response, there are many elements that can be planned for, but there are also many that will not behave as they have done in the past, and which will occur unexpectedly (Bronen et al., 2018; Gros et al., 2019; ICRC, 2020; IFRC, 2020a). Humanitarian organisations need to be prepared to work in flexible and adaptive ways, which requires change at individual, programme and organisational levels:

**At the level of the individual**, managers need to be comfortable making decisions in the context of uncertainty. For example, by providing training and raising awareness, the START fund helps managers to accept the need



to commit funds in the early stages of disasters (START, 2020).

**At the programme level**, flexibility may involve devising contingency plans for the multiple risks that can occur over the life of the programme, or a planning approach that allows activities to be modified in response to changing situations (DFID, 2011; Obrecht, 2019). Programme budgets may include ‘modifiers’: funds that can be accessed if there is an unexpected deterioration in a disaster situation. Early responses can be ‘low’ or ‘no-regret’, providing benefits even where the situation is not as bad as initially expected (DFID, 2011; Maxwell and Hailey, 2020).

**At the organisational level**, the ability to work more flexibly will depend on making changes to processes – particularly in relation to procurement and information management (Obrecht, 2019). Supporting or developing local response capacity is also an effective way of increasing flexibility (Tanner et al., 2019; Dicker et al., 2021): a greater number of smaller local organisations will be able to adapt more rapidly to changing situations than organisational monoliths.

### LESSON 3

**Humanitarian actors should consider the impact of climate change in regions experiencing armed conflict and find ways to work with development actors and governments to deliver climate-related programming in conflict areas**

IMPORTANCE: no average expert rating<sup>1</sup>



HIGH RELATIVE FREQUENCY: 11 papers



QUALITY: ● 1 low quality ● 5 medium quality ● 3 high quality

● 2 very high quality

As many of the most immediate and visible effects of climate change are weather-related, there is a tendency to associate climate issues with ‘natural’ disasters and to think of them as being distinct from ‘man-made’ disasters and conflict. This common distinction between ‘natural’ and ‘man-made’ disasters is one possible reason why countries experiencing conflict tend to attract less climate-adaptation related funding (ICRC, 2020; IFRC, 2020a).

In fact, climate change is disproportionately likely to affect fragile, conflict-affected states (IASC, 2021), and to have a much greater impact on the population. This is partly because low-income conflict-affected states are highly reliant on agriculture (ICRC, 2020) – often severely disrupted by climate shocks and stresses – and partly because conflict will have made many people more vulnerable to crises by, for example, increasing food insecurity, disrupting economic activity and decreasing the ability of the government to provide services (Jayawardhan, 2014; UNDRR, 2019; ICRC, 2020; IPCC, 2020; Wagner and Jamie, 2020).

Proactive, pre-disaster activities such as providing support for resilience and anticipatory programming are difficult to do in conflict-affected areas (UNEG Humanitarian Evaluation Interest Group, 2018; UNDRR, 2019; ICRC, 2020; Poole et al., 2020). Despite this, there are a number of examples of climate change adaptation and broader resilience programming being undertaken by humanitarian organisations in conflict areas (Dalrymple and Hanssen, 2020; IFRC, 2020a; Klausen et al., 2019; UNDRR, 2019; Zahmore, 2019). In these contexts, humanitarians can use their particular skills and experience to implement programmes funded by development actors (Zahmore, 2019). Successful programmes tend to ‘shadow’ pre-conflict government structures and standards, which enables governments to adopt and sustain them when conflict ends (Zahmore, 2019). In Yemen, for example, the World Bank has supported UNICEF in undertaking resilience and emergency interventions using the pre-existing government social welfare beneficiary registry, applying its existing standards.

There are fewer examples of anticipatory programmes in conflict-affected areas, although some have been established (IFRC, 2020a; Wagner and Jamie, 2020). In these cases, early warning systems often rely on data that can be collected outside the country (Poole et al., 2020; Wagner and Jamie, 2020). In Somalia, for example, Concern Worldwide has developed a system that combines analysis of climate data, vulnerability factors, disaster impact history and satellite-based remote sensing data to trigger humanitarian responses (Wagner and Jamie, 2020).

#### LESSON 4

**Humanitarian actors should improve their ability to evaluate and learn from resilience building activities, climate-related adaptation and anticipatory and preparedness efforts in order to focus resources on the most effective approaches**

VERY HIGH IMPORTANCE: 4.2 average expert rating



VERY HIGH RELATIVE FREQUENCY: 14 papers



QUALITY: ● 5 medium quality ● 6 high quality ● 3 very high quality

Despite the number of resilience and adaptation projects conducted over the last decade, evidence on what works in this area, and under what conditions, is very limited (DFID, 2011; Zamora et al., 2017; Dalrymple and Swithern, 2019; Dicker et al., 2021; ICRC, 2020). This is particularly true for resilience activities that have been implemented in areas experiencing conflict (ALNAP, 2018; Peters et al., 2020; UNDRR, 2019; Zahmore, 2019).

There is also a notable lack of evidence around anticipatory programming. Overall, the evidence that exists in this area is very contextual and should not be generalised to early warning and/or early

action as a whole (Weingärtner et al., 2020). More work is required in this area (Tanner et al., 2019).

All organisations implementing or funding climate-related activities should ensure as a priority that they put in place evaluative mechanisms to conduct and share research into ‘what works’, what doesn’t, and why (Jaime and Harris, 2019; Weingärtner et al., 2020; Willitts-King et al., 2020).

## Organisational structure

### LESSON 5

**‘Dual-mandate’ humanitarian organisations should address internal silos by undertaking joint analysis, creating cross-sectoral teams and restructuring where necessary**

VERY HIGH IMPORTANCE: 4.6 average expert rating



HIGH RELATIVE FREQUENCY: 11 papers



QUALITY: ● 5 medium quality ● 1 high quality ● 5 very high quality

A key constraint to effective humanitarian action on climate-related disasters is the ‘siloing’ of humanitarian, development and climate change activities (IPCC, 2014; Eriksen et al., 2017; UNEG Humanitarian Evaluation Interest Group, 2018; Inter-Agency Humanitarian Evaluation, 2019; Klausen et al., 2019; Zahmore, 2019; Dalrymple and Hanssen, 2020; IFRC, 2020a). This problem exists beyond the humanitarian sector: governments and development organisations also find it difficult to work across internal boundaries – for example between ministries and departments – or with actors outside their own accustomed spheres of action (UNEG Humanitarian Interest Group, 2018; Diwakar, 2019; IFRC, 2020a).

Where an organisation is ‘siloed’ internally, these siloes will be reproduced in the work that it does. ‘Dual-mandate’ donor and humanitarian organisations should modify internal structures that separate humanitarian, climate and development specialists and thereby impede or prevent effective responses to climate-related crises (Klausen et al., 2019; Dalrymple and Hanssen, 2020). A first step towards achieving this may be to conduct joint analysis and consider how different programmes across the organisation will build on it (DFID, 2011; Maxwell and Hailey, 2020). Another useful approach is to form cross-sectoral teams for programme design and implementation (DFID, 2011). In Nepal, DFID formulated a joint climate change and humanitarian business plan, using a single, shared analysis to determine how all interventions in DFID’s country portfolio could strengthen resilience to natural disasters (DFID, 2011).

## LESSON 6

### Development and humanitarian actors should decentralise decision-making to create programmes that fit the context and can overcome sectoral silos

VERY HIGH IMPORTANCE: 4.4 average expert rating



LOW RELATIVE FREQUENCY: 6 papers



QUALITY: ● 1 low quality ● 1 medium quality ● 3 high quality  
● 1 very high quality

Wherever possible, humanitarian organisations should decentralise their decision-making. Many of the more successful actions linking developmental and humanitarian activity on issues related to climate change have been developed at country level, rather than at headquarters (DFID, 2011; Concern Worldwide, 2017; Klausen et al., 2019; UNDRR, 2019) and relied on the ability of country teams to make decisions. Decentralised decision-making can also help to overcome silos by focusing attention on location-specific problems that demand or require a variety of approaches (Peters et al., 2020). Similarly, early warning seems to be more effective where programming decisions are made at country, not HQ level, and so are more informed by context (Sheel et al., 2019; UNDRR, 2019).

When decision-making is decentralised, the teams making the decisions need to control the resources that are required to put them into practice. The Swiss Agency for Development and Cooperation (SDC) gave embassies authority to initiate and coordinate programme design, which led to collaboration between development and humanitarian specialists on programmes promoting and supporting resilience. Implementation of these programmes was, however, hampered by centralised finance and funding processes, which required humanitarian and development activities to be funded separately (DFID, 2011; Concern Worldwide, 2017; Klausen et al.; UNDRR, 2019). The SDC has gone a step further, engaging in an organisational restructuring exercise intended to create more coherence between different approaches (personal communication).

## Partnerships and working with others

### LESSON 7

#### Humanitarian actors should partner with development and climate actors, using joint analysis and common standards

HIGH IMPORTANCE: 3.8 average expert rating



MEDIUM RELATIVE FREQUENCY: 8 papers



QUALITY: ● 1 medium quality ● 3 high quality ● 4 very high quality

Effective partnerships between humanitarian, development and climate actors may be created by:

- Undertaking regular, joint analysis of the risks and vulnerabilities associated with the short-, medium- and longer-term effects of climate change that focuses on specific regions, rather than on sectors or mandates (Dalrymple and Swithern, 2019; IFRC, 2020a; Klausen et al., 2019; Taylor et al., 2017; UNEG Humanitarian Evaluation Interest Group, 2018; Zahmore, 2019). In Mauritania, for example, the Common Country Analysis was enhanced by a workshop analysing resilience systems, conducted by the Organisation for Economic Co-operation and Development (OECD) and the United Nations Country Team (Zahmore, 2019). In some cases, national adaptation programmes may provide a platform for the joint analysis required.
- Clarifying and agreeing respective roles and responsibilities (Allen et al., 2012; UNDRR, 2019; Zahmore, 2019). This allows for better understanding of ways in which the different actors can contribute to different aspects of the challenge, and of ways in which work on short-term response, for example, can be articulated with longer term adaptation. (Allen et al., 2012; UNDRR, 2019; Zahmore, 2019).
- More closely integrating humanitarian, developmental and climate interventions through a focus on common standards (such as standards or norms for the use of cash assistance) and supporting the same country level systems and structures, such as social protection systems. Working through common systems, or adopting a similar approach, better aligns programmes and increases the scope for mutual support in implementing them (Klausen et al., 2019; Zahmore, 2019).

## LESSON 8

### **Humanitarian actors should co-design climate change programmes with vulnerable people and groups, ensuring that they understand and can discuss climate change, its effects and the potential impact on their lives and livelihoods**

VERY HIGH IMPORTANCE: 4.55 average expert rating



VERY HIGH RELATIVE FREQUENCY: 16 papers



QUALITY: ● 1 low quality ● 6 medium quality ● 3 high quality  
● 6 very high quality

Given the significant effects of climate change on people's lives and livelihoods, and considering the transformative nature of humanitarian action to respond, it is vitally important to engage with affected groups and communities when designing programmes. In some cases, this may be even more challenging than in other humanitarian programming. Humanitarian organisations should allocate a specific budget and a timetable for inviting affected or exposed communities – the intended end-users – to offer ideas, discuss programme design and identify performance indicators (Levine and Venton, 2019; Harris and Cardenes, 2020; IFRC, 2020a; Wagner and Jamie, 2020).

There is evidence that such consultative processes lead to better outcomes in resilience and adaptation programming (Allen et al., 2012; IPCC, 2014; Clarke and Cruz, 2015; Eriksen et al., 2017; Dicker et al., 2021; IFRC, 2020a) and in anticipatory programming and disaster response (Tanner et al., 2019; Zahmore, 2019; Johnstone, 2020; IFRC, 2020a). In Fiji, for example, the inclusion of local knowledge about wildlife behaviour in early warning systems made early warning more effective (IFRC, 2020a; Harris and Cardenes, 2020; Levine and Venton, 2020; Wagner and Jamie, 2020).

At the same time, humanitarian organisations should be aware that people often have no concept of the scale or speed at which climate change is happening, its effects or likely impact (ICRC, 2020) and may therefore suggest or support resilience activities that would be ineffective or inadequate. Moreover, people may not wish to commit to or engage in projects that involve significant change or could be perceived as a threat to their current way of life (IFRC, 2020a). All programmes should include opportunities to build people's understanding of the threat posed by climate change (Featherstone et al., 2019; ICRC, 2020; IFRC, 2020a), but it is also important to provide information, offer space for discussion and allow people to make their own, informed choices.

Finally, communities are not homogeneous and the people who are most vulnerable to the effects of climate change are often marginalised within their own communities (IPCC, 2014; Eriksen et al., 2017). Community engagement activities should ensure the involvement of such groups, for

example by developing specific criteria to encourage their engagement or by drawing on the knowledge of researchers who are familiar with local social structures (Sterret, 2015).

## Programme design

### LESSON 9

**Humanitarian actors should design climate programmes with an understanding of how vulnerability occurs in that context, making sure that activities are relevant and accessible to marginalised groups in terms of resources, capacities and social networks**

VERY HIGH IMPORTANCE: 4.55 average expert rating



VERY HIGH RELATIVE FREQUENCY: 28 papers



QUALITY: ● 1 low quality ● 11 medium quality ● 6 high quality  
● 10 very high quality

Much humanitarian climate change programming overlooks the poorest and most marginalised people or communities (Gero and Dominey-Howes, 2010; Allen et al., 2012; Concern Worldwide, 2017; Eriksen et al., 2017; ALNAP, 2018; Bronen et al., 2018; UNEG Humanitarian Evaluation Interest Group, 2018; Dalrymple and Swithern, 2019; Harris and Cardenes, 2020; IFRC, 2020). Programming should include a specific focus on marginalised population groups or communities within the region of focus (DFID, 2011; Allen et al., 2012; IPCC, 2014; Diwakar, 2019; Levine and Venton, 2019; ICRC, 2020; Peters et al., 2020). In Vietnam, for example, a climate-smart, community-based risk reduction project conducted by IFRC and American Red Cross considered the specific challenges that prevented older people and people with disabilities from engaging in agricultural work and developed activities that could be carried out at home instead of in fields and required less physical effort (Sterret, 2015).

Vulnerability to the effects of climate change differs according to context, but women and girls are vulnerable in most settings – a fact that is regularly overlooked (Arab European Foundation for Consulting and Training, 2015; Concern Worldwide, 2017; Zamora et al., 2017; Klausen et al., 2019; Levine and Venton, 2019; Nyirenda, 2019; Sheel et al., 2019; Maxwell and Hailey, 2020). Humanitarian organisations should always take full account of the gendered aspects of vulnerability, make explicit how they have been addressed in planning and in programming, and ensure that there are clear benchmarks and criteria for monitoring them. Women may not have access

to all community spaces and may therefore be excluded from any climate change information that's shared there. They often do not have access to the same information channels as men, meaning they may miss out on early warnings and other critical information (ALNAP, 2018; START, 2020). In many contexts, women have less control over household resources and production strategies or are not allowed to access certain types of income-generating activities and so may not be able to take advantage of resilience or adaptation programming that concentrates on these activities or access to particular assets (Levine and Venton, 2019). Humanitarian organisations should always consider these gendered aspects of vulnerability, and make clear in planning and monitoring how they have been addressed.

Populations, communities or groups that have been displaced – including those displaced by climate-change mitigation or adaptation programmes – tend to be particularly vulnerable to climate-related crises (Allen et al., 2012; Jayawardhan, 2017; ICRC, 2020). Humanitarian organisations should be aware of the specific vulnerabilities of displaced people, advocating at national level for their inclusion in social protection systems and at international level, where there is scope for more forceful advocacy, for the needs and rights of those displaced for reasons related to climate change and environmental degradation (Biermann and Boas, 2010; Hall, 2016; UNEG Humanitarian Evaluation Interest Group, 2018; Dalrymple and Swithern, 2019).

## LESSON 10

**Humanitarian actors should build on existing structures as the default approach to all climate-related activities, looking for local systems of administration and welfare systems that can take the lead where central government is weak or engaged in conflict**

HIGH IMPORTANCE: 3.85 average expert rating



LOW RELATIVE FREQUENCY: 7 papers



QUALITY: ● 3 medium quality ● 1 high quality ● 3 very high quality

Humanitarian organisations should, by default, look for, build on and support existing government and civil society structures to take forward action related to climate change (IPCC, 2014; Zahmore, 2019). These structures already provide the majority of assistance in most disasters or crisis situations (ALNAP, 2018) and humanitarian action related to climate change has been shown to be more effective where the humanitarian actors are junior partners in larger, generally government-led, programmes (ALNAP, 2018; Zahmore, 2019).

When humanitarian organisations work with government, humanitarian



‘red lines’ must be made clear: elements of government with which the agency cannot work, activities that cannot be supported or constraints that would hinder principled programming. Beyond this, however, humanitarian organisations should adapt to fit government structures wherever possible (UNEG Humanitarian Evaluation Interest Group, 2018; Dalrymple and Swithern, 2019; Zahmore, 2019). Where humanitarian principles prevent agencies from working with government, it is advisable to establish and work through structures that mirror those of government. It may also be possible to work with less politicised and more welfare-oriented structures within government (Zahmore, 2019) or with local government structures (IPCC, 2014; Arab European Foundation for Consulting and Training, 2015; Zahmore, 2019; Maxwell and Hailey, 2020).

Humanitarian NGOs can also play an important role in bringing the voices of people affected by climate change into government discussions and in sharing information about government programmes and support with marginalised communities. In Bangladesh, for example, World Vision International has used its Citizen Voice and Action programme to improve marginalised people’s access to government social safety net programmes.

## LESSON 11

**Humanitarian actors and their partners should ‘climate-proof’ existing resilience, disaster risk reduction and preparedness activities and ensure that they do not make people more vulnerable to the effects of climate change in the longer term**

VERY HIGH IMPORTANCE: 4.05 average expert rating



MEDIUM RELATIVE FREQUENCY: 8 papers



QUALITY: ● 2 medium quality ● 2 high quality ● 4 very high quality

The effects of climate change exacerbate the risks faced by many people who are already of concern to humanitarian agencies. All humanitarian action, including existing or established programmes, should be ‘climate-proofed’ by taking future risks into account. For example, agriculture and livestock projects should factor in precipitation changes and the construction of transitional shelter should calculate for increasing temperatures (Allen et al., 2012; IPCC, 2014; Jayawardhan, 2017; Levine and Venton, 2019; IFRC, 2020a). Some guidelines on specific approaches are already available – albeit for development programming rather than humanitarian action (Hahn and Fröde, 2010).

Moreover, current humanitarian activities may even increase future vulnerability to risk – by, for example, providing communities with incentives to stay in areas that will become increasingly less productive because of the effects of climate change. It is important for humanitarian

actors to recognise any potential unintended negative consequences, and to discuss options and alternatives with the people who will be affected, clarifying arguments for and against different types of activity and response (UNDRR, 2019; ICRC, 2020).

## Resilience planning and adaptation

### LESSON 12

**Humanitarian actors and their partners should acknowledge the scale of the resilience challenge, being realistic about what can be achieved and clear about the limits of their respective capacities to contribute to resilience**

HIGH IMPORTANCE: 3.6 average expert rating



VERY HIGH RELATIVE FREQUENCY: 19 papers



QUALITY: ● 3 medium quality ● 6 high quality ● 10 very high quality

Resilience programming can improve lives in several ways, including through increased incomes and better nutrition (DFID, 2011; Sterret, 2015; WFP and Oxfam, 2016; Zamora et al., 2017; Murphy et al., 2017; IFRC, 2020a). However, these improvements are generally not of sufficient scale or breadth to ensure that people or communities become resilient to climate change impacts in the longer term. Achieving resilience for those most vulnerable to the effects of climate change requires massive structural change to address, among other issues, the extreme poverty of the most vulnerable people and their lack of access to healthcare and the formal labour market; poor or entirely absent infrastructure for storing and transporting produce; the absence of clean water or the infrastructure to access it; and insecure land tenure (Allen et al., 2012; Madajewicz et al., 2013; Sterret, 2015; Eriksen et al., 2017; Dalrymple and Swithern, 2019; Levine and Venton, 2019; ICRC, 2020). Even before the impact of climate change is taken into account, an average household in Ethiopia in receipt of humanitarian assistance would need a tenfold increase in income before it could be considered 'resilient' in the face of disaster (Levine and Venton, 2019).

Transformations on such a scale have sometimes been achieved as a result of government intervention (Diwakar, 2019) and may be realisable with the support of groups of development actors that combine their programmes and activities (ALNAP, 2018; UNDRR, 2019; Dalrymple and Hanssen, 2020). Humanitarian organisations should recognise, however, that, acting alone, they are unlikely to make a significant contribution to

resilience (UNEG Humanitarian Evaluation Interest Group, 2018; Levine and Venton, 2019; ICRC, 2020; Dicker et al., 2021). Instead, they should support larger-scale government programmes, acknowledging that change will take time (Sterret, 2015; Dicker et al., 2021) and that projects should be designed with clear, measurable paths to desired outcomes linked to resilience rather than to, for example, income generation (see also [Lesson 13](#) in this section). This will provide a ‘reality check’ on the degree to which the programme can be expected to contribute to full resilience (Taylor et al., 2017; Dalrymple and Swithern, 2019).

## LESSON 13

**Humanitarian actors and their partners should not conflate income with resilience; rather they should also consider other paths, particularly health and community empowerment**

HIGH IMPORTANCE: 3.8 average expert rating



LOW RELATIVE FREQUENCY: 6 papers



QUALITY: ● 1 medium quality ● 3 high quality ● 2 very high quality

Income-generation programmes can contribute to improved welfare but are generally not enough by themselves to build resilience to potential climate-related disasters. Given the many constraints to achieving resilience, and the fact that it is unrealistic to promote resilience through income generation alone, humanitarian organisations should also consider supporting the provision or continued provision of basic welfare services: improved health, social protection and education are likely to strengthen resilience (Diwakar, 2019; Levine and Venton, 2019; Zahmore, 2019; IFRC, 2020; Peters et al., 2020). Spending on health and education represents a high proportion of the outgoings of many poor households and can make it difficult for a household to accumulate savings or invest. Humanitarian provision of health and educational services can allow people to develop more, and better, social and livelihood options.

It is also extremely important that humanitarian organisations consider how programmes provide goods and services. In an assessment of a resilience programme that involved community groups in its design and implementation, participants suggested that the most significant benefits accrued from increased social integration – particularly the integration of marginalised groups – rather than any material benefits produced; the participatory approach strongly influenced the outcomes and benefits (Murphy et al., 2017).

## Early warning and early action, anticipation, preparedness and response

### LESSON 14

**Humanitarian actors and their partners should ensure that forecasting and early warning systems are reviewed after each disaster event, and routinely at fixed intervals over the longer term**

HIGH IMPORTANCE: 3.65 average expert rating



LOW RELATIVE FREQUENCY: 6 papers



QUALITY: ● 3 medium quality ● 3 high quality

The accuracy of forecasts is critical to the success of early warning and early action systems, but high degrees of accuracy are not easily achieved. The Start Network's 2020 review of early warning mechanisms found that forecasts were correct on 36% of occasions. Even one of the best-established food security early warning mechanisms has accuracy rates of only 50% to 78% (Maxwell and Hailey, 2020). Early warning systems should be formally reviewed after each disaster or instance of early warning (whether or not a disaster ensued) so that failures or errors can be addressed and corrected as far as possible (Jaime and Harris, 2019; Sheel et al., 2019; Harris and Cardenas, 2020; Maxwell and Hailey, 2020; START, 2020). Since no system will be fully accurate every time, organisations developing and running early warning systems should also ensure that they are routinely reviewed over longer timeframes – independently of the incidence of disasters – in order to evaluate their longer-term performance.

### LESSON 15

**Designers of early warning, early action and anticipatory activities should build in flexibility**

HIGH IMPORTANCE: 3.9 average expert rating



MEDIUM RELATIVE FREQUENCY: 10 papers



QUALITY: ● 1 low quality ● 3 medium quality ● 3 high quality  
● 3 very high quality

Highly deterministic early warning or early action models, where a ‘trigger’ automatically leads to the implementation of pre-determined activities with a pre-determined budget, are often poorly suited to the realities of dynamic, unpredictable environments (Gros et al., 2019; Jaime and Harris, 2019; Nyirenda, 2019; Harris and Cardenes, 2020; Lung, 2020; Maxwell and Hailey, 2020; Peter, 2020).

To ensure that anticipatory programmes respond to the unexpected or unprecedented, humanitarian organisations and their partners should consider using ‘softer’ triggers, which depend on experts reviewing the situation, or undertaking an ‘appropriateness check’ of activities before they are launched. These models should be flexible enough for interventions to be modified in the course of implementation (Harris and Cardenes, 2020; Lung, 2020; Wagner and Jamie, 2020). A number of pooled funds such as the Central Emergency Response Fund (CERF) use ‘soft’ allocation methods, rather than automatic triggers: they follow agreed guidelines for resource allocation but decisions are in practice made by expert groups (Willitts-King et al., 2020). In Uganda, the Northern Uganda Social Action Fund – a social safety net – uses two triggers: a hard trigger based on satellite data on weather, and a softer trigger, based on multiple data sources assessed using expert opinion (Lung, 2020).

## LESSON 16

### Humanitarian actors and their partners should ensure that planned early actions are realistic, with implementation systems ready in place

VERY HIGH IMPORTANCE: 4.2 average expert rating



VERY HIGH RELATIVE FREQUENCY: 14 papers



QUALITY: ● 3 low quality ● 7 medium quality ● 4 high quality

Planned anticipatory responses may be ineffective when partners have divergent views about whether the planned activities are desirable or when activities cannot be implemented in the time available (Jaime and Harris, 2019; Tanner et al., 2019; Zahmore, 2019; START, 2020; Consultores, 2021). Pre-planned early action programmes should take into account local conditions and constraints, including logistics, communications and other local delivery capacity, to ensure that they can realistically be implemented. This may mean that organisations maintain a continuous local presence on the ground (Levine and Venton, 2019), route assistance through existing mechanisms such as social protection systems (Wagner and Jamie, 2020; Willitts-King et al., 2020) or pre-position relief items at the regional level (Grunewald, 2016). In Ethiopia, for example, the Productive Safety Net Programme is used as a vehicle for early action, using a risk-financing

mechanism to provide payments to people on the basis of early warning data (International Crisis Group, 2016; Concern Worldwide, 2017; FAO, 2021). Using pre-existing systems has proved more cost-effective than establishing new delivery infrastructure (World Bank, 2013).

## LESSON 17

**Early warning and early action systems will not be effective every time. Humanitarian actors and their partners should clarify what levels of uncertainty they are prepared to accept and plan to respond to disasters that were unanticipated or on a larger scale than expected**

HIGH IMPORTANCE: 3.85 average expert rating



LOW RELATIVE FREQUENCY: 5 papers



QUALITY: ● 2 low quality ● 3 medium quality

Any early warning or early action system needs to be clear about the level of uncertainty involved, and be transparent about how it works and what its strengths and limitations are. Humanitarian organisations should establish with partners and other donors the level of uncertainty they are all prepared to accept. They should agree on a strategy for addressing ‘false positives’ (when forecasts wrongly suggest a significant weather event or disaster will occur) and ‘false negatives’ (when the early warning system fails to predict a significant event) (International Crisis Group, 2016; Jaime and Harris, 2016; Concern Worldwide, 2017; Harris and Cardenes, 2020; START, 2020). Organisations should ensure that they have the resources ready – or readily available from partner organisations – to launch humanitarian interventions in situations where early warning systems are not effective (Jaime and Harris, 2019).

## LESSON 18

**Humanitarian actors and their partners should enhance preparedness for climate-related crises by pre-positioning emergency stocks and supplies, building capacity and providing information**

VERY HIGH IMPORTANCE: 4.05 average expert rating



MEDIUM RELATIVE FREQUENCY: 10 papers



QUALITY: ● 2 medium quality ● 3 high quality ● 5 very high quality

Preparedness activities save lives and protect livelihoods in disasters related to the effects of climate change (ALNAP, 2018; Peters, 2020). Pre-positioning emergency stocks seems to be a particularly effective measure (Meerkatt et al., 2015). Given the key role that individuals and communities play in disaster response, preparedness activities should focus on these groups, prioritising capacity building for existing organisations and providing people with training – including on how to generate and share information within communities (Allen et al., 2012; Sterret, 2015; WFP and Oxfam, 2016; Jayawardhan, 2017; UNEG Humanitarian Evaluation Interest Group, 2018; Featherstone et al., 2019; UNDRR, 2019).

# B // Lessons from imperfectly understood disasters: tropical storms behaving in new ways

The lessons in this chapter emerged from the review of literature relating specifically to responses to tropical storms behaving in new ways. Some of these lessons may be relevant to responses to other climate-related disasters; however, they are presented here because they were identified from the specific literature review on tropical storms.

## The changing nature of tropical storms

### LESSON 19

**Tropical storms increasingly present new or unexpected patterns and can catch the population or responding institutions off guard; understanding the new risks entailed is central to preparing and responding**

VERY HIGH IMPORTANCE: 4.4 average expert rating



MEDIUM RELATIVE FREQUENCY: 9 papers



QUALITY: ● 4 medium quality ● 4 high quality ● 1 very high quality

As a result of climate change, tropical storms are following new patterns, are less predictable and are causing greater damage and devastation. Populations are exposed to tropical storm risks and hazards that are outside their previous experience, and therefore have not developed adequate capacity to respond or cope. Small islands and coastal zones, where tropical storms occur regularly, and also regions where they were previously unknown, are even more vulnerable to their impact. The humanitarian system faces new challenges in regions that have historically experienced frequent climate-related disasters and, at the international level, is developing processes to support adaptation and preparedness.

Over decades, if not centuries, Indigenous populations have tested and developed reliable and appropriate methods of forecasting weather – including potential weather hazards or disasters: they study the sky, winds and key celestial bodies; observe animal behaviour or sudden changes in the flow of rivers or in sea levels. However, changing climate patterns make it increasingly difficult to accurately ascertain and thus adjust to weather-



related events that local people, their administrative authorities nor humanitarian and development agencies have experienced before (IFRC, 2013; Cuaton and Su, 2020).

For example, although Hurricane Matthew in 2016 was identified a few days in advance of its development, predictions about its final trajectory turned out to be wrong; it eventually made landfall in northern Haiti, where the alert was triggered at the very last minute (Grunewald and Scheckenberg, 2016). Similarly, evidence from cyclones in the Indian Ocean shows that they may follow unexpected patterns, with their final trajectory and strength only detectable at the last stages of their development. Such potentially extreme weather events are often picked up not by classic satellite-based imagery systems – which make observations and provide data over a fixed timescale – but by weather radar systems, which can provide critical information on precipitation intensity and wind velocity in real time. Technical solutions such as weather radars or other weather observation systems, do exist to enable information on the location and characteristics of extreme weather events to be made available (Vaisala, 2017) and used in predicting flash flooding, exceptionally high winds or lightning storms. These solutions should be better known and used by stakeholders in early warning and alert systems (Patra et al., 2013).

## Resilience and adaptation

### LESSON 20

**Humanitarian actors and their partners, including affected populations, should improve disaster risk reduction in view of the increasing risks of tropical storm-related disasters in coastal and densely inhabited delta areas**

HIGH IMPORTANCE: 3.8 average expert rating



VERY HIGH RELATIVE FREQUENCY: 21 papers



QUALITY: ● 1 low quality ● 7 medium quality ● 4 high quality  
● 9 very high quality

In regions potentially affected by new patterns of tropical storms, the main proactive strategy remains two-pronged: disaster risk reduction and preparedness (Chang, 2011). Both types of activity are important in parts of the world that are likely to be increasingly affected by concurrent or simultaneous weather events, which cause sea-level rise and storm surges' (Rahmstorf, 2017) that which devastate coastal areas or densely inhabited deltas (Edmonds et al., 2020). Such events are still largely unpredictable, but

it is clear that many regions face increased exposure to tropical storms with new and unexpected characteristics as a result of climate (Allen et al., 2012).

In these regions, it will be essential to take a ‘no-regrets’ approach, proactively implementing a broad spectrum of disaster risk management measures that will have no negative effect even if the worst forecasts are not realised because they build resilience. These measures might include improving risk-based land and watercourse management, establishing early warning and alarm systems, identifying evacuation itineraries and sharing information on evacuation procedures, communicating key disaster response messages and delivering training (Sarsycki, 2019).

Many tried and tested lessons on disaster management can be applied proactively in regions where an increased risk of tropical storms seems inevitable (Wilkinson et al., 2018). Some of these lessons – for example on house construction techniques, urban management, watercourse management and coastal infrastructure and management – apply primarily to development actors (often disaster risk reduction can fall outside the humanitarian domain). Humanitarians can, however, usefully engage in advocacy, so that development actors understand the benefits of ‘no-regrets’ investment in applying these lessons.

Full disaster preparedness or risk mitigation measures (Dash and Walia, 2020) may be undertaken in cities, towns and other human settlements, according to their scale, context and prevailing social conditions. There are high accompanying risks of technological disasters (Kraussman, 2017; Örtl, 2020), which need to be taken into account in regions where tropical storms have not hitherto normally occurred and are therefore new phenomena. Classic disaster preparedness measures can also be implemented – such as defining and communicating evacuation procedures (Nirupama, 2013), developing proactive messaging and communication tools for the local population or community (Mahmood, 2013; Winterford and Gero, 2018; Grunewald, 2020).

## Preparedness

### LESSON 21

**Humanitarian agencies need to reflect on the past, learn from the present and actively imagine the near, increasingly threatening future**

VERY HIGH IMPORTANCE: 4.4 average expert rating



MEDIUM RELATIVE FREQUENCY: 10 papers



QUALITY: ● 2 low quality ● 4 medium quality ● 1 high quality  
● 3 very high quality

In the future, tropical storms may affect previously unaffected regions and exhibit new or unexpected patterns in terms of their trajectory, seasonality, strength (Chang, 2011), accompanying rainfall or power of any associated storm surge. Yet these weather events remain recognisable, in their essential characteristics, as tropical storms and therefore lessons from past humanitarian responses are still valid (Action Against Hunger, 2010; Cosgrave, 2014; Baker et al., 2020). Existing experience and knowledge on tropical storm management – which has been accumulated by international humanitarian and development institutions, national and local disaster management agencies and communities themselves – must be actively deployed.

The study of historical disasters, and the vulnerabilities they exposed, is critical to the analysis of recurrent extreme weather events such as tropical storms; evidence from previous disasters may cover atypical (or non-classic) early warning signs, social precursors, effects and responses, ‘which can provide information today for societies experiencing changing hazards’ (Walsh et al., 2020). In using this information to imagine and prepare for future events, priority should be given to healthcare systems in regions where regular tropical storms are set to become increasingly powerful and even more so in regions where they have hitherto been unknown (Keim, 2006). Healthcare systems must go on functioning as new risks emerge, not least to reduce death from injuries sustained in violent storms, but also to ensure continuing provision of non-disaster-related health services like pre- and post-natal care.

## LESSON 22

**Humanitarian actors and their partners should ensure that disaster responses to tropical storms should take account of potential secondary effects, such as flash floods, landslides and disease**

VERY HIGH IMPORTANCE: 4.35 average expert rating



MEDIUM RELATIVE FREQUENCY: 10 papers



QUALITY: ● 6 medium quality ● 2 high quality ● 2 very high quality

Disaster response programming should include the proactive monitoring of possible secondary effects of tropical storms using risk mapping and multi-scenario analysis. Classic health impacts of tropical storms include wounds from flying objects or from people being violently flung against obstacles by strong winds or rapidly flowing water. Drownings are also frequent (Doocy et al., 2013). In regions where tropical storms are unknown or not normally violent there is limited experience of administering appropriate first aid or treating other health effects (Patra et al., 2013). One key lesson signalled by the Red Cross is that populations and communities in ‘at-risk’ regions should be better prepared and their health systems readied to respond appropriately.

Tropical storms also often have an impact on public health (Zarikson et al., 2020) – and when these events behave in new ways, the waterborne disease follow new dynamics too. Tropical storms may increase the surface area under water, and this excess water stagnates rapidly and breeds disease. Water and sanitation systems may quickly be overwhelmed, as contaminated water floods systems and infrastructure that is not equipped to deal with high contamination levels. Tropical storms may also affect chemical factories or other types of infrastructure where polluting, often highly dangerous, chemicals are stored in insufficiently storm-resistant conditions – which could trigger a full-scale environmental disaster (Erikson et al., 2019).

Only proactive, preventive and preparedness measures will limit the impact of these potential secondary effects. Such measures have been introduced in some regions where tropical storms are frequent, but multi-risk analysis and anticipatory measures are needed in regions where tropical storms are newly occurring events (Kim et al., 2021).

## LESSON 23

**Humanitarian actors, their partners and affected communities should invest in new types of alarm and alert systems, giving priority to systems that transmit information and making use of all available options**

VERY HIGH IMPORTANCE: 4.4 average expert rating



HIGH RELATIVE FREQUENCY: 11 papers



QUALITY: ● 1 very low quality ● 3 medium quality ● 2 high quality  
● 5 very high quality

Established early warning systems have proven their value. However, even in regions where they are well established, these systems are increasingly challenged or put under stress by the changing dynamics of tropical storms – especially in vulnerable small island states (Kuleshov et al., 2020). Key elements of early warning include TV messaging using information provided by meteorological stations and institutions – for example, the Network on Humanitarian Action (NOHA) or Meteo France – monitoring the development of tropical storms through satellite imagery and remote sensing. Often, the storm’s final trajectory, its moisture charge and wind velocity may not be fully measured by meteorological systems, which record and process data over relatively long timeframes. In the case of mid-ocean small island states (Kuleshov et al., 2020), temperature exchange and moisture take-up between sea and atmosphere are significantly modified by climate change: small islands in these regions may experience the development of tropical storms that modify extremely suddenly, in unexpected ways. This may also be the case in large, densely populated river delta regions. Without adequate information and preparation, the effects can be devastating.

Timely information is essential. Communication systems very quickly break down under the impact of tropical storms (Grunewald and Schneckenberg, 2016) and it is therefore wise to plan to communicate through multiple channels – even at risk of some being redundant (Time, 2020). Given populations will tend to prefer one information system in particular, but all available systems should be deployed, depending on their exact characteristics and how information systems in a given region may be complementing one another. This includes national and local radio, SMS systems, high frequency (HF) and very high frequency (VHF) communication systems, local alarms and sirens, and loudspeakers to deliver simple messages intended to trigger instant responses (for example, ‘Stay home’, ‘Evacuate’ or ‘Keep in touch with family members’). The latter type of messaging will be very region-specific (Rubiera Torres and Puig, 2012). Densely inhabited cities in river delta regions are likely to use different means of communication from rural or remote zones.

## LESSON 24

**Humanitarian actors should listen to affected people and communities, recognise the importance of their anticipatory capacity and champion further research on how traditional knowledge can inform us about risks and potential disasters**

VERY HIGH IMPORTANCE: 4.05 average expert rating



VERY HIGH RELATIVE FREQUENCY: 19 papers



QUALITY: ● 10 medium quality ● 3 high quality ● 6 very high quality

Many societies are regularly confronted with unexpected, sometimes violent, events and have developed mechanisms for dealing with them. This includes responses to the consequences of climate change, including the changed dynamics of tropical storms. Local and Indigenous knowledge, in the form of community narratives, has an important ‘storytelling’ function, defining and interpreting complex environmental events and phenomena. When tropical storms behave in new ways, people and institutions are caught off guard, as classic datasets cannot reliably predict their development. But to the surprise of observers, traditional ‘detection’ systems have functioned well, identifying potential unexpected disasters in some situations. Two weeks before Typhoon Haiyan in 2013, a traditional procedure that is conducted by community elders (the mangitalos) to predict forthcoming calamity, alerted some of the Philippines’ island-dwelling populations. The Indigenous Mamanwas, for example, began preparing for a powerful typhoon, in the absence of any information from official sources such as the Philippine Atmospheric, Geophysical and Astronomical Services Administration of the Department of Science and Technology (Cuaton and Su, 2020). Further research is needed to explore what traditional knowledge can tell us about future risks, including unexpected weather events.

## Responses

### LESSON 25

#### **Humanitarian actors, their partners and affected communities should invest in new information and communication technologies, from dedicated tools to user-generated data systems**

HIGH IMPORTANCE: 3.8 average expert rating



MEDIUM RELATIVE FREQUENCY: 10 papers



QUALITY: ● 2 medium quality ● 1 high quality ● 7 very high quality

Many large-scale disasters have led to the development of new information and communications technology (ICT) for disaster management. ICT can be deployed either through official systems and institutions or through social networks drawing on user-generated information.

The Philippines is regularly affected by disasters of different types that increasingly follow new, more extreme, patterns of development. Here, experts at the National University Manila devised a web-based application for early warning, monitoring relief efforts and recording casualties. The application, 'Anduyog', delivers aggregated reporting in real time to facilitate the operation of the incident control system for a given disaster. It fulfils three requirements (Rodriguez et al., 2017): (1) to inform, which it does through an SMS information dissemination module that aggregates and shares information about the disaster or extreme weather event and proposes proactive responses like evacuation; (2) to facilitate relief distribution and coordination through information sharing in real time; and (3) to improve reporting and accountability to affected citizens and management operations.

In regions that lack dedicated applications for disaster management, social media platforms such as Twitter, Facebook and others provide substitute channels that fulfil similar functions – that is, they provide user-generated information and enable community responses to be monitored. The first well-documented use of social media by aid actors was in Kenya in 2006 to monitor and report on post-election violence, and it has grown exponentially since.

In regions at risk, when there may be high degrees of uncertainty, such systems for informing populations and communities, generating a 'bottom-up' flow of information, go a long way to improving emergency management and enhancing resilience to disasters (Hong et al., 2012). Social media was used extensively during Hurricane Sandy (2012), in the Colorado flooding (2013) and during Hurricane Matthew (2016), helping to identify affected areas, organise search and rescue, and monitor evacuation and recovery procedures.

## LESSON 26

**Local authorities, working with humanitarian actors and other partners, should develop alternative shelter and evacuation systems in regions that are not typically disaster zones, but which could be affected by tropical storms in future**

HIGH IMPORTANCE: 3.45 average expert rating



MEDIUM RELATIVE FREQUENCY: 10 papers



QUALITY: ● 2 medium quality ● 1 high quality ● 7 very high quality

In regions where tropical storms are frequent, strategies to protect populations and communities have been developed, evacuation sites and shelters have been designated and built, and itineraries to access them signed and communicated (Paul and Dutt, 2010). Bangladesh is among the pioneers of these measures, especially in the country's delta area, which are most acutely at risk of extreme weather events arriving from the Bay of Bengal (Dash and Walia, 2020). Yet even in these high-risk zones, evacuation procedures may encounter resistance (Chakma and Hokugo, 2020). In regions where tropical storms have hitherto been infrequent, new approaches to evacuation and shelter procedures are needed (Miyaji et al., 2020). Simple but effective improvements include physical markers and tags on shelters, and basic indicators such as arrows pointing out evacuation zones; roleplay or formalised evacuation 'games'; training and practice exercises on different aspects of disaster management in the local context (Solinska-Nowak et al., 2018); and structured discussions about disaster scenarios and appropriate responses as part of the school curriculum (Parvin et al., 2019).

## LESSON 27

**The likelihood of new forms of extreme climate effects and weather events caused by climate change necessitates improved dialogue and coordination between government and civil society on how to respond to and manage them**

HIGH IMPORTANCE: 4.0 average expert rating



MEDIUM RELATIVE FREQUENCY: 9 papers



QUALITY: ● 2 medium quality ● 3 high quality ● 4 very high quality

Coordination between government, civil society and the private sector contributes significantly to effective responses to disasters and could also



contribute to formulating a longer-term post-disaster development agenda (Mahmood, 2013). However, such coordination faces additional challenges because of the new and unknown dynamics of extreme weather events, which may affect new regions. In places where tropical storms are becoming more frequent, more violent and are following new trajectories according to new and unfamiliar seasonal trends, sometimes in regions that were previously unaffected by tropical storms, coordination between government and civil society is even more important. Central and local government, national and local civil society networks and the general population may all be caught off guard by a disaster – by its unexpected magnitude and severity, its new trajectory and the characteristics of its aftermath (such as the effect on watercourses or water infrastructure). In such circumstances, a spirit of cooperation normally prevails (Grunewald, 2020). Cooperation and dialogue between a wide range of actors has regularly been vital during the first few hours and days following a disaster, before the classic elements of the humanitarian response get underway. Experience of initial response periods should be harnessed and used to influence and strengthen longer-term governance and institutional arrangements for risk-informed development planning (Winterford and Gero, 2018).

## LESSON 28

### **Humanitarian actors and partners – especially at local level – should recognise and support immediately following a disaster any effective informal first-response networks or citizen-led responses**

HIGH IMPORTANCE: 4.0 average expert rating



MEDIUM RELATIVE FREQUENCY: 8 papers



QUALITY: ● 1 low quality ● 3 medium quality ● 1 high quality  
● 3 very high quality

In many countries, there is insufficient understanding of the potential contribution to be made by first-line ‘zero-order’ responders – for example neighbourhood solidarity movements, local networks including those established by faith actors and communities (JLIFLC, 2016), or spontaneous solidarity initiatives (Corbett et al., 2021). The energy and dedication of these responders in difficult situations, at a time when organised relief systems are often only just being mobilised, are extremely impressive (Briones et al., 2018). There has been very little research or reporting on such initiatives (Grunewald, 2020) and even less reporting on strategies that might be deployed to support them. Although this issue applies broadly to almost all disasters, it emerged as particularly important in relation to tropical storms behaving in new ways. This is because, where tropical

storms affect populations that haven't experienced them frequently in the past, formalised national and local emergency management institutions, trained Red Cross volunteers and local NGOs with relevant experience are not always in place.

## LESSON 29

### **Women are key actors in managing unknown risks and should be properly supported and empowered in preparing and responding to new dynamics of tropical storms**

VERY HIGH IMPORTANCE: 4.4 average expert rating



MEDIUM RELATIVE FREQUENCY: 9 papers



QUALITY: ● 1 low quality ● 5 medium quality ● 3 very high quality

Women are important actors in both disaster response and preparedness measures when faced with tropical storms behaving in new, imperfectly understood ways or happening with increasing regularity in regions where they were previously unknown. Women are ready and able to experiment and innovate, and therefore to assist at every stage of disaster preparedness, response and recovery. For example, women market vendors in Vanuatu who experienced Cyclone Pam and the severe drought that followed have developed a series of adaptive farming practices to reduce the extent of damage when disasters such as tropical storms hit (McNamara et al., 2021). These women learn from every type of extreme weather event – including tropical storms – that the best defence is to prepare (ibid). For example, they may trim crops to reduce exposure to tropical storm damage; change the planned location of crops depending on their propensity to be damaged, planting more sensitive crops closer to home so they can be more quickly attended to in the event of an extreme weather event; plant certain crops according to seasonal patterns, for example taro and manioc in the dry season or taro alone during the tropical storm season since manioc is more susceptible to weather damage (ibid). Women may also change their approaches to gardening, undertaking rotational cropping to combat poor soil quality, or maintaining several smaller gardens so that if the effects of a tropical storm destroy one garden, there will be one or more reserve gardens left (ibid). In response to extensive damage caused by tropical storms or drought, women also develop seed banks, to keep in reserve for replanting crops and vegetables and mitigating losses. Based on these findings from Vanuatu, McNamara (2021) call on those working in the disaster and development fields to: (1) acknowledge and use women's knowledge and skills in disaster response and recovery; and (2) support women to further develop their capabilities and address underlying vulnerabilities.

# C // Lessons from new weather events: heatwaves

The following lessons relate to the adaptation, anticipation and response to new disasters. Some of these lessons may be relevant to responding to other climate-related disasters, but they are presented here because they emerged from the specific review of literature on responses to heatwaves.

## The nature of heatwaves

### LESSON 30

#### Humanitarian actors and their partners should formulate programmatic responses to the challenges presented by extreme heat and heatwaves

VERY HIGH IMPORTANCE: 4.25 average expert rating



LOW RELATIVE FREQUENCY: 7 papers



QUALITY: ● 3 high quality ● 4 very high quality

To date, heatwaves have attracted ‘ad hoc’ responses – reactive but unsupported by strategic reflection or planning. However, climate modelling and other science suggests that climate change will have the effect of making heatwaves more intense and more frequent around the world. The IPCC’s latest 2021 report finds, for example, ‘every additional 0.5°C of global warming causes clearly discernible increases in the intensity and frequency of hot extremes, including heatwaves (very likely)’ (IPCC, 2021). Moreover, extreme temperatures are expected to have not only direct consequences on populations and communities but also indirect consequences, influencing other environmental phenomena causing damage such as slope instability or flooding (Allen et al., 2012; Papathoma-Koehle et al., 2016). The IPCC’s special report, ‘Global Warming of 1.5 Degrees Centigrade’, concludes that 420 million people will be exposed to extreme heat and heatwaves in the near future (Price et al., 2021).

Humanitarian actors propose that the long-term effects or impact of heatwaves be better mapped, by capturing the ways in which they change or influence attitudes, behaviour patterns or migration trends among heatwave-affected populations or communities. Given the increasing frequency, intensity and geographical extent of heatwaves, humanitarian agencies should embed long-term heatwave planning into their programmes.

## Resilience and adaptation

### LESSON 31

**Humanitarian and other actors should focus support to communities and socioeconomic groups that are particularly exposed to the harmful effects of heatwaves as the threat of them increases**

VERY HIGH IMPORTANCE: 4.45 average expert rating



VERY HIGH RELATIVE FREQUENCY: 16 papers



QUALITY: ● 4 medium quality ● 2 high quality ● 10 very high quality

While extreme heat will assail a given geographical region indiscriminately, its adverse effects will be experienced differently by different socioeconomic, demographic and community-specific groups, according to their vulnerability to heat stress and other effects. Older people, children, pregnant or breastfeeding mothers, and people with cardiovascular or pulmonary disorders are more vulnerable owing to their physiological factors or underlying health status. Poverty is a further determinant of vulnerability: poor migrants moving from rural to urban areas, settling in informal conditions – often slums – without basic WASH or energy supplies (let alone a continuous access to energy services) are ill-equipped to resist heat stress. The urban poor, in particular, have limited access to healthcare and often work in the informal sector as daily wagers or street vendors, meaning they are exposed to extreme heat in their working hours (Peters et al., 2015).

When humanitarian actors design interventions to mitigate or manage the effects of heatwaves they should therefore take specific account of the needs of vulnerable and at-risk groups. One example of good practice is Ahmedabad's Heatwave Action Plan, published in 2013. It focuses on groups such as daily wagers and construction workers, as both are more exposed to extreme heat than people who are able to work indoors. Two of the plan's key objectives are to improve public awareness and to inform at-risk groups about heatwaves and heat stress. Its outreach programme uses various communication channels such as billboards, advertising of other kinds, media alerts, and messages through mobile phone applications like WhatsApp. In coordination with NGOs, local authorities have installed more than 1,100 drinking-water stations around the city and Ahmedabad's Estate Department ordered construction sites to provide workers with drinking water and shade in the form of adequate onsite shelters. A survey of the provision of drinking water and shelter was carried out at all construction sites in the city (Kirbyshire and Paul, 2017). The success of the heat action

plan of Ahmedabad (first implemented in 2013) can be gauged from the fact that there were fewer than 20 casualties in the city during the 2015 heatwave as opposed to 1,344 additional deaths reported in the 2010 heatwave (Ahmedabad Heatwave Action Plan, 2016, Easy Read Version).

## LESSON 32

### Humanitarian actors should support efforts to secure reliable access to sustainable energy, which is needed for effective strategies for adapting to increasing heatwaves

HIGH IMPORTANCE: 3.65 average expert rating



LOW RELATIVE FREQUENCY: 6 papers



Quality: ● 1 high quality ● 5 very high quality

Indoor air conditioning is an effective short-term defence against heatwaves but an unsustainable and often unaffordable solution that's inaccessible to low-income populations or communities. The use of air conditioning also has a negative environmental impact as it increases energy consumption and CO2 emissions. Air conditioning often breaks down in regions or urban areas where the power supply is unreliable, with power outages likely to be more frequent during the hottest period of the year or during heatwaves, when demand peaks. Vulnerable households that rely on air conditioning during heat-related events will be even more vulnerable to the effects of blackouts (Flores-Larsen and Filippin, 2021).

While air conditioning may be beyond the reach of low-income communities, many still make use of low-cost electrical appliances, such as fans. Although a relatively low-cost means of coping with high temperatures, fans also depend on power supply – which is often erratic in districts where the population is overwhelmingly poor. The increased demand for power when air conditioning or other lower-cost appliances are used may raise consumption beyond the carrying capacity of the urban grid, leading not only to relatively short blackouts but to extended periods without power that threaten other services (including healthcare). Humanitarian actors must attempt to ensure reliable access to sustainable energy in devising effective adaptation strategies against heatwaves.

### LESSON 33

#### Humanitarian actors should develop their understanding of the complex impact of extreme heat on livelihoods

HIGH IMPORTANCE: 3.8 average expert rating



NO FREQUENCY: 0 papers



QUALITY: The lesson was proposed by advisors and verified by the expert panel

What limited research there is on the impact of heatwaves has focused mainly on human health and mortality, giving less attention to livelihoods – for example the number of working days lost to extreme heat and its effects. In lieu of literature on this topic (and in response to its absence), this lesson was identified by members of the expert advisory group and strongly approved by the broader expert review panel.

Value chains risk disruption when temperatures reach extreme levels, from production to consumption. Perishable goods such as farm produce liable to spoil quickly, particularly in places where widespread cold storage is lacking. And, further up the value chain, extreme heat affects livestock, fisheries and crops. In India, for example, high temperatures have a detrimental impact on the habitats of tiger shrimp – a key seafood export that earns valuable foreign exchange. With fewer shrimp available to catch, fishers may be unable to meet their basic needs and require assistance (cash or in-kind or both) from humanitarian agencies.

### LESSON 34

#### Partnership between humanitarian actors and government can support social protection to vulnerable groups in the event of extremely high temperatures or heatwaves

VERY HIGH IMPORTANCE: 4.2 average expert rating



NO FREQUENCY: 0 papers



QUALITY: The lesson was proposed by Advisors and verified by the expert panel

Some socioeconomic groups, especially in urban areas, are more vulnerable to the effects of heatwaves through a combination of insecure livelihoods, poor living conditions and inadequate access to medical care. Humanitarian actors can play a role in encouraging governments to expand social safety nets to these more vulnerable groups of people, and to include within social

protection funds access to public healthcare and compensation for days of work lost to extreme heat and its effect. Extending social protection to those most vulnerable to the effects of extreme hot temperatures will require partnership between humanitarian actors (who are able to identify those most at risk), insurance companies (who operationalise social protection mechanisms) and governments (who support and meet the costs of expanded measures).

## Preparedness and response

### LESSON 35

**Humanitarian actors should support and play their part in multisectoral approaches across shelter, urban planning, WASH and public health to help communities improve their capacity to withstand and respond to the effects of heatwaves**

VERY HIGH IMPORTANCE: 4.2 average expert rating



VERY HIGH RELATIVE FREQUENCY: 17 papers



QUALITY: ● 5 medium quality ● 6 high quality ● 6 very high quality

The effects of extreme heat stress and heatwaves are manifested in complex ways and may require a humanitarian response across a number of different sectors. Consequently, there is no single approach for humanitarian actors instead there is evidence to show how adopting multidisciplinary approaches that include interventions in shelter, urban planning, WASH and public health can be more effective in managing the risks of extreme heat.

**Shelter:** Painting the roofs of low-income housing white to reduce heat absorption has proven a successful adaptive strategy, reducing temperatures by between 2°C and 5°C (AMC, 2018; Dicker et al., 2021). Other successful heat mitigation strategies relating to shelter include improving night ventilation, planting trees or climbing plants to provide shade (sometimes creating quite elaborate ‘green walls’) or installing opaque ventilated facades or under-roof insulation. These simple approaches improve the indoor environment of low-cost housing and reduce the electricity consumed in the hottest months (due to less need for fans or air conditioning), bringing down expenditure on the part of low-income households (Flores-Larsen and Filippin, 2021).

**Urban planning:** Not only can urban planning strategies provide relief amid extreme heat, but they also have other benefits. Approaches might include developing alternative modes of transport; increasing access to safe drinking-water fountains; creating more cool spaces such as small,

shaded public areas, ‘cooling centres’ in churches or schools and swimming pools and their surrounds; increasing access to both existing and new cooling spaces by extending opening hours or improving night transport needed to travel to and from such cooling spaces; preserving or restoring outdoor areas where vegetation might have an additional cooling effect; or increasing native vegetation and tree cover (Harlan et al., 2006; NRDC, 2013; Raven et al., 2016; Pasquini et al., 2020).

**WASH:** Water may be distributed to the general population, for example in public parks, outdoor markets and at mass transportation hubs and tourist attractions. WASH programmes can also distribute water in places frequented by groups that are particularly exposed or vulnerable to extreme hot temperatures – such as construction sites, lower-income neighbourhoods or community centres (IFRC, 2019).

**Public health interventions:** Vulnerability and adaptation assessments provide a basis for developing policies and programmes, including information on what is unlikely to succeed and why. Interventions should enhance preparedness and put in place the modalities for appropriate responses to health risks, and other types of risk in the event of disastrously high temperatures or heatwaves. Just as with meteorological and climatological variables, a set of agreed health indicators should be defined according to measured or observed impacts of heatwaves on health outcomes and accompanied by the means to verify performance against them. These indicators should be used to define and calibrate proposed preparedness and response activities. They will also establish a baseline that enables programmes to monitor and evaluate effectiveness of health adaptation activities and provide the basis for future comparative studies of how different approaches work in different scenarios.

## LESSON 36

### Governments, researchers and humanitarian actors should share the financial burden of mitigation activities

HIGH IMPORTANCE: 3.3 average expert rating



LOW RELATIVE FREQUENCY: 6 papers



QUALITY: ● 2 medium quality ● 1 high quality ● 3 very high quality

Heatwave contingency planning may often involve large urban areas and exorbitant costs. Innovative financing streams should be identified for heatwave planning, with the costs shared between the main actors involved – including civic authorities, research institutions and humanitarian organisations. There is also scope to involve the scientific community in policymaking for more effective risk reduction interventions to combat heatwaves (Keramitsoglou et al., 2017). In developing its 2013 heat action



plan, the Ahmedabad Municipal Corporation dedicated a budget line (initially \$60,000) to covering the plan's start-up activities. Further efforts under the plan were supported by international organisations including the Climate and Development Knowledge Network (Kirbyshire and Paul, 2017).

Humanitarian actors and their development partners should explore the possibilities of financial cooperation with governments and research stakeholders that enables evidence to be gathered, recorded and reviewed to identify lessons from successful interventions that could be scaled up. It is useful to document best practice from a specific region or regions (Ebi and Otmani del Barrio, 2017).

In Ahmedabad, a coalition of academic, municipal, health and environmental groups came together in planning and addressing extreme heat issues with the Indian Institute of Public Health Gandhinagar, the Natural Resources Defence Council and Ahmedabad's Municipal Corporation (Dicker et al., 2021). Similarly, humanitarians and partners should explore the possibilities of South–South, South–North and North–South learning exchange and knowledge sharing on heatwaves (Dicker et al., 2021).

### LESSON 37

#### Humanitarian actors should contribute to awareness-building among groups who do not understand the dangers of extremely high temperatures or heatwaves

VERY HIGH IMPORTANCE: 4.15 average expert rating



LOW RELATIVE FREQUENCY: 5 papers



QUALITY: ● 1 medium quality ● 4 very high quality

Communities may not always perceive extreme heat as a serious risk and therefore awareness building is important. Humanitarian actors should build community-level awareness of the adverse effects of extreme high temperatures and heatwaves in order to encourage communities to change their behaviour. Understanding people's current attitudes and behaviour will be critical to this (McGregor et al., 2015). This should be done through multiple, diverse communications channels – for example, in India, the city of Ahmedabad shared messages about heatwave risk via billboards, media alerts, advertisements, mobile phone applications like WhatsApp, and citizen-awareness drop-ins held in vulnerable neighbourhoods (Kirbyshire and Paul, 2017).

The dangers of insufficient awareness are illustrated by reports from Dar es Salaam (Tanzania) and Sindh (Pakistan). In Dar es Salaam, residents of Vingunguti ward lacked knowledge of heat risks for health, which seriously limited their ability to plan and implement adaptive measures (Pasquini et al., 2020). In Sindh, the 2015 heatwave coincided with Ramadan. Although Islam

provides for the postponement of Ramadan practices in the event of ill health or physical fragility, many people are unaware of this and the heatwave caused numerous casualties among fasting males over the age of 50 (Hanif, 2017). There were also high numbers of casualties among construction workers, who have very little knowledge or understanding of heatwaves, and continue working in the heat without taking precautionary measures (Hanif, 2017).

## Anticipation

### LESSON 38

#### Advocate for greater investment into early warning against heatwaves

HIGH IMPORTANCE: 3.75 average expert rating



HIGH RELATIVE FREQUENCY: 12 papers



QUALITY: ● 4 medium quality ● 1 high quality ● 7 very high quality

Early warning is crucial, as a wealth of data from different sources clearly shows. Technological improvements as a result of recent new investments in early warning have enabled scientists to forecast the onset of tropical storms, very effectively and in a timely manner, particularly in Spain and South Asia. In total 5 billion people live in regions where early warning systems can forecast heatwaves and therefore save lives. An effective heatwave early warning system, coupled with strong heat-awareness campaigns that focus on the need for behavioural change (Kirbyshire and Paul, 2017), can significantly mitigate the adverse effects of heatwaves; their efficacy has been noted globally from Hong Kong to Milwaukee in Wisconsin, US, to Florence in Italy to Odisha in India (Hess et al., 2018).

### LESSON 39

#### Humanitarian and other donors should invest more time and resources in better risk assessment and improved monitoring and evaluation of heatwave preparedness and adaptation programmes and activities

HIGH IMPORTANCE: 4.0 average expert rating



MEDIUM RELATIVE FREQUENCY: 9 papers



QUALITY: ● 3 medium quality ● 3 high quality ● 3 very high quality

Given the uncertainty about the precise impact and effects of climate change – including the increasing incidence of heatwaves and hot extremes – more robust risk assessment is needed in order to improve resilience, preparedness and mitigation measures. Donors should increase financial support for robust, long-term, community-led, open-ended monitoring and evaluation of preparedness and adaptation initiatives to strengthen, broaden and diversify the evidence base and improve the effectiveness of current heatwave mitigation strategies.

For example, the city of Ahmedabad has a rigorous evaluation of process within its Heat Action Plan (2013) to ensure the correct focus on specific vulnerabilities and to take account of new and emerging issues. The city has used the information to revise the plan each year. The gaps highlighted in the evaluation process are then addressed in the next year's plan (AMC, 2018). Ahmedabad's experience also showcases how rigorous monitoring of adaptation measures for heatwaves can lead to positive externalities and result in an improvement in health outcomes (Dicker et al., 2021).

#### LESSON 40

### Humanitarian and other actors should design their interventions in ways that engage affected communities in heatwave mitigation plans and programmes

VERY HIGH IMPORTANCE: 4.55 average expert rating



RELATIVE MEDIUM FREQUENCY: 8 papers



QUALITY: ● 2 medium quality ● 3 high quality ● 3 very high quality

Meaningful community engagement is central to successful heatwave preparedness and mitigation planning. Reaching out to vulnerable communities and ensuring their participation in the development stage of the heatwave planning process will result in significantly better outcomes and engaging communities in the programme itself can lead to vital behaviour changes. For example, in Ahmedabad, community engagement successfully encouraged people to alter their daily routines in heatwaves or to increase their intake of fluid – particularly among vulnerable groups and communities. (Dicker et al., 2021). It is also important to note, that community engagement needs to be a continuous and cyclical process to have the maximum impact; community engagement programmes – for example, in slum areas – continue in Ahmedabad (Dicker et al., 2021).

# Authors' reflections on the evidence

The authors found abundant evidence that climate change has exacerbated the frequency and intensity of disasters in almost all parts of the world. Articles and reports reflected the IPCC's grave warnings about this trend and emphasised the need to adapt humanitarian action so that it can better respond – illustrating the relevance of this paper.

However, identifying specific lessons and recommendations that might help to inform future humanitarian response was challenging given that the exercise is rooted in reviewing past experiences and because of the availability and strength of the evidence. Moreover, the importance of context emerged strongly from the evidence. To fully understand and react to climate-related disasters – heatwaves or tropical storms that behave in new ways, for example – it is important to consider contextual issues such as specific vulnerabilities (for example, among different sectors of populations or communities); capacity at different levels in different types of organisation; the range of exposure to the effects of a disaster; and assets to be safeguarded or otherwise taken into account.

## Learning from the past to inform an unknown future

The currently available evidence on climate change and climate-related disasters looks back at previous experience. However, the challenges of dealing with climate change lie ahead, in the future, and are still largely unknown. The global response to climate change and its fallout will need to address unprecedented, often unpredictable events and phenomena.

Since future experience of extreme weather events in the context of climate change is likely to be very different from what we have known in the past, what role will there be for lessons learnt from previous humanitarian interventions in this context? Will it be useful or relevant to transmit best practice from previous interventions? How valuable or reliable is our experience – or trends deduced from our experience – as a guide to a profoundly uncertain future? This was a key challenge for the authors of this lessons paper.

## Availability of evidence

In the preliminary stages of this research, the authors recognised that an exploration of existing databases and literature was yielding only partial results: in particular, important references were not emerging from searches conducted using the initially agreed key words. These references later emerged from the Advisory Group, or from supplementary database searches using better-targeted key words that had been identified from further reading, discussions with interlocutors or from the authors' own experience.

Although many of the lessons and recommendations draw upon approaches and interventions that have previously worked when dealing with climate-related disasters, they also focus on gaps where more work is evidently needed. For example, there is useful evidence available on the impact of heatwaves and extreme temperatures on human morbidity and mortality. This type of evidence is relatively easy to collect and collate and helps to identify lessons for humanitarian action focused specifically on maintaining human well-being in situations where hot weather is extreme and prolonged. However, there is much less evidence available on the more complex effects of heatwaves on human or societal attitudes and mechanisms for coping. Better research is needed on the way heatwaves may alter human attitudes and behaviour, and lead, for example, to changes in livelihoods or patterns of economic activity – especially in the informal sector.

## Strength and quality of evidence

Many interesting new approaches had only been tested in a small number of cases and were not comprehensively discussed in published work: this made for a weak evidence base and few direct citations have been possible. Heatwave action planning is a good example: as it is a new and emerging field for humanitarian actors, responses and procedures are still being developed and tested. There remains much 'ad-hocery' in current responses to heatwaves, with almost no guidelines on the approach to take, at any level (from household to state to regional). Over the next few years, better in-depth work on issues related to heatwaves and heat emergencies should result in better information and better-defined response protocols.

The authors were surprised at the paucity of evidence on previous and current humanitarian practice in several key areas. This was understandable in the case of disasters that were unprecedented or imperfectly understood, given there was little or no history or established pattern of humanitarian response. However, there was often only weak evidence in support of approaches that are becoming or have already become core humanitarian policy when responding to climate-related disasters. This means that current approaches and practice have been enthusiastically adopted despite there being little to no evidence of

whether they will be effective in addressing climate-related disasters. Evidence was particularly weak for anticipatory approaches and for efforts by humanitarian actors to support resilience.

### **Get prepared to the unknown and adaptive management**

The effects of climate change may require humanitarians and other actors to intervene in situations that they might not have been called to previously. For example, at the start of the 2014 Ebola Epidemic in the Gulf of Guinea, there were only a handful of specialists trained to operate in the quasi-laboratory environment required for fighting the disease, most of them from major professional agencies (the Center for Disease Control, the World Health Organization, etc). By the time the crisis was nearing its end, thousands of humanitarian actors had been trained to operate appropriately, applying professional skills and techniques.

Similarly, humanitarian actors will have to learn ‘on-the-spot’ as they respond to new types of climate-related disasters. Lessons from this paper will be useful but many other lessons will emerge; learning must therefore be an integrated element of adaptive management.

It’s also important to note that this learning will emerge from and apply to responses in different parts of the world – not only developing or low-income countries. This paper largely excludes the experiences of developed or wealthier nations; however, these countries are increasingly subject to climate-related emergencies and vulnerable to their effects that may be unexpected or unprecedented. Moreover, a higher level of economic development does not act as an automatic safety net in the event of a climate-related disaster; solutions and responses explored or tested in low- and middle-income countries may be equally appropriate in developed or wealthier countries. There is scope for learning exchange between all countries and regions affected by extreme weather events, to share ideas on issues such as resilience, anticipation and response. This might usefully be made the subject of a further discussion paper.

# Endnotes

1. There is no expert panel grade for this Lesson 3 because it emerged from complementary analysis and reorganisation of lessons after the panel review process.

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