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Learning from experience: a review of early warning systems

Moving towards Early Action 2016

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and Andrew Kruczkiewicz, International Research Institute for Climate and Society, Columbia University.

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Executive Summary

A review of Early Warning Systems (EWS) for Early Action (EA) is needed to improve World Vision's current practice. This review focuses on EWS for slow on-set hazards in Africa. The methodology of the review consists of a threefold process: first, to highlight perspectives external to World Vision an internet-based key word search for EWS reviews was conducted; second, World Vision were queried for reviews and document sharing; and third, interviews were conducted with internal and external experts. Interviewees were identified from both a trust-based chain-referral method and personal networking during recent EWS and risk reduction meetings, workshops and conferences.

In order to support the review of EWS, and in acknowledgment of the overarching role of climate in EWS, a discussion on climate data and information is provided. In summary, various types of climate data exist: forecasts, predictions, outlooks, projections and scenarios (Mason et al. 2015) are types that are most relevant to EWS. The three main characteristics of each are: timescale; lead time and target period. Existence and analysis of reliable historical data are necessary in order to establish 'normal' conditions, which in turn are used to assess the magnitude of the extreme event relative to the defined 'normal'. The skill (confidence)[1] of climate information is an important consideration as it may influence actions and user decision-making.

Understanding the nuances of skill is an important step in developing an EWS. Some regions (central Sahara Desert region, for example) lack forecast skill regardless of season, while other regions experience quite a significant shift in skill based on target season and lead-time. Skill of a forecast can change widely from place to place, meaning a forecast can be potentially valuable for an EWS in eastern Kenya and not in western Kenya. Further, skill can change in a single location if the lead-time changes and/or the target period changes, for example a seasonal forecast in western Kenya for rainfall may be more valuable in October than June. Additionally, in western Kenya, an October forecast with a 1-month lead time (meaning issued in September) may have more skill than a forecast issued on a 3-month lead time (issued in July). From a practitioner perspective, it is important to be aware of the right questions to ask relative to shifts in skill (such as inquiring if a seasonal shift in skill occurs), in addition to inquiring if a region of interest simply has skill or not.

In the context of a climate-related sector-specific EWS, feasibility of a such a system is driven by both the availability of a forecast that affords sufficient lead time for appropriate preparedness actions (such as distributing bed nets to prevent malaria, as a result of high rainfall) and the assessment of skill of the available forecast. A needs assessment is useful in determining the demand for particular actions, as well as the capacity for various stakeholders to take those actions.

Evaluating the socio-economic impact of taking action, not only on depletion of funds and cost of potential disruptive impact, but also on risk perception of communities and other difficult to quantify socioeconomic variables, is challenging and can lead to inconclusive results (Barnes et al. 2007). Quantifying the impact of taking action based on a forecast when no disaster occurs (acting in vain) is also challenging and remains a key barrier to evaluating impact. As a result, some agencies have adopted a 'no regrets' approach to taking actions based on uncertain climate information.

'No-regrets' describes actions taken by households, communities, and local/national/international institutions that can be justified from economic, and social, and environmental perspectives whether natural hazard events (related to climate change or other hazards) take place or not. 'No-regrets' actions increase resilience, which is the ability of a system to deal with different types of hazards in a timely, efficient, and equitable manner. Increasing resilience is the basis for "sustainable growth in a world of multiple hazards" (Siegel, no date, retrieved 30 October 2016). There exists alternate schools of thought regarding the definition of action 'regret level', with some organisations considering actions with regret as those actions that are important to consider. Actions that have regrets, such as evacuation, can often be of high value if the hazard does occur. Therefore, many organisations advocate for the consideration of such 'potentially regretful' actions when paired with an appropriately strong forecast. These regrets also reflect the opportunity cost of taking action; the time and money used for any forecast-based action could have achieved greater impact elsewhere if the hazard does not occur.

Following a discussion on climate data and information are case studies of EWS that have been developed with key agencies. These agencies include: World Vision International, World Vision Ethiopia, SomReP, the United Nations Food and Agriculture Organisation (FAO); Interagency Standard Operating Procedures – El Niño, La Niña; the Met Office United Kingdom (UK), the Red Cross Red Crescent Movement – Forecast-based Financing; and the Start Network (UK) – Anticipation Window. The findings distilled from analyses of these case studies capture several opportunities and barriers. Opportunities include: developing holistic EWS for EA approaches; setting up early action funding/ contingency funding with clear triggering mechanisms; building capacity and strengthening partnerships for using information, understanding forecasts, evaluating impacts and action planning.

A holistic approach has been articulated by World Vision and includes three key components: collection and analysis of EW data; translation of EW data into EA through information management and clearly defined decision-making, systems and procedures at each level, including monitoring and evaluation; and recommendations of early action for a range of stakeholders.

Holistic approaches to EWS for EA can include exploring the potential to set up a reserve fund for preparedness actions. This can be developed based on action plans for high risks areas in collaboration with stakeholders and agencies (see case studies: FAO, Red Cross Red Crescent Climate Centre – Forecast-based Financing). Accessing funding as a coalition has proven to be successful (see case studies: SomReP, Start Network Anticipation Window) and could be an appropriate direction to move towards as financing for development is increasingly prioritising outcomes at scale.

The opportunity to build capacity for staff knowledge of EWS and climate information has been established with international structures, such as the Global Framework for Climate Services (GFCS), establishing linkages between national meteorological/hydrological services (NMHS), government ministries, private sector actors, local level organisations and other implementing agencies (see case studies: World Vision Ethiopia, SomReP, FAO, Met Office (UK)). Formalising these relationships is necessary to understand the availability, access and use of climate information as well as to agree on a coordinated plan of action linking key

[1] In this document confidence and skill are taken to have the same definition. High skill means high confidence.

stakeholders in country. Further, there is an opportunity to leverage recent work on outlining user priorities for climate services to inform the goals for scaling up EWS (Vaughan et al. 2016).

In addition to opportunities for implementing EWS, several barriers, internal and external, have been highlighted: 1) Culture of risk avoidance in the sector; 2) A reactive operational model; 3) Insufficient financing for early action; 4) Lack of decision making capacity; 5) Projects designed for demonstration of short term impact rather than sustainable institutionalisation; 6) Narrow focus on preparedness; 7) Weak information management and content; 8) Insufficient warning interpretation at community level; 9) Missing guidance for appropriate actions; 10) Focus on information rather than utility; 11) Disagreement on EWS accuracy and appropriateness; 12) Missing health indicators and lack of cross sector coordination; and 13) Lack of understanding coping strategies.

The external barriers include: 1) Unclear roles and responsibilities; 2) Media coverage; 3) Political considerations of affected countries; and 4) Political considerations of donor governments.

Recommendations have been proposed to address opportunities and tackle several of the barriers. Listed here, these are not meant to define the necessary steps for EWS development; rather, they are noted more as guidelines and best practices. Many of the recommendations arise from the existing practice detailed in the case studies. Identifying one's starting point in taking up the recommendations should first consist of a review of current experience and existing capacity in EWS design and implementation. Several organisations, as seen through the case studies, have key elements in place already to build upon. For example, the SomReP approach is rooted in community empowerment, therefore addressing, at least to some extent, various recommendations noted here. Furthermore, EWS for EA is meant to link to and compliment well established risk sharing approaches, such as social protection, pro-poor insurance and savings groups. It is not a solution to tackling the drivers of vulnerability but rather a system which can help to avoid disaster losses.

Opportunities	Recommendations for Early Warning Systems for Early Action based on Case Studies
Principles; Holistic; Financing; Capacity Building;	• Develop principles for EWS for EA to guide policies, focus investments and develop partnerships. • Provide a separate funding stream for early action and routine data collection and analysis. Use the rising evidence base to influence senior leadership/donors perception of the cost saving benefit of pre-disaster investment, based on weather forecast and climate outlooks. • Work in coalition to seek funding for EWS for EA and manage risks of the decision to act early. • Build a holistic approach EWS for EA which includes decision-making, bridging humanitarian, government and development departments. • Build capacity of communities and staff and develop needed guidance to: understand climate and weather forecasts, understand and monitor current risks and develop cross sector early actions that can be taken up at the community level. • Explore capacity of climate expertise at national hydrological and meteorological offices, and/or at regional centres for climate research/forecasting and develop partnerships. • Design and update current EWS for EA in synergy with national hydrological and meteorological offices and key stakeholders. Advocate for formalised agreements with the met services, and support them in outlining climate risk and climate forecast information.

Internal Barriers	
1. Culture of risk avoidance in the sector; 2. A reactive operational model; 3. Insufficient financing for early action; 4. Lack of decision making capacity ; 5. Projects rather than Institutionalisation; 6. Narrow focus on preparedness;	• Use evidence base, including value for money, to showcase benefits for agencies and communities which have acted early to fundraise and influence senior leadership.g. • Include knowledge of EWS into job specifications and annual reviews -especially for senior leadership and key personnel for ownership and accountability. Develop a minimum standard for EWS knowledge. • Embed EWS for EA into development programming and humanitarian response through project models, national office strategies and programme design, monitoring and evaluation.
7. Weak information management and content; 8. Insufficient warning interpretation at community level; 9. Missing guidance for appropriate actions; 10. Focus on information rather than utility; 11. Disagreement on EWS accuracy and appropriateness; 12. Missing health indicators and lack or cross sectoral coordination; 13. Lack of understanding coping strategies	• Develop partnerships with key organisations, such as national meteorological offices, FEWS Net and relevant ministries, for data gathering, analysis and action planning. • Involve community in risk analysis, action planning and feedback on successes and challenges. Explore the potential for innovative approaches to link/engage across stakeholders. • Identify context specific indicators through collaborative discussions with key sector experts and key partners and include conflict and health indicators to avert disease outbreaks and violent conflict as well as increase coordination for action plans. • Ensure timely, appropriate and verifiable information is shared with key stakeholders (internal and external partners) so that actions can be taken at the right time. This requires partnerships with national met offices and external agencies. • Develop clear communication and dissemination systems tailored to key stakeholders – i.e. senior management, government, partners and communities.
External Barriers	
1. Defining roles and responsibilities	• Agree on a joint EWS led by the national government and on indicators and thresholds and on roles and responsibilities of different agencies. • Develop pre-defined action plans based on agreed thresholds through cross sector discussions with both development and humanitarian experts. These can expand on existing contingency plans.
2. Media coverage 3. Political considerations of affected countries 4. Political considerations of donor governments	• Build partnerships with media – international, national to local- to disseminate EW information and showcase achievements of early action, potentially identifying actions taken and best practices in addition to reporting number of lives and/or funds saved. • Work with relevant ministries to develop coordination as well as information sharing through standard operating procedures and memorandums of understanding. • Organise field trips for key politicians to see EWS for EA activities underway and highlight cost savings that can be shared with their electorate. • Promote inter-governmental peer-to-peer learning.

Section One:
Introduction and Purpose

Why a review?

With the increase in frequency of disasters and better information systems, there is a need and opportunity to improve early warning systems for early action (EWS for EA) that enables World Vision to reduce exposure of risks faced by children and their families. A real challenge is the lack of robust evidence on what an effective early warning system looks like at the different levels of action.

One of the main drivers for a review of defining EWS was the 2011 failure of agencies, donors and the international community to prepare and respond to the Horn of Africa drought crisis and famine in Somalia (Hillier and Dempsey, 2012).

Retrospective analysis found that climate information, such as forecasts for below average rainfall and current metrics of vegetation departure from average, coupled with analyses of pre-existing socioeconomic conditions, could have been used to promote early action before the drought occurred (Hillbruner & Moloney 2012). Underscoring not only the need for timely information, but for appropriate action to be taken that would save lives and livelihoods before a crisis, a range of actors began to increasingly use the term, 'early warning, early action' to define EWS.

Further outlining the need for EWS, the cost for delayed action has been recognised (Catham house, 2012) by humanitarian organisations (Coughlan de Perez et al. 2016) as well as donors. The United Kingdom Department for International Development (DFID) commissioned cost benefit analysis through resilience measures in Kenya and Ethiopia to ascertain the case for early action (DFID, 2012).

Since 2006, World Vision has been active in implementing early warning systems. This has evolved from a focus on food security in Ethiopia to a multi-hazard EWS in both the Eastern and Southern African regions. Most recently, World Vision's EWS has been tested by the recent 2015 El Niño which has severely impacted communities across Central America, East Africa (particularly Ethiopia), and the Pacific and Southern Africa. Furthermore, World Vision has more than ten years experience in building resilience through disaster risk reduction and climate change adaptation (Carabine et al., 2015) and has actively contributed to related policy dialogues on reducing risk and promoting EWS through the Sendai Framework for Disaster Risk Reduction. Alongside World Vision's evolution of its EWS for EA have been similar improvements in practice across a range of agencies.

Despite this range of experience, there remains a lack of clarity and agreement at different levels of the organisation of what is currently needed from an effective EWS, which level (s) it should operate at within the organisation and how best to ensure any EWSs developed are contextually appropriate, efficient and effective for early action.

The purpose of this review is to:

- Provide learning from World Vision's and external agencies' practices on early warning systems (EWS)
- Inform World Vision's early warning steering committee of findings and recommendations in order to inform a EWS for EA roadmap to improve practice.

The findings will be shared and discussed with the World Vision EWS steering committee and shared externally.

Structure of the Report

The structure of the report is aimed to provide readers quick access to experiences, findings and recommendations. As such, is it divided into five sections.

Section one, the introduction, includes an executive summary. This provides a condensed summary of the internal World Vision and external agencies experiences in EWS, findings and focuses on the recommendations based on the evidence. The introduction also includes: the purpose of the report the methodology applied, and a short discussion on the definitions of early warning systems and the evolution of the term to now include early action. Section two, provides overview of the different types of climate information that is currently available and their uses. It also highlight challenges of climate data and delivering timely actions.

Section three of the report focuses on World Vision's rationale for EWS for EA. It then provides key components of an EWS. The section then moves towards case studies and learning reviews based on slow onset hazards. The first is a case study of World Vision's recent 2016 experiences responding to El Niño. The second case study is from Ethiopia charting its progress and learning from 2006 to the recent experience to acting early to the impacts of El Niño in 2016. The third case study includes experience from the SomReP consortium in Somalia over the past four years.

Section four of the report gathers best practices on EWS for EA from a range of external agencies. Case studies have been developed based on exchanges with experts from the following agencies: the United Nations Food and Agriculture Organisation (FAO); Interagency Standard Operating Procedures – La Niña; the Met Office, the Red Cross Red Crescent Movement – Forecast-based Financing; and the Start Network.

Section five of the report analyses these experiences from the internal World Vision practise and external agencies into principles for EWS for EA, opportunities and internal and external barriers to effective EWS for EA.

Section six responds to these opportunities and barriers by suggesting recommendations based on the findings in the evidence sections two and three and includes a list of top recommendations to consider for World Vision's EWS for EA. The section includes a conclusion highlighting key recommendations and next steps for World Vision International.

Methodology

This review will focus on EWS for slow onset hazards in Africa in order to narrow the scope of the study. The implications of this are: lessons will be based on forecasting for slow onset hazards rather than rapid onset hazards such as earthquakes, hurricanes and typhoons. If this review proves to be of great value, it can be adapted for rapid onset hazards in other regions. Consideration of the linkages of the health sector and livelihoods are included as health is often absent from EWS.

For the purpose of this review on EWS for EA and disaster preparedness based on climate information, data was collected through a number of qualitative methods. In order to separate out traditional disaster risk reduction preparedness activities from EWS, the use of weather/ use of forecast/seasonal outlooks in conjunction with risk assessments will be used.

Methods

The methodology used to conduct this review is threefold. External and internal reviews of EWS for EA were conducted as were interviews of key internal informants and external experts.

For the external review, 3 methods were employed. First, a boolean google search of reviews of EWS was undertaken using key words and terms: early warning system*; disaster preparedness; feedback mechanisms; community response; community decision making; and end to end decision making. In addition, requests for information sharing on EWS review and experience were sent to the Start Network Anticipation group and the OCHA Standard Operation Procedures Rome Drafting group. Together, this research request has reached more than 30 non-government agencies working in forecasting as well as UN institutions. Additionally, attendance to the World Bank's Understanding Risk Conference[2] presented the opportunity to explore the latest thought in EWS. A chain-referral method from the conference to gather further information from key actors met was achieved.

For a review of internal World Vision experience in EWS, World Vision International (WVI) personnel were polled through email. First, a request was sent to World Vision Resilience & Livelihoods CoP (over 2000 members) for examples of project documents or reviews that include preparedness at local level based on weather information (time, rainfall, hydrological information); and National Office early warning systems. In addition, WVI Humanitarian Operations Senior Director - Francois Batalingaya – sent a request to the World Vision Humanitarian Emergency CoP and Humanitarian Emergency Regional Directors for project documents or reviews that include: preparedness at local level based on short to medium range (hours to 14 days) weather information (time, rainfall, hydrological information) and reviews of World Vision National Office early warning systems.

A chain-referral method was used to identify key World Visions staff to interview as well as external experts. A maximum of 15 interviews could be conducted. The interview questions are included in Annex Two.

[2] https://understandrisk.org/ur2016-program/

Definitions of Early Warning Systems

A clear definition of EWS by World Vision was needed to begin the research process. A review of the literature highlights that there are a variety of definitions for Early Warning Systems. According to UNISDR (2009) terminology, EWS are defined as:

The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

Comment: This definition encompasses the range of factors necessary to achieve effective responses to warnings. A people-centred early warning system necessarily comprises four key elements: knowledge of the risks; monitoring, analysis and forecasting of the hazards; communication or dissemination of alerts and warnings; and local capabilities to respond to the warnings received. The expression "end-to-end warning system" is also used to emphasize that warning systems need to span all steps from hazard detection through to community response.

In Reducing Disaster: Early Warning Systems For Climate Change (Singh and Zommers, 2014), it is shown that a single definition does not exist with doubt for agreement on a universal definition in the future. They support the UNISDR's 2009 definition and underscore an EWS being a social process aiming to avoid the hardship caused by natural hazards.

The term Early Warning, Early Action has been increasingly adopted by practitioner organisations. In 2008, an IRCR publication, "Early Warning, Early Action" (ICRC, 2008) highlighted the principles of an EWS that would lead to early action. Other agencies soon followed with UN agencies, such as FAO, IASC and World Organisations, such as WMO adopting the term. UK NGO practitioners working in the field of humanitarian response and development have also begun to use the term (i.e. Start Network). In these contexts, the terminology surrounding early warning systems (EWS) and early warning and early action (EWEA) are centred around social processes that lead to decision making to prepare and respond to a certain natural hazard. It is the social processes that are explored in the review below, alongside the key elements of an EWS for Early Action (EA).

Section Two:
Climate Information

An EWS, as an example of a climate service, should connect climate information to decision making, supporting various modes of climate risk management (Vaughan et al. 2016). Climate information is likely to be a valuable component of an EWS, however if integrated without proper scrutiny, it could deem the EWS useless. Foremost, in the context of an EWS, climate information must be available on appropriate timescales relative to the action/intervention being considered. Further, availability, access and use of climate information are challenges that can limit the usefulness of an EWS, thus limiting the ability to take appropriate action (Dinku et al. 2014). Following methods found in Mason et al. 2015, this section will outline basic concepts of climate information, including compiling historical climate datasets, monitoring current weather and climate conditions and managing prognostic climate and weather information on various timescales. The section will also introduce the notion of linking climate information to action, using examples from a health sector context.

Weather and Climate

While at times used interchangeably, weather and climate have distinct meanings. Both refer to atmospheric conditions, with weather describing conditions at a particular place and location and climate describing how the atmosphere behaves over long periods of time at a particular location or over regions (NASA, 2005). A quote sometimes attributable to author Mark Twain notes the difference as, "climate is what you expect, but weather is what you get".

For a depiction of climate and weather in Africa, figure 1a indicates the location for Blantyre, Malawi, while figure 1b is a bar chart showing the monthly distribution of rainfall there. This historical climate information is a climate descriptor and is calculated by taking the mean monthly precipitation value from many years (in this case, 1971-2000) (IRI Data Library, accessed 2016). From this analysis, we can glean a shift in precipitation across seasons (as noted by the change in heights of bars, which is indicative of different mean monthly precipitation levels). As an example, in January one can conclude that approximately 200 mm of rainfall is expected. This conclusion is based on what was experienced in previous Januarys and while it is assumed an exact amount of 200 mm is unlikely, 200 mm is the value that can be expected. As this is the expected value, per historical records, it is likely that communities in this region have developed resilience to this amount of rainfall. However, the temporal (daily) distribution of the rainfall is important considering shifts in risk. For example, it can be assumed that the 200 mm of rainfall does not occur in one day, and is distributed at least partially over the 31 days of January. Perhaps if 200mm (or more) occurs in one or a few days, resilience may be decreased and impacts in terms of flooding could possibly be expected. Fluctuations in both timing and quantity of precipitation are most important to account for in areas predominantly relying on rain fed, smallholder agriculture.

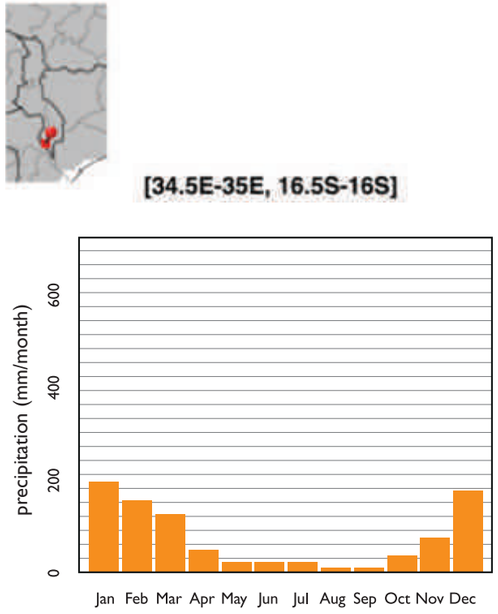


Figure 1- a) map of Malawi with pin point indicating Blantyre, the area of consideration for the mean monthly precipitation analysis. B) Mean monthly distribution of precipitation (1971-2000) for Blantyre.

Using the 2015 Malawi Floods to further contextualize the meaning of climate and weather, on January 12, the Chichiri section of Blantyre reported 398mm of precipitation, causing disastrous flash floods (Vanya, 2015). This one day heavy rainfall was the highest reported on record in Blantyre and is a manifestation of an extreme weather event. A climate assessment of the mean monthly rainfall distribution for January would not have indicated an increased risk for this level of rainfall (or even less severe, yet potentially impactful levels) for Blantyre on 12 January, however short to medium range weather forecast may have provided insight to an increased risk for an extreme weather event.

While climate informed us that January is historically the rainiest month in Blantyre, which may lead us to glean that flood risk is higher than other months, it would be likely unreasonable to prepare each year for an extreme rainfall and subsequent disaster similar to the January 2015 flash floods each year due to risk of acting and the event not occurring.[3] By definition the extreme rainfall and flooding event that occurred in Malawi in January 2015 has a long return period, meaning there will be many years in between occurrences of a similar magnitude. To determine the magnitude of increased risk, one requires both types of information – current, including short to medium range prognostic, climate and weather information alongside historical climate data. By definition, without weather information to inform a short term increase in risk, it may be difficult to justify costly preparedness actions that have a high risk of 'acting in vain'.

Occurring at 2-10 year intervals, El Niño and La Niña do not fit well into the climate nor weather categories (Philander 1983). Both are considered modes of the El Niño-Southern Oscillation, the interaction between the equatorial Pacific ocean and the atmosphere that incites a 'domino effect' in weather conditions on a global scale (IRI ENSO Maproom, accessed 1 Nov 2016). In addition to El Niño and La Niña, other modes of climate variability impact local weather conditions. One example is the Indian Ocean Dipole impacting rainfall patterns in east Africa (Behera et al. 2005) and the Indian monsoon (Saji and Yamagata 2003).

Sources of climate information

Practitioners will need to integrate weather and climate information within the development of EWS if climate-smart actions are desired. Important characteristics of climate information include availability, access and use. Availability refers to the source of the climate information, usually consisting of two types; weather station based or satellite derived (Mendelsohn et al. 2007). Access of climate information refers to the opportunity and process of obtaining and rendering the climate information, which may manifest as numerical data or in visual (map or other chart) format. Increasingly, climate information, both station and satellite based, can be accessed freely online.

In terms of prioritizing efforts to access a particular type of climate information (satellite or station), it is important to understand the limitations of both. In many regions, station data is not available at high spatial or temporal resolutions, resulting in a situation where users need to extrapolate the weather condition in the 'gap' of the data, either spatially (what is happening at a location between stations?) or temporally (what is happening at a location between reporting?). Further, gradients of station quality are likely to exist in country, demanding the need for further evaluation.

In order to fill in the gaps presented by station data, satellites are often used. Satellite data can be a valuable tool for practitioners as they afford the opportunity to use a single dataset across political lines as well as over periods where inconsistent station data recording protocol exist. The latter could be due to periods of socioeconomic and political instability.

Increasingly, methodologies allow for the merging of satellite and station data. This process enhances climate and weather data availability by creating a more spatio-temporally coherent dataset, exploiting the benefits of each dataset type (Xie and Arkin 1997). These merged climate information has been found useful for practitioners across a variety of sectors.

In summary, there are many climate information sources, including satellite and station based, however, for inclusion within an EWS, the key principles of accessibility, access and use should be addressed.

Prognostic information

There are many types of prognostic climate information available providing insight to what climate or weather conditions may be like in the future, both in near and long terms. Statements about what climate and weather may be in the future can take various formats, including forecasts, predictions, outlooks, projections and scenarios (Mason et al. 2015). The three main characteristics common to each statement type include: timescale; lead time and target period. Timescale includes the length of time of the forecast, for example a forecast for January-March 2016 captures a timescale of 3 months. Lead time is the period of time between forecast issuance and forecast validity period (WMO, 2000). For example, a 2-month lead time exists in a forecast made on January 1 for the month of March as well as for forecasts made for the seasonal period of March-May. Target period is defined as the period of validity of a forecast. For example, a forecast made on January 1 for March would have a target period of March (Shabbar and Barnston, 1996). In general, as forecast lead time decreases, confidence increases, however a decrease in lead time also decreases available time to take preventative action.

[3] This is referred to 'acting in vain'.

Forecast Timescales

Climate information, including prognostic climate information, exists across a variety of timescales. The three timescales that are outlined here include weather (minutes to days), climate variability (3 weeks to years) and climate change (decades and centuries).

As the forecast time scale (or lead time) increases (forecast is issued further away from the target date), uncertainty generally increases. As seen in the Figure 2 below, the space between the two black lines show the amount of uncertainty, in a general sense, for each time scale. For example, in evaluating the uncertainty for the 'Hours' timescale, the smaller space between the black lines indicates a lower level of uncertainty, and thus a general increase in skill. Conversely, in comparison to the uncertainty for the climate change timescale, the larger space between the black lines indicates a higher level of uncertainty.

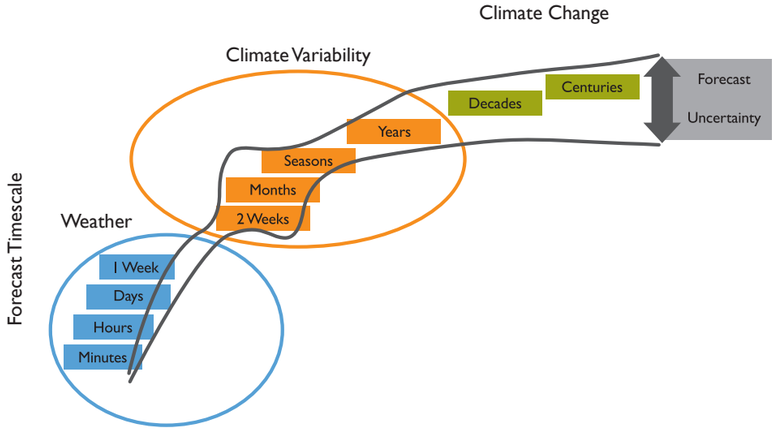


Figure 2 - Diagram showing general level of uncertainty relative to various timescales, including weather, climate variability and climate

It is important to note that the change in uncertainty is not linear. In Figure 2, a 'rebound' of certainty can be seen when comparing forecasts on the 2-weeks and months timescales to the forecasts on the seasons and years timescale. This is shown by a shrinking of the space between the black lines. This rebound is due to shifts in the methods of forecasting as well as a shift in presentation of the forecast.

Prognostic climate information is generally presented as either deterministic or probabilistic (Bickford 2013). An example of a deterministic forecast is that the high temperature and expected rainfall for Addis Ababa, Ethiopia in three days from now will be 10 C and 20 mm respectively. For the seasonal timescale, forecasts are expressed probabilistically and can be used to identify where and when temperature and precipitation conditions, when averaged over a period of the next 1-3 months (say Jan-Feb), could be expected to be above or below the historical 1-3 mean (for example, the mean conditions for Jan-Feb for 1970-present) (Barnston et al. 2003). Probabilistic is the term that refers to a forecast presented as the probability of a shift in a likely outcome, usually above-average, below-average and average (Mason et al. 2015). In summary, when considering timescales of climate information it is important to note forecast uncertainty is relatively higher in the 2-weeks and months period.

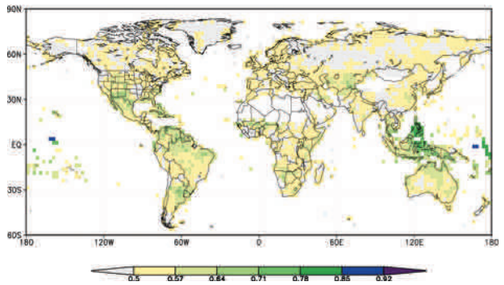


Figure 3 -Map showing skill score of IRI seasonal precipitation forecasts on a 1 month lead time for all three month periods, in a year. Deeper greens indicate areas that experience a higher level of seasonal forecast skill regardless of target month, on a 1-month lead time. Seasonal forecast skill fluctuates depending on target month and lead time. This map shows the total skill for all seasons (three month periods), answering the question: In general, considering all seasons, which areas globally have the highest seasonal precipitation forecast skill at a 1-month lead time?

Depending on what season we are investigating, skill/ uncertainty can widely vary. Depending on the season of interest, a seasonal climate forecast can be valuable or useless. This has implications for EWS as, depending on the implicated lead time (as determined by length of time needed to take action), some regions or seasons may be precluded for consideration.

Global gradients of seasonal forecast skill and temporal variations of skill across seasons at a single point are important considerations in designing an EWS which links forecasts and actions at the 2-4 month timescale. For example, some regions (central Sahara Desert region, for example) lack forecast skill regardless of season, while other regions experience quite a significant shift in skill based on target season and lead time. From a practitioner perspective relative to designing an EWS, it is important to be aware of the right questions to ask relative to the spatio-temporal shifts in skill, in addition to inquiring if a region of interest simply has skill or not.

Bolivia is a country that exhibits a shift in forecast skill depending on season. In evaluating seasonal forecast skill for precipitation in Bolivia on a 2 month lead time for each 3-month period in a year, skill is low (figure 4a). However, skill is fairly high during the June-August (JJA) season (figure 4b).

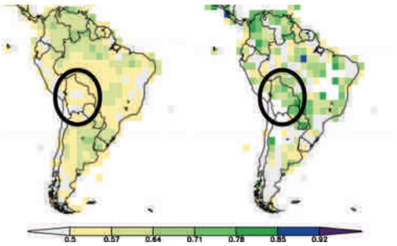


Figure 4-Skill score over South America for seasonal precipitation forecasts on a 2 month lead time, as defined by the general relative operating characteristic (GROC). Yellows indicate areas of relatively lower skill, while deeper greens and blues indicate areas of relatively higher skill. The map on the left shows seasonal precipitation forecast skill of 2 month lead time forecasts for each 3-month period in a year- note the overall low skill in Bolivia (circled). The map on the right shows seasonal precipitation forecast skill of 2 month forecasts for the June-July-August period- note the darker greens in eastern and northern Bolivia, indicating a relatively high skill during that period.

Simply knowing the heightened skill during JJA may not be enough to understand the value of the climate information. Skill, depending on season, can be more or less valuable to a decision maker. For example, in Bolivia during JJA there are low values of precipitation, therefore a forecast for above average precipitation during JJA may not manifest as an increase risk for flooding, however alternatively, perhaps a forecast for a slight increase could be of interest if community consultation has identified the risk as such. Alternatively, a forecast with a strong signal for above average precipitation could be a boon for certain industries, such as some sub-sectors of the agriculture industry. However, the opportunity to experience any potential benefit could be missed if one is unable to evaluate and act on this uncertain information. Even during times of a forecast with a 'strong signal', uncertainty is present.

In comparison, keeping with the Bolivia context, there is also heightened skill on a 2-month lead time for precipitation seasonal forecasts for February-April (FMA). With a relatively high amount of precipitation usually falling during FMA, a forecast for above normal conditions in FMA may lead to a situation of heightened risk for floods. However, similarly, without estimations of vulnerability and other socioeconomic factors determining if and how a shift (both spatiotemporal and magnitude of) of risk for societal impact will occur is difficult (Thomalla et al 2006).

In conclusion, forecast skill for a specific location will likely vary based on target period, lead time and variable. It is important to consult with climate experts in order to increase the likelihood of proper interpretation of prognostic climate information.

Historical: setting the baseline

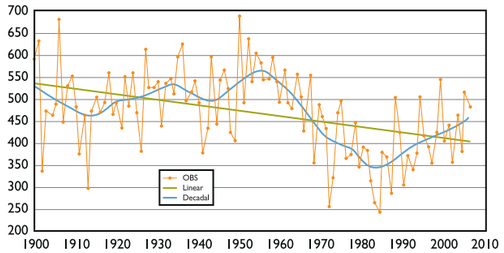


Figure 5: Observed Annual Rainfall in the Sahel over 1900-2006. Source: Giannini, Saravanan and Chang, 2003.

Data for past conditions is pertinent in establishing the context of current climate and weather conditions. Climate can shift from year to year, decade to decade and on a longer term climate change timescale (ibid, 2015). Figure 5 shows, in the context of rainfall in the Sahel region of Africa, how depending on the historical context of interest, the trend can change magnitude and even sign (increasing or decreasing).

The red line depicts inter-annual variability, or year-to-year shifts. The circles (filled in with red) indicate annual rainfall totals with the time series showing variable amounts from year to year.

The blue line depicts decadal averages. This line is important for assessing longer term (10-30 year) shifts of clusters of climatic periods. For example, it can be seen in the time series that Sahel rainfall decreased from 1960-1980, then increased thereafter even up to the present period. It should also be noted that in both the period of decadal rainfall decline and increase, individual annual rainfall values of the opposite sign (relative to normal) were noted.

The black line depicts long term changes in rainfall, or climate change induced rainfall shifts. It is noted that over the long term period of 1900 to present, rainfall in the Sahel has declined.

In respect to the importance of having historical data to establish 'normal' conditions, this chart shows how normal is context specific. If data was only available from 1980 to the present, one may conclude that climate change is leading to increased rainfall in the Sahel. Data availability going back to 1900 depicts a much different story, where rainfall is declining over the long term.

Understanding the limitations of data due to data availability is an important part of assessing the value of an early warning system which uses climate information. Data availability impacts the definition of normal conditions and in short, only when normal is defined can extremes be identified.

Current Information: understanding the significance of deviation from normal

The value of current weather and climate information lies in their placement within a historical context. Timescales of current information can vary, but are usually derived on daily, weekly, monthly and seasonal (3-month) periods (Mason et al 2015). In some contexts, the absolute value of current information is less useful in decision making processes, such as an EWS, as the value provides no context relative to what is the 'normal' or 'expected' value. For example, if a 1-week rainfall total is observed at 70mm, that could reflect normal conditions during the rainy season (August-October) in Tshopo Province in north-central Democratic Republic of the Congo (DRC) (or even below normal conditions in certain locations), however it could indicate a significant increase in risk for potentially hazardous flood conditions in the Hardap Region of Namibia. To contextualize current climate information to represent the deviation from normal conditions a value referred to as an 'anomaly' can be calculated. For example, the 70 mm observed weekly rainfall value may be less than what is expected (a negative anomaly) for a weekly rainfall total during the rainy season in Tshopo, DRC indicating a potential heightened risk of drought conditions, whereas that same 70 mm weekly rainfall value may be more than what is expected (a positive anomaly) for Hardap, Namibia, which can be indicative of an increase in flood risk.

Current information is becoming increasingly produced on sub-daily timescales. When information is produced on minute to hourly basis it is commonly referred to as 'nowcasting' (Alfieri et al 2012). A challenge of using nowcasting could be the lack of historical data available at that timescale, limiting calculation of anomalies, and thus identification of potential hazardous conditions.

Climate Information for EWS and Actions

One of the more acute challenges of an early warning system is linking actions to forecasts. Forecasts and actions both have time periods that need to be considered and aligned. Examples of successful preparedness actions are outlined in Coughlan de Perez et al. 2016 and include prepositioning stocks and cleaning drains. Another key component of taking action includes understanding the risks associated with 'acting in vain'. Acting in vain, in the context of EWS, is taken to refer to the intersection of 2 conditions; 1. An action is taken prior to potential impact that is influenced by the consideration of prognostic climate information and 2. The potential impact, either climatic or not, does not occur. In other words, the forecast triggered a 'false alarm'. If the stakeholders involved in the EWS have a collective risk aversion to 'acting in vain', the level (within the forecast) at which action is taken can be raised, however while 'acting in vain' will decrease, so will acting 'appropriately' before the impacts (Lowe et al. 2013).

Further, the persistence or 'lifetime' of an action is also important consideration in the scope of an EWS (Coughlan de Perez 2016). An assessment of the lifetime of an action's effect is useful in determining the risk for effect duplication. For example, if an EWS triggers the same action (i.e. distribution of bed nets) multiple times (numerous forecasts of flooding) within a narrow timeframe, further action may not be needed (bed nets given one month prior are still useful for the next month), but if it is taken, effect is duplicated.

Health and Climate Data

The notion of an EWS for health impacts has been explored for various epidemics and situations and should be included in EWS for EA. For example, the predictive capacity of climate and weather variables has been explored for various vector borne (malaria and rift valley fever, for example) and water borne (cholera) outbreaks (Thomson and Connor, 2001; Mendelsohn and Dawson 2008; Anyamba et al. 2008). Current research is ongoing to explore the potential for an early warning system for other vector borne disease epidemics such as leishmaniasis (Sweeney et al. 2014) and Zika (Paz and Semanza, 2016).

Further, the relationship of forecasts of extreme temperatures and the occurrence of extreme above average temperatures has been explored to develop an EWS identifying when and where human impacts of a heat wave are increasingly likely to occur, in the form of heat stress, and outlining preventative steps to reduce human impact (Lowe et al. 2011).

In identifying the relationship of climate and weather on health, the conversation on reducing the potential impact closely follows. In order to promote early actions that will decrease risk for potential health impacts, the skill of forecasting the hazard which drives the increase in health risk needs to be assessed. It is important to note the timescales on which each particular geophysical variable or hazard could be forecast. For example in the case of malaria, which has been noted to increase with increased rainfall (Hay et al. 2002, Pascual et al. 2008), the skill of forecasting rainfall on seasonal and short-medium terms (1-14 days) is an important step in developing an EWS. It is also important to note that the actions that can be taken must be defined in conjunction with the forecast being used. If the length of time of taking early action aligns with a skillful forecast able to produce on that time scale, then including such prognostic information on rainfall and associating it with an action of providing bed nets is useful inclusion into an EWS for EA. However, if if distribution of bed nets or other malaria prophylaxis takes 20 days, a 10-day forecast, regardless of skill, is irrelevant in triggering that set of actions. Thus, a seasonal forecast showing high probability of increased precipitation over the next 2 months could inform the distribution of bed nets.

This example is meant to stress the importance of contextualizing the actions and the forecast skill for a particular climate hazard on various lead times, outlining the potential prevented impact in terms of lag time between climate hazard and potential impact, and understanding the intermediate processes that may amplify or dampen the priority of particular actions. Further, it should be reiterated that the preceding example was presented to describe an early warning system based on short term or medium range weather forecasts, deterministic forecasts occurring on a lead time with less uncertainty than probabilistic seasonal forecasts (Palmer 2000). With the goal to inform danger level threshold development tailored to the beneficiaries of the EWS, comprehensive sector specific risk assessments should be conducted. This will contribute toward closing the gap between EWS implementation and decrease in socioeconomic impact (WMO 2015).

Section Three:
Internal World Vision Experience

World Vision's Rationale for Early Warning Systems for Early Action

Responding to early warnings related to social, political and environmental hazards and stresses protects the benefits of development investments, community livelihoods – and can save lives. Quantifying the exact return on investment is difficult due to the high number of variables involved and the difficulty in measuring the hypothetical impact of an averted disaster. However, it is noted that proportional costs are low with ongoing project costs less than 0.5% (half a percent) of area development programme (ADP) field spend (Kelly et al. 2012).

Early warning systems result in targeted and context appropriate aid due to development of customised local triggers. As a result, an increase in community awareness of local trends empowers local groups and stakeholders to take ownership of livelihood protection and local development activities (Ibid, 2012). Early warning systems for early action can promote child wellbeing. A key aspect of Child Well Being (CWB) is security and stability and protecting family members from harm. Early action to early warning protects communities and their children through adaptation and disaster mitigation activities. Livelihood protection can be promoted through adaptation mitigation activities (such as appropriate availability of seeds, or early destocking of agricultural outputs).

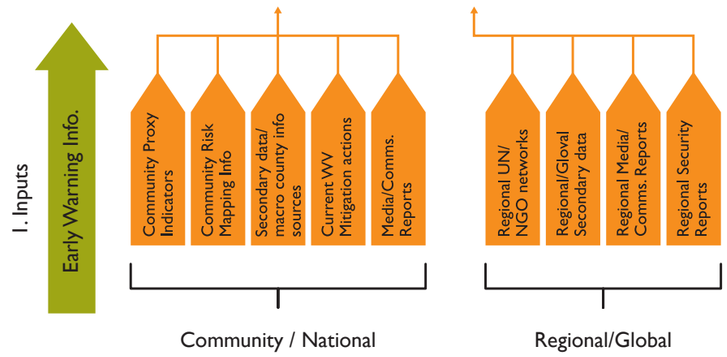
Key Components of an EWS for EA – World Vision's Experience

World Vision has been working in the realm of disaster risk reduction in earnest since the Asian Tsunami in 2004. Since then it has increased its attention to developing EWS at both the community, national, regional and global level. World Vision International has developed numerous proposals and conducted several workshops to develop an EWS for EA blueprint. For example, in 2011 a design team drew on the knowledge and insights of a multi-stakeholder working group comprising 'representatives of the Office of Strategy Management, Global Knowledge Management, Support Offices, Regional Offices, Humanitarian and Emergency Affairs, Health, Livelihoods, Disaster Risk Reduction, Peace Building, National Offices, Global Programme Effectiveness Team and others' (Taetzsch, 2014, p.3).

Through a survey of both primary and secondary data sources and consultations with over 30 subject matter experts and robust engagement with INGOs, the blueprint comprises of three components: Collection and Analysis of EW data; Translation of EW information into EA through information management and clearly defined decision-making rights, systems and procedures at each level; Recommendations of early action for a range of stakeholders.

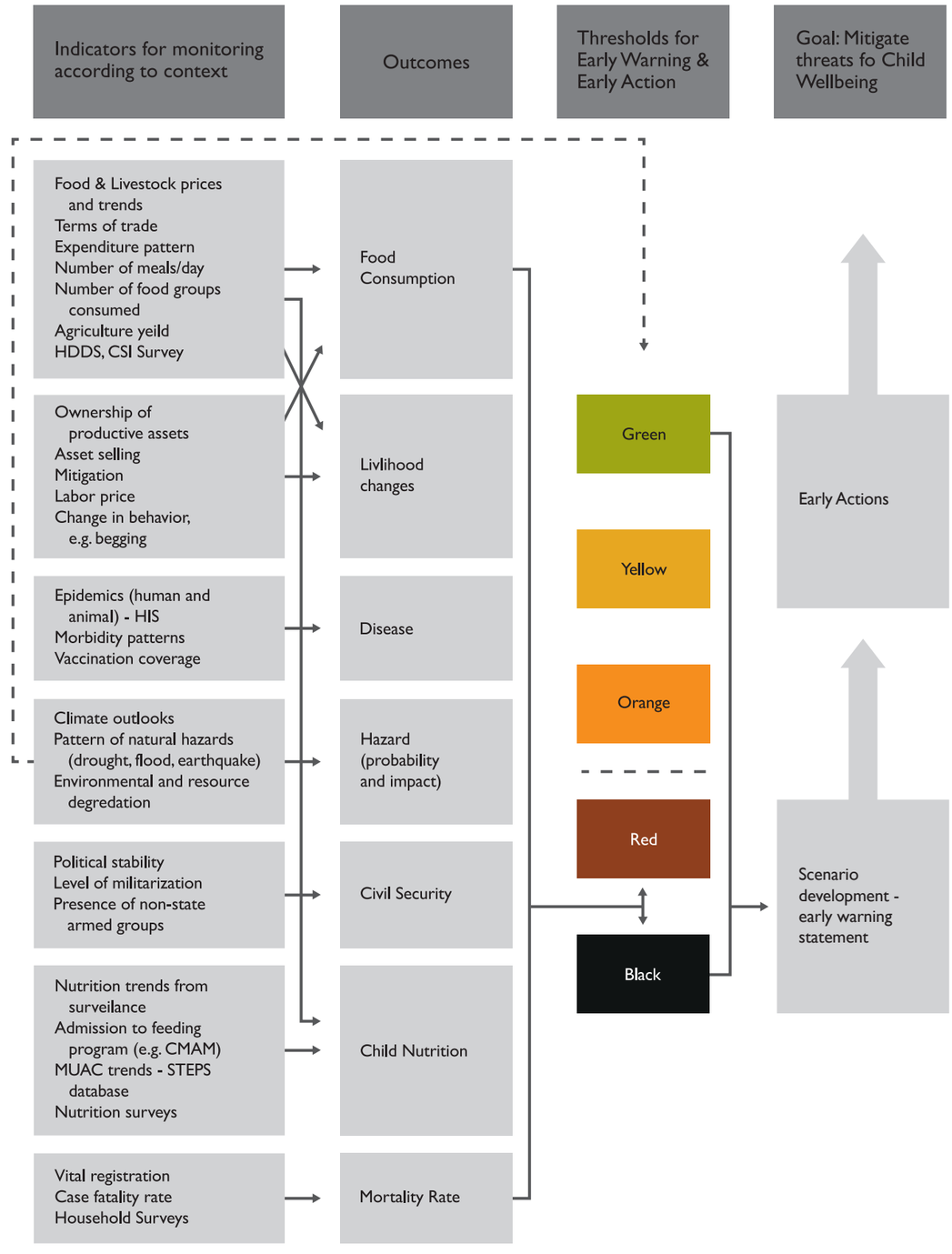
1. Collection and Analysis of EW data: data is collected from the local, national, regional and global levels, through primary and secondary resources.

Figure 1: Inputs into EWS from Kelly et. al 2013



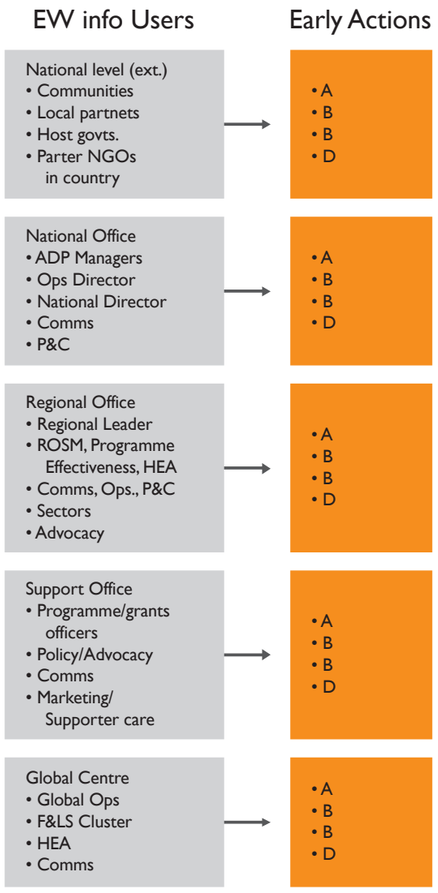
2. Translation of EW information into EA through information management and clearly defined decision-making rights, systems and procedures at each level. Once collected, the data is analysed at both the National and Regional levels. "The changing context on the ground will itself dictate the analytical urgency. By tying the rate of data communication and analysis to the community context, we capitalise on internally developed best practices and use staff time and organisational resources more efficiently".

Figure 2: Indicators and Thresholds and from Kelly et. al 2013



3. Recommendations of early action for a range of stakeholders. A set of agreed actions by a range of actors across the organisation and externally. These range from programme implementers to advocacy personnel and marketing staff. Different channels of information dissemination is needed for the different levels of EW stakeholders. Methods and technologies should be identified to meet the stakeholder's needs.

Figure 3: Early Action and Information Users from Kelly et. al 2013



Case Study One: El Niño Southern Oscillation – Testing World Vision's ability to act early

Since mid-2015, there have been strong warnings of the likely impact of El Niño precipitated droughts and floods on food security and water availability with consequent impacts on agricultural production, health, nutrition, protection, education and political stability. Currently, 60 million people around the world were already affected by the 2015-16 El Niño. The food security and agriculture sector were most affected the by the 2015-16 El Niño, with 80 percent of the funding requested in national response plans are from this sector (Taetzsch, 2016).

Food insecurity was predicted to peak in December 2016, meaning that the humanitarian needs from El Niño will last well into 2017 as well as possible impacts from the La Niña which is projected to be felt from November of 2016 (IRI forecast 2016). The funding shortfall is currently USD 2.5b, making the call for more efficient and effective funding more important than ever (see latest OCHA Report).

To prepare for El Niño, the Natural Environment and Climate Issues (NECI) team within World Vision created and circulated a set of documents in 2012/2013 about the ENSO cycle. It was shared internally through the relevant communities of practice. In March or April 2014, the NECI team were watching the possible development of an El Niño event, and alerts were sent by the NECI Director to all Regions, including Regional Leaders, Operational Directors, and Humanitarian Emergency Directors. They were provided with International Research Institute for Climate and Society (IRI), Columbia University, maps and materials on the usual impacts of an El Niño event. "By March of 2015 it was clear that "something" was up, and the same group was alerted again. By May 2015 the data was clear and another alert distributed that we were clearly at the beginning of a significant El Niño event. […] A community of practice meeting was held with Dr. Lisa Goddard, head of the IRI, on 1 September, 2015. Dr. Goddard shared the science, the way their different groups do their work, and the likely effects of El Niño" (NECI Director, Email, 2016). She also provided links to their web sites and gave space to ask questions. In 2016, an information coordination mechanism was set up to gather and share latest information on El Niño impacts, preparedness and response activities, as well as key advocacy messages to be shared with donors, funders and the UN system.

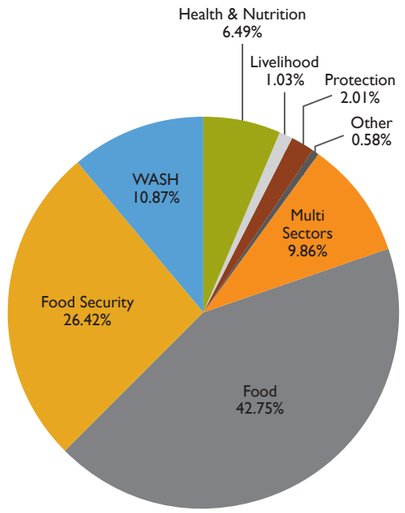


Figure 4: Total Confirmed Funding Per Sector (WV Declared Emergencies)

El Niño has affected 263 Area Development Programs and almost 1 million (940,256) registered children. An assessment carried out in April 2016 in Southern Africa revealed that children outside World Vision programmes have been forced to miss school as a result of food shortages and incidents of abuse have increased. In a recent review from the 35 National Offices (NO) responding to El-Niño crises, 26 NO's have self-reported that EWS are in place, of which 15 led to early warning action supporting El-Niño preparedness and response (Taetzsch, 2016).

The survey shows that 37% of World Vision's work was described as early action. For example, in the Southern African region, early declaration of the CAT III response recognised the situation early and aimed to get an early response rather than waiting for the peak of the crisis. As a result, in World Vision Malawi for example, only 2.5% of the community in a World Vision Area Development Programme were in need of food aid. The World Vision Malawi office asserts that this is the case as a result of the diversification of farming and the irrigation projects in the area. A breakdown of World Vision's response work by sector can be seen above with the majority of activities falling under food security and food, with a total of 5,000,000 beneficiaries reached, including 2,500,000 children (Taetzsch, 2016).

World Vision's global Southern Africa El Niño Emergency Response was extended and expanded to include La Niña preparedness activities, e.g. for flood-prone areas in some of the ongoing response countries. The recent visit of one of the UN's Special Envoys, Mary Robinson, to a World Vision Water and Sanitation intervention in the most severe drought-affected areas in Swaziland highlighted to the UN the need for holistic engagement, climate change adaptation and resilience building as well as protection of most vulnerable community members-including children.

Findings

Although successes from the review are highlighted, there is still room for improvement to World Vision's EWS for EA to ensure that the use of the ENSO prediction led to less impact on communities' livelihoods. While 37% of World Vision's work was early action, perhaps a higher percentage could have been reached with a comprehensive EWS for EA imbedded across World Vision's programming. The El Niño coordination mechanism led to: effective communications across the World Vision partnership; a successful visit of the UN Special Envoy to response work and to increased funding for emergency response.

Case Study Two: From Famine to El Niño - Ethiopia 10 years of EWS

World Vision Ethiopia has been active in EWS since 2006. Ethiopia experienced a deadly famine in 1984 to 1985 which claimed the lives of nearly one million people. As a result of the famine, World Vision Ethiopia introduced an EWS during this period in parallel with the government to avoid deadly famines. The initial focus was on information collection around agriculture, health and nutrition. Between 1995 and 2000, a unit dedicated to Early Warning was set up at national office level. Food Security (FS) and Humanitarian Emergency Affair (HEA) officers were placed in each program offices and development facilitators were given the responsibility of monitoring and reporting early warning situation in each area programme (AP). This allowed for the coverage of collection of early warning data in a range of indicators (early indicators, stress indicators and late indicators for drought monitoring). Through this system a good culture of using EW information for decision making for early action began to emerge through preparedness activities and response. An innovation arose where Area Programme (AP) managers were able to revise their budgets of up to 20% of development program. In addition to 20% of the budget which AP managers could allocate to early response activities, a National Emergency Reserve Preparedness Fund was introduced - 3 %/ year to fund preparedness activities.

During this period, a multiple level data collection system was evolving. Community information was complimented with district level, and regional government level. Furthermore, World Vision Ethiopia integrated different sources of information such as USAID's FEWS Net, and UN OCHA information. This information was triangulated and analysed at the National Office level and sent back to Area Programme

level for community development. As such, there was a bottom up and top down flow of information on early warning data.

From 2011 onwards a new early warning tool was introduced by World Vision International for use across Southern and Easter Africa called BUSTER. This tool is multi-hazard, an improvement to the previous food security focus. The hazards monitored include: drought; flood; human and animal epidemics; economic crises; social and political crises; adverse weather related hazards; risky geological activities through using a set of selected indicators. At the National level, weather outlooks for 2 weeks, 1 month, 2 months, and seasonal forecasts and 2 days and 3 daily forecasts were available through the National Met Office. However, World Vision Ethiopia only uses rainfall though they recognise the importance of other climate information. Such as the recent impacts of El Niño and La Niña. Other natural hazard indicators include: hailstorm; frost; windstorm; landslide; earthquake; wild forest fire; flood and more. In addition to climate information, social hazards are also included through indicators on price shocks and food prices as well as child school attendance rates. Furthermore, health indicators are included such as: crop pest disease/outbreak; livestock disease/ outbreak; human health epidemics/pandemics; child mortality and others. These indicators are gathered and analysed at each level of the organisation (District based Area Programme (AP), Cluster Program Office (CPO) and National Office(NO) and shared upwards. The analysis also includes forecasts for the next six months and shows alert stages: normal; watch; warning; emergency and crises. These stages are associated with a template with a list of activities which are then built into a proposal for funding request or adapting existing programmes up to 20%.

Challenges

Several challenges in the use of BUSTER have been shared. A key challenge was collecting weather information at the district level and combining it with indigenous knowledge to validate and promote better take up at the Area Programme (local) level.

As the Buster tool has 90 indicators to fill, staff have found that there are numerous indicators which are irrelevant for their context. Also, for certain relevant indicators, there has been difficulty in getting the information, such as rainfall at district level from the meteorological agency. If staff would acquire the information it would often be too late for the monthly report.

In addition to a lack of timely data, some indicators have proved difficult to measure. For example, the percentage of water sources, like rivers, reduced or increased. As there is no baseline, the number of cm increase is added but total change in the river system is not possible to measure.

Similarly, certain indicators require wide surveys, for example, percentage of farm land which is productive with crops. This information is very difficult to acquire through the district level agriculture office on a regular basis. World Vision Ethiopia conducted joint surveys with the agricultural office at the district level which provide seasonal data twice a year. However, crop production requires continuous monitoring because, for instance crops once estimated 95% productive then can be reduced in 1 month by other factors – disease, drought, flooding. World Vision Ethiopia thus requires a budget for continuous monitoring through rapid assessment techniques – which also must be devised. This can be possible by integration of such surveys into existing World Vision supported savings groups, and other programmes such as Farmer Managed Natural Regeneration.

In addition to the issue of availability and timeliness of the information, the tool collects indicators at the national level (i.e. national population number, inflation rate, mortality rate) masking regional diversity. Affected persons based on percentage of total population have been amended to reflect this in District level data where possible. As the tool is already pre-defined, staff cannot include population baseline in the seasonal calendar and vulnerability sections making disaggregated data difficult to represent. This national data can be misleading as at the community level some communities may have severely affected crops for example which as offset by good production across other regions.

Similarly, this points to the issue that the tool and system itself is not people centered. Staff have recognised that the tool should have been accompanied by a process to empower communities better to know their risks and take actions. The approach called Community Based Disaster Risk Management can be linked to the early warning tool and system. Furthermore, the EW tool and CBDRM are both focused more on scientific data with limited room for indigenous knowledge to be included to verify the data. In addition, as a principle early warning systems are expected to provide warning messages to communities at risk. However, due to low literacy rates and shortage/lack of community mass media services, it remains difficult share warnings and provide advice to community members. Use of radio and mobiles messaging must be used to reach communities to gather and share information in local languages. If local communities are made part of the EWS through CBDRM approach, this can help to early warning information and mitigation activities be trusted and used by communities.

Recently, as a result of increased rainfall, Ethiopia is suffering from a cholera outbreak with more than 208 districts are currently affected AWD (cholera) currently, but highly likely to increase during the rainy season. Current EWS must include health epidemics and hazards to ensure that development and response programmes can act early to prevent such outbreaks from occurring. Although World Vision Ethiopia is responding to the cholera outbreak, it has mainly focused its response to the drought and more funding is needed to respond to the latest outbreak. The National Emergency Preparedness Response Fund (USD 100,000.00) has been used to support this response by providing mainly: strengthening existing surveillance systems, availing logistics to detect and isolate cases; raising community awareness, providing water treatment chemicals, providing IEC/ BCC materials.

There are no clear indicators of cholera in the current early warning system. Moreover, the government is sensitive about health related issues and does not release such information in a timely manner. World Vision Ethiopia Area Development Programs have been providing preventive support to their respective areas of operation. There is currently a call for proposal from OCHA and World Vision Ethiopia is planning to scale up the response once more funding is received.

Ethiopian Government EWS

Currently, the Government has taken steps to strengthen national disaster risk management, including transforming the Disaster Risk Management and Food Security Sector (DRMFSS) into the National Disaster Risk Management Coordination Commission (NDRMCC). The NDRMCC is to ensure a more streamlined Disaster Risk Reduction and disaster response approach across all government sectors. A structure for the coordination of disaster risk management activities at all levels will be created. Regarding accountability, while the federal level structure will be accountable to the Prime Minister's Office, those created at regional, zonal, district levels as well as at Addis Ababa and Dire Dawa City Administrations levels will be answerable to their respective administrations. Lead sector institutions shall be assigned for every hazard at the different levels and they will be responsible for undertaking activities ranging from monitoring to response.

The EWRD collects early warning information on a regular basis from the lower structures. The Regional States each have their own Disaster Risk Management Bureau. Within these, Regional Early Warning Officers are based. Early Warning Offices also exist at District and Zonal level. The Early Warning Officers are responsible for the collection and analysis of information from zonal and district level offices. The Information obtained from Zonal and District level is compiled and analysed together with additional information collected from line ministries and other information sources, notably the National Meteorological Agency.

The early warning information is disseminated on a regular basis through a monthly Early Warning and Response Bulletin prepared in the national working language (Amharic) and more recently in English. This is distributed to regional states and different stakeholders in Addis Ababa, but it rarely reaches communities in time. The Bulletin contains detailed information on rainfall patterns, crop and livestock conditions, terms of trade (shoat to maize), food prices, water availability, nutrition survey data, nutrition programme coverage and relief pledges (food and non-food items) by region. The existing EWS is not well-suited to fast-onset natural hazards such as floods, and certain rapidly spreading diseases and pests, and conflicts.

Findings

Early Warning tools, such as BUSTER are very important for EW monitoring but it should be designed at the district level in order to be able to capture changes at that and the local level. In order to ensure that the local level is involved, approaches that empower communities to identify, analyse and monitor risks should be included.

In addition to supporting local level community analysis, partnerships at the District level need to be strengthened as well as inclusion of technical staff across a variety of sectors (such as health officers, water resource officers, environment officers). Staff across World Vision and the government District technical officers must collaborate and share assessments and findings. Currently World Vision Ethiopia at the Area Development Programme level work only with livelihood specialists at the District level. This needs to be strengthened so that a multi-hazard early warning system can benefit from District and local level information across a range of risks.

It is within this new structure which El Niño occurred in 2015. The Ethiopian government is said to have committed an unprecedented US$380m to drought relief efforts in Ethiopia - approximately one third of the total funding committed to the response in that country. Although El Niño impacts made headlines in BBC news in September 2015, it was not until March 2016 that farmers were receiving information through their local radio and TV station that they should expect a delay in the rainy season and wait to plant crops. Had these communities been linked to national forecasts, they could have made decisions on when and what to plant earlier. As a result of this unfortunate delay, the impact of El Niño on Ethiopia's food security left 10.2 million people left at risk.

Case Study Three: Somalia – SomReP
The cost of a disaster that didn't happen

Somalia remains highly vulnerable to drought and the affects of climate change, particularly when exacerbated by conflict and insecurity in the South Central region. While some DRR structures are in place across different regions, the capacity of these actors to implement is limited by poor financing and low capacity. The coordination of these structures with both communities and national level early warning systems also remains limited. In June and July 2014, SomRep agencies piloted the EW/EA model across three regions of Somalia. The pilot assessment examined the usefulness of each early warning indicators collected, the feasibility and the importance of each indicator in monitoring early warning at the local level. SomReP's DRM approach is grounded in community empowerment. Using a contextualised CBDRM approach developed in Somalia member agency Oxfam, consortium agencies facilitate local community efforts to establish EW. These community level EWCs are trained and supported by agencies to monitor simple early warning (EW) indicators and develop contingency plans for fast onset (floods, conflict) and slow onset (drought and climate change) disasters. SomReP contingency funds are in place to be used in case of an emergency. By linking EW indicators to their contingency plans, EWCs identify when early action is needed, and when to advocate to the implementing agency or government for actions beyond their own resources and capacity.

Further, EWC will also receive regional EW information from FSNAU/FEWS NET through radio and SMS to aid their decision making process. EWC monitor three areas including: food security and livelihoods; health and nutrition; and conflict for early warning signs of slow onset disaster at a district level.

In June and July 2014, SomRep agencies piloted the EW/EA model across three regions of Somalia. The pilot assessment examined the usefulness of each early warning indicator collected, the feasibility and the importance of each indicator in monitoring early warning at the local level.

Some highlights of the pilot's findings:

- The importance of communities and civil society taking leadership in monitoring local early warning signs that may get missed in regional early warning systems
- Traditional food security indicators are generally retrospective and can be too time consuming and expensive to carry out on a regular basis
- Monitoring and responding to early warning signs require NGO staff to be trained in new concepts and skills
- Local understanding of markets, seasons and historic context is essential

Due to late and inadequate rains during the 2014 Gu season, SomRep saw increased stress and heightened needs among the most vulnerable HHs in some of its operational areas of Badhan, Eyl, and Dangorayo districts in Puntland, and El Barde and Luuq Districts in South-Central Somalia. By July 2014, using early findings from its pilot assessment, agency rapid assessments and technical reports from FSNAU and FEWS NET, SomReP circulated an early action request to its donor community for early actions in these five districts. Within 7 days this request was fully funded by donors Swedish International Development Cooperation Agency (SIDA), and the Australian Government (DFAT). With the FEWS NET forecast of improved Deyr Rains in October, early action activities were focused on Hagaa season water crisis (Dangorayo, Badhan and Eyl), and conflict related food security issues (El Barde).

In the month of August 2015, the International Research Institute for Climate and Society forecasted that there is now a greater than 85% probability of occurrence of El Niño in the October-December (Deyr) rainfall season through 2016 in Somalia (Climate Prediction Centre and the International Research Institute for Climate and Society).

This warning was further reinforced by the Somalia NGO consortium in October 2015 who *"warned that El Niño conditions are expected to severely hit the Horn of Africa nation during this year's September to December rainy season (Deyr rainfall)"*.

In August 2015 The Greater Horn of Africa Climate Outlook Forum (GHACOF) confirmed that El Niño conditions had intensified and would affect the region during the September to December rainy season. The El Niño event was likely to lead to a wetter than normal Deyr season in parts of Somalia. The rainfall forecast indicates that the Deyr 2015 season in Somalia is expected to be above normal (45% probability of above normal rains) with a tendency of 35 % probability of normal rains in the south and central regions. This also included part of the Ethiopian highlands which contribute significantly to both Juba and Shabelle river flow inside Somalia (FAO /SWALIM, 2015).

The Somalia Resilience Program (SomReP) recognises that early action at the community level revolves around information gathering, information sharing, consultation and mobilization of community members. The SomReP Early Warning Early Action (EWEA) system is based on the following core principles 'parsimony', 'optimal ignorance', existing data/information sources, and 'best practice' - 'no regrets' programming. In line with SomReP programming principles and the forecasted effects of El Niño, farmers in the Gedo region of Somalia were advised not to plant crops as normal.

In collaboration with the Food and Agricultural Organization of the United Nations, SomReP agencies disseminated early warnings messages through SMS broadcasts to Early Warning Committee leaders in each location. Field agency focal point persons then commenced community based positioning and preparedness activities. These preparedness and positioning activities utilised SomReP's existing EWEA structure with communities in the Gedo region of Somalia. Early Warning messaging were also transmitted through radio broadcasts which reinforced community based tools and mechanisms. Key messaging included flood alerts and flood preparedness meetings for Early Warning Committees.

However the impact of El Niño flooding was less than predicated in these areas with El Niño rains been less severe in the estimated timescale and geographical area.

Based on SomReP's principle of no regrets programming in December 2015 primary research was conducted in the Gedo region of Somalia to determine what was the financial cost of actions taken based on these early warnings verses the possible cost of no actions taken as a result of no early warning and early actions. .

Data was collected in Dollow and Belet Hawa region in total 85 respondents were interviewed at household level a breakdown of respondent by village is presented in Table 1 where household surveys were also conducted covering eleven percent of SomReP beneficiaries.

Table 1: Breakdown of respondents by village in Dollow and Belet Hawa

Village	Number of Key Informants
Barabarey	7
Dayah	17
Dhaygab	7
Hamara	9
Kurtun	6
Odaa	13
Sadhumay	13
Unaa	8
Wareyle	5
Total	85

Preliminary findings to date as presented in Table 2 indicate that based on the worst case scenario and including the seeds saved by farmers which are usable a total saving of USD 42,247 was made by the survey population in terms of what they would have lost had they planted. When this sample is multiplied out by the total SomReP beneficiary population in the selected villages the savings reach a staggering USD 369,288 with losses been reduced from USD 729,998 to USD371,596 if in the worst case scenario the EA pattern of farmers remained the same. While the seeds lost due to the EW information total USD9572 for the beneficiary population.

While this is exploratory research it is statistically significant.[4] These calculations are based on the main crops grown identified through primary research in the area. Two focus group discussions with 15 farmer association members further reinforced these findings.

Table 2 –Savings made under worst case scenario based on EWEA

	Survey Population	Beneficiary Population
Number of people	85	743
Production cost losses (worst case scenario) USD	83,513	729,998
Early Warning Early action Savings (USD)	42,247	369,288
Average saving per person (USD)	497	497
Seeds lost which need replacement USD due to EWEA	1095	9572

Conclusion

This research highlights the importance of no regrets programming and the potential financial losses that can be avoided by sound Early Warning Early Action initiatives. However in order to ensure such messages are heeded in the future SomReP and other actors in the development arena must ensure that contingency funds exist to cover not only losses when a disaster occurs but also individual losses based on early actions that are based on sound informed early warning information and no regrets programming. In this case the losses based on early action of a disaster that did not occur was 9572 USD verses a potential loss of 729,998 USD.

[4] A sample size of 85 respondents was targeted during the assessment. The assessment used both random and non-random techniques to select the elements within the samples. The formula used for these calculations is shown here (this is the formula used by Krejcie and Morgan in their article "Determining Sample Size for Research Activities").

Section Four:
Best Practice from External Agencies

In order to ensure that World Vision can strengthen its current EWS, a review of external agencies best practices is needed. Innovations in processes are included below, as well as a highlight of key principles that some agencies adhere to in order to ensure that systems lead to action by key stakeholders.

Case Study One: United Nations Food Agriculture Organization (FAO)

The FAO have been one of the most advanced in indentifying the ENSO and the impacts it will have on the agricultural sector for at risk countries. This work on Early Warning Systems began in May 2015.

FAO's Early Warning-Early Action team consolidates EW Information for senior management and links them to early action recommendations in a global EWEA report to identify funding prioritization for early action. This Global EWEA report highlights countries at risk at food insecurity between a 3-6 months period. At country level, the main goal is for FAO to both support national governments to build up systems to enable them to identify risks and develop relevant action plans and to strengthen the organization's internal EWEA capabilities.

For the 2015-16 El Niño event, FAO developed early action plans for high-risk countries and proceeded to advocate for funding to take action. This worked particularly well in Somalia where donors provided quick funding for the implementation of Early Actions.

The decision to act early was rewarded. For the risk of floods, FAO implemented early action initiatives such as reinforcement of river banks, building of flood barriers and the repair of breached riverheads. As a result, no flooding occurred despite the increased rainfall and water volume. The return on investment for Somalia was 4, 910 hectares saved, an area which can produce 22 tonnes of maize which could feed 2 million people for a month.

Key findings from the El Niño included that: 1) Early actions need to be developed in local offices through a variety of sectoral experts 2) a protocol is needed for UN agencies and other key agencies on how to deal with slow onset hazards, leading to the SOP described below for El Niño/La Niña. 3) A dedicated reserve fund is needed to ensure Early Warning Action Plans can be implemented as needed. FAO has created an internal EWEA fund and has earmarked 3 million Euro of funds as seed funding to leverage more funding from a pool of donors. 4) Evidence on return on investment must be shown at the right time for continued donor support. 5) The timing of the implementation of early actions is critical. Calculations are needed for each sector to estimate time needed, for example procurement, and define the threshold to have the desired outcome. In order to achieve this, various technical sector leads must be brought together and better data and knowledge of the different activities and knowledge of lead time and links to each sector must be shared at the different threshold levels. Action plans thus become complicated and there is a need to communicate these actions in a simple and clear manner so that a range of actors can coordinate on needed actions.

To benefit from such learning, FAO have identified a number countries at risk to develop pilot EWEA Action Plans, these include: Kenya, Sudan (2017), Madagascar, Guatemala (17), Pacific Solomon Islands, Philippines, Paraguay, Haiti. This choice of pilot countries was based on a geographical coverage and where FAO capacity lie in developing action plans.

Although not made explicit in FAO's EWEAS documentation, they have been guided through 5 key principles: be demand driven, be guided by the end user, influence upper management, governments and donors through evidence in a timely manner, and work with government ministries and build on existing capacities.

Case Study Two: Interagency Standard Operating Procedures – El Niño, La Niña

The recent 2016 ENSO has once again demanded that agencies improve on acting upon information early instead of responding to humanitarian crises only when the extreme climate effects have started to impact communities. Across Africa as well as some areas of Central America and the Pacific, millions of people have become food insecure as a result of ENSO. The Secretary General's Special Envoys on El Niño and Climate have set out to develop a global 'blueprint' for a more concerted and integrated global approach for mitigating and responding future El Niño/La Niña events and other climate-related slow onset disasters.

As a first concrete step towards the blueprint, during a recent El Niño: Impacts and Priorities for Action meeting organised by FAO, WFP, IFAD and OCHA in March 2016, a commitment was made to develop Standard Operating Procedures (SOPs) to mitigate the impacts of slow-onset disasters like El Niño. The SOPs forms a collective agreement by agencies and their partners to implement pre-agreed early actions, within agreed timelines, once early warning systems indicate a medium to high risk of an El Niño or La Niña event happening.[5] It activates mechanisms and tools to ensure that the system delivers effectively and can monitor its performance. The SOPs contains 4 key elements: (1) Risk analysis and Early Warning; 2) Coordination and Information Management; 3) Programming; 4) Financing. This collective work has also highlighted the need for clear messaging and advocacy which would support the operational effort. The UN Special Envoys on El Niño and Climate, Mary Robinson of Ireland and Macharia Kamau of Kenya have been identified as key actors to raise awareness, specifically in the upcoming Southern Africa regional meetings and at the upcoming UNGA in September.

Key messages include:

- the SOP should eventually be expanded to address all weather-related slow onset disasters
- The need for linkage between Early Warning and appropriate Early Actions
- The importance of the differentiation between probability of the weather phenomenon and their expected impact
- concrete actions, and a monitoring/ basic accountability element embedded in the SOPs
- the essential resourcing/ financing mechanisms that have to be in place in order for the SOPs to be implemented

Although not made explicit, an organic working group formed to develop an SOP according to several principles: inclusion across relevant sectors, as well as a range of UN agencies, IFRC and NGOs to form an effective SOP. In addition, the group has recognised the importance of a culture change from reacting to disasters to responding early and have set out a means by which this can happen – both through identifying key advocacy messages (cost benefit and value for money) as well as documenting evidence of success. Some agencies have also reinforced this culture change by earmarking a separate fund for Early Actions triggered by Early Warning systems – such as the FAO.

[5] The exact thresholds for activation of the SOPs will be further defined during the SOPs development exercise.

Case Study Three: Met Office (UK) – Impact Based Forecasting and Indigenous Knowledge

The United Kingdom Met Office is a leader in meteorology and EWS. Through their range of experiences in providing weather services for the United Kingdom and abroad, they adopt the World Meteorological Organization's (WMO) Service Delivery Implementation Plan's (SDIP) clear processes which can be tailored depending on the country and situation which, ideally, includes four stages and six elements for a service oriented approach.

The four stages of a continuous, cyclic process for developing and delivering services are:

1. User engagement and developing partnerships
2. Service design and development
3. Delivery
4. Evaluation and improvement

The six elements necessary for moving towards a more service-oriented culture are:

1. Evaluate users needs and decisions
2. Link service development and delivery to user needs
3. Evaluate and monirot service performance and outcomes
4. Sustain improved service delivery
5. Develop skills needed to sustain service delivery
6. Share best practices and knowledge

Within the SDIP, there are clear principles of working. These principles are crucial to develop effective early warning systems in any context. They include:

1. People Centred approach: to ensure the use of weather information it has to be based on people's real life needs. According to the Met Office (UK), they will initially follow the guidance from UNISDR in Developing Early Warning Systems: a checklist (UNISDR 2006) and are actively involved in shaping its evolution as part of the Global Platform from lessons learned in their application of this internationally.

"The objective of people-centred early warning systems is to empower individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner to reduce the possibility of personal injury, loss of life and damage to property and the environment. A complete and effective early warning system comprises four inter-related elements, spanning knowledge of hazards and vulnerabilities through to preparedness and capacity to respond. Best practice early warning systems also have strong inter-linkages and effective communication channels between all of the elements" (p.2. UNISDR, 2006).

2. User engagement: A key element in the development of an effective EWS is understanding how different users will interpret and act upon warnings. An example of this includes the consideration of indigenous knowledge of weather impacts and exploring how this can enhance the communication of warning messages so they are relevant to specific communities. For example, in a project in Kenya, indigenous information and proxies for types of rainfall was used to communicate the impacts of severe weather. This was found useful in bringing scientific information to local communities by using their knowledge system instead of only scientific language. DFID's Building Resilience and Adaptation to Climate Extremes (BRACED) project in Burkina Faso led by Christian Aid is also assessing the reliability of indigenous techniques and whether this has been affected in the last few decades due to climate variability. This will help to identify where the National Met Services needs to provide additional information to communities.
3. Building on existing strengths: In a latest project to help Myanmar develop the institutions and tools needed to enable informed decision making and to implement integrated river basin management on the Ayeyarwady, the skills development process included:

Capacity building and training,

(i) developing and implementing a capacity building and training program which includes strategic planning, user engagement activities, user focused product development and stakeholder management, forecaster training, study tours, education at universities, and training in WMO Regional Training Centers; and (ii) implementing training activities (workshops, round tables, etc.) for major users (e.g., disaster management, agriculture, water resources, energy, health, surface transportation and civil aviation).

Systems design and integration, component management and monitoring,

(i) detailed design of the systems, support for procurement and support for implementation; (ii) project management, monitoring, reporting and evaluation of subcomponents and (iii) assistance with its operational systems and in the development of new services.

These principles have allowed the Met Office (UK) to support the development of EWS. Currently, it is exploring an innovative approach based on impact based EWS rather than monitoring risks only. It combines risk information and vulnerability information and sectoral information to develop sectoral action plans with a range of stakeholders and includes the use of indigenous knowledge to ensure that communications are affective.

Case Study Four: Red Cross Red Crescent Movement - Forecast Based Financing

The Red Cross Red Crescent Climate Centre (RCCC) in cooperation with the German Red Cross (GRC) has developed an approach called 'Forecast-based Financing' (FbF). FbF aims to make disaster preparedness and early action more effective. When a strong enough forecast arrives, funding is automatically released to take anticipatory, pre-defined actions before a potential hazard event materialises. The concept of FbF has emerged to address the consistent lack of early action upon arrival of credible early warnings from EWS, especially in developing countries.

Forecast-based Financing provides a organising system whereby risk analysis, understanding of potential impacts and analysis of forecast reliability are combined to provide a set of options to trigger actions when a specific forecast threshold is reached. This approach is a shift from a traditional early warning, which is based mainly on a forecast, towards an impact-based forecasting model. FbF proposes a change in the current humanitarian and development financial landscape by supporting real-time decision making and action backed by predictable funding.

A key element of FbF is that it relies on a set of pre-agreed actions embedded in 'standard operating procedures' (SOPs), which are carried out once a specific parameter of a forecast reaches a certain threshold of probability. Each action is budgeted for, which is key to ensuring that, once a threshold is surpassed, funding will automatically be used to take early action.

The FbF approach has been explored across various timescales, for numerous place-specific actions and hazards. On a seasonal timescale, for El Niño, Peru was selected as the target region. SOPs were developed before forecasts were selected, with the length of time needed for taking action informing the lead time of included forecasts. Amongst stakeholders, it was agreed that SOPs would be a function of the probability of impact. In testing the system, a low and medium probability for floods led the Peruvian Red Cross to trigger the SOPs for the implementation of pre-defined early actions and preparedness for response . The actions were implemented successfully and included training of Red Cross volunteers and local DRR committees, strengthening homes, distribution of chlorine tablets, hygiene promotion campaigns among other actions.

As El Niño had a relatively low impact in Peru, the RCCC and GRC assessed its learning from the approach, the implementation of low-cost actions based on a low-probability forecast contributed both to the immediate readiness of target communities and to reinvigorating of actions in the long term DRR plans.

Since 2008, the FbF concept has been piloted by the Red Cross Red Crescent but also more recently by WFP, together, in more than fifteen countries. Actions have been triggered in several of these, including Peru, Uganda, Togo and Bangladesh. Preliminary evidence points to significant cost-savings of the approach. In Bangladesh, where the main action supported by the pilot will consist of cash transfers in advance of floods, a cost-benefit analysis has found that every dollar invested in the programme would save three dollars in beneficiary losses. It is expected that households use cash to take anticipatory actions and better prepare, but also to absorb the expected shocks more quickly, avoiding negative coping strategies.

Key Findings:

1. Understanding risks at different levels (Government, Red Cross Red Crescent National Societies and communities) is essential to define thresholds and prioritise effective actions according to the expected risk reduction objectives and preparedness for response.
2. Build capacity over time: It is hard to adapt traditional practice –guide national partners within a broader DRM framework, a Forecast-based Financing mechanism aims at contributing to governmental DRM strategies.
3. Design understandable thresholds (danger levels). To ensure sustainability of the process the respective thresholds can be done at higher scale (river basin, regional, national level) rather than very localised.
4. Stay flexible. Actions are prioritised based on lead times, capacity of implementation, value of money, social acceptability, reduction of hardship, consequences of "acting in vain" among other criteria. A clear understanding of preparation and implementation time per action is crucial for an effective FbF impact.
5. Scale up: FbF should focus on larger target regions, capturing hazard prone areas that have high probability of occurrence of certain forecasted hazard.
6. More evidence is needed: in order to scale up the concept and to promote that it is recognised by national government within their DRR strategies, it is essential to continue building the evidence of its impact. Developing robust but flexible methodologies is crucial.
7. Advocacy for a shift of the current humanitarian and development financial landscape: more flexible funding is pivotal for effective early action and preparedness for response based on forecast.

Principles applied through the FbF mechanism include: contribute to the overall disaster risk management strategy of the respective government, being prepared through an anticipatory funding mechanism, and pre-defined Standard Operating Procedures, understating of forecast skills and disaster impacts to define thresholds (danger levels), building on existing strengths of the respective Red Cross Red Crescent National Society, prioritise actions based on capacity to reduce disaster risk and prepare for effective response.

Case Study Five: Start Network - Anticipation Window

The Start Fund Anticipation Window is an NGO-managed pooled fund aimed at catalysing early action by systemising the use of forecasting information to access a dedicated fund for forecast-based interventions. The Start Fund has been 'trialling' anticipatory interventions since September 2015 and has had four activations to date, in Sri Lanka, Ethiopia, Zambia and Pakistan. All of these activations have involved some form of joint risk analysis and advanced preparedness activities and initial results indicate that decision-making is brought earlier by the presence of a fund which incentivises earlier action (£11 million per year). Nevertheless, there is much to learn about how to translate forecasting information into early action.

ECHO have committed funds to support the development of this financing mechanism, including increasing the disbursement pot for agencies, including World Vision, to use for forecast-based actions, improving the quality and systematisation of forecasting information and developing tools to appraise the effectiveness and efficiency of early action. Anticipation alerts have been smaller grants aimed at advanced preparedness, such as prioritisation, coordinating analysis, harmonising messaging, conducting joint assessments of markets, capacity etc. The maximum amount per proposal (£300,000) and overall disbursement pot is the same as the Start Fund but anticipatory activations have tended to be much smaller in cost due to the type of activities proposed.

An intended impact of this work is to improve coordination and decision-making across the Start Network on the basis of a forecast. A small drawdown fund is also available for agencies to conduct joint risk assessment and information gathering and analysis.

The Start Network convenes a group looking at how to improve systems to enable agencies to act earlier, called the Forewarn. The group meets on a monthly basis to raise awareness and find applications for coordinated action on approaches to risk analysis, use of forecasting information, MEAL for anticipation, early action interventions, etc. The group plays a technical advisory role for the Start Fund, including in the development of national iterations.

As of yet, no case studies or reviews have been conducted however, the set up of the Forewarn window is clear – prepare funding in advance, share knowledge and experience across a network, share risk in deciding to act early and advocate as a network to leverage influence. In addition, the Forewarn group intends to build the capacity of its members to be forecasters by sharing intelligence and documenting successes and challenges.

Section Five:
Findings

The review of World Vision's internal EWS for EA experience alongside a show case of external agencies recent innovations provides findings key findings: common principles being applied in EWS for EA; opportunities and barriers to EWS for EA.

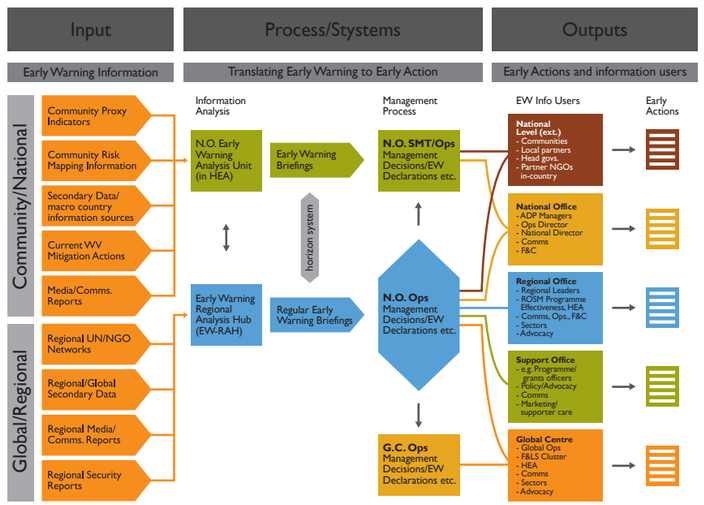
Opportunities

The evidence from the case studies above highlights several opportunities which implementing agencies can champion and implement. These include: a holistic approach; early action funding/ contingency funding ; capacity building and partnerships for information, forecasts, impacts and action planning.

A holistic approach

With the 2015-2016 El Niño there has been the opportunity to learn from our current ability to act early across various regions. A positive finding is that that World Vision created a coordination group to share impacts and advocate in key policy arenas. It also highlighted that more work is needed to embed EWS across the organization. In EWS working group developed a system through a 'back casting' approach where the decision making elements were given a priority in designing the system. Figure 4 below from (Luetz, 2014) depicts World Vision's EWS for the case of a medium risk. The figure includes several needed elements of the system: input, process, outputs. This proposal was not put in place across the organization as there has been a lack from senior leadership to champion EWS but could be reconsidered now that there is more attention from donors and the UN system on EA.

Figure 1: Medium level risk scenario
In this illustration the three components of EWEAS (1. early warning data; 2. translating EW to EA; and 3. early action and stakeholders) are shown in the context of a medium level risk scenario requiring early action at local, regional and support office levels.



'The EWEA system aims to provide managers at various levels of the organisation with the best assessment of likley future risk scenarios and to provide them with relevant and timely management recommendations for early action. In order to do this World Vision needs good consistent data analysis and systems that translate data into usable management information.' (Richard Rumsey, World Vision Director Disaster Risk Reduction & Community Resilience)

Together the three components show that an EWS for EA is much more than the collection and analysis of EW information which can often be the area that agencies spend the most time and energy focused on. It is also imperative to invest into an effective information management and clearly defined decision-making rights, systems and procedures at each level. Furthermore, the space in which EWS resides in World Vision has oscillated back and forth between being a development concern to a humanitarian emergency action. "We have many years of experience with this pendulum, and the problem is that in Humanitarian Emergency Action does not get traction in the development side. The real heart of the problem is that World Vision needs to act together for any system to work" (Shore, Christopher. Previous Director of NECI, September 2016).

Early Action Funding/ Contingency Funding

Through the various case studies it is clear that EA is supported when there is funding in place. In World Vision Ethiopia flexibility in the use of funding of up to 20% was put in place for Area Development programmes for preparedness and response. In addition, the National Emergency Reserve Preparedness Fund 3%/year was also made available to fund preparedness activities. In the case of the impacts of El Niño, this funding was not enough to prepare all ADP's to El Niño impacts and more funding was needed.

Another model of funding, as illustrated by the Red Cross Red Crescent Climate Centre is the Forecast based Financing mechanism which sets up funds available based on early action plans developed. Similar to this is the FAO funding which has been earmarked to develop early action plans and to leverage further financing for their delivery.

Finally the Start Network's Forewarn Anticipation fund and SomReP highlight the opportunity to seek funds for EA as a collective. They also underscore the opportunity to manage the risks of early action as a network of agencies and to conduct value for money assessments for EA to influence donors and development agencies.

A range of financial models are available however, administering EW funds as a network seem to be the most promising in managing risks. A combination of agencies' earmarking funds for EA with joining a network of agencies could be a powerful way of moving closer to institutionalising effective EWS and EA across development and humanitarian programming.

Capacity Building

The capacities to understand forecasts and climate information for making appropriate decisions are highlighted in the case studies herein. The World Vision El Niño case study discusses how El Niño forecast information was shared and how an internal community of practice discussion with an IRI climate scientist was made available for staff to understand the forecast. The FAO's work on El Niño focuses on national governments to build up systems to enable them to identify risks and develop relevant action plans and to strengthen the organisation's internal EWEA capabilities. This is done by providing sector experts to build early action plans as well as sharing risk information with FAO's senior management to make informed operational decisions. In addition, the Met Office (UK)'s use of the WMO Service Delivery Implementation Plan includes a key component of capacity building for key stakeholders which ranges from strategic planning, focused product development to field visits in order to provide effective EWS.

The SomReP and Red Cross Red Crescent Climate Centre case studies highlight how building community capacity (volunteers, EW or DRR committees) to understand the risks they face, coupled with consulting existing risk assessment reports can be used to avert crisis. The World Vision Ethiopia case study suggests the need to build staff capacity in order to integrate indigenous knowledge with other indicators routinely collected to improve their current EWS.

Defining Success

There is an opportunity to encourage additional discussion on the topic of defining success of an early warning system. Various tools and methods can be used to evaluate success, a cost benefit analysis being one such example, however the selection and/or weighting of these tools/methods is highly contextualized.

It has been established in this review that 37% of World Vision action is characterized as 'early action', with 5,000,000 beneficiaries reached. While this level may initially seem sufficient, it is difficult to ascertain. It is an opportunity to review how World Vision has defined its success criteria before the development of the EWS, and further, how that success criteria should be defined moving forward. More research should be conducted to explore how EWS establish success criteria in advance in order to evaluate success of early action. One source with potential value towards establishing success criteria could be the Global Targets section of the Sendai Framework, including b) Substantially reduce the number of effected people and c) Reduce direct disaster impact on economic loss (UNISDR 2015). For

World Vision, an evaluation of economic loss due to El Niño driven drought would require a substantial amount of investment, which, if the overall budget were to remain static, would limit the allocation of funds for beneficiary impact.

Partnerships for Information, Forecasts, Impact and Action Planning

Several of the case studies highlight the role of partnership with other agencies in order to improve access to weather information and climate forecasts The SomReP and World Vision Ethiopia case studies both demonstrate the use of FEWS NET to access credible forecasts. Similarly, the World Vision El Niño case study highlights how partnership with a leading climate research and forecasting institution, IRI, can allow for a various range of practitioners to have timely discussions of forecasts and increased probability of risk. The case study from World Vision Ethiopia, demonstrates the need to address climate information on a variety of timescales; including outlooks for 2 weeks, 1 month and 2 months, seasonal forecasts for 3 months and 2 and 3 day forecasts through the National Met Office. It also highlights the need to have strong District level data from government sources across the range of risks, from various government ministries and departments. Discussions involving various sector experts to note potential impacts are useful to guide action planning, as noted in the FAO case study. Furthermore, the UN El Niño SOP recognises the need for UN and other key agencies to share risk information and forecasts and jointly develop action planning. The Start Network highlights how to share information and forecasts across a range of agencies, centralizing decision making, reducing reputational risk for any single agency.

Barriers to translating Early Warning into Early Action

An internal review conducted for World Vision identified systemic barriers of converting information into action (Taetzsch, 2016. p. 8). Alongside World Vision's experience, a 2013 report from the Science for Humanitarian Emergencies and Resilience scoping study, which aims to provide the UK Government's Department for International Development (DFID) with evidence-based recommendations on future research priorities for risk assessments and early warning systems also provides findings on challenges. The focus of the review is on weather-related hazards (i.e. cyclones, floods, droughts and landslides) for humanitarian and development purposes in low-income countries across Africa, South Asia and the Caribbean (HTSPE Limited and IMC Worldwide Limited Joint Venture,2013).

Overall 190 papers, reports and online resources were reviewed with a fairly even coverage across each region and on early warning systems, risk assessments and analytical tools, and on how information is used to inform decision making. Early warning systems require several components, i.e. risk knowledge, monitoring, dissemination and communication and response capacity. A weakness or breakdown in any one part of an early warning system can result in its failure (UNISDR, 2006; Kundzewicz, 2013). The report's findings suggest a very mixed picture with good examples and continued progress on early warning systems in parts of South Asia and the Caribbean but far less progress on national risk assessments and a lack of integration between EWS and risk assessment tools. The main findings on risk assessments are more limited as, with few exceptions, there was a lack of data on detailed, quantitative risk assessments for humanitarian purposes in Africa, the Caribbean and South Asia.

The review highlights specific opportunities to improve both early warning systems and risk assessments in each region, particularly with regards to (i) flood forecasting and the communication of drought forecasts in Africa (ii) drought and flood forecasting in the Caribbean and (iii) early warning systems for landslides in Nepal, an important hazard in terms of fatalities (Brown, 2013).

Together the internal review by World Vision and review by Practical Action Consulting (Brown, 2013) provided a comprehensive assessment of barriers to translating EWS into effective EA. These are grouped into internal and external barriers and ranked in importance.

Internal barriers include: 1) Culture of risk avoidance in the sector; 2) A reactive operational model; 3) Insufficient financing for early action; 4) Lack of decision making capacity ; 5) Projects rather than Institutionalisation; 6) Narrow focus on preparedness; 7) Weak information management and content; 8) Insufficient warning interpretation at community level; 9) Missing guidance for appropriate actions; 10) Focus on information rather than utility; 11) Disagreement on EWS accuracy and appropriateness; 12) Missing health indicators and lack or cross sectoral coordination; 13) Lack of understanding coping strategies

External barriers include: 1) Unclear roles and responsibilities; 2) Media coverage; 3) Political considerations of affected countries; 4) Political considerations of donor governments.

Internal Barriers to Early Action

1. Culture of risk avoidance in the humanitarian response sector - the 'fear of getting it wrong'

Reducing the penalties for failure is a positive incentive for early action (EA). Slow onsets demand a change in mind set. EA requires acting on uncertainty. However, with financial and reputational concerns at stake, there is a powerful incentive to delay humanitarian intervention until it is too late to save livelihoods.

Staff fear that they will have their risk mitigation actions questioned as there may be no evidence of success if the crisis is averted. If an agreement has not been made on no regret strategies then acting early may be a financial and reputational risk.

"World Vision does not always react to these kinds of disasters (slow on sets) fast enough because they have reservations about the consequences of acting too early" (Taetzsch, 2016, p.9).

One respondent also mentioned that country offices do not respond to forecast done months in advance with very little detail on its impact on their ADPs, "it's only as information becomes more specific that country offices react but this is often already too late". " I have a lot of priorities and plans that are agreed and programs I am managing and you are telling me something that is in the future and uncertain » People on the ground want specifics" (Taetzsch, 2016, p.9).

Financially, scarcity of funds creates an environment in which waste avoidance becomes a priority; the undeniable needs of mature disasters are more likely to receive funding. Additionally, the information requirements of many donors become easier to meet as the disaster grows (and thus becomes easier to quantify). Overcoming this reluctance to act – and learning how to responsibly calculate the risks we must take – is perhaps the most challenging barrier to Early Action (Kelly et al., 2012).

Leadership at country level is critical for early response, in a recent review of World Vision's experience in the El Niño response, it was uncovered that most of the World Vision's NO senior leadership do not see the importance of early action and how it can prevent malnutrition with children " we don't get many directors saying ' the rains are going to be below normal, so what do we do about this, how do we need to engage" this is something that does not happen…until you start seeing others actors getting ahead of us or you start seeing that is has been caught by donors' (Taetzsch, K. 2016, p.6).

The traditional humanitarian response model embraces the philosophy of 'hurry up and wait.' Even the terminology World Vision uses – 'response,' for example – highlights the reactive nature of established humanitarian practices. This is understandable – it is much easier to prioritise action, mobilise surge capacity and launch new programming once a disaster is defined, documented and undeniable. As mentioned below, mature disasters also attract media attention, thus helping to facilitate large-scale fundraising. This operational model, however, is tailored towards rapid onsets disasters. When applied to slow onset crises, it is inadequate (ibid, p.6).

2. A reactive operational model

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3. Insufficient financing for early action

Both the internal and external reviews highlight that financing for early action is a key challenge. Short-term, unpredictable funding, and the void of earmarked funding for EWS, continues to be a challenge. Drought responses are chronically underfunded; the 2011 Horn of Africa Response to Drought (HARD), for example, received roughly 20 percent of the requested funding. This problem has ties with both media coverage and the challenges associated with public mobilisation for slow onsets.

A lack of resources and a lack of strong and robust evidence also contribute to decision makers' reluctance (internally and externally) to commit the funds they do have. Financing challenges are compounded when roles and responsibilities are not clearly defined.
This can leave gaps in responsibility for financing actions across all levels (community, sub-national and national). Furthermore, if responsibility for financing certain actions is parcelled out (e.g. dissemination of information, capacity building, maintenance and upkeep of hydro-meteorological stations); it may lead to disconnected system. Thus both the scarcity of funding for early action, and the lack of EWS and action being fully prioritised and funded, impact any real ability to act before a disaster takes root.

4. Lack of decision making capacity

Within World Vision the review also highlighted the fact that humanitarian (HEA) managers struggle to effectively advocate and generate action within their respective NO's. In most offices, the HEA manager is not a member of the Senior Leadership Team (SLT) and must thus rely on their line manager to carry the report forward. A central issue is that those who generated the report have no recourse to ensure actions be taken, especially when those responsibility are outside the HEA department. In addition, staff operating in contexts with established humanitarian actors found the Buster report difficult to share with their peers, including for external use for consortia.

'…we know enough to make good decisions about managing the risks of climate-related disasters. Sometimes we take advantage of this knowledge, but many times we do not.' (Chris Field, IPCC Co-chair, WG II)

The need for timely, accurate and predictive information makes information management a key task in the proposed EWS. Any EWS must take steps to triangulate, verify data and provide timely dissemination. However, the delayed response in the Horn of Africa did not result from a lack of dependable information or warning. The existence of FEWSNET drought warnings in early 2011, for example, failed to motivate large-scale action (despite their demonstrated accuracy). This is equally true for World Vision and other stakeholders and INGOs. Decision makers are not always able to efficiently access the information most relevant to them and trust that there is an agreed interpretation of data to set off a trigger for action. Thus, inadequate information management is a key inhibitor of EA (ibid, pg.6).

5. Projects rather than Institutionalisation

Similarly the external review notes that in order for the EWS to be adopted and scaled up is ensuring that it becomes integrated into local government policies, plans and institutions, with support from national government legislation, policies, plans and budgets. This integration into development plans and policies remains a key challenge for many community based EWSs and requires a shift in prioritising funds and making them available for early action. This is also true within World Vision. Funding is needed for both an organisational EWS as well as EWS at each Area Development Programme through access to latest climate information and other trends. Thus, there is a need for linkages across EWS from local to national levels and coordination of the information collected and shared and actions taken.

6. Narrow focus on preparedness

In addition to the narrow focus on response by senior leadership and the culture of most organisations, an EWS which is narrowly focused on disaster preparedness will not create the needed links to disaster risk reduction, climate change adaptation, multi-hazard EWS. A joined up approach would help to make the most of scarce resources of government and agency budgets leading to greater efficiencies and sustainability of the system. Furthermore, at the local level, community base disaster risk reduction must include latest climate information to be effective across a range of risks.

7. Weak information management and content

Of particular concern were issues related to internal capacity to collect the data necessary to complete the Buster indicator dashboard, dealing with contexts with affected by a chronic issue or multiple hazard profiles, and effectively turning early warning into relevant actions across responsible departments in the National Office. What was clear was that the recommended actions were insufficient and required substantial improvement.

In addition, the June 2016 snapshot of World Vision's El Niño response highlighted that EWEA should be part of M&E system at ADP/project level so EA plans are align to the context, and must have 'no regrets' features such as river bank strengthening, WASH and storage improvements, preparedness mechanisms. EWEA must benefit beneficiaries and build community resilience and if predictions of EW are not accurate, actions should be seen to reduce vulnerability and encourage resilience.

Furthermore, World Vision's EWS should be for both a system for professional disaster managers and another system for Area Development Programming (ADP) at the community level. Automated weather station data is needed and to be discussed at each ADP to inform programming on a routine basis. If automated weather stations are difficult to fund, remote sensing and earth observation can be used. In this way an EWS can be based on community needs as opposed to organizational needs. Both needs are valid, but World Vision needs to recognise the importance of having both systems in place mutually reinforcing each other.

The external review by Practical Action consulting suggests that one of the greatest technical challenges within an EWS is the processing and transmission of weather and climate information to users. The need to ensure that information is relevant, accessible and timely and reaches end users, especially the most vulnerable within affected communities is essential. Furthermore, sharing information in appropriate ways (TV, radio, mobile phone) in the appropriate local languages to different communities who may also be on the move is a challenge.

8. Insufficient warning interpretation at community level

In addition to local coping capabilities, the 2013 review by HTSPE Limited and IMC Worldwide Limited Joint Venture shows that national or sub-nationally developed warning systems are not always appropriate for, or applicable to, local communities. They assert that for an effective EWS, it is necessary that the system is linked to local risk and hazard assessments, and that communities fully participate in the design and communications of the system. Another significant challenge is the determining of appropriate thresholds for action and how these will be interpreted by communities which are often removed from the information gathering process.

9. Missing guidance for appropriate actions

Within World Vision, staff endorsed EWS in principle, but were clear that the current Buster reports provides guidance on what steps should be taken for the hazard/index levels generated by the report, however the capacity and culture of reviewing and applying the recommendations is low. Similarly, staff largely welcomed the Buster feature that allows for the user to track the status of recommended actions, but few make use of this feature, either for tracking their departments' progress or for accountability across departments involved in the response.

10. Focus on information rather than utility

Information does not automatically lead to positive decision making. The challenge with early warning systems is that they focus solely on information collation. This has been proven to not actually bring about early action. Moreover, the Horn of Africa crisis did not suffer from a lack of information but lack of action due to internal and external systemic barriers.

In the review of World Vision's use of their BUSTER tool in 2014 as mentioned above, the design team took a 'backcasting' approach and felt that it was necessary to actually turn the system on its head and start with early actions and work backwards to the information analysis requirements. The initial concept was not to start with the information analysis process but to deal with the constraints to the early action and shape the system requirements and management information needs rather than information analysis. One disaster management professional elaborated "we need business intelligence that is tailored to decision makers and implementers. Rather than keeping all informed, we need to focus on decision-makers at field, regional, support office levels and develop systems to suit their needs. By approaching the system from a "management point of view, identifying who the managers are, what types of decision they need to make to take early action, what they need in terms of information developers should build on the premise of what is going to work as opposed to conceptually brilliant". Thus the centre piece was not about the data but the process, and decision making capacity at various levels of the organisation.

In terms of successes, staff discussed a number of situations in which the Buster report had effectively flagged a crisis that had not been noticed, enabled an update to community preparedness plan or prepositioning of resources---precisely the early actions the tool was intended to initiate. In South Africa, the buster helped staff to identify an emerging flood threat in Limpopo, while in Kenya, the Buster report proved essentially for confirming early warning reports coming out of the National and regional platforms. Similarly, the Mauritania team not only raised an early alarm this last quarter, but also were able to use the buster to advocate/mobilize funds from two institutional donors. Malawi noted that their early warning reports were instrumental to triggering the reallocation of ADP funds to reduce risk in an area prone to flooding.

In the West African Regional Office, staff working in Ebola-affected countries, recognised the emerging epidemic early enough but were unsure how to proceed. In this case, staff remarked that the early action recommendations in the Buster report were not well tailored to type of situation and must be enhanced with more detail tasks for rapid-onset epidemic response. Similarly in Mauritania, the Buster effectively flagged potential problems tied to national elections, but did not capture the riots that followed, nor provided much insight for how the NO might deal with a situation of urban unrest.

11. Disagreement on EWS accuracy and appropriateness

Without an agreement on indicators and the process to be followed (collection, monitoring, analysis, dissemination and action planning), the external review by HTSPE Limited and IMC Worldwide Limited Joint Venture contends that it is difficult for an EWS to gain national (or regional) recognition and support. Dispute over the accuracy and appropriateness of EWS process is a major obstacle to EWS effectiveness. Disagreement can lead to duplication of efforts by various agencies, conflicting messages and disengagement from early warning by key stakeholders (policy makers and communities). Also as seen in the World Vision Ethiopia case study above, each level from local to national EWS should link and reinforce each other in order for appropriate actions to be taken in a timely manner.

12. Missing health indicators and lack or cross sectoral coordination

As seen in the case study above from World Vision Ethiopia, there is a significant gap in the current early warning system in order to track health indicators. As a result, after the drought was followed by rainfall, a cholera outbreak ensued. Without monitoring health indicators and the ability to share the information in a timely manner, it was not possible for World Vision Ethiopia to act early but to mainly respond to the outbreak. A significant challenge is to access the health data from the current government and health services. If this information was available, gathering of cross sectoral experts is needed to develop early action plans that include health to overcome the potential for epidemics and outbreaks.

Together, the internal findings on barriers provide a clear list of significant challenges to overcome. Recommendations on how to do so will be provided below.

13. Lack of understanding coping strategies

Critical to understanding how a community is dealing with stress, coping strategies must be captured by the EWS (Buster) indicators. Presently, the Coping Strategy Index is the principle data-point used to gauge stress in affected population. In some contexts however, some coping strategies represent temporary or seasonal actions taken by affected populations, rather than general distress. For instance, rural-urban migration in pastoralist communities is often temporary by design, and not necessarily an indication of exiting or irreversible damage to traditional livelihoods. In this sense, the EWS tool (Buster) would benefit from a more nuanced set of indicators gauging stress and the significance of the strategies being used by the affected population.

Together the reviews highlight twelve significant and mutually reinforcing barriers, most of which are systemic, and take persistence to change. Thus, the internal barriers to acting early are significant and added to this are external barriers to overcome. These are described below.

External barriers to early action

The systemic internal barriers that agencies face are magnified by external barriers. These unfortunately are numerous and in most cases are systemic and require a change process across the political system and cultures of agencies and communities themselves.

1. Unclear roles and responsibilities

Similar to the roles and responsibilities to financing for EWS as seen above, in many systems the distinct roles, responsibilities and mandates of different institutions/ bodies engaged in EWS have not been clarified. Typically there are a large number of agencies and organisations involved in supporting an EWS, and coordination and cooperation remains a challenge, particularly where there is no guiding framework, policy or consensual vision underpinning the EWS. Having a vision and consensual framework is critical as most national government agencies with an early warning mandate are focused narrowly on emergency preparedness and response, without necessarily prioritising linking up with other actor or other parts of government, including those mandated to tackle underlying causes of risk.

Coordination and cooperation challenges are significantly multiplied in areas where trans-boundary or transnational cooperation is required (HTSPE Limited and IMC Worldwide Limited Joint Venture, 2013).

2. Media coverage

Media coverage significantly influences humanitarian responses; media attention sensitises the general public and influences the political decisions of national and donor governments. From the disaster response perspective, humanitarian agencies are often unable to raise the funds necessary for large-scale interventions until the media draws attention to the disaster. However, in the case of slow onset disasters like drought, media coverage prefers to follow what has happened (with pictures) rather than what might happen. Therefore, 'leading' the media to cover slow onsets earlier is a key challenge (ibid, p.4).

3. Political considerations of affected countries

Although World Vision's work with many national governments represents an institutional strength, the fact remains that our activities may be limited by political considerations. For example, case study research on World Vision Ethiopia's Early Warning System revealed that during the 2011 drought in the Horn, World Vision Ethiopia could not mount an official response to the developing disaster – or even conduct a formal nutritional assessment – until the Ethiopian government issued its own disaster declaration. Similarly, it could not access the needed health information to monitor the outbreak of cholera.

In other contexts national governments may perceive declaring a slow onset emergency as an admission of failure, and thus will only do so when the situation is critical. EWS effectiveness is thus severely compromised where warning information is politically manipulated or suppressed. This is often a critical factor in the slow transition from EW to EA. The reasons why national governments may be slow to act depend on the particular context within the affected country. Factors are likely to include national politics, national institutions, capacity, the strength of civil society and the independence of media. When a crisis is upon them, governments may remain reluctant to request assistance for fear of being blamed for not acting quickly enough (HTSPE Limited and IMC Worldwide Limited Joint Venture, 2013, p.5).

Developing an effective EWS is especially challenging in scenarios where there are restrictions on data collection, analysis and information sharing because of conflict or strong political interference In such situations, the legitimacy and acceptance of the system can be undermined.

4. Political considerations of donor governments

For their part, donor governments are reluctant to mobilise resources until credible data is available to justify releasing spending for a specific disaster. Reluctance to fund disasters that have yet to occur and/or peak is understandable given the pressure on aid budgets and global scale disaster management portfolios. Globally broadcasted images of the disaster induced help release funding – increasing political pressure/justification as well as providing irrefutable evidence of a disaster. Donor governments may also be more or less responsive to early warnings depending on their geopolitical or historical relationship with the affected country. This influences the incentives and risk preferences under which donor staff operate, resulting in delays or the placement of restricting conditions on funding (ibid, p.5). There is growing evidence, such as that found in the Forecast-based financing case study, that donors are becoming more sensitive to the value in releasing funding based on a forecast.

Section Six:
Conclusion and Recommendations for Effective Early Warning Systems and Early Action

A review of World Vision's experience in EWS as well as key external agencies provides rich information on the direction of EWS for EA. Through a discussion of climate information, it is clear that one of the biggest challenges of an EWS is identifying and prioritising preparedness actions based on climate forecasts. In selecting which climate information is most appropriate for an EWS, the skill (confidence) of the forecast needs to be known and risk aversion to acting in vain should be defined. An increased use of climate information and greater understanding of how to link climate information, including forecast information, to disaster risk reduction and preparedness action should be a goal of future capacity building exercises for personnel working in EWS. However, there are limits to how much development and humanitarian actors can interpret forecasts without consulting climate experts. Partnerships should be developed in country where highly skilled climate experts exist, potentially seated at national hydrological and meteorological service office, or regionally at centre for climate excellence.

Through World Vision's evolving experience in EWS, a holistic approach (see Section Five) has been developed that recognises that EWS are much more than the data collection and analysis. Effective early warning systems include: collection and analysis of EW data; translation of EW information into EA through information management and clearly defined decision-making rights, systems and procedures at each level; and recommendations of early action for a range of stakeholders. This should be done in partnership with existing National Meteorological and Hydrological Services.

The case studies, both internal and external, highlight several findings of this review of EWS for EA. They include opportunities as well as barriers. Opportunities comprise of principles (See Annex 1) to be determined by EWS stakeholders to guide a holistic approach, policies, and procedures. This may help in creating linkages across community based EWS which have proven effective and EWS at the agency and national government levels. There is currently little research which explores how best to link these different systems.

Building capacity of staff in different sectors to make use of information and build cross-sector action plans is an area of investment that is needed to improve EWS for EA. Linked to this is the systematic and multi-stakeholder agreed earmarking of funding for EA based on action plans before a potential crisis. In addition to the opportunities, several barriers have been identified.

Internal barriers include: 1) Culture of risk avoidance in the sector; 2) A reactive operational model; 3) Insufficient financing for early action; 4) Lack of decision making capacity ; 5) Projects rather than Institutionalisation; 6) Narrow focus on preparedness; 7) Weak information management and content; 8) Insufficient warning interpretation at community level; 9) Missing guidance for appropriate actions; 10) Focus on information rather than utility; 11) Disagreement on EWS accuracy and appropriateness; 12) Missing health indicators and lack or cross sector coordination; 13) Lack of understanding coping strategies.

External barriers include: 1) Unclear roles and responsibilities; 2) Media coverage; 3) Political considerations of affected countries; 4) Political considerations of donor governments. The opportunities and barriers have led to recommendations (see table below) which may help to overcome these barriers.

Opportunities	Recommendations for Early Warning Systems for Early Action based on Case Studies
Principles; Holistic; Financing; Capacity Building;	• Develop principles for EWS for EA to guide policies, focus investments and develop partnerships. • Provide a separate funding stream for early action and routine data collection and analysis. Use the rising evidence base to influence senior leadership/donors perception of the cost saving benefit of pre-disaster investment, based on weather forecast and climate outlooks. • Work in coalition to seek funding for EWS for EA and manage risks of the decision to act early. • Build a holistic approach EWS for EA which includes decision-making, bridging humanitarian, government and development departments. • Build capacity of communities and staff and develop needed guidance to: understand climate and weather forecasts, understand and monitor current risks and develop cross sector early actions that can be taken up at the community level. • Explore capacity of climate expertise at national hydrological and meteorological offices, and/or at regional centres for climate research/forecasting and develop partnerships. • Design and update current EWS for EA in synergy with national hydrological and meteorological offices and key stakeholders. Advocate for formalised agreements with the met services, and support them in outlining climate risk and climate forecast information.
Internal Barriers	
1. Culture of risk avoidance in the sector; 2. A reactive operational model; 3. Insufficient financing for early action; 4. Lack of decision making capacity; 5. Projects rather than Institutionalisation; 6. Narrow focus on preparedness;	• Use evidence base, including value for money, to showcase benefits for agencies and communities which have acted early to fundraise and influence senior leadership. • Include knowledge of EWS into job specifications and annual reviews -especially for senior leadership and key personnel for ownership and accountability. Develop a minimum standard for EWS knowledge. • Embed EWS for EA into development programming and humanitarian response through project models, national office strategies and programme design, monitoring and evaluation.
Internal Barriers	
7. Weak information management and content; 8. Insufficient warning interpretation at community level; 9. Missing guidance for appropriate actions; 10. Focus on information rather than utility; 11. Disagreement on EWS accuracy and appropriateness; 12. Missing health indicators and lack or cross sectoral coordination; 13. Lack of understanding coping strategies	• Develop partnerships with key organisations, such as National Met Offices, FEWS Net and relevant ministries, for data gathering, analysis and action planning. • Involve community in risk analysis, action planning and feedback on successes and challenges. Explore the potential for innovative approaches to link/engage across stakeholders. • Identify context specific indicators through collaborative discussions with key sector experts and key partners and include conflict and health indicators to avert disease outbreaks and violent conflict as well as increase coordination for action plans. • Ensure timely, appropriate and verifiable information is shared with key stakeholders (internal and external partners) so that actions can be taken at the right time. This requires partnerships with national met offices and external agencies. • Develop clear communication and dissemination systems tailored to key stakeholders – i.e. senior management, government, partners and communities.
External Barriers	
5. Defining roles and responsibilities	• Agree on a joint EWS led by the national government and on indicators and thresholds and on roles and responsibilities of different agencies. • Develop pre-defined action plans based on agreed thresholds through cross sector discussions with both development and humanitarian experts. These can expand on existing contingency plans.
6. Media coverage	• Build partnerships with media – international, national to local- to disseminate EW information and showcase achievements of early action, potentially identifying actions taken and best practices in addition to reporting number of lives and/or funds saved.
7. Political considerations of affected countries	• Work with relevant ministries to develop coordination as well as information sharing through standard operating procedures and memorandums of understanding.
8. Political considerations of donor governments	• Organise field trips for key politicians to see EWS for EA activities underway and highlight cost savings that can be shared with their electorate. • Promote inter-governmental peer-to-peer learning.

For World Vision International to move forward, a consideration of the findings and recommendations are needed by the EWS Steering Group to inform the development of the World Vision's EWS roadmap. It is hoped that the findings and recommendations can also inform other agencies to improve on current EWS for EA.

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Annex 1:
Principles for Early Warning Systems and Early Action

A set of common principles have emerged from the review of the internal and external case studies of EWS. These can be used to develop an EWS for EA or review current practice. Principles that were mentioned in several case studies include:

1. People Centred approach: empower individuals and communities to "act in sufficient time and in an appropriate manner to reduce the possibility of personal injury, loss of life and damage to property and the environment" (p.2. UNISDR, 2006).
2. 'no regrets' approach: "'No-regrets' actions are actions by households, communities, and local/national/international institutions that can be justified from economic, and social, and environmental perspectives whether natural hazard events or climate change (or other hazards) take place or not. 'No-regrets' actions increase resilience, which is the ability of a "system" to deal with different types of hazards in a timely, efficient, and equitable manner. Increasing resilience is the basis for sustainable growth in a world of multiple hazards" (WRI). [6]
3. demand driven: work with agencies, ministries, specific countries where there is a desire to improve current practice. Understanding the perception of risks from these stakeholders' perspectives.
4. champion EWS for EA to: influence upper management, governments and donors through evidence in a timely manner.
5. work with government ministries and different levels: contribute to the overall disaster risk management strategy of the respective government.
6. build on existing strengths of the agency or partners: this will allow for progress to be made and identification of partnerships to fill gaps.

Explicitly articulating principles that guides an EWS for EA can be a way to communicate the norms, rules, and values of the system and help to govern an agencies EWS policies and objectives. It may also help to build partnerships with other agencies.

[6] A no-regrets approach may not be fitting depending on hazard, location, forecast and other variables. Future research is needed to evaluate the cost of acting in vain and selection of suitable actions

Annex 2:
Interview Questions

Objective of Interview: Reflective practice to embed their learning; to bring out needed information; to build a working core team regionally so that development of EW system can be driven by key stakeholders.

Key Themes (update this after lit review): Key principles of EWS; information gathering and end user; organisational buy-in, decision making and accountability; innovations and collaborations.

Questions will only be asked where documentation provided did not provide answers or required clarifications and additions.

Overall and Warm up questions:

What does success look like in an effective EWEA system?

Added value of WV EWEA system?

What key principles would you identify for a successful EWS?

Information Gathering and Users:

What type of information is needed for your decision making? Where you sit in the organisation.

What information does do you already collect – via communities. Via existing data systems (FEWSNet: weather and climate, markets and trade, agricultural production, livelihoods, nutrition, and food assistance). What information gaps exists? Do you have examples of indicators to share?

Does WC currently have existing information gathering through ADPs into EW management systems?

Linking internal analysis with external in complimentary way: What are the key external data sets that are crucial for your context? (i.e. FEWSNet: weather and climate, markets and trade, agricultural production, livelihoods, nutrition, and food assistance, conflict).

Who gathers the information? And who decides threshold and EW actions? What triggers to determine severity of situation (e.g.IPC system). What agreed triggers do you have in place now? How effective is this currently?

Is this someone's specific role? i.e. EWS coordinator?

Do you have a technical platform that gathers the information and displays it in a user friendly way?

What information does your agency need to share – and with whom?

Who receives information? What decisions need to be made and in which spaces? From previous reviews stakeholders have been identified within World Vision: Community level: community leader; EW/DRR community groups; NO level: ADP managers, Ops Director, ND, Comms, P&C, HEA coordinator; RO level: R Leaders (R&L; HEA?), ROSM, PE, HEA, Comms, Ops, P&C, Sectors, Advocacy. SO level: Programmes, grants officers, Policy/Advocacy, Comms/Media, Marketing, Supporter Care. GC level: Global Ops; F7L GP, HEA, Comms, Sectors, Advocacy). Are we missing any critical stakeholders?

Has the info been tailored to the user group?

Organisational Buy in; Decision Making and Accountability

How would you describe the organisational commitment to EWEA? What does this look like and in which spaces?

Incentives: what is needed for the different information gathering and decision making spaces at the different levels? (the lack of "incentives" for those that enter data to analyse and determine action based on analysis (NO and ROs).

What is the process for an agreement on appropriate Early Actions?

Where is the decision making authority currently placed and is it at the right level to be sustainable?

What opportunities are there to adapt World Vision's ADP programming (or implementing agency programming)? What successes and what challenges have you experienced? What recommendations would you suggest for improvement?

Will this change in your design, monitoring and evaluation approach? (WV:LEAP 3?) What would your suggestion be to strengthen adaptive programming; (i.e. EWS Project Model, indicators in Resilience and Livelihoods technical programmes (TP), indicators for EWS across all TPs?)

What role to support National DRM systems?

In El Niño countries: Did (WV ADP) hotspots wait until CAT 3 declared before adapting programming?

Innovations and Collaboration Opportunities:

Which partnerships were built with key organisations? (i.e. National Met Office, Forecasting Technology firms; Telecomms, government departments, UNDP CIRDA) to learn from innovations and develop collaborations?

Have we reached out to key government departments to fill their info need gap of end user? Communities – most vulnerable? Can you please provide me with examples?

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