

# **Learning from El Niño Costero 2017:**

## Opportunities for Building Resilience in Peru





A photograph of a woman in a pink tank top and pants standing in a room that is almost completely flooded with muddy water. She is holding a large metal pot and pouring water from it into the flood. To her left is a wooden bed frame with a patterned mattress. The background shows a wall made of woven bamboo or reeds, with a blue jacket hanging on it. A large red cloth is draped over the right side of the room. The floor is covered in water, reflecting light.

## Learning from El Niño Costero 2017: Opportunities for Building Resilience in Peru

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# EXECUTIVE SUMMARY

The 2017 El Niño Costero flooding in Peru was highly destructive, both to northern Peru and the country as a whole. The flooding continued for nearly three months, affected over 1.5 million people, caused 162 deaths, and damaged hundreds of thousands of homes — impacts that make this event comparable to the El Niño floods in 1982-83 and 1997-98. Peru is now grappling with how to recover, with the knowledge that disaster events can and will happen again. The flooding, though a tragedy, is also an opportunity to understand the gaps and opportunities for developing resilience and fundamentally reducing disaster risk in Peru.

This report — a collaborative effort between ISET-International, Practical Action Peru, and the Zurich Flood Resilience Program — uses the Post-Event Review Capability (PERC) methodology to explore what happened, where disaster risk reduction, response and recovery have been most effective, and where there is opportunity to further build flood and multi-hazard resilience during and following reconstruction and recovery.

## Key Insights

**Greater coordination and communication is needed between all levels and sectors of government and between government and non-government entities.**

Peru is a young democracy and has undergone several major transitions in recent years. Though the country has intentionally focused on building their disaster risk management (DRM) capacity, these regular changes mean that roles and responsibilities continue to shift, hindering multi-year, coordinated efforts. During and after the floods, lines of authority and responsibility were and continue to be unclear. Coordination between sectors and across scales, particularly with local government, is limited. Decisions are often made at the national level with little or no local input and without the flexibility to address local needs and priorities.



Committing to a consistent DRM structure with clear lines of authority, creating a culture of collaboration across sectors and between levels of government, actively engaging local level stakeholders in decision-making and implementation, and allocating funding to support long-term action will strengthen DRM in Peru.

### **Social recovery is as critical to DRR as infrastructure recovery**

The Peruvian government is focusing primarily on public infrastructure (e.g. rebuilding roads and bridges, repairing protection infrastructure, and expanding drainage systems) to bolster recovery. However, thousands of households have lost assets and livelihoods. If social recovery is not intentionally undertaken, these families and their communities will succumb to greater vulnerability. In recovery, it is critical to think beyond physical systems and also strengthen community wellbeing. The Five Capitals approach used by the Zurich Flood Resilience Alliance points to the importance of improving human capital (knowledge, skills, health), social capital (social relationships and networks), financial capital (livelihoods, savings, insurance), and natural capital (access to water, land, etc), in addition to addressing physical capital (infrastructure, equipment, etc), to support holistic recovery.

### **Resettlement needs to be approached as a multi-faceted issue**

Currently, there is significant attention focused on the hundreds of thousands of people in Peru living on high-risk lands and/or displaced by the floods. Resettlement is being framed as the solution to this risk in areas deemed ‘unmitigable’. However, resettlement is far more complex than just relocating people from one area to another, and ‘unmitigable’ is not a black and white condition. The Peruvian government must work with local government, NGOs, and communities to explore the trade-offs between adaptation, mitigation and resettlement. Where resettlement is the best option, it must be delivered in tandem with provision of services, retention or enhancement of livelihoods, and housing models that are designed for long-term use and adaptable over time. Households to be resettled must be active and willing participants.

### **Protection infrastructure must be viewed in conjunction with its residual risk**

Protection infrastructure, such as river levees and landslide debris nets, can help protect existing infrastructure. However, they should not be used to ‘protect’ high risk lands for the purpose of development. Even with protective infrastructure, there is residual risk. Globally, some of the most-costly flood impacts, in terms of both assets and lives, occur when protective infrastructure fails due to poor construction, lack of maintenance, or simply by being overwhelmed by the scale of the event. Therefore, it is critical that those ‘protected’ by

such structures know that they are at risk, and that backup systems such as early warning and the knowledge and capacity to respond in the case of failure are maintained. In parallel, land use planning and enforcement are needed to identify and prevent development of currently undeveloped high-risk lands.

### **Developing a Resilience Approach**

As Peru grapples with how to recover from the flooding, it must be remembered that this is not a standalone event. After this disaster is before the next disaster. As demonstrated in Houston, Texas, which has had “one-in-500-year floods” every year for the past three years, the ‘next’ disasters are occurring with increasing regularity and intensity. The 2017 floods in Peru have already pushed households and communities into greater poverty and vulnerability; another disaster within the next few years would be beyond devastating. Therefore, the reconstruction and recovery phase needs to be leveraged to reduce disaster risk and build resilience.

There is no ‘silver bullet’ or ‘recipe’ for building resilience. As demonstrated in the ‘Key Insights’ above, building resilience requires an integrated approach that spans sectors and scales of governance and is strongly rooted in local context, culture, needs and priorities. Furthermore, building resilience is not about preventing disasters entirely; rather, it’s about learning to live in the face of uncertainty without losing the development gains made previously. In Peru, DRR and resilience approaches need to

account for a changing, multi-hazard landscape and emerging development pressures from urbanization and migration. Achieving this will require investment and long-term engagement that prioritize building back better. Avoiding the creation of new risk and strengthening well-being are ultimately more socially beneficial and cost-effective than repeated pre-event preparation and post-event recovery.



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## Post Event Review Capability Reports

As part of Zurich’s flood resilience program, the Post Event Review Capability (PERC) provides research and independent reviews of large flood events. It seeks to answer questions related to aspects of flood resilience, flood risk management and catastrophe intervention. It looks at what has worked well (identifying best practice) and opportunities for further improvements.

For further information see: <https://www.zurich.com/en/corporate-responsibility/flood-resilience/learning-from-post-flood-events>



# Acronyms

Acronyms	Spanish Definition	English Definition
ANA	Autoridad Nacional del Agua	National Water Authority
ARC	Autoridad para la Reconstrucción con Cambios	“Authority for Reconstruction with Changes”, created by the Peruvian President to rebuild the country after the El Niño Coastal flooding
CENEPRED	Centro Nacional de Estimación, Prevención y Reducción de Riesgos de Desastres	National Center for Estimating, Prevention and Reduction of Disaster Risk
CEPIG	Centro de Procesamiento de Información Geoespacial de INDECI	INDECI’s Center for the Processing of Geospatial Information
CEPLAN	Centro Nacional de Planeamiento Estratégico	National Center for Strategic Planning
CERF	Fondo Central de Respuesta a las Emergencias	Response Fund for Emergencies
COEN/COER/COEL	Centro de Operaciones de Emergencia Nacional/ Regional/ Local	National/ Regional/ Local Emergency Operations Center
CONAGERD	Consejo Nacional de Gestión del Riesgo de Desastres	National Council for Disaster Risk Management
CONAGER-FEN	Consejo Nacional de Gestión de Riesgos del Fenómeno El Niño	National Council for Management of El Niño Risk
DIPECHO	Programa de preparación para desastres de ECHO	ECHO Disaster Preparedness programme

Acronyms	Spanish Definition	English Definition
ECHO	Protección Civil Europea y Operaciones de Ayuda Humanitaria	European Civil Protection and Humanitarian Aid Operations
ENFEN	Estudio Nacional del Fenómeno El Niño	National Study of El Niño
FOMIN	Fondo Multilateral de Inversiones	Multilateral Investment Fund of the IDB Group
FONCOMUN	El Fondo de Compensación Municipal	Municipal Compensation Fund
FONDES	La Comisión Multisectorial del “Fondo para intervenciones antes de la ocurrencia de desastres naturales”	Multisectoral Commission of the “Fund for interventions in the event of natural disasters”
FONIPREL	El Fondo de Promoción a la Inversión Pública Regional y Local	Fund for Promotion of Regional and Local Public Investment
IGP	Instituto Geofísico del Perú	Peru Geophysical Institute
IMARPE	Instituto del Mar del Perú	Institute of the Sea of Peru
INDECI	Instituto Nacional de Defensa Civil	National Civil Defense Institute
MCLCP	Mesa de Concertación y Lucha Contra la Pobreza	Poverty Reduction Roundtable
MEF	Ministerio de Economía y Finanzas	Ministry of Economics and Finance
MIDES	Ministerio de Desarrollo e Inclusión Social	Ministry of Development and Social Inclusion



# Acronyms

Siglas/ Acronyms	Definición en español	English Definition
MINDEF	Ministerio de Defensa	Ministry of Defense
MIRA	Evaluación Multisectorial Inicial Rápida	Multi-Cluster/Sector Initial Rapid Assessment
MMP	Ministerio de la Mujer y Poblaciones Vulnerables	Ministry of Women and Vulnerable Populations
MVCS	Ministerio de Vivienda, Construcción y Saneamiento	Ministry of Housing, Construction and Sanitation
NOAA	Administración Nacional Oceánica y Atmosférica de los Estados Unidos	United States National Oceanic and Atmospheric Administration
PCM	Presidencia del Consejo de Ministros	Presidency of the Council of Ministers
PEN		Peruvian Sol
PLANAGERD	Plan Nacional de Gestión del Riesgo de Desastres	National Plan for Disaster Risk Management
PP 0068 / PREVAED	Reducción de la Vulnerabilidad y Atención de Emergencias por Desastres	Reduction of Vulnerability and Attention to Disaster Emergencies funding
PREDES	El Centro de Estudios y Prevención de Desastres	Center for Disaster Studies and Prevention

Siglas/ Acronyms	Definición en español	English Definition
Proyecto Esfera/ The Sphere Project	Proyecto Esfera: <i>Carta Humanitaria y normas mínimas para la respuesta humanitaria</i>	The Sphere Project: <i>Humanitarian Charter and Minimum Standards for Humanitarian Response</i>
SDRM	Secretaría de Gestión del Riesgo de Desastres de la Presidencia del Consejo de Ministros	Secretariat for Disaster Risk Management of the Presidency of the Council of Ministers
SENAMHI	Servicio Nacional de Meteorología e Hidrología	National Meteorological and Hydrological Service
SIGRID	Sistema de Información para la Gestión del Riesgo de Desastres del CENEPRED	CENEPRED's Information System for Disaster Risk Management
SIMSE	Sistema de Información de Monitoreo, Seguimiento y Evaluación del CENEPRED	CENEPRED's Monitoring, Monitoring and Evaluation System
SINADECI	Sistema Nacional de Defensa Civil	National Civil Defense System; law prior to SINAGERD
SINAGERD	2011 Sistema Nacional de Gestión del Riesgo de Desastres	2011 National Disaster Risk Management System
SINPAD	Sistema Nacional de Información para la Prevención y Atención de Desastres del INDECI	INDECI's National Information System for Prevention and Attention to Disasters
SIRAD	Sistema de información sobre recursos para atención de desastres del INDECI	INDECI's Information System for Disaster Management





# Introduction

In January 2017, coastal waters off Peru warmed suddenly and unexpectedly. Low lying coastal storms dropped intense rainfall at low elevation, causing rivers, ephemeral streams, and low-lying areas to flood. Repeated episodes of rainfall, flooding, and landslides affected populations west of the Andes from Ica in southern Peru to the northern border of Peru. The flooding continued for nearly three months, affecting over 1.5 million people, causing 162 deaths, and damaging hundreds of thousands of homes. Critical infrastructure was also heavily damaged, cutting off access to hundreds of villages and towns in desperate need of aid.

As Peru grapples with how to recover from the disaster, it must be remembered that this is not a standalone event. Peru has a multi-hazard landscape, prone to floods, earthquakes, tsunamis, landslides, droughts and wildfires, and there is no saying when the next disaster will strike. The 2017 floods in Peru have already pushed households and communities into greater poverty and

vulnerability, and the impacts of another disaster will be beyond devastating. Therefore, recovery is not enough. Rather, the reconstruction and recovery phase needs to be leveraged to reduce disaster risk and build resilience.

In Latin America and also globally, resilience has generated widespread discussion and debate. Though theoretically resilience provides a way of integrating disaster risk management (DRM) into development in the face of climate change and broader uncertainty, in practice resilience is an abstract concept and how to operationalize it remains unclear. Part of the challenge is that building resilience is context dependent – there is no ‘silver bullet’ solution or a ‘recipe’ for building resilience. Building resilience requires a grounded, integrated and multi-faceted approach that spans sectors and scales of governance. The 2017 event in Peru is an opportunity to understand the gaps and entry points for developing such a resilience approach and fundamentally reducing disaster risk in Peru.



FIGURE 1.  
PIURA REGION IN NORTHERN PERU



This report synthesizes existing knowledge and analysis to tell the story of the 2017 floods from a resilience perspective, applying the unique PERC methodology to learn from disasters. It explores what happened, where disaster risk reduction (DRR), response, and recovery have been most effective, and where there are opportunities to further build flood and multi-hazard resilience during and following reconstruction and recovery. This study focuses specifically in Piura in northern Peru. Piura (Figure 1) was one of the most flood affected areas, with 430,943 people heavily impacted. This report follows a retrospective El Niño analysis conducted by French and Mechler (2017) focused on the Peruvian risk landscape, DRM mechanisms and DRR and preparedness investment in Peru in anticipation of the 2015/2016 El Niño, which did not materialize as expected.

The report begins with a **Vulnerability** section that briefly discusses the major physical, political, social and economic factors that have contributed to the vulnerability of Peruvian households and communities to disasters. This is followed by the **Disaster Risk Reduction and Preparedness** section, which describes Peru’s DRM institutional structure and the DRR and preparedness activities that were pursued in anticipation of the 2015/2016 El Niño. The **What Happened** section describes how the disaster unfolded and emergency response and early recovery activities that were taken. The **Long-term Recovery and Reconstruction** section discusses Peru’s recovery agenda and compares it with key recovery needs in Peru. Based on the information in these sections, the **Lessons Learned** section

identifies key gaps and successes in resilience and DRM in Peru. In turn, the **Recommendations** section consists of broad recommendations and opportunities for action to improve DRM and build resilience in Peru. These recommendations provide a platform for key stakeholders in Peru to design an appropriate approach and interventions for building resilience. The **Conclusions** section steps back to reflect overall on the report’s findings and how the recommendations fit into a broader resilience approach.

The information presented in this report is a combination of primary information collected via interviews with individuals from key national, regional, and local governmental agencies, non-profits, academic institutions and flood-impacted communities, and secondary data obtained from newspaper articles, reports, peer-reviewed

papers, presentations and policy documents. Peru is a very data-rich environment and much of what is presented in this report is already broadly available in sectoral and NGO reports, newspaper articles, and peer-review articles. Because the goal of this report is to be impartial and unbiased, in the interests of allowing our interviewees to speak freely, we have acknowledged their contributions at the end of this report but do not attribute specific information by source.

### A note about administrative divisions in Peru

Peru has several levels of government. Some of these levels are relatively recent, and others have been grandfathered in from previous political administrations.

- National: This refers to the central government in Peru.
- Regional: Peru is divided into 26 regions. These are sometimes referred to as ‘departments’, though technically the term changed to ‘regions’ in 2002.
- Provincial Municipality: Regions are subdivided into provinces. There are 196 provinces in Peru.
- District Municipality: Provinces are divided into districts. There are 1869 districts in Peru.
- Centros Poblados: This is the most local form of government, and translates to ‘population centers’.

Provincial governments, district governments and centros poblados make up local government. In this report, we refer to these levels of government as ‘local government’, unless distinctions need to be made.





# Vulnerability

## Physical Landscape

Peru lies along the west coast of South America, south of Ecuador and north of Bolivia and Chile. The Andes Mountains run roughly north to south through central Peru. On the eastern side is Amazonia, which receives one or more meters of rain a year and in some years and locations as much as 10 meters. The western side of the Andes is dry and arid, receiving less than 210 mm of rain a year except in El Niño years. Fifty-three main rivers drain the western slope of the Andes Mountains, but only about twelve of them flow year-round. Others channel water between December and March, during the rainy season in the highlands. A few are predominantly dry, flowing only in the wettest of years; people that move into the area during drier periods may not even know they are rivers.

The city of Piura lies near the center of the region of Piura (shown in Figure 1) on the northern portion coastal plain of Peru, about 100 km south

of Ecuador, 50 km from the coast to the west and 60 km from the Andes foothills to the east. The landscape is flat, marked only by creek beds, shallow depressions and rises, and the Piura River. Heavy rainfall in this environment and in the foothills of the Andes to the east rapidly runs off the impervious ground. Rivers respond quickly, resulting in flash floods in the hills, and rapidly changing from low to high flows on the plains. Rainwater also collects in shallow depressions and creek beds. Particularly in areas where natural drainage features have been blocked, during intense rainstorms water can become quite deep fairly quickly.

The city of Piura is bisected east to west by the Piura River. As it passes through town, the river is several hundred feet wide. Levees, which were first constructed in 1984, line both sides of the river and in many places rise well above the ground floors of the buildings they protect. The river channel is sand-bottomed and, along the margins, is often overgrown with vegetation.





**TABLE 1.**  
 SECTORAL DAMAGES AND EXPOSURE ESTIMATES ACROSS PERU FOR THE 1982/1983 AND 1997/1998 EL NIÑO EVENTS (FRENCH AND MECHLER, 2017) AND 2017 EL NIÑO COSTERO EVENT (INDECI, 2017)

	1982-83 El Niño	1997-98 El Niño	2017 El Niño Costero
Population	512 deaths, 1.27 million affected	366 deaths, 0.53 million affected	114 deaths, 1.08 million affected
Transportation	2,600 km of roads, 51 bridges	3,136 km of roads, 370 bridges	4,931 km of roads, 881 bridges (489 total destroyed)
Housing	98,000 homes destroyed; 111,000 damaged	48,563 homes destroyed; 108,000 damaged	38,728 collapsed, 372,020 damaged, 27,635 rendered uninhabitable
Education	875 schools damaged	2,873 schools damaged	2,150 schools damaged
Health	260 health posts damaged	580 health posts damaged	726 health posts damaged
Total Losses in US\$	3.28 billion (in 1998 USD)	3.5 billion (in 1998 USD)	~3 to 9 billion (in 2017 USD)

West of Piura, the river slows, then enters La Niña lagoon, which is poorly connected to the sea. At high flows, the lack of adequate drainage to the ocean causes the lagoon to rapidly grow in size, slowing and increasing the height of the river as it flows through Piura, and intensifying flooding in communities on the west side of Piura.

In addition to flood risk during heavy or sustained rains, Peru has a high earthquake risk. In Piura, the last major earthquake was about 40 years ago. This risk needs to be factored into disaster risk planning, both in terms of the capacities and skills needed to respond to disaster, and in how earthquakes could potentially interact with flood protection and mitigation solutions. For example, levees and dams, if not built to withstand earthquakes, can collapse and exacerbate loss and damage.

**Past Floods**

Flooding on the western coastal plain of Peru primarily occurs when sea surface temperature off the coast are high and the warm waters result in substantially more moisture in the air. This condition primarily occurs during El Niño events; typically, strong El Niño events result in significant flooding in Northern Peru.

The last two strong El Niño events were in 1982/1983 and in 1997/1998 (see Table 1). In 1997/1998, El Niño rains caused flooding and landslides that swept away people and livestock. Standing floodwaters caused mosquitos to thrive, triggering severe outbreaks of vector-borne diseases. The fishing industry was devastated as the warmer waters of El Niño temporarily wiped

out the traditional ecosystems that support cold-water fish, which resulted in wide-ranging impacts on livelihood security across the country. However, flood water also poured into the coastal Sechura Desert, which for the previous fifteen years had remained dry, transforming it into the second largest lake in Peru and creating a window of opportunity for lagoon fishing and agriculture.

It was with the memory of the 1982/1983 and 1997/1998 El Niños still strong that the Peruvian government declared a 60-day state of emergency in July 2015 in response to the forecast of a strong El Niño in 2015/2016. The forecast was for an El Niño as strong or stronger than the El Niños of 1982/1983 and 1997/1998, and prompted the preparative activities described in the following sections. When the 2015/2016 El Niño did not materialize as expected, preparations were discontinued. The 2017 El Niño Costero came as a surprise to the country in early 2017 (see Box 1 for an explanation of the difference between El Niño and coastal El Niño).



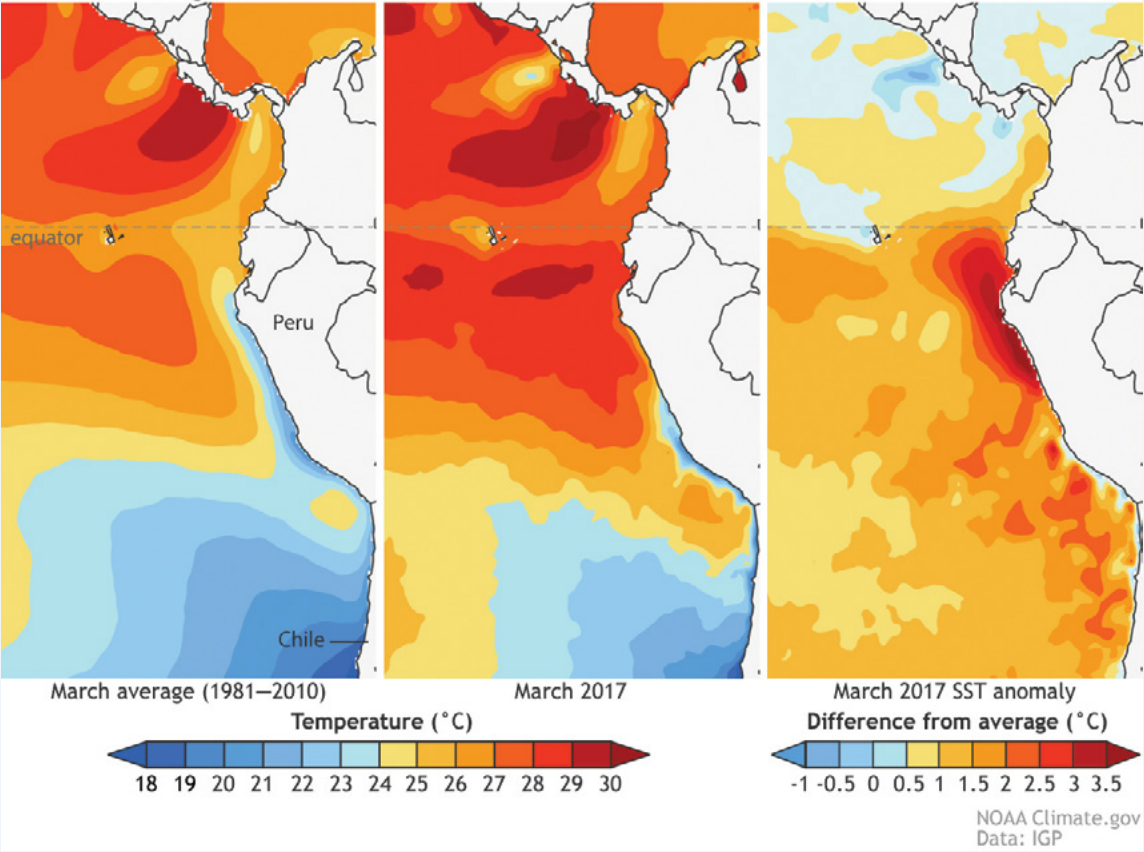
**BOX 1.**  
**EL NINO COSTERO: A COASTAL EL NINO**

The name “El Niño” originated in the 20th century with Peruvian fishermen who noticed warming of ocean waters off the northern coast of Peru at Christmastime. This term was adopted by the international community to describe the warm phase of the El Niño Southern Oscillation (ENSO), an event where a band of warm ocean water develops in the central and eastern equatorial Pacific Ocean including off the coast of South America. The above-average sea surface temperatures associated with El Niño cause a shift in atmospheric circulation and a weakening or change in direction of ocean winds, and result in significant changes in weather in South and Central America, Indonesia, and Australia (NOAA.gov).

El Niño events can be forecasted. It takes several months for El Niño wind, pressure, and sea surface temperature conditions to develop, and modern monitoring and modeling now allows us to forecast El Niños. Though the forecasts aren’t perfect, and can certainly under- or over-estimate the eventual impacts, they allow for early action and preparation.

Though the Peruvians designated the 2017 event as “El Niño Costero” — the “Coastal El Niño” — the event was not technically an El Niño event as described in the previous paragraphs. A “coastal El Niño” occurs when coastal winds which typically blow from south to north weaken. In Peru, this causes warmer waters off the coast of Ecuador to move south, creating unusually warm sea surface temperatures off the coast of northern Peru. Records from the early 1900s indicate that the “El Niño” of 1925 was probably a coastal phenomenon similar to the 2017 event (Martinez and Takahashi, 2017). Nearly a century later, however, and unlike El Niño events, scientists are still unable to predict these coastal warming events because they depend on winds that can only be forecast a week or two in advance.

**FIGURE 2.**  
**EXTREME WARMING OF COASTAL WATERS OFF PERU**



The left panel shows the average sea surface temperature (SST) in the eastern Pacific during March from 1981-2010. The middle panel shows average SST for March 2017. The right panel shows the difference between the left and middle panels — the SST anomaly, or how different sea surface temperature is from average — during March 2017. In March, off the northern coast of Piura, sea surface temperatures were on average more than 3.5°C higher than normal. Climate.gov map, Ken Takahashi, Instituto Geofísico del Perú using UKMet OSTIA data.



Social Vulnerability

Though the 2017 El Niño Costero has been pronounced an exceptionally large event, there is evidence to suggest that the rainfall and flooding may not have been as significant as in 1982/1983 and 1997/1998 (see Box 2). This suggests that the 2017 floods were largely a human-caused disaster and that infrastructural damages were greater in some sectors during the 2017 event not because of greater flooding, but because of rapid urbanization in recent years. Understanding why requires a deeper dive into the social vulnerability of the flood-impacted areas and Peru at large.

Peru is a middle-income country with high levels of inequality despite experiencing sustained economic growth between 2005 and 2014. Seven million people (about 21% of the population) live in poverty, and more than a million people (about 3% of the population) live in extreme poverty. In the regions of Piura, Cajamarca, and La Libertad in the north-west, and in Apurímac in the southern central region, extreme poverty is near 25% (WFP, 2017). Women make up the majority of the population living in extreme poverty, with as many as 30% of women not having access to personal income.

Peru has made strides in increasing norms, policies and programs that promote and protect the rights of its inhabitants. Public-private coalitions like the Poverty Reduction

BOX 2. HOW SEVERE WAS THE 2017 EL NIÑO COSTERO?

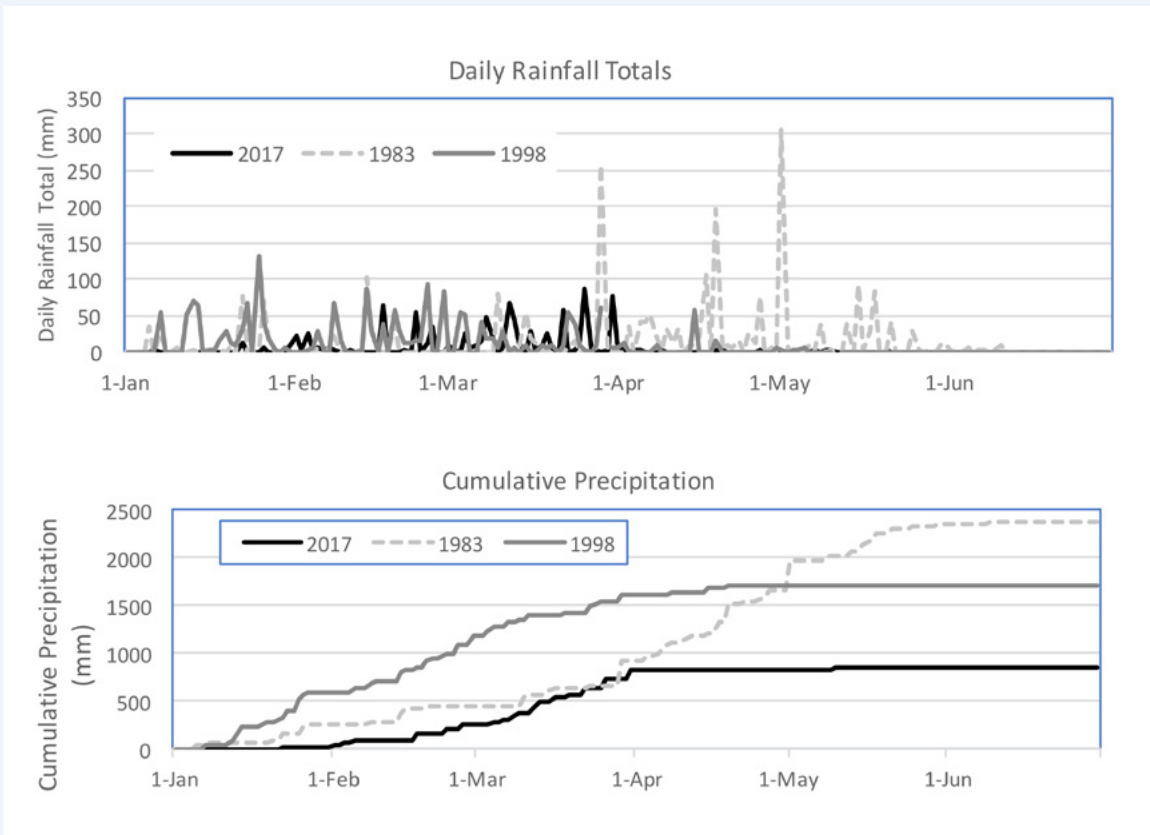
There is always a rush to quantify precipitation and flood events, and often they are cast in dramatic terms — “... an event of biblical proportions...”, “unprecedented”, “a 1000-year event”. The 2017 El Niño Costero flooding in Peru was no exception. Reynaldo Hilbck Guzman, governor of the Piura region, was quoted as saying the volume of water coursing through the Piura River was “unprecedented”.

There is no doubt the flooding was severe — lives were lost and damages were extreme. But, how does the 2017 El Niño Costero compare to the 1982/1983 and 1997/1998 events?

River stage measurements are available for the Piura River. However, when rivers aren’t cleaned, when sediment fills channels, and when debris blocks flow, it is hard to accurately compare measurements between events. By looking at the precipitation received in Piura, we can at least compare local rainfall-related flooding within Piura.

Figure 3, on the right, shows daily precipitation and cumulative daily precipitation in Piura for January through May of 1983, 1998 and 2017. What becomes quickly clear is that the total rainfall in 1983 was nearly three times that of 2017; rainfall in 1998 was nearly twice that of 2017. The largest single day events in 1998 and 1983 were larger than the single largest daily rainfall in 2017. The largest daily rainfall totals

FIGURE 3. DAILY RAINFALL TOTALS AND CUMULATIVE PRECIPITATION FROM JANUARY 1 THROUGH JUNE 30 FOR 1983, 1998 AND 2017 FOR PIURA. RAINFALL DATA DOWNLOADED FROM TUTIEMPO.NET\*



\*<https://www.tutiempo.net/clima/ws-844010.html>

in 1983 may have been three or four times larger than any single-day rainfall in 2017, and there were several events of that size.

This is hardly a rigorous analysis, and there certainly may be as many issues with rainfall data as with river flow or river height measurements. However, it does raise some doubt regarding how “unprecedented” the

2017 floods really were. Not only does the evidence suggest there may be clear precedent for similar floods of the same magnitude, the floods 20 and 34 years ago may have been significantly larger.



Roundtable (MCLCP) have been working with the national government for several years to promote public participation in budget-related decision-making and to increase government transparency and accountability. However, national averages on human development and economic indicators hide disproportionate inequities that exist across cultural, ethnic, linguistic, socio-economic and geographic lines. These inequities have been perpetuated and exacerbated by national politics and economic growth patterns in Peru.

Peru's government is still in transition following President Fujimori's fall from power in 2000. Subsequent governments have generally worked to return Peru to democracy, however, government turnover is frequent, which makes it difficult to sustain policy agendas. Peru has also been in the process of decentralizing since 2002 as a means to reduce inequalities across Peru and improve living conditions and access to public services. However, decentralization has been challenging in what is ultimately a young government in a country with a strong history of centralism and authoritarianism. As a result, Peru's social and economic condition has been slow to change.

Social and economic changes have been further constrained by Peru's history of mass rural-to-urban migration. Between 1940 and 1970 the coastal population grew from 300,000 to 4 million in response to growing economic opportunity in the increasingly urbanized western side of the country. This migration was further exacerbated due to armed conflict starting in 1980.

Peru has had strong economic growth in recent years, especially between 2005 and 2011 during which the economy grew an average of 7% per year (Cockburn et al., 2015). This boom has largely been attributed to environmentally extractive practices like mining and logging (both of which contribute to climate change) and diverse public policy agendas addressing issues such as childhood anemia, maternal mortality, and service provision in informal settlements. Economic growth has supported major reductions in poverty and extreme poverty in this time (Cockburn et al., 2015). Because of this progress, Peru has been classified as a "high human development" country since 2013<sup>1</sup>. However, most investments in development have been focused in the coastal population centers, and poverty rates remain high.

Migration has heavily changed Peru's risk landscape. Shifting to vastly different ecosystems means that new migrants may be unaware of hazard risk along the coast, and therefore unable to adapt traditional building techniques and climate change coping mechanisms to their new environment.

Migration has increased the population of urban poor along the coast. These groups have "squatted wherever they could in marginal areas where nobody would want to live if they were not forced to by poverty" (Collyns, 2017), forming vast swathes of informal settlements; 70% of the people in Peru live on invaded land

<sup>1</sup> Retrieved from <http://hdr.undp.org/en/composite/HDI> on 28 September 2017

or in informal settlements (IRIN, 2017). Over the years, people have built houses on dry riverbeds or in steep ravines where flash floods occur with little warning. Peru's government has often provided these settlements with access to core urban services like water and sanitation. Local governments have also been known to provide households with land titles prior to local elections. However, with this acceptance of informal settlements, land trafficking has also increased.

Land trafficking consists of occupying and reselling land. A lot of land traffickers (often associated with construction companies) invade empty, often marginal lands that are state-owned or in areas where land ownership is under litigation. A Peruvian land invasion law states that if no one contests the invasion of the land for three days, then the invaders can stay on the land. Often those with wealth or influence can also directly buy the land from the government for development, even though many of these areas have been designated as river buffer zones or other non-buildable lands.

The end result of this ongoing corruption and development of high-risk lands is that today floodplains, river corridors, and other high-risk lands are heavily populated. Building in high-risk environments has been exacerbated by the aridity of Peru's Pacific slope. Because there is very little precipitation during most years, infrastructure is often located in flood-prone zones and built in ways and with materials incapable of handling significant rainfall and surface runoff. As a result, the intense precipitation of severe El Niño years is particularly destructive.

The destruction of El Niño events is not limited to houses, infrastructure, and lives. El Niños consistently destroy livelihoods. Infrastructure failures and losses have cascading impacts across Peru's key economic sectors, in particular fishing, agriculture, services sectors such as education and health, construction, and transportation. Fisheries are heavily impacted by the dramatic sea temperature changes, often taking a year or more to recover. Flooding and mudslides destroy productive lands. Agriculture is highly climate-dependent and hazard-prone, and in both the 1982/1983 and 1997/1998 El Niños agriculture faced critical, long-term damages.

Agriculture is one of the most important economic sectors in Peru. Though agriculture makes up only 7% of the GDP, it employs 23.3% of Peru's economically active population. Agricultural practice ranges from subsistence farming to industrialized agriculture (USAID, 2011). The coastal zone west of the Andes is Peru's most productive agricultural zone, and much of the production is exported (e.g. lemons, grapes, mango, cotton, asparagus). In the Piura and Lambayeque areas, big agribusinesses have been expanding; they are able to afford water and to access necessary infrastructural services (e.g. irrigation, transportation, sanitation) unlike smaller farms (USAID, 2011). These agribusinesses are major employers of the urban poor, especially women. Losses in this sector have far-reaching consequences in Peru, with livelihood, food security, and economic impacts. These losses can bring recovery to a standstill.



### BOX 3.

#### GENDER AND VULNERABILITY: HOW WOMEN ARE IMPACTED BY DISASTERS

Globally, women are disproportionately impacted by disasters, especially floods. Women make up 60% of the world's poor, earn less than men, have less access to key opportunities (e.g. education, jobs), and are excluded from political decision-making processes such that policies and programs do not reflect women's roles, needs and priorities, exacerbating their vulnerability. As a result, women "bear the brunt of 95% of the natural hazards that occur in the world" (Reyes & Lu, 2016).

In rural, peri-urban, and urban areas alike, women tend to be employed in agriculture and other informal sectors that are often heavily hit by disasters. Across Nepal, high male migration to the Middle East and India in recent decades has led to 'feminization' of the middle hills. As a result, women have been left in charge of their household and traditional livelihoods (e.g. subsistence farming). After the 2014 Karnali floods and the 2015 Gorkha Earthquakes, women have

also had to lead household recovery despite a lack of skills associated with reconstruction and poor access to credit and loans. Social recovery in Nepal is at a standstill, and these women-led households have succumbed to greater poverty.

Similarly, a study conducted in Malabon City in Metro Manila (Reyes and Lu, 2016) found that women tend to be more involved in DRM than men at the household-level, especially in preparedness and recovery, and yet have not benefited from the DRM system at large. Emergency aid often fails to account for women's health needs (e.g. sanitary napkins, birth control pills). Recovery often does not consider women's susceptibility to disease outbreaks (e.g. contracting illnesses from relatives they are caring for), increases in gender-based violence in the aftermath of disasters, or the psychological and physiological burdens of managing household impacts and adopting new livelihoods to supplement household income for recovery.

These issues are playing out now in Peru, as vulnerable families that have lost livelihoods assets, like moto-taxis, have resorted to male-migration for employment opportunities, leaving women and children behind. In Piura, an estimated 100,000 women aged 15-49 and 134,000 children aged 17 and under have been left in highly vulnerable situations due to the floods (OCHA, 2017). In female-headed households, the burdens of post-flood health challenges (e.g. sick/injured elderly and children) and loss of housing have landed on the women's shoulders. In some families, the children pay the cost, in terms of health, nutrition and schooling. These families will be left more vulnerable without targeted support.

To fundamentally reduce disaster risk, DRM approaches must pay special attention to the needs, priorities and vulnerabilities of women and girls. This requires an approach beyond simply ensuring that women can

attend or participate in public forums and discussions. Rather, there needs to be a targeted approach focused on helping women recover their livelihoods and mandating that food-for-work and cash-for-work programs employ women. In addition, reconstruction and recovery should prioritize the reconstruction of women's spaces (e.g. meeting spaces) and childcare facilities.

There were instances where the 2017 floods made the capacities of women, who have managed to channel relief and recovery support, more visible. Here, there is an opportunity to leverage the skills that women bring to household and community DRM to reduce women's vulnerability and overall increase their and their communities' resilience to disasters.





# Disaster Risk Reduction and Preparedness Context

## Institutional Structure and Implications

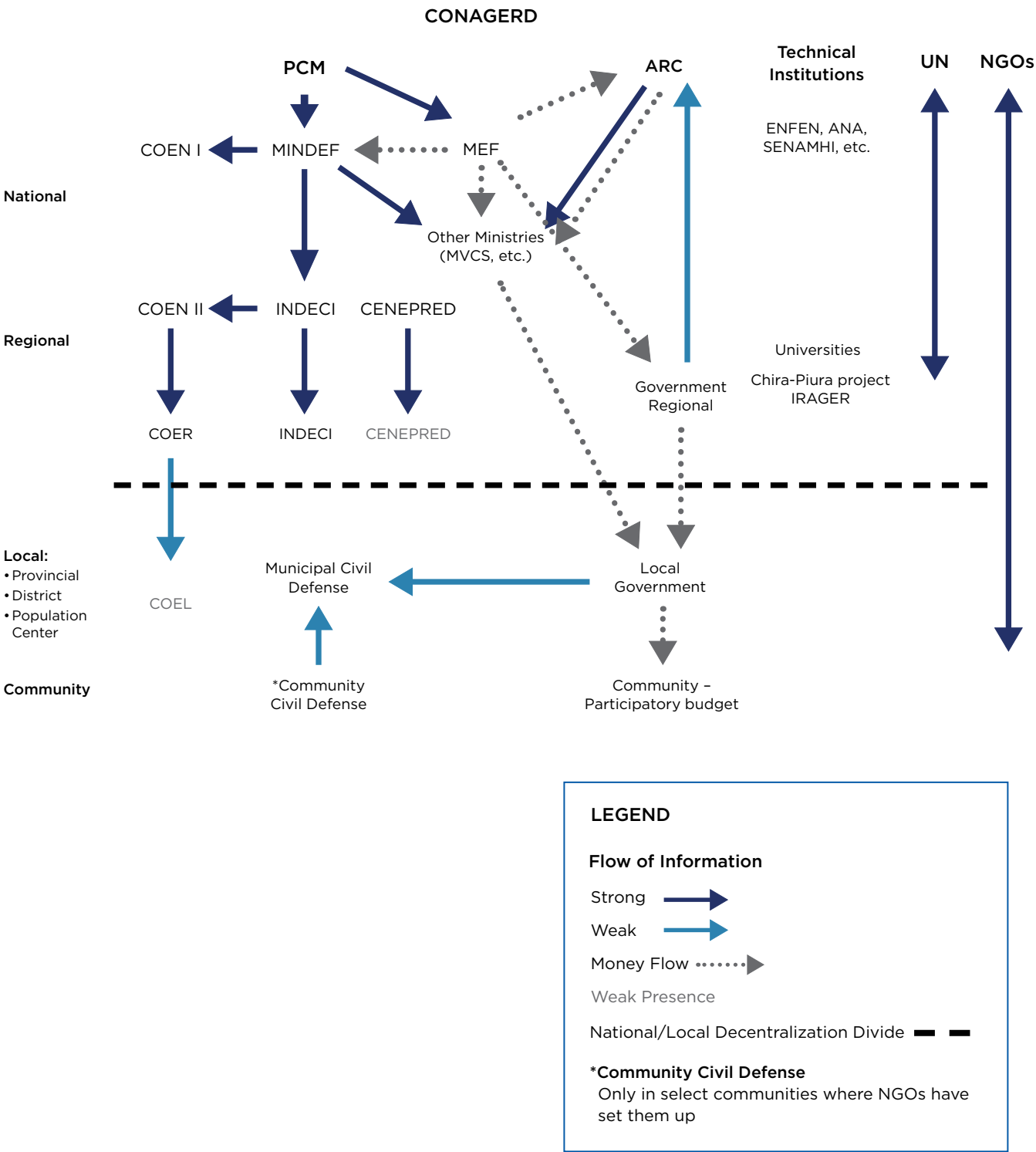
At first glance, Peru seems to have a strong disaster management system. There are national laws and policies that govern DRM and prioritize DRR. Furthermore, there are national-level DRM entities and institutions that provide technical capacity related to disasters, along with funds for regional and local governments to use for DRR and response. But these institutions are young and still developing. Peru's disaster management has undergone significant reform in recent years, and is still reforming. The institutional landscape map shown in Figure 4 illustrates the DRM institutional landscape in Peru. However, it should be noted that this is a simplified version of what is a highly complex and dynamic system.

## National DRM System

Peru's disaster management has been governed by the National Disaster Risk Management System, SINAGERD, since 2011. SINAGERD replaced the Civil Defense Law (SINADECI), which was in place for the prior 39 years and focused only on allocating funds and resources during emergencies. SINAGERD places great emphasis on identifying and reducing risks, preparing for and responding to disasters, and outlines the institutional structure for DRM nationally. The National Council for Disaster Risk Management (CONAGERD) is the primary decision-making body for the DRM system, and is led by the President and the Ministries. The Presidency of the Council of Ministers (PCM), headed by the Prime Minister, was the technical secretariat of CONAGERD until recently. The National Center for Strategic Planning (CEPLAN) coordinates with the PCM on inclusion of DRM in the national plan of development.



**FIGURE 4.**  
SIMPLIFIED DRM INSTITUTIONAL LANDSCAPE MAP OF PERU AS OF MID-2017.



Prior to SINAGERD, the National Civil Defense Institute (INDECI) was the public body responsible for disaster response, disaster and damage assessment, and recovery. A key institutional shift with SINAGERD was the division of INDECI's pre-2011 roles between INDECI and the National Center for Estimating, Prevention and Reduction of Disaster Risk (CENEPRED). INDECI is now broadly responsible for preparedness and response, and CENEPRED for DRR — both prospective and corrective — and reconstruction, though primarily in a technical advisory capacity. However, response and DRR/preparedness are not always distinct categories. These divisions are apparent at the regional levels as well.

In December 2016, the national government began reform of SINAGERD. The Ministry of Defense (MINDEF) was assigned by decree as the lead for emergencies starting February 24, 2017, right before the worst of the 2017 flooding hit northern Peru. Most of INDECI's and CENEPRED's functions were moved under MINDEF. INDECI assumed PCM's role as the technical secretary of CONAGERD. MINDEF took over much of the PCM's role in SINAGERD, but PCM maintained its status as regulatory authority. The Ministry of Housing, Construction, and Sanitation (MVCS) assumed responsibility for technical inspections that were previously the purview of CENEPRED.

This reform is a part of a wider modernization trend in Latin America to restructure the political landscape and simplify the administrative functions of the government. The thought is that shifting disaster response to the military domain will help better link national defense with civil

defense. However, these changes have led to a number of challenges:

- Leadership remains fragmented and lines of authority are unclear. Reform was implemented with the goal of simplifying leadership between disparate DRM entities. However, CENEPRED and INDECI, once in equal position to ministries, found themselves demoted. In addition, sectoral ministries (e.g. Ministry of Economy and Finance, Ministry of Housing, etc.) found themselves with greater responsibilities with regards to DRM.
- Other countries are hesitant or unable to send aid and funds to MINDEF, which is a national defense entity.
- While MINDEF has historically assisted in disaster response, they have no experience in DRR, preparedness, and recovery.
- Much of DRR reform has focused on the national level while the sub-national institutional structure for managing disasters has not changed much. It is unclear if this reform has been taken down to the local level, or if the local level has been adequately capacitated on conducting DRM in the context of national reform.





### Sub-National DRM System

At the regional-level, the government oversees and implements regional programs, acts as an interface between national and local governments, and provides local governments with technical support to fulfill national policy and requirements for DRR and preparedness. The regional emergency operations centers (COERs) conduct short-term monitoring, provide analysis of weather, climate, and natural hazards information, and disseminate information obtained from the

National Meteorological and Hydrological Service (SENAMHI) and the National Study of El Niño (ENFEN).<sup>2</sup>

Local governments are the first line of emergency response during a disaster through

<sup>2</sup> ENFEN is a multi-sectoral committee formed in the 1970s focused on monitoring El Niño conditions. They publish monthly reports, and when there is a threat of El Niño, they send out alerts and weekly/bi-weekly reports of El Niño conditions. Their reports are available online.

municipal civil defense groups, as required by PLANAGERD, and emergency operations centers. Local governments are supposed to have local emergency operations centers (COELs) to oversee and direct response; however, these entities are inactive in many locations. Local governments are also expected to pursue DRR and preparedness in their localities. For example, they may apply for national funds from the “Reduction of Vulnerability and Attention to Disaster Emergencies” (PREVAED) budget, also known as PP 0068, to fund DRM measures.

The PP 0068 budget has increased dramatically since its start in 2011, yet many local governments have not taken advantage of this budget and other national and regional resources and capacities. National and regional governments are quick to point out that local governments lack local capacity and will; local governments in turn state that the regional and national governments do not provide them with necessary support or involve them in broader decision-making processes. In reality, the problems faced at the local level are a combination of these issues, and have constrained DRR and preparedness efforts locally:

- **Weak incentives:** Local governments should be using some of their annual allocations for DRM-related drills, storage, awareness-raising, and risk reduction measures (e.g. improving drainage). However, they largely do not do this as they see their role as responding during emergencies, and have not yet embraced the value of DRR and preparedness.

Furthermore, local governments tend to prioritize their investments based on what will win them votes. Though local-level DRM is required by SINAGERD, ultimately there are few incentives to get local governments to apply for DRM funding, and few sanctions for inaction.

- **Limited budgets:** Local governments are expected to develop their own technical proposals to secure funding for projects, but many cannot afford the cost of proposal development. This is exacerbated by discrepancies in timing of annual funding allocation for DRR, as explained in Box 4. Delays in funding allocations and rigid deadlines regarding when funds should be spent incentivizes special projects (usually with short-term, tangible results) over longer-term integrated planning and capacity building.
- **Frequent transfer of staff:** Local government staff turnover is high after every local election because elected officials bring their own staff. Often, staff with technical knowledge are not retained, and new hires are not required to have technical experience. Such turnover makes it difficult to continue DRM over the long-term, and more broadly maintain institutional memory.
- **Low technical capacity:** Peru has technical expertise, but their services (and knowledge products) are underutilized. Universities have technical expertise, but do not have a seat at the table with local government. Weak





relationships between local and higher levels of governments limits local government outreach to and collaboration with regional government expertise. These weak relationships stem from local resentment over being excluded from higher levels of decision-making and perceptions that regional governments are conducting special local-level projects that are really the jurisdiction of local government.

- **Competition between mayors and governors:** There is very low coordination between local and regional governments. In part, this is due to personal stylistic differences between elected officials and parties that lead to conflict. In part, it is due to political party and political movement competition, which is exacerbated by the low capacity of what are short-lived political movements and parties and result in elected officials who lack the capacity to govern.

These issues have resulted in low implementation of national DRM policies locally. For example, SINAGERD requires all government entities across sectors and scales to have 6 disaster-related plans: Prevention and Reduction of Disaster Risk, Preparation, Emergency Operations, Community Education, Rehabilitation, and Contingency. The national government has tried to incentivize local governments with the promise of additional money if plans are developed, but this has had limited success. Most sub-national government entities have not developed these plans.



BOX 4.  
KEY DISASTER RISK MANAGEMENT FINANCE MECHANISMS

In Peru, despite decentralization, the national government is still the primary source of funds for the regional and local governments, including DRM funding. For the most part, funding goes to regional governments, who in turn allocate funds to local governments. However, there are some funding mechanisms that bypass the regional government.

Key DRM finance mechanisms include:



Reduction of Vulnerability and Attention to Disaster Emergencies (PREVAED, PP 0068)

This is a major source of DRM funding in Peru, and is allocated on a yearly basis. Local governments submit proposals to the national government in July with the expectation that funds will be allocated by the end of December. However, funds are often only disbursed in March or April the following year. Yet, funds still have to be spent by December (the end of fiscal year). Allocation delays combined with the short funding timeline dis-incentivize local governments from pursuing larger, integrated DRM programs that require continuity and collaboration.

Municipal Compensation Fund (FONCOMUN)

These funds are not DRM-specific, but can be used for DRM initiatives, though they are very small and generally enough just to pay staff, not develop expensive activities. The national government allocates these funds directly to local governments, prioritizing those that are poorer and marginalized. For many local governments, these are the only funds they have consistent access to. However, the national government tends to allocate this funding solely to provincial governments, and not to district governments and centros poblados. There are cases where provincial governments have not distributed these funds to centros poblados for up to 8 months.

Fund for Promotion of Regional and Local Public Investment (FONIPREL)

This is a competitive fund which the national government allocates to co-finance public investment projects and pre-investment studies aimed at reducing gaps in the provision of services and basic infrastructure. The fund prioritizes projects aimed at reducing poverty. The majority of this money is allocated to regional governments with extensive conditions for use: projects need to be approved by the regional government's technical unit and then by the national government's technical unit, and the technical studies require significant time and money. Project proposals can stagnate for years and then get dropped.

Incentive Program for the Improvement of Municipal Management

This program transfers resources to local governments that achieve certain goals in a given period. This program has been used to incentivize local governments to develop and implement DRM plans with varying degrees of success.



### DRR and Preparedness in Anticipation of the 2015/2016 El Niño

Predictions of a major global El Niño began in mid-2015, and by late August that year ENFEN warned that the El Niño could be as strong as the 1982/1983 and 1997/1998 El Niño events in Peru. With this warning, the national government released the “Decree of Urgency” (D.U. #004-2015) in early September to create the National Council for Management of El Niño Risk (CONAGER-FEN) and catalyze redistribution of the national annual budget to support DRR and preparedness efforts. The national government allocated funds and CONAGER-FEN developed

sectoral and geographic plans for DRR. Such proactive DRR is not new in Peru; similar allocations were made prior to the 1997/1998 El Niño event.

However, the 2015/2016 El Niño rains were much smaller than anticipated, and the momentum around DRR and preparedness waned. Ultimately, only two-thirds of the 3.2 billion PEN allocated by the national government was spent. Of this, only 25% of the funds were allocated to regional and local government; much of the DRR work was led by the national government.

### Government-led DRR and Preparedness

The majority of pre-El Niño preparedness work consisted of risk mitigation in key watersheds, led by the Ministry of Agriculture and regional governments in rural and peri-urban areas and by the Ministry of Housing in urban areas. Activities included clearing riverbeds, irrigation channels, and drains of debris and improving water flow. Measures were also taken to prepare infrastructure in the health, education, water, and housing sectors, improve existing protective infrastructure, and preposition relief supplies. See French and Mechler (2017) for a more detailed summary and analysis of 2015/2016 DRR and preparedness activities undertaken across government sectors in Peru; see the ‘What Happened’ section of this report for an exploration of how these investments performed in 2017.

Poor maintenance of infrastructure is a consistent issue across sectors in Peru. Flood-related maintenance, such as improving water flow in rivers and streams and clearing drains, tends to be conducted only in the months prior to an El Niño event. Improvements and expansion of infrastructure, especially protective infrastructure such as levees and drains, tends to be done only in the year or two following major flood events. The initial drainage system in Piura, for example, was constructed after the 1982/1983 El Niño, partially cleaned and expanded following the 1997/1998 El Niño, and partially cleaned again prior to the 2015/2016 El Niño, with little attention between these events. The city, however, has been

rapidly growing the entire time, often infilling natural drainage to do so.

Substantial work was also undertaken to improve the preparedness of disaster response entities. CENEPRED worked on updating risk evaluations and provided this information to regional governments. INDECI prepositioned emergency supplies in their regional storage centers and distributed supplies to local governments. The majority of these projects were infrastructure-focused. Though there is no coherent national early warning system or guidelines, the national government made investments to improve early warning systems. The majority of this investment went to Piura. Box 5 explains the gaps and opportunities around early warning in Peru.



**BOX 5.**  
**GAPS AND ENTRY POINTS FOR EARLY WARNING SYSTEMS IN PERU**

There are four key elements in an early warning system:

1. MONITORING DANGER	2. COMMUNICATION	3. ALERT	4. PLANNING FOR RESPONSE
<p>This includes monitoring sea surface temperature and river flows to assess if there is potential hazard. The National Water Authority (ANA), SENAMHI, IGP, COEN and COER all monitor risk. Key gaps, however, are too few monitoring stations and poor data sharing and coordination between monitoring entities. For example COER only receives information from COEN, even though ANA generates a lot of information at the regional level. Part of the issue is that ANA’s monitoring is more focused on water management rather than informing populations; this seems indicative of a generally poor connection between ANA and sub-national governments. There is little flow of information from the regional and lower levels up to the national level.</p>	<p>This involves determining how and to whom to communicate warnings. There is a protocol for dissemination of information across scales, from the national to the regional to the local level. However, translation of scientific information into usable warnings for local governments is weak. Without translation (or locally-relevant explanation), the average citizen, or even many local authorities, likely cannot understand what 1000 m3/sec of discharge or red alert means, or why the government has taken certain precautionary actions (e.g. closing bridges).</p>	<p>This has to do with releasing warnings to areas that are at imminent risk from a hazard. In theory, COENs and COERs are supposed to communicate warnings to COELs and local governments, but they often do not. COERs also transmit warnings via Whatsapp and radio. Some local governments and NGOs have worked sub-nationally to implement early warning systems. In one such system, upstream river and rainfall observers communicate via telephone to downstream governments if they think there is flood risk. Though these systems have been successful, securing national government support has been challenging. For example, the national government refused a budget request of 1 million PEN from a local government</p>	<p>in Lambayeque on the grounds that the system was ‘too technical’.</p> <p>This has to do with planning for response based on early warnings. Early warning systems in Peru provide just enough time for escape or evacuation, and perhaps moving important assets to higher ground. As a result, much of this element is focused on producing risk maps and evacuation plans, conducting drills, preparing emergency shelters, ensuring that loud speakers work, and prepositioning emergency supplies and aid.</p>



The Role of Non-Government Actors

NGOs, in particular, played critical roles in closing the gaps in government-led DRR and preparedness in anticipation of the 2015/2016 El Niño. When funding allows, many NGOs commit to long-term projects and capacity building in communities (see Boxes 6 and 9). The most successful of these activities were those that were conducted in collaboration with, or with the support of, government and/or civil society.

These activities provided substantial benefits to communities during and following the 2017 flooding.

However, the ability of NGOs to pursue comprehensive and integrated DRR is increasingly constrained by the shifting funding landscape. Long-term funding is difficult to come by (partly due to decreasing donor interest in Latin America and inadequate focus/scope of DIPECHO), pushing NGOs to pursue a project-by-project

approach. Increasingly, NGOs are arriving in communities, conducting projects, writing reports, and leaving. This makes it difficult to implement long-term programmes that fundamentally reduce risk at the community-level.

DRR and preparedness actions were not limited to NGOs and government. For example, the University of Piura trained staff in first aid and managing floods and fires. They also trained students to assist local governments

with requesting resources from the national government. Agribusinesses built and/or improved their walls to protect their crops from an El Niño event. Unfortunately, although these walls helped to prevent overland flow from damaging crops and irrigation infrastructure during the 2017 event, in some places these efforts redirected flood impacts by diverting water into urban areas.

BOX 6.  
AN EXAMPLE OF AN INTEGRATED, LONG-TERM APPROACH TO DRR AND PREPAREDNESS

Practical Action Peru has been working with Polvorines, a community highly vulnerable to floods, since 2014. Polvorines is an informal settlement with approximately 3,500 families. Similar to other informal settlements in Piura, the lack of appropriate urban planning, land-use regulation and enforcement combined with high rural-to-urban migration has resulted in the construction of homes on marginal lands that are prone to flooding. Polvorines is considered a high-hazard flood area as it is close to a pond that swells with heavy rains. Floods can reach 0.60 to 2 meters, and drainage is slow. The houses in Polvorines are built with low quality materials, and building codes are largely ignored (Soluciones Prácticas, 2017).

Practical Action Peru has implemented a variety of integrated DRR interventions in Polvorines. They worked with the community to create a community-level civil defense group and conducted a series of workshops and trainings to build capacity around: (1) first aid, (2) shelter, (3) early warning and evacuation, and (4) water and sanitation. Working with the community, they produced risk maps and marked evacuation routes. The members of the civil defense group are responsible for promoting DRR and preparedness in their community, disseminating early warnings, providing community members with additional information on how to act, and coordinating emergency response.

Over the three years of the project, there have been notable attitude shifts across the community with regards to DRR and preparedness and a greater willingness to reduce risks, prepare for floods, and take heed of early warnings. Key to this change has been working with community leaders to strengthen social capital and encouraging community participation in DRR and preparedness initiatives. For example, the civil defense groups negotiated the support of the local authorities to rehabilitate and clean the drains and they built a demonstration emergency center for floods and heat. Currently, the civil defense group is increasingly self-sustaining and is working with the municipality to train other community civil defense groups.

Before the 2017 floods, Polvorines received significant media attention over concerns that it would be seriously impacted given its history of flooding, poverty, and poor infrastructure. Nevertheless, the flood did not cause much damage. Though low-lying areas had up to 0.7 m of water, Polvorines was prepared. As rains intensified in January, the civil defense group worked to warn community members of potential flooding, and community members responded, for example by shifting critical assets to higher locations and evacuating as needed. This helped prevent the loss of life and assets, limit recovery needs, and speed recovery.





# What Happened?

## The Event

The floods in Peru came as a surprise; the United States National Oceanic and Atmospheric Administration (NOAA) and regional and Peruvian meteorological agencies did not forecast the event. Coastal sea surface temperatures began increasing at the end of December 2016. Humidity increased with sea surface temperatures, and rains began in January 2017 along the central coast, in Ica, and in Lima. Only when sea surface temperatures continued to increase throughout January, reaching a peak of 6.6°C above normal on January 31, did the government realize that they were dealing with El Niño-like rainfall conditions.

With the initial flooding in January, the National Emergency Operations Center (COEN) was activated, and engagement and activity increased as flooding spread. On February 23, a supreme decree was released declaring emergency in Tumbes, Piura and Lambayeque in northern Peru.

At the national level, there were daily briefings during which every DRM-related institution presented on the situation, including risk analyses, climate models, meteorological data, rivers and lagoons, sea surface temperatures, and types of fish seen (to track changes to sea temperatures and fish markets). Alerts were disseminated to Ministries, the Prime Minister, and regional governments. Approved alerts were released for dissemination, ideally at least 3 hours prior to floods; however, some alerts were not released until it was too late for them to be useful.

In Piura, residents experienced periodic flooding from intense rainfall in February and March, and the worst flooding occurred between March 26 and 27, when intense rainfall combined with already high river flows. The Piura River rose above the top of the embankment in town and flowed through gaps in the cement barriers, exacerbating flooding in the Plaza del Armes. The city's drains, built after the 1982/1983 El Niño and





updated after the 1997/1998 El Niño, failed due to inadequate maintenance and due to the sheer volume of water. South of town, embankments broke and caused major flooding in Catacaos and Curamori, where the deep, fast-moving water killed four people.

On March 29, the government declared a Level 5 emergency in the region of Piura – the highest level on the national emergency scale – which opened the event to national and foreign aid and response support. This declaration, originally for 60 days, was extended for another 45 days, and

then again extended for 60 days. The entire city, an important economic center, suffered damage to housing, and population displacement was particularly high. The Armed Forces mobilized 3,600 troops and assisted more than 5,000 people during the first 48 hours. Some 10,000 affected people in the Catacaos district were relocated to shelters in Piura. Thirty-one shelters and 1,041 tents were established for 11,652 people (UNDAC, 2017).

The extent of damage was in part due to poor preparedness and communication. The COEN

is responsible for generating official danger notifications and alerts, based on information they receive from national level ministries and agencies. There are few formal mechanisms for feeding locally or regionally generated information up to the national level. Ideally, the Regional Emergency Operations Centers (COERs) receive official danger notifications from the COEN and are responsible for disseminating this information to local governments and COELs. However, only some COELs are active, and others have not met in several years. Where local governments received warnings, dissemination was varied. In many places, warnings did not go out quickly enough, sometimes for reasons as simple as missing sirens and megaphones, though in Piura local authorities received alerts from the COER via Whatsapp and the radio.

Where warnings were disseminated in a timely fashion, many people did not believe the warnings or take action until they saw floodwaters rising. In some cases, such as businesses in the Plaza de Armas, people assumed the water would stop rising before it became a problem. Only when it was clear that it would continue to rise did people start moving furniture and assets. In other places, households received warnings but did not evacuate, fearing that their homes would be looted; they only left once floodwaters were too deep to stay.

For the households and communities where warnings were received and people wanted to act, many of them lacked information about their options. In particular, there were not clearly identified areas to evacuate to. The exceptions were communities where disaster preparation had

been introduced and/or where there were strong civil response groups. In Polvorines, for example, Practical Action has supported the establishment and training of a community-level civil defense group (see Box 6). This group was critical for successfully disseminating warnings and evacuating households. Households evacuated to formal evacuation sites set up by the government or to other informal sites such as their family's and friends' homes.



## Emergency Response and Early Recovery

### A National Emergency

As flooding worsened along the coast of Peru, mayors and governors found themselves overwhelmed and unable to respond to the unfolding emergency. Municipal civil defense groups did not have emergency plans, and local governments had not yet received annual funding allocations from the national government (the fiscal year starts in January, but there are often delays in disbursing funds), limiting their ability to act. Consequently, requests to INDECI from local and regional governments for emergency resources started almost immediately. Initially, there was pushback from INDECI as regional and local governments have their own disaster response resources — local and regional governments receive PP 0068 funds for drills and disaster response, and there were perceptions nationally that these funds had not been used well and that local emergency supplies had been misused for electoral purposes.

Requests from sub-national governments for resources and support intensified and resulted in the declaration of the event as a national emergency. The President also directed municipalities and other government entities to reallocate what they had not spent of their 2016 budgets to the emergency. Media began solidarity campaigns and offers of international aid started coming in, though the national government initially turned them away.

The national emergency declaration also authorized the Peruvian Ministry of Defense (MINDEF) to take charge of coordinating response. The timing for this was challenging; the national DRM system was in the midst of significant reform when the floods hit. MINDEF, newly appointed to head DRM nationally, was inexperienced in coordinating the full scope of disaster response. At the same time, the leadership at INDECI and CENEPRED had been appointed in 2017 and the new leadership had brought in their own people.

As a result, there was an absence of clear leadership and clarity around roles and responsibilities. MINDEF responded by appointing the military to lead coordination and communication of the response effort. In the past, the Peruvian military has only helped maintain order in emergencies; this was the first time they supported emergency response. General Jorge Chavez converted the military war room into a COEN and rapidly mobilized military resources for response. This rapid, decisive, and successful action earned the General much appreciation and praise. The scale of disaster warranted MINDEF and military support due to their ability to provide logistics support, quickly mobilize resources, and conduct emergency reconstruction (e.g. rebuilding bridges).

However, MINDEF and the military had little understanding of how to work in local contexts and how to allocate aid. In Piura, for example, the military allowed only evacuated families to stay in emergency tents; the elderly and other individuals had initial difficulty obtaining shelter. While local governments were happy to receive national



support with transportation and access, they did not want support with the delivery of relief. To bridge the local-national divide during response, national ministers were appointed to each region, but results were mixed. These ministers assumed significant decision-making roles; in some instances, they superseded the authority of the local government, which led to conflict. National authorities, unlike local authorities, did not know where and what resources needed to be allocated.

INDECI is better attuned to working in local contexts, given their history of leading national emergency response. INDECI also had aid prepositioned and were ready to respond, but (along with CENEPRED) were sidelined during the early response effort. Coordination with INDECI eventually improved, though it's clear that INDECI was not used to their full capacity.

In the affected regions such as Piura, the UN became involved with the declaration of a Level 5 emergency. The UN mobilized its humanitarian





network and activated the cluster system to coordinate response with the government and other organizations. The network conducted a Multi-Cluster/Sector Initial Rapid Assessment (MIRA) to assess immediate humanitarian needs. In the cluster system, response is divided into thematic clusters (e.g. Health, Water and Sanitation, Shelter, and so on); each cluster is co-headed and coordinated by the UN and INDECI. However, the system has not, for the most part, functioned well in Peru due to a lack of buy-in and participation on the part of INDECI and Ministries. The exceptions have been in the shelter and water and sanitation clusters; the shelter cluster in particular was able to leverage the UN's three-month Central Emergency Response Fund (CERF)

and rapidly distribute shelter through NGOs. However, help didn't reach the portion of the population that stayed in their homes.

### Flow of Information

One of the roles of COEN and the COERs is damage and impact mapping. However, impact-related information such as inundation and damages maps produced at the national and regional levels did not flow down to the local levels. Indeed, nationally produced data didn't even reach the regional level in many cases.

For example, national cooperation with the EU's Copernicus Program began soon after the flooding in March and produced maps in real-time

of damages and blockages in transport networks. For Peru, this type of data was new, and proved to be valuable in national relief efforts. Similarly, the national government used satellite imagery in new ways during the event and also obtained drone images from the private sector. However, this data largely went unused at the regional and municipal levels.

There are several reasons for the poor flow and use of information between the national and sub-national levels. First, though there are multiple information repositories for specific information accessible to specific entities, there is no widely accessible central repository to host or provide open access to a broad spectrum of information<sup>3</sup>.

Second, there was redundancy in data collection and analysis between the national and regional levels. COERs were conducting their own data collection and producing their own impact maps. The maps at both levels were not totally identical due to COER's access to on-the-ground information not available to COEN and COEN's access to data and imagery not available to COER. A great deal of duplicated effort could

have been avoided, and resulting databases and mapping made more accurate, had information been more effectively shared.

Third, the information that was shared was difficult to use, especially given that technical capacity in many local governments is poor. For example, maps were shared, but they were not adequately explained or translated and therefore failed to address questions such as where there were impacts, where it was safe to put tents, and so on.

### Distribution of Aid

Initially aid went primarily to Piura. The regional INDECI office in Piura had prepositioned supplies near their office in the city, and Piura was also easily accessible. Other areas like Lambayeque, Rio La Leche, and Trujillo were difficult to access because of damage to bridges along the Pan American highway. Parts of La Libertad could only be reached by air. Flood damages also made it difficult to reach communities located along rivers and in the upper basin. INDECI transported supplies by plane and boat to inaccessible communities when possible.

Immediate relief focused on shelter. Floodwaters heavily impacted homes in low-lying areas throughout the cities of Piura, Catacaos, and Curamori. The regional government, local governments, and ministries evacuated and relocated over 11,000 people to higher areas within the first 48 hours. COER and INDECI set up temporary shelters in public schools. Families were allocated tents, as well as cooking pots, mosquito nets, and buckets.

<sup>3</sup> There are various information systems and agencies working in Peru, with limited coordination between them, including: CENEPRED's Information System for Disaster Risk Management (SIGRID) and Monitoring, Monitoring and Evaluation System (SIMSE); INDECI's Information System for Disaster Management (SIRAD), National Information System for Prevention and Attention to Disasters (SINPAD), and Center for the Processing of Geospatial Information (CEPIG); the National Meteorological and Hydrological Service (SENAMHI); the Geophysical Institute of Peru (IGP); the Institute of the Sea of Peru (IMARPE); and multiple universities and national and international experts involved in research generating information and knowledge.



The government did not provide other emergency relief that flood-affected households require, including food, water, latrines, health services, and more permanent shelters. The Sphere Project establishes minimum protocols organizations should have for humanitarian aid, but these protocols have not been fully adopted in Peru. Health, in particular, has been an issue with outbreaks of water- and mosquito-borne diseases (e.g. dengue, zika, chikungunya, and malaria). The Ministry of Health did not arrive until 48 hours after the March 26 flooding in Piura, and did not adequately communicate health hazards and prevention (e.g. mosquito nets, insect repellents, full-sleeved clothing). Disease transmission only began to drop in July when floodwaters finally dried up.

In order to access emergency aid and financial relief, local governments are required to fill out and submit an Evaluation of Damages and Analysis of Necessities (EDAN). EDAN registers aid requests in the National Information System for Response and Rehabilitation (SINPAD). The process is time consuming and detailed. Separate EDANs are filed for each community and require information on a household-by-household basis. Furthermore, local governments were unsure of when to begin filing EDANs, especially in areas that were facing recurring floods. EDANs are submitted to the COER and INDECI for approval and funding, a process which is supposed to take 24 hours but in reality can take up to a week. And, once received, EDAN funds are rigid and cannot be reallocated from one household or community to another, even if disaster conditions have evolved and/or worsened. As a result, though

funds were requested, their utility and timeliness was highly constrained.

Similarly, emergency funds disbursed by the Ministry of Economy and Finance (FOMIN) were slow to reach communities in need due to bureaucracy; some poorer local governments had not received emergency funds from FOMIN five months after the floods. Local governments indicated that this money was often insufficient to continue emergency relief and implement early recovery efforts. The allocation to Veintiseis de Octubre in Piura was a fraction of the 15 million PEN the mayor estimated he required for immediate shelter needs and the reconstruction of drains and two bridges.

As floodwaters receded, many people were able to return to and rehabilitate their homes. However, in vulnerable communities with poorly constructed houses, homes have been rendered permanently uninhabitable. As of July 2017, an estimated 12,000 families were still living in tents in their communities or along roads across the Piura municipal area.

### The Role of NGOs

In the absence of government distributed food and water, flood victims relied on NGOs and local donations from residents, restaurants, religious groups, businesses and universities for food and water. Residents also opened their homes to family members; 20,000 families were estimated to still be staying with family and friends three months after the floods.



NGO assistance focused primarily on communities that the government was unable or unwilling to reach. NGOs with a history of working in specific communities were particularly effective at supporting those communities with flood impacts. Practical Action Peru, for example, has been working in Cuatro de Mayo, a very poor informal settlement in Piura, on DRR and preparedness. In the floods, Cuatro de Mayo was inundated with 1.5 meters of water and homes were destroyed. Months later, when residents moved back with their shelter tents, Practical Action provided them with water tanks and dug latrines, and are now exploring further recovery options for the community.

Support from less-grounded NGOs, however, presents challenges, particularly around understanding needs and coordinating with other actors in the community. In some cases, because of this lack of communication and coordination, NGOs realized only after receiving funding that their aid would be redundant. One such story is of an NGO that arrived in a community to work on sanitation and water only to find another group had already done much of their planned work, and because their funding was water and sanitation-specific, it could not be used for other community needs.





# Long-term Recovery and Reconstruction

## Prioritizing Investments

In the aftermath of the floods, the national government set aside 2.5 billion PEN (770 million USD) for recovery and reconstruction over a three-year period. There is recognition nationally that the recovery and reconstruction phase needs to be leveraged to ‘build back better’. With this in mind, the national government established the Autoridad para la Reconstrucción con Cambios (“Authority for Reconstruction with Changes”, ARC) through Decree 30566 in May 2017 as the lead authority for reconstruction.

ACR is autonomous and is responsible for reconstruction, in particular prioritizing and allocating reconstruction funds to national, regional and local government through public and private funds and tax works. CENEPRED and Ministries involved in reconstruction, such as the Ministry of Housing and Ministry of Education, coordinate with ACR. Their role is primarily to provide regional governments with

technical assistance for reconstruction and local governments with support on risk analyses and project development to reestablish critical services.

In June 2017, Decree No. 132 was passed to establish the Multi-Sectoral Commission of the Fondes (FONDES), a permanent commission consisting of MEF, MINDEF, and the Ministry of Environment, with INDECI as the secretariat. FONDES is tasked with fast-tracking technical proposals, allocating funds for reconstruction from MEF’s “Fund for interventions in the event of natural disasters”<sup>4</sup>. These funds are to be moved from the national to the regional and local levels within 30 days of accepting a proposal, while also

<sup>4</sup> This fund is a State-created instrument through which, in particular, regional and local governments can access financing for prevention, response, rehabilitation and reconstruction activities and investments. It allows for mitigation and response to damage caused by rain and associated dangers in areas declared in a state of emergency.



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*Rebuilding infrastructure and restoring services is only one aspect of resilient recovery.*

ensuring that proposals are a part of a multi-sectoral vision for reconstruction. Other sources of reconstruction funding include Cooperacion Financiera and FONIPREL.

Though the government has set up key institutions to coordinate recovery nationally, they have run into difficulties over what investments to prioritize. This is largely because:

- **A systematic damage and needs assessment was not conducted at the national level.** This has been partly attributed to poor data from the local level. Many local governments failed to conduct local-level assessments due to the pressure to respond quickly. Where local level assessments were conducted, the reliability of numbers provided has been questioned. There are cases where local mayors inflated beneficiary numbers to receive more funding and aid, or did not update numbers to reflect later floods. CENEPRED is now responsible for conducting risk assessments, and the hope is that these assessments will help plan and prioritize recovery investments.
- **ARC is not well-integrated into the existing DRM system.** ARC is a new institution and was formed in response to fears that CENEPRED did not have the institutional capacity to lead reconstruction efforts for the scale of the El Niño Costero flood disaster. ARC lacks the relationships and knowledge needed to effectively coordinate with other DRM institutions. Consequently, recovery allocations are being made on a project-by-project basis rather than following an integrated DRM vision.
- **Local governments have been left out of decision-making processes related to reconstruction funding allocation.** The majority of funds allocated for reconstruction thus far have gone to regional governments and the private sector, due to a lack of confidence in local government capacity to adequately execute reconstruction projects. Many local governments are not even eligible to receive funds as reconstruction funds can only be allocated to entities that have spent at least 75% of their annual budget. Mayors in flood-impacted areas have gathered to protest ACR's authority and demand that ACR prioritize projects identified by local governments as the most urgent given their knowledge of the local context.



## Reconstruction versus Recovery

Globally, long-term disaster recovery efforts typically focus on rebuilding infrastructure. Peru is no different. In the Reconstruction Plan authorized by Law 30556, 77% of the funds are allocated for recovery of gray infrastructure, including repairs to roads, flood protection infrastructure and drainage systems. 21% of the budget is allocated for prevention works. Only 2% of the budget

is earmarked for strengthening of institutional capacities<sup>5</sup>. This focus on infrastructure also extends to the regional government. The Piura regional government is funneling 781 million PEN into cleaning the river (e.g. clearing debris and

<sup>5</sup> Supreme Decree No. 091-2017-PCM. <http://busquedas.elperuano.com.pe/normaslegales/decreto-supremo-que-aprueba-el-plan-de-la-reconstruccion-al-decreto-supremo-n-091-2017-pcm-1564235-1/>





plants) and building dikes and drainage systems in 2017.

As noted above, allocations for infrastructure are being made on a project-by-project basis, making it difficult to pursue an integrated vision for reconstruction and, overall, ‘build back better’. Universities and public-private coalitions

like the Water Resources Council of Chira-Piura Basin have developed and continue to develop integrated proposals for DRR, reconstruction, and recovery. These plans advocate for reforestation in the foothills, protection infrastructure and annual cleaning of the river at lower elevations, building stormwater basins and reservoirs along

the rivers to allow for both flood control and irrigation, improving connection and flow of the Piura River to the ocean, and designating and enforcing floodplain no-build zones. While the Piura regional government seems interested in this proposal, securing national government buy-in and commitment has largely been unsuccessful and these plans remain aspirational. Less well-established basin-scale planning efforts have achieved even less recognition.

The lack of focus on the human element of reconstruction is equally problematic. There is no doubt that infrastructure is important in the aftermath of a disaster. People need access to core services like electricity, water, and transportation as a means to maintain livelihoods and economic activity. In addition, infrastructural projects provide income generation opportunities to those who have lost their homes and livelihoods and are attempting to recover. NGOs have established ‘cash for work’ and ‘food for work’ programs in flood-affected areas. So far, there is no similar effort on the part of the government.

This focus on infrastructure means that social recovery has largely fallen by the wayside. Yes, reconstruction projects are an income-generation opportunity, but this is not a viable long-term livelihood option for many, nor is local hiring a requirement or even a stated policy in government-funded reconstruction projects. This leaves many households not only grappling with issues of rebuilding their homes but also seeking to rebuild livelihoods. The prevalence of disease outbreaks further complicates household

recovery and points to an urgent need for health interventions. A damage and needs assessment carried out by the Piura regional government highlighted the critical losses and damages faced by the health and education sectors. Due to these damages, people are unable to go to work (either caring for themselves or a sick relative) and children are unable to go to school. While much of the damage to these sectors was caused by poor infrastructure, the resulting social impacts need to be addressed just as much as impacts to roads and buildings.

Where the government is focusing on social recovery, efforts have been hampered by sudden leadership transitions. For example, the Ministry of Women and Vulnerable Populations (MMP) was responsible for social economic and technical rehabilitation in the Rimac Basin in Lima. They organized and led several coordination meetings with public and private actors to make recovery decisions and implement recovery activities. In May 2017, the MMP’s responsibilities were abruptly transferred to the Ministry of Development and Social Inclusion (MIDES) without adequate handover of prior work and activities. Recovery activities have had to be redeveloped and restarted, which has overall slowed down recovery in the Rimac Basin.

Non-government actors have attempted to fill gaps in government-led recovery. For example, the University of Piura started a university hospital with 42 beds to treat dengue, and NGOs have been working with select communities on long-term recovery. However, the reach of these efforts is small compared to the need. Overall,





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*The intense focus on rebuilding infrastructure means that social recovery has largely fallen by the wayside.*

social and livelihood recovery are largely left to households and communities to enact on their own (see Box 7). This is true even in resettlement discussions, as reflected in the section below, where the focus is on physical housing rather than helping recover lives and livelihoods. A lack of attention to social recovery, including livelihoods, health and education is likely to result in increased vulnerability for many households, as households will be forced to choose short-term survival over long-term recovery.

#### BOX 7.

#### INVISIBLE COMMUNITIES: RECOVERY OPTIONS IN THE ABSENCE OF GOVERNMENT SUPPORT

Cuatro de Mayo is a very poor informal settlement located on the east side of the Piura River. It is largely made up of single mothers who work as maids or for large agribusinesses. Of the few men in the community, many are moto-taxi drivers. In the 2017 event, Cuatro de Mayo faced severe flooding when drains failed and rainwater collected in the low-lying community. Community members reported waters 1 to 1.5 meters deep, which destroyed homes and moto-taxis. Five hundred houses were damaged or destroyed, and many families are still living in emergency tents. In the short-term, households need materials to rebuild their homes, but in the long-term an estimated 300 families need to be relocated or assisted to build their adaptive capacity to live with occasional floods.

The community has had little success in approaching the local government for their recovery needs. Residents inhabit the land illegally, and the landowner has threatened to sue the municipality if they provide the Cuatro de Mayo community with any services or support

post-floods. The municipality has even stopped garbage collection in the community. In the absence of government support for recovery, Cuatro de Mayo residents have relied on their own social networks, particularly relying on each other, on family, and on support from Practical Action Peru. Prior to the floods, households had electricity but no access to potable water. Now they have neither. Practical Action has helped them dig latrines and provided water cisterns. Women cook communally to feed the community at large.

The importance of social cohesion in this community is enormous. The settlement is nine years old and in those nine years, the women especially have built strong social networks. Some husbands are in jail and others have travelled to the coast to fish. The women have had to rely on each other for daily survival for several years. Social capital is such an important part of their daily survival that they have told the municipality they will not relocate unless everyone relocates together.



## Resettlement

The 2017 floods heavily impacted many settlements located on marginal, flood-prone lands. Resettlement of these largely informal communities has been identified as one of the possible solutions in areas where there is high risk and that risk has been determined to be unmitigable (see Box 8). According to Resettlement Law No. 29869, Article 4, resettlement should be carried out where “the implementation of mitigation measures will be more expensive and more complex than relocation”. While the floods have led to broad discussion about whether and how to resettle communities heavily impacted by the floods, resettlement is a multi-dimensional, complex issue and there is no consensus on how to best go about it. The issues with resettlement can be divided into ‘who’, ‘what’ and ‘where’.

### Who needs to be resettled?

The Peruvian government has decided that households and communities on unmitigable land need to be resettled. There are laws that define what constitutes unmitigable versus mitigable and outline methodologies for making determinations. The Ministry of Housing and the National Authority for Water (ANA) are working with local governments and CENEPRED (who conduct risk assessments) to determine

### BOX 8. MITIGABLE OR UNMITIGABLE: A CONUNDRUM

The existing Peruvian resettlement law allows for government relocation of households if they live in locations with ‘unmitigable risk’. Recent national legislation has refined the definition of unmitigable risk as areas where there is likelihood that the community or their livelihoods will suffer recurrent damages in disaster events and implementation of mitigation measures is more expensive and complex than simply relocating the households and providing urban services. The challenge in implementing this law, however, is that flood risk is rarely so black and white, and the line between what can be mitigated and what can’t is fluid.

Many of the communities in Piura that were heavily impacted by flooding in 2017 were flooded due to rainfall. Rainwater collects in low-lying areas throughout the city. If rainfall is intense, the collected rainwater can get meters deep. However, there are many ways to deal with this type of flooding. Natural drainage can be restored or artificial drainage can be added. In this case, the flood risk has been mitigated, assuming the drainage is maintained and that it isn’t overwhelmed by the intensity of rainfall. Alternately, homes can be elevated on stilts, early warning systems can be developed, and community capacity can be built so that people can evacuate with their assets. In these cases, the flooding occurs, but the impacts on people’s

lives have been mitigated. This approach to ‘living with floodwaters’ is not always seen as ‘mitigation’, yet for the people in the community, this is often enough of a solution to remain where they are.

Mitigable vs. unmitigable becomes yet more complicated in the case of Catacaos and Curamori, to the west of downtown Piura. These two communities were flooded in 2017 due to failure of the river levee. This type of protection infrastructure failure is regularly seen in post-flood landscapes in both the most and least developed countries in the world. Though the flood risk to these town was “mitigated”, **the mitigation failed and revealed the residual risk that still exists with any protection infrastructure.**

Protection infrastructure needs constant, annual maintenance if it is to perform in an emergency. And, even perfectly maintained infrastructure will eventually be overwhelmed when the size of the event exceeds what the infrastructure is built for. For example, the 1983 El Niño flooding in Piura was of such high volume that it eroded the channel bottom, widened the river, and undermined the levees causing them to collapse. Even in places with physical protection infrastructure, capacity building and early warning systems are needed for the rare event when either protection structures fail or the size of the event the protection structure is designed for

is exceeded. Had there been an awareness of the residual risk in these communities and an early warning system to alert people to levee failure, lives and critical assets might have been saved.

Resettlement is expensive, time consuming and difficult to do well. Done badly, it leaves individual households and often whole communities more impoverished and at greater risk. At the same time “unmitigable” risk is hard to determine. A more effective way forward is to engage communities in discussion about how to mitigate the potential impacts of both their immediate risk and their residual risk.





whether or not flood-impacted houses and lands are mitigable. These entities are largely technical entities, and much of their decision hinges on whether lands border the river, encroach upon floodplains, or even lie within the riverbed. In some cases, a clear argument can be made for relocation. In many other cases, the argument is less clear. For example, a large part of the district of Lurigancho-Chosica, outside Lima, has been designated non-mitigable. This decision has

been questioned because of its impracticality. Furthermore, government definitions of ‘mitigable’ and ‘unmitigable’ do not adequately account for highly contextual ‘softer’ solutions (e.g. early warning systems, retrofitting homes, capacity-building) that promote ‘living with floods’ over ‘preventing floods’ and substantially reduce flood risk.

At the community-level, even among highly impacted households, there is often little agreement about relocation. Many households prefer to be close to their livelihoods and the services and opportunities that support their lives. People often have strong social networks within their communities that are critical in times of crisis. Communities may be unwilling to relocate unless the entire community relocates together, and multi-family households may be unwilling to move if only one family is granted new housing or legal title to land.

### In what should they be resettled?

Households being resettled need a physical structure to live in. Many have lost critical assets and livelihoods and are unlikely to be able to immediately build a shelter of their own on new land. To address this need, the Ministry of Housing has developed modular housing as a way to quickly create resettlement communities. However, these modules were not developed with adequate consultation with sub-national governments, and there is concern that people will not buy the modules as they do not meet local needs (e.g. a lack of space for animals and small farms). There is also increasing evidence of technical and quality problems with the housing. For example, the modules cannot stand high heat, and housing installed in early 2017 showed signs of deterioration within months. While these modules are intended to be temporary and provide flood-impacted households with shelter until they can build more permanent houses, global experience demonstrates that ‘temporary housing’ is often still in use 10 or more years after disasters. Resilient housing reconstruction

requires, at a minimum, durable ‘temporary’ housing that can serve as the nucleus of a more extensive home as households recover and have the resources to add to it.

### Where should they be resettled?

Currently, government entities at all scales – COER, local government, Ministry of Housing, and so on – are identifying potential resettlement sites. Where to resettle people is constrained by available land, which is limited. Some entities are advocating to build satellite towns for displaced households. In other cases, there are plans to resettle people back onto flood-prone lands (similar to what was done in many cases after the 1997/1998 El Niño). In Pedregal, government modular housing is being installed in the areas that flooded. There is recognition that this is a bad idea, but the use of land is a sensitive issue. Some have suggested that private companies have an obligation to donate land to surrounding communities and others have suggested that land traffickers should give up their illegally obtained lands to the displaced, but both are contentious suggestions.

People don’t want to move to lands that are currently unoccupied because they tend to be far from the city. In anticipation of the 2015/2016 El Niño, efforts to relocate populations living in flood-prone areas to unoccupied locations were not successful. In Castilla, for example, many who were relocated returned to their homes in unsafe areas. High-risk lands have been occupied because they provide livelihood benefits and are low cost. Resettlement locations will need to provide similar benefits to attract and retain



inhabitants. This includes features such as being close to livelihoods, markets, public services, highways, hospitals, and so on. Lands that have been identified for resettlement to date are far from the municipality and/or are communal lands that lack basic services.

Finally, even if the government manages to successfully relocate communities, they will be faced with the challenge of ensuring that high-risk, flood-prone lands aren't reoccupied after the original occupants are resettled elsewhere. It is common for migrants to see an empty space and then occupy it. Interestingly, there have also been cases where those that are resettled think they still have access to their old property due to confusion around the land legalization process. In the past, the government has legalized informal settlements, providing people with land titles; people believe that their ownership of their previous land remains even after they have been resettled.

#### **BOX 9.** **EL NIÑO COSTERO FLOODING IN THE** **RIMAC BASIN**

The Rimac River flows from the Andes through central Lima to the ocean. The upper catchment areas of the basin are dammed for hydropower and heavily regulated. The lower catchment through Lima is reinforced and overflow is rare. The transition zone in the eastern outskirts of Lima, however, is unregulated and the riverbed and surrounding hills are easily eroded. In this middle zone, heavy rainfall causes debris flows and flash flooding (huaico).

Practical Action Peru has been working in eight communities in this transition zone since 2014 to build community resilience to flooding. Prior to 2014, the communities were aware of the risks they faced, but were not using weather forecasts, lacked protection infrastructure, and were not organized to collaboratively address their flood risk. Practical Action Peru helped establish a community civil defense group, build risk awareness, map hazard areas, and create an early warning system for debris flow and flash flooding. In parallel, they worked with local government to build cross-sectoral ties and collaborations. These activities, in combination with national government action to install protective infrastructure, helped minimize losses and damages during the El Niño Costero.

Locally, the civil defense groups and early warning system were critical in saving lives in the 2017 flooding. Though the early warning only provided tens of minutes of advance notice, households were prepared and were able to rapidly evacuate. In response, and now in recovery, government institutions, including firefighters, police, and health workers are working in closer collaboration. Each institution had its own plan, but for the first time they have started coordinating those plans, e.g. local police have been sharing information with the local emergency center.

Communication and collaboration with the Ministry of Transportation resulted in prepositioning heavy equipment to keep the national road connecting Lima to populations and resources to the east open. In the past, debris flows would leave the road impassable for days. In 2017, pre-positioned equipment (for what was expected to be a normal rainy season) allowed the road to be cleared much more quickly than in previous years.

Debris flows were also addressed through installation of debris nets in landslide-prone gullies above population centers. Unlike

concrete walls, which can be overwhelmed or broken, the metal nets span gullies to catch debris and absorb the energy of the flow. As part of the preparations for the 2015/2016 El Niño, the Ministry of Agriculture invested 22 million PEN to install a series of nets. During the 2017 rains, the nets successfully caught and held multiple debris flows, preventing substantial downslope damage and minimizing road closures. Without them, many of the communities would have been under several meters of mud. The combination of a reduction in debris flows (because of the debris nets) and the prepositioned heavy equipment to clear what flows occurred meant that transportation remained open, maintaining trade and preventing spikes in food prices.

Overall, the Rimac is an example of the range of capacities that need to be built to increase DRM, from civil defense groups to cross-sectoral collaboration to technical capacity of not just Government Ministries but entire communities to understand and advocate for effective solutions.





# Lessons Learned

## Cross-Cutting Issues

**Peru is decentralized, but there is still a strong culture of centralism.** While national governments have, to some degree, handed over capacities and roles to regional governments, this has not been the case for local governments. Local governments continue to be left out of key decision-making processes, and remain unable to effectively access information and funding. Technical and staff capacities remain low. This had led to distrust and weak relationships between local governments and higher levels of government, making it challenging to collaborate on and/or coordinate DRM activities that are embedded in the local context.

**Local governments face significant challenges in accessing DRM funding.** In theory, there are several funding mechanisms through which local governments can access DRM funds. In the majority of these funding mechanisms, the national government allocates funds to regional

governments, which in turn allocate funds to local governments. In practice, most of these funds stay at the regional level; when they do reach the local level they are very slow to arrive. Local governments can directly access FONCOMUN, a national funding stream. However, FONCOMUN money is very small, limiting its utility, and is disbursed only to provincial governments who are then expected to distribute the money among district governments and centros poblados; they often don't.

**There is poor coordination between key players in DRM.** This poor coordination results in significant confusion around roles and responsibilities of various players, and has led to duplication in capacities across sectors and scales of government and throughout the DRM system. Emergency response and early recovery have been hampered by transitions in MINDEF, INDECI and CENEPRED's roles and a lack of clarity about new lines of authority and responsibility.



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*Disaster risk management is a cross-sectoral issue and should not be addressed as a series of separate sectoral obligation if the goal is to fundamentally reduce disaster risk.*

Governments have also suddenly re-assigned responsibility for projects without continuity or transition.

DRM has also been hampered by duplication of technical capacity. Peru has significant technical capacity within regional governments, national research institutions, and universities. However, these capacities are underutilized. For example: regional governments have their own technical studies departments to provide technical validation for reconstruction-related proposals, and do not leverage technical capacity in national government or universities. Similarly, COENs, COERs, and COELs do not communicate well. COENs and COERs, in particular, produce much of the same information and do not coordinate information-sharing well with each other, with COELs, or with civil defense platforms.

#### **NGOs work to fill gaps in government DRM.**

NGOs play a critical role in DRM across scales, in particular working with communities to help them with preparedness, response, and recovery. However, NGOs cannot reach every community

and cannot be expected to fulfill what should be government responsibilities where DRM is concerned.

**DRM planning is not happening.** SINAGERD requires all regional and local governments to implement DRM groups. These groups are responsible for engaging and coordinating management across all sectors to mainstream DRM in all development actions, largely by reducing already existing risk. However, very few local and regional governments fulfill this expectation. There are several factors that likely contribute to this: a lack of technical capacity, though there are at least in theory technical resources sub-national governments can access; lack of funding, as planning takes time and sometimes significant financial resources; and the burden that DRM coordination and development of multiple DRM plans place on local governments. Where local governments have begun addressing DRM, actions are generally not integrated into development planning or other existing obligations. DRM is a cross-sectoral issue and should not be addressed as a separate



sectoral obligation if the goal is to fundamentally reduce disaster risk. However, the current system of a separate funding stream and set of DRM obligations promotes exactly this approach, maintaining DRM as a separate activity stream.

### **DRR and Preparedness**

**Investment in DRR requires a focus beyond infrastructure.** In anticipation of the 2015/2016 El Nino, Peru invested heavily in maintaining old infrastructure and building new protective

infrastructure. However, during and after the 2017 event, it became evident that some of the most critical gaps in DRR are less ‘tangible’. Critical gaps include poor coordination and communication between sectors and scales, issues with accessing DRM funds, few investments in community-based DRR and/or resilience, poor DRM capacity at sub-national levels, and a lack of clarity around lines of authority, roles and responsibilities in an increasingly complex governance system. It is not enough to pursue a





year of rushed DRR spending on infrastructure improvement in anticipation of a predicted event to substantially reduce risk and build resilience to future events. Addressing these gaps will require long-term investment and engagement, especially in the face of uncertainty.

**Land-use and housing are key contributors to disaster risk.** Peru's physical risk landscape has been shaped by poor land-use planning, illegal and legal development of high risk lands, the proliferation of informal settlements, and

poor construction practices. Migration and land trafficking have both led to the development of marginal, flood-prone lands, many of which were heavily impacted by the 2017 event. This development is largely because, since the 1980s, national and sub-national government have legitimized and continue to legitimize many informal settlements by providing access to core urban services, and in some cases providing land titles. This is not entirely bad; government investment in informal settlements has been a

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*Natural hazards become ‘disasters’ when they happen in places that impact human beings and their property. Without adequate land-use and urban planning, Peru’s hard-won development gains will be challenging to maintain in the face of recurring disasters.*

key strategy for reducing poverty and improving human development across Peru. However, without adequate land-use and urban planning and equitable housing policies, hard-won development gains will be challenging to maintain in the face of recurring disasters.

**Local government capacity to prepare for and respond to disasters is limited.** Local governments do not see DRR and preparedness as their responsibility, and are not effectively leveraging their funding for DRR, preparedness, and emergency response activities. Many COELs are not functional, leaving much of the burden of preparedness and response on municipal civil defense platforms. DRR is largely ignored. Where local governments do apply for funding for DRR, funding is allocated on an annual basis and national-level delays in disbursement leave local governments with limited time to fulfill DRR project plans. As a result, local governments tend to pursue special projects over comprehensive, integrated DRR programs.

**Prepositioning emergency equipment and supplies is an important part of preparedness.**

In the Rimac, prepositioning heavy equipment was key for keeping roads open during and immediately after the event and ensuring smooth emergency response. In Piura, emergency response was aided by prepositioning supplies and equipment in nearby regional warehouses, though significant damage to transportation networks meant that many flood-impacted communities were difficult to reach for days and weeks after the event. Nonetheless, even in accessible communities, the aid distributed was inadequate. The government focused on providing emergency shelter, but failed to provide food and water, which are equally fundamental needs. In most cases, people accessed food and water either through social networks or through NGOs. As emergency food and water were not addressed by the government there was also no systematic evaluation of whether supply met needs.



## Emergency Response and Early Recovery

**People do not understand forecasts and early warnings.** There is significant forecasting capacity in Peru. At the national level, ANA, SENAMHI, the COENs, and other similar entities produce forecasts. At the regional level, COERs also produce forecasts. However, there are gaps in making forecast information useable. The forecasts and associated warnings that are disseminated are too scientific, do not provide information on local implications and impacts, and do not indicate how people should respond. Only communities that had specific training around risk and response, such as Polvorines and Cuatro de Mayo, had the knowledge and capacity to understand the early warnings and take coordinated, community-wide action to prepare for and respond to the floods.

There are also gaps in disseminating early warnings. Ideally, COELs should be involved in producing and disseminating locally-grounded early warnings, but many are not functional. As a result, it is up to local civil defense platforms to disseminate warnings. However, they are often ill-equipped for this role due to poor coordination and communication with COERs and poor equipment (e.g. broken or missing sirens and megaphones). Fortunately, the Piura COER disseminated warnings via Whatsapp and radio, reaching all municipal civil-defense platforms. The COER also received information via Whatsapp regarding damages and emergency needs.

**MINDEF responded strongly to the physical challenges of the emergency, but was ill-equipped to address the social challenges.**

MINDEF brought to the emergency many important capacities, including organizational capacity, logistics support, rapid mobilization of equipment, personnel and resources, and emergency reconstruction. However, they did not have an understanding of local level risks and vulnerability, which is key for coordinating emergency response and distribution of aid. And, because the emergency system had been reformed to include MINDEF just prior to the disaster, collaborative relationships with other entities that could fill this gap were not yet in place. In particular, INDECI, an entity with long-standing experience in disaster response, and local governments with a grounded understanding of local impacts and needs were marginalized or excluded from emergency response.

**Government response protocols and emergency funding mechanisms are very rigid.** At the national and regional levels, Peru has protocols for disaster response and disbursement of emergency funds and aid. However, disasters rarely unfold as expected. In Peru, the rigidity of protocols made it difficult to respond to rapidly evolving conditions. For example, the procedure for filing EDAN, in particular entering information household-by-household and submitting forms community-by-community, limited the ability of local governments to respond to community needs as they arose.



## Long-term Recovery and Reconstruction

National priorities are being promoted over community-identified needs. This has manifested across the long-term recovery and reconstruction process in the following ways:

- **Reconstruction of infrastructure is the priority.** The majority of recovery and reconstruction funding has been allocated to the reconstruction of damaged infrastructure or the construction of new infrastructure.

Though the government has embraced the goal of ‘building back better’, there is little evidence that the majority of reconstruction is more than returning to the status quo. Re-building protection infrastructure frequently repeats past mistakes. Plans to improve maintenance of structures and riverbeds are aspirational, particularly when funding is limited and there is frequent change in leadership. Without ongoing, dedicated funding and regularly executed maintenance, similar failures will occur in the next flood.





- **Social recovery is missing from government-led recovery.** With the focus on infrastructure, social recovery has largely fallen to the wayside. People have lost their homes and/or livelihoods, and many are heavily impacted by losses in the health and education sectors. The opportunity to use infrastructure projects to employ locals impacted by the floods and thereby support local recovery is not being intentionally leveraged. Without recovery support, household and community recovery has become stagnant. In Cuatro de Mayo, a heavily impacted informal settlement, households are relying on their social networks for daily survival.

- **Local governments have little to no say in recovery and reconstruction-related decision-making.** Decisions on what gets funding and what does not are made at the national level by ARC, a new authority with few linkages to either the local level or the existing DRM system. However, a systematic national government-led damages and needs assessment was not conducted, in part due to poor reliability of locally-sourced damages data. Technical data like satellite and drone images have not been adequately leveraged or synthesized. This has made it difficult to prioritize where and how to use recovery funding. As a result, most of the funding is going to high-visibility national and regional-level projects. Local governments have

received relatively little money, even though they are more familiar with the local context and their localities' needs.

- **The approach to resettlement is top-down.** The national government intends to resettle flood-impacted households that live on 'unmitigable' lands. However, whether or not an area is unmitigable is unclear and dependent on the local context. Locally, there is a lot of resistance to resettlement. Households have formed strong bonds in their communities and have established access to core urban services, livelihoods, and markets. The national government's approach to resettlement has largely been to find a resettlement site and provide

temporary modular housing. However, for most communities the resettlement sites don't provide the same benefits as their current locations, even when taking current risk into consideration. Furthermore, the proposed new housing generally does not accommodate household needs or address the reality that there is no such thing as 'temporary' housing.





# Recommendations

## Cross-Cutting Recommendations

Invest in capacity building at local levels, coupled with more dependable, multi-year DRM funding streams local governments can use to invest in on-going actions. Effective DRM requires action at all scales, from national down to local. Effective integration of DRM into existing institutional structures will require actions focused on local-level capacity building. At the moment, only 2% of reconstruction funds are allocated for capacity building, which does not reflect the need. In parallel, there needs to be commitment from national and regional-level funding streams to support multi-year efforts. Funds need to be delivered directly to the government doing the work. Expenditure should continue to be reported via existing platforms for fiscal tracking and transparency to prevent corruption. Local advocacy and education campaigns are needed to develop understanding, support and lobbying for action by citizens.

Improve coordination between all levels and sectors of government and between government and other entities. Disaster response occurs at the local level, primarily conducted by local government, non-government, and civil society. Yet the majority of the funding and capacity for response is currently held at the regional and national levels, and even at those levels is strongly divided by institution and sector. Improved coordination between the local level and regional and national governments and across sectors and institutions within government will enable stronger, more timely response, better utilization of resources, and more accurate targeting of resources to address the greatest need. As part of this effort, technical capacity and expertise should be clearly identified and mechanisms developed for sharing information at all times, not just during disaster. Flow of information — not just from the top down but also from the bottom up — should be emphasized. This is particularly true for the COEN/COER/COEL system.





## DRR and Preparedness

**Equitable land-use planning and housing policy are required to meaningfully address disaster risk in Peru.** This will involve: capacity building at all levels of government and society on the importance and benefits of land use planning and equitable housing; clear national and regional guidance on how to evaluate whether lands are or are not at risk; a clear, strong incentives program for local governments to develop land use and

housing policies that incorporate disaster risk; and transparent and equitable enforcement. Planning and enforcement needs to be supported by the national government both financially and through the provision of technical expertise where it is locally lacking, though as noted, much of this can be accomplished by connecting local governments with existing resources.

**Monitoring and maintenance of infrastructure is a critical element of DRR.** Infrastructure — particularly risk reduction or high hazard infrastructure like drains, levees, dams, and bridges — must be regularly maintained and monitored for degradation. Globally, the failure of unmaintained and/or weakened infrastructure is a common source of damage, often causing some of the most expensive or impactful damages and greatest loss of lives.

**Regional and national institutions and governments need to more actively pursue coordinated basin-scale planning.** Particularly for flood risk, decisions about land use, development, water management, and protection infrastructure require basin-scale planning. There are several such initiatives already underway or well developed within the country through the recent creation of eight water basin boards. Existing initiatives should be more actively pursued and should be used as examples for action in other basins.

**Invest in municipal and community level Civil Defense groups.** Globally, large-scale disasters often overwhelm government response and disrupt transportation, leaving communities and households to mount their own disaster response. Communities like Polvorines that have a strong understanding of risk are more prepared and able to respond and recover more quickly than communities with less information. In Polvorines, the community level civil defense group was critical for identifying local risk and helping community members respond to that risk. The local government is now working with Polvorines

to develop community-level civil defense groups in other communities. This model is one that the national and regional governments could promote and fund, with the support of NGOs. NGOs can pilot approaches and techniques for this work, and the government can institutionalize successes.

**Learn from examples of successful prepositioning of supplies.** Prepositioning heavy equipment in the Rimac Valley was key for keeping roads open during the 2017 event. Identifying opportunities and gaps in maintaining critical services during disasters and acting on them will help improve disaster preparedness and response.

Food, water and shelter are the most fundamental immediate needs in any disaster. Where and how these will be sourced must be clearly understood at all levels and across all sectors. Having supplies housed in-region with a plan for mobilization and distribution needs to be agreed upon in advance. These plans must take into account the full range of vulnerabilities and needs within communities. Plans must also consider how resources will be moved if there are failures in the transportation sector (e.g. damaged roads and bridges, fuel shortages), to ensure that all communities in need can be reached.



## Emergency Response and Early Recovery

**Improve dissemination of emergency information, and build local capacity to understand and act on that information.**

Better collaboration between national, regional and local entities is needed to help ground otherwise top-down information. People respond to warnings better if they know what the implications are locally. This requires building the capacity of local government staff to understand what warnings mean and/or building the capacity of technical staff to communicate information in more understandable ways. It is also important that people know how to respond to disseminated warnings. Given the reality of migration, not everyone will be aware of local risk and know what warnings mean and how to respond. This needs to be overcome with simple, targeted messaging from trusted authorities.

**Increase the flexibility and adaptability of response.** Every emergency is different. Situations rapidly change, information is limited, and core systems needed for transportation, communication and service provision may be damaged. It is important that lines of communication and responsibility are clear, that the willingness to collaborate is high, and that response protocol and actions are adaptable and flexible. In particular, there needs to be flexibility within national and regional response to adapt and respond to local conditions. This requires strong communication with local governments and stakeholders who understand local needs and priorities and how they may change as the

disaster unfolds. Systems like the EDAN need to be adapted to be more flexible and timely and to allow reallocation of funds if changing conditions warrant reprioritization.

## Long-term Recovery and Reconstruction

**Leverage the potential benefits of disaster events.** Reconstruction can be leveraged to support social recovery. Post-disaster, there is always a surge of infrastructure repair and reconstruction. Policies requiring local hiring and utilization of local construction companies can provide needed employment to residents who have lost livelihoods and assets and need support to recover.

Similarly, though agriculture and fisheries are both typically heavily impacted by El Niño events, El Niños also bring opportunities such as abundant water, the ability to cultivate diverse crops, and lagoon fisheries. Building public-private partnerships with agribusiness and fisheries in advance of El Niño events with the goal of leveraging these opportunities could offset some of the losses caused by El Niño and aid economic recovery.

**Expand thinking around how to deal with communities on high-risk lands.** Ideally, households would not be located on high-risk lands. However, with a significant portion of the Peruvian population living in high-risk areas, resettlement is not an option for everyone. Government and non-government organizations should work with vulnerable communities to



build community understanding and capacity to address their hazard risk. Simple solutions can often fundamentally reduce disaster risk. In parallel, governments, NGOs, the private sector, and communities should collaboratively explore solutions to mitigate risk, such as improving or restoring drainage, elevating homes, or building other types of protection infrastructure. However,

it should be communicated that even with these 'solutions' there is residual risk communities need to be aware of and prepared to address.





**Integrate local needs with government priorities for resettlement.** For communities that will be resettled, successful resettlement requires more than just a site for resettlement and shelters for households. Community cohesion and social networks need to be maintained; this will likely require moving entire communities together rather than sending individual households to

different places. Resettled communities will need access to livelihoods, schools, clinics, markets, and other critical services. Shelters will need to be simple, durable, and modifiable. Shelter design will need to be flexible enough to accommodate single families, multi-family households, and a range of livelihoods needs.

Understanding and addressing these needs will require close communication and collaboration with both the households that are being moved and local governments.

**Vacated high risk lands need a purpose and enforcement to remain vacant.** High-risk lands are occupied because they are convenient, and will likely be reoccupied after households are resettled if the land is not immediately converted to another use. This will require the development and implementation of robust policy and incentives. Internationally, efforts to redevelop floodplains into public spaces (e.g. parks, playing fields, parking areas, and other lower-risk amenities) have been successful. However, there needs to be public and local government buy-in for these to be installed and maintained.

**Leverage the reconstruction period to ‘build back better’.** A key element of long-term recovery from a disaster is repair of core services and infrastructure. The push to rebuild and repair can be used to increase resilience by incorporating resilience principles of ‘safe failure’, ‘redundancy’, and ‘flexibility’ into infrastructure design, and developing clear plans, funding streams, and expectations for ongoing maintenance.

- Safe failure refers to the ability of a system to fail in a predictable and/or planned way that will minimize damage (e.g. dams are built with spillways in case there is so much water it overtops the dam; river levees have designated points where they will be intentionally broken to reduce the height of the river rather than risk the levee accidentally breaking in a high-value or inhabited area).

- Redundancy refers to the ability of a physical system to accommodate disruptions through multiple pathways for service delivery (e.g. multiple roads into and out of a city; hospitals have generators for backup power).
- Flexibility refers to the ability of a physical system to perform essential tasks under a wide range of conditions (e.g. schools are intentionally built in safe locations and in ways that will allow them to be used as flood and earthquake shelters).





# Conclusions

Peru made a wise, progressive decision in allocating significant funds for disaster risk reduction and preparedness in anticipation of the 2015/2016 El Niño, and it is likely that these investments helped reduce the impacts of El Niño Costero. However, though much of the El Niño Costero's catastrophic impacts were blamed on its 'unpredictability', the disaster was mostly human caused and the impacts were largely foreseeable (French and Mechler, 2017). DRR and preparedness investments failed to address risk exacerbated by rapid urbanization and the development of flood-prone lands. A single year of preparation cannot compensate for years of unplanned development, deferred maintenance and a lack of technical capacity and cooperation.

However, where there are human causes for disasters, there are also human solutions. Across Peru, there is a desire to 'build back better' and

increase resilience to disasters. This will take time and commitment. Much of the damage and loss caused by the El Niño Costero was to livelihoods, homes, and other household and community assets. Globally, we have seen that social recovery can take over a decade. In Peru, Pisco is still recovering from the 2007 earthquake and there are still legal problems related to tenure of housing and lands. If Peru wants to increase resilience and 'build back better', the government needs to commit to a long-term process, beginning with supporting the recovery of the hundreds of thousands who have been left more vulnerable in the aftermath of El Niño Costero.

Ideally, the recovery and reconstruction period following the El Niño Costero flooding will be leveraged to integrate DRM into development. Yet, the challenge with DRM is that, to be truly effective, it cannot be simply disaster focused.





It needs to embrace a wider resilience, and conversations and actions need to move beyond single events and be embedded into a whole system of development. Ultimately, building resilience is not about preventing disasters entirely; rather, it's about learning to live in the face of uncertainty without losing the development gains made previously.

Consequently, resilience is not an end goal; it is an ongoing process as risk landscapes continuously shift due to emerging contextual

conditions and pressures. Even in the most 'resilient' places, there is residual risk — risk from unexpected events, from systems that fail or break, from events that exceed design thresholds, or from deferred maintenance. In parallel with good design, construction, and maintenance of systems and services, governments and communities need capacities and skills to deal with the unexpected. Achieving this requires engagement and participation across the full spectrum of society. For the national government, this will require pursuing

important, inclusive conversations with civil society, local governments, the private sector, and NGOs on how to create equitable land-use and DRM systems that serve the Peruvian population.



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This report presents a snapshot of events and responses during the January-March 2017 flooding in Northern and Central Peru. It is not comprehensive - much more could be said on the degree of resilience of Peru's preparation for, response to and recovery from the floods. What this report does provide is a collection of short, field-tested examples of resilient systems and actions and a discussion of what it is that makes those resilient. It also describes factors which limited the ability of people and systems to weather the storm.

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