

# El Niño Insurance & Low-Emission Climate-Resilient Development in Peru

Benjamin Collier, GlobalAgRisk, Inc.,  
Agricultural Economics at University of Kentucky

Nuevo Vallarta, Mexico  
15 March 2011



# Outline

---

- ▶ UNDP's support to Low-Emission & Climate-Resilient Development and the UNDP/GlobalAgRisk project in Peru
- ▶ Understanding El Niño
- ▶ Mechanics of El Niño Insurance
- ▶ Working with households and associations
- ▶ Working with government agencies
- ▶ Next steps

## GlobalAgRisk Mission

*Improve access to financial services for the rural poor through innovative approaches for transferring weather risk*

- ▶ **Activities**
  - ▶ Research and development
  - ▶ Technical capacity building
  - ▶ Educational outreach
- ▶ **Supported by**
  - ▶ Multilateral organizations
  - ▶ Governments
  - ▶ Private donors
  - ▶ Nongovernment organizations
- ▶ **Select Country Work**
  - ▶ Peru – El Niño/Flood
  - ▶ Mongolia – Livestock
  - ▶ Vietnam – Flood/Drought
  - ▶ Indonesia – Earthquake
  - ▶ India – Drought
  - ▶ Morocco – Drought
  - ▶ Mexico – Drought
  - ▶ Romania – Drought
  - ▶ Ethiopia – Drought

# UNDP

## *Low-Emission and Climate-Resilient Development in Peru*

---

- ▶ As part of UNDP's support to countries to transition to low-emission, climate-resilient development, and in line with a area based approach to managing climate change risks and opportunities, which is directed at strengthening the capacity for risk management and adaptation to climate change at national and sub-national levels
- ▶ Low-emission and climate-resilient development in Peru
  - ▶ Build capacity for Peru to adapt to climate change
  - ▶ Provide technical assistance to put Peru on a low emission development pathway
- ▶ UNDP is supporting the application of an index insurance product as a measure to prepare for extreme events of El Niño
  - ▶ Integrated approach to risk management that uses the El Niño Insurance
  - ▶ Increase the risk-coping capacity, adaptive capacity and economic resilience of households, local and regional governments

## UNDP

### *Low-Emission and Climate-Resilient Development in Peru (cont.)*

---

- ▶ El Niño is primary disaster risk in northern Peru
- ▶ Some evidence suggests El Niño events will become more frequent/severe due to climate change
- ▶ Project supports insurance market development for El Niño
- ▶ UNDP work with GlobalAgRisk supports applications with
  - ▶ Households and farmer associations
  - ▶ Governments
- ▶ Complements GlobalAgRisk work with private-sector firms in northern Peru (supported by Bill and Melinda Gates Foundation)

# Linking Insurance and Risk Adaptation

---

Combining insurance with adaptation strategies can reduce risk exposure and protect livelihoods against severe events

- ▶ Encourage risk management *and* appropriate adaptation
- ▶ Smooth cash flow between disaster and non-disaster years
- ▶ Targeted, timely payments
- ▶ Build on existing network for education and access to reduce cognitive failure and reduce transaction costs
- ▶ Stakeholders may use payouts to finance adaptation investments (e.g., infrastructure, livelihoods transitions, etc.)

*Insurance is not a solution to climate change*

- ▶ *Insurance can protect against weather extremes, but adaptation is necessary to adjust to changing climate trends*
-

# Piura, Peru

## *Severely Affected by 1998 El Niño*

---



- ▶ Population of 1.7 million
- ▶ Largely arid region
- ▶ Very productive agricultural region
  - ▶ Good soils, irrigated agriculture
  - ▶ Agriculture employs 37 % of workforce
  - ▶ Almost all farms are less than 10 hectares
- ▶ 54% at or below the poverty line

Source: Instituto Nacional de Estadística e Informática, 2007

---

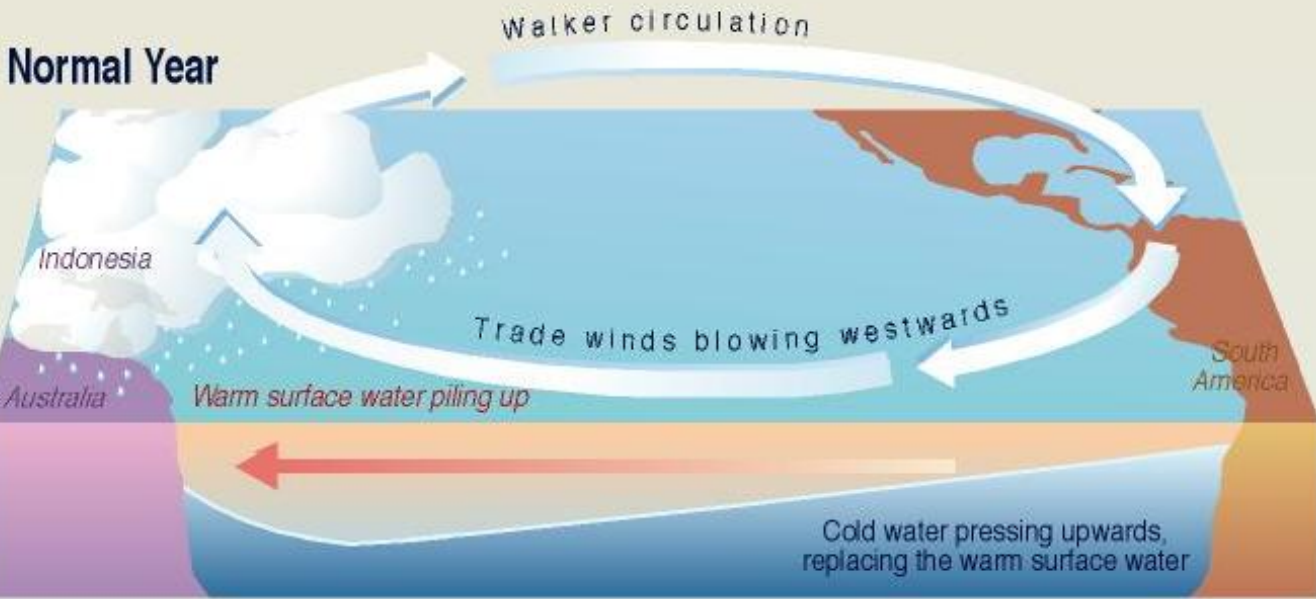
# Extreme Flooding and El Niño

---

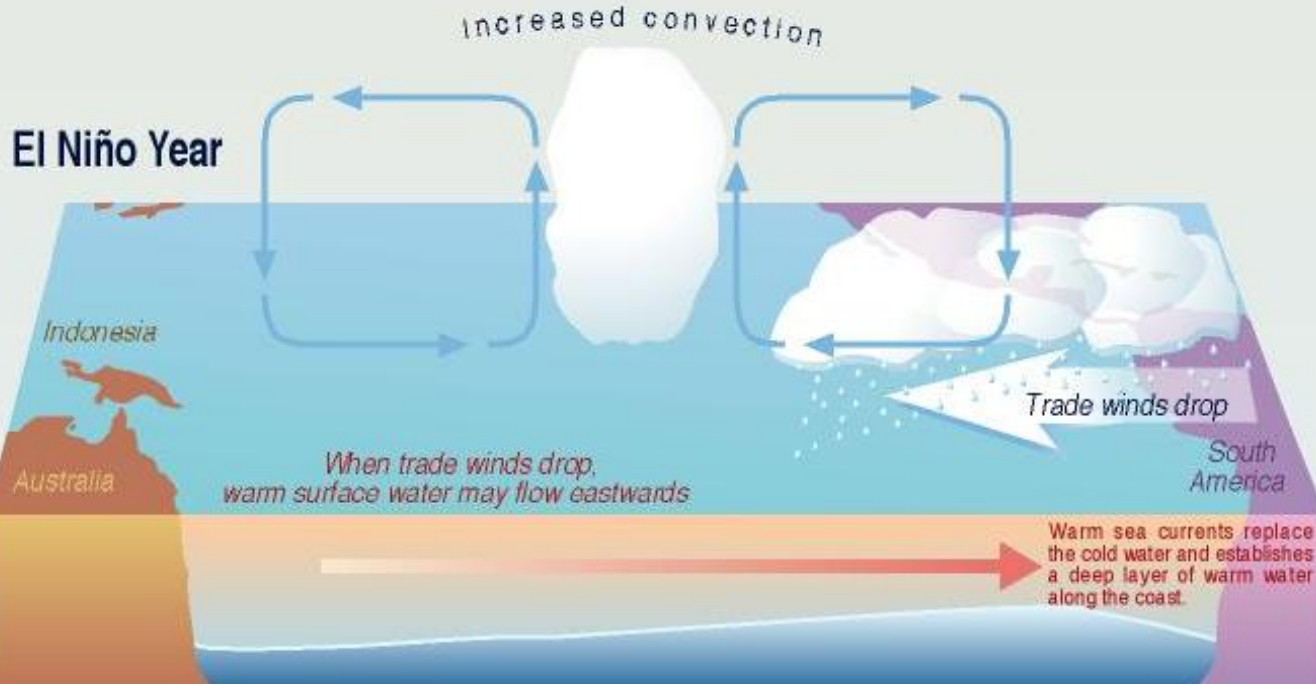
- ▶ **Extreme flooding in Piura is directly tied to El Niño**
  - ▶ Warm Pacific trade winds meet cold air coming down Andes Mountains
  - ▶ Results in extreme, prolonged rainfall
  - ▶ Severe El Niño occurs roughly 1 in 15 years
- ▶ **Most recent severe El Niño events: 1982/83 and 1997/98**
  - ▶ Rainfall was 40x normal for January to April
  - ▶ For 1997/98, volume of Piura River was 41x median value
  - ▶ For 1982/83, volume of Piura River was 36x median value



# Normal Year



# El Niño Year



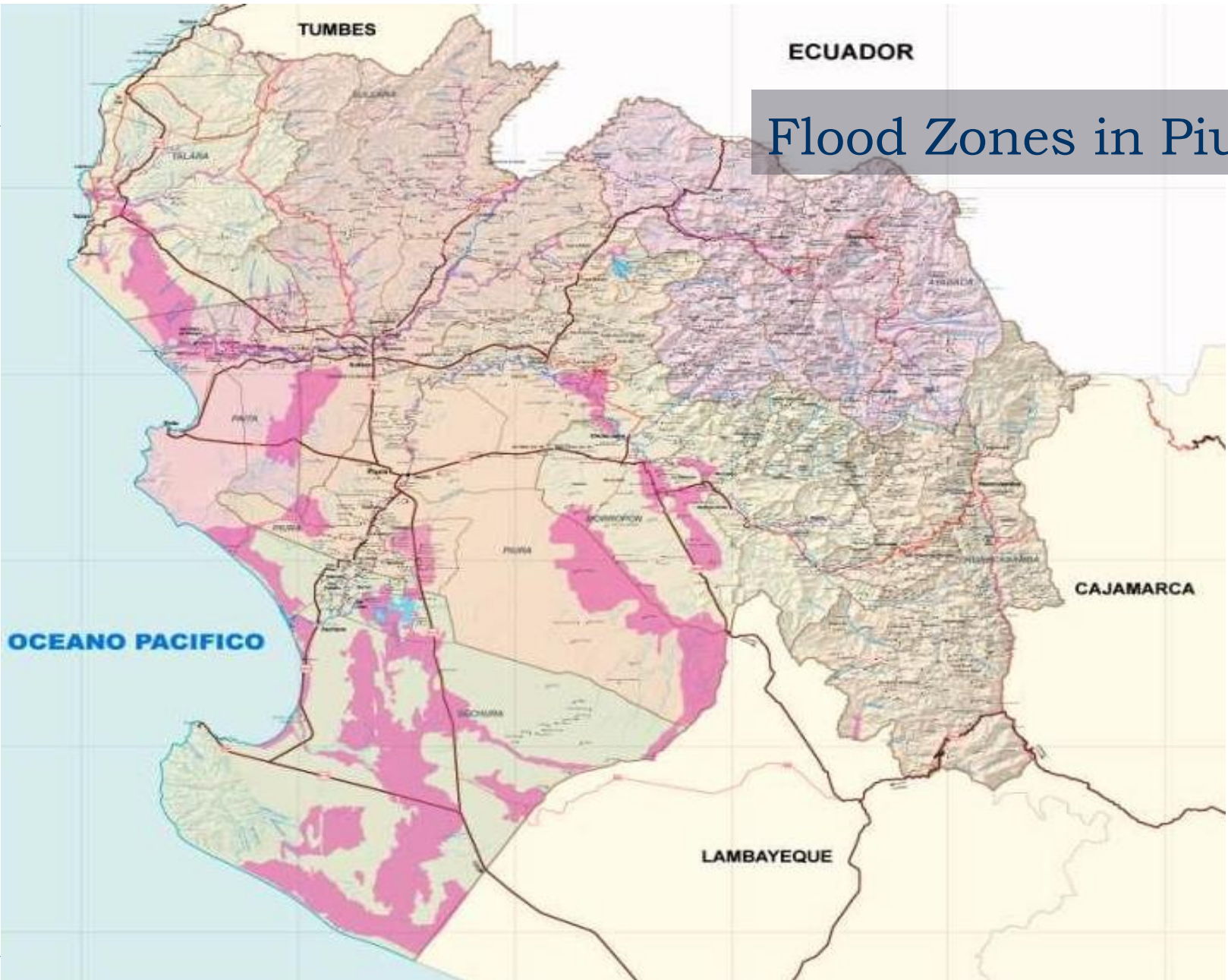
# El Niño and Peru

Source: <http://www.grida.no/publications/vg/africa/page/3105.aspx>

# The Widespread Effects of El Niño in Piura

---

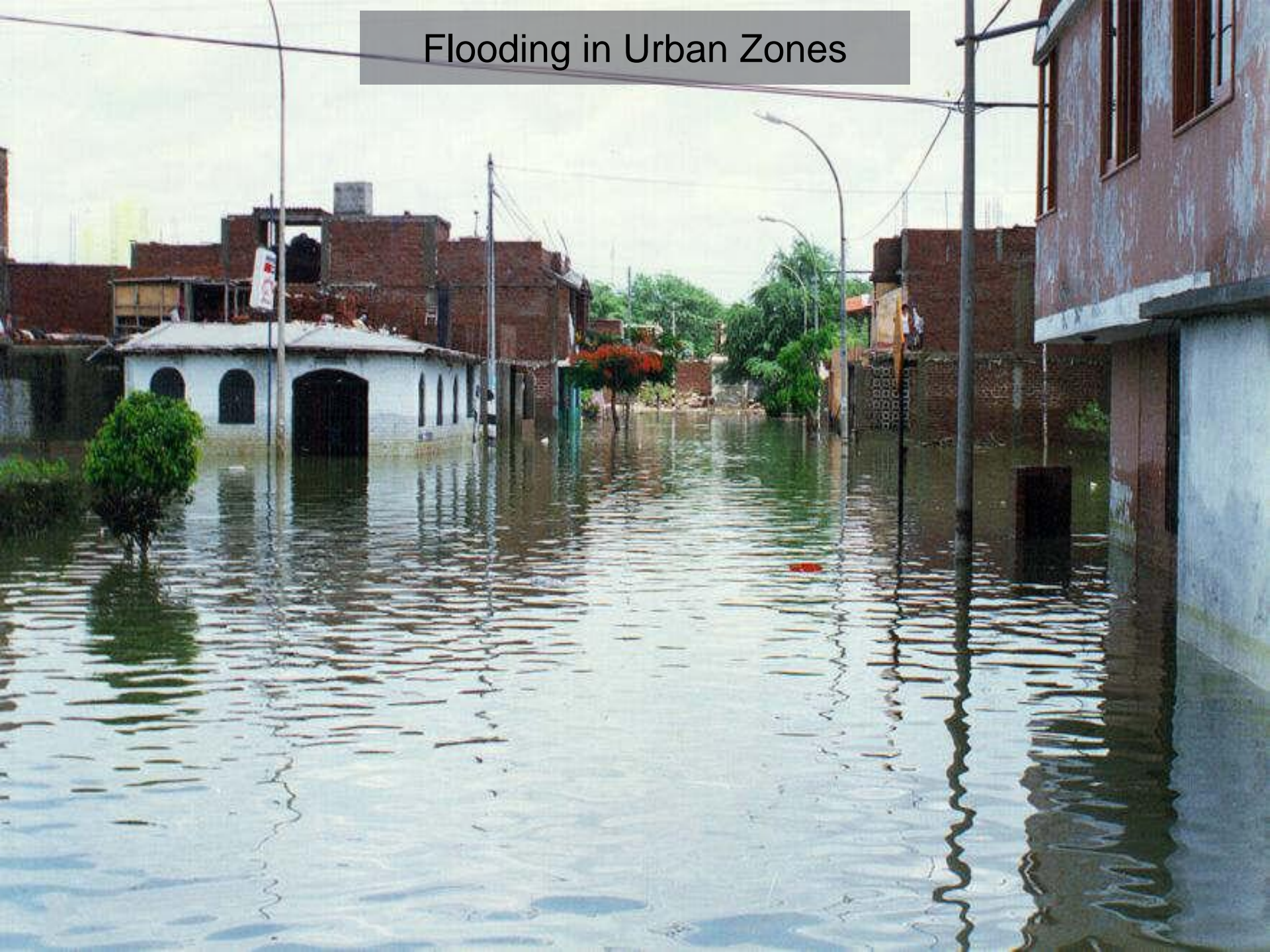
- ▶ Damaged infrastructure
  - ▶ Transportation sector — accounted for 59% of losses in 1998
  - ▶ Poechos Reservoir – capacity was reduced by ½ in last El Niño
- ▶ Disruptions in major markets
  - ▶ Financial services (about 3 percentage points of interest rates tied to El Niño)
  - ▶ Agricultural value chain — fertilizer sales down 27% in 1998
  - ▶ Significant declines in the anchovy catch
  - ▶ Significant declines in exports
- ▶ Disruptions in household livelihoods
  - ▶ Destruction of homes and other private property
  - ▶ Loss of GDP and tax base of government



# Flood Zones in Piura



# Flooding in Urban Zones





# Distruction of the San Miguel and Bolognesi Bridges in Piura



## El Niño-Related Production Losses in Piura

Sector	Value of production losses in 1,000 of soles (%)	
	1982-83	1997-98
Agriculture	116,923 (31,5%)	118,399 (19%)
Transportation	183,277 (49%)	374,216 (60%)
Health	1,355 (0,5%)	1,276 (0,5%)
Housing	63,240 (17%)	37,456 (6%)
Education	6,910 (2%)	30,487 (5%)
Total Soles	371,705 (100%)	621,157 (100%)
Total US\$	116 Million	177 Million
Source	CISMID	INEI

## El Niño Insurance

---

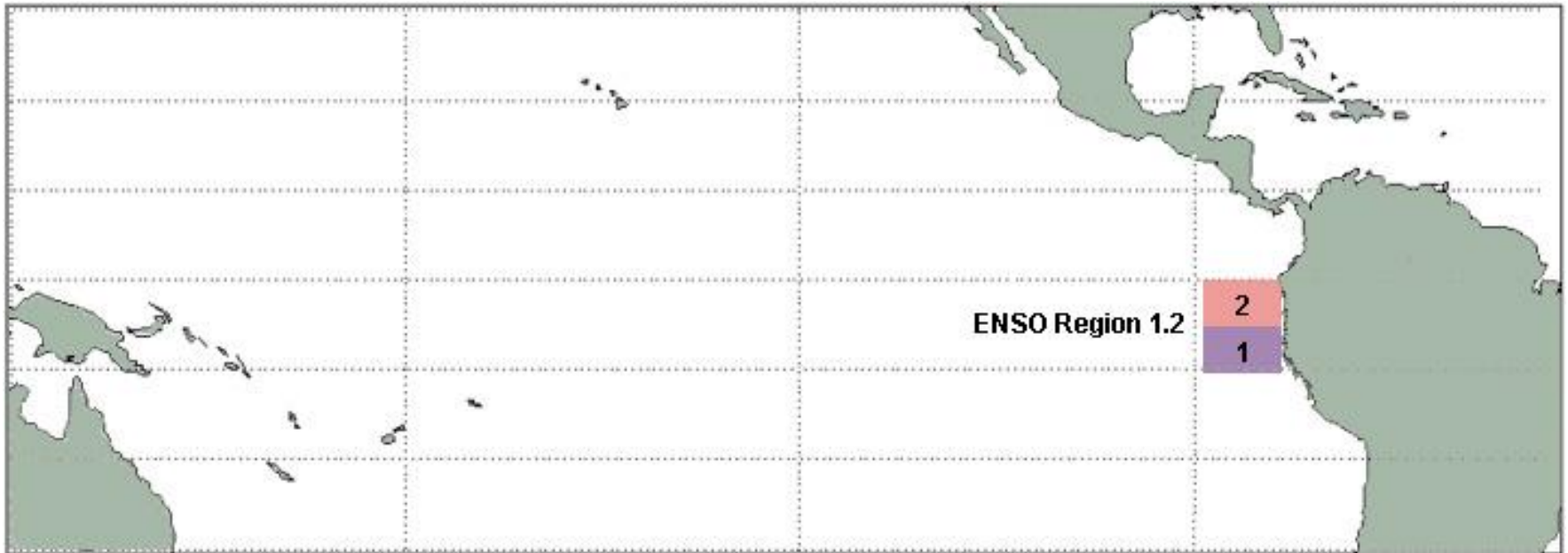
- ▶ Designed to compensate for any of the consequential losses and extra costs that are suffered when extreme El Niño creates catastrophic flooding in northern Peru
- ▶ Payments are based on NOAA measures of sea surface temperature off the coast of Peru
- ▶ Sea surface temperature highly correlated with heavy extreme rainfall
- ▶ Payments come in January, just as the extreme flooding is beginning
- ▶ First regulator-approved forecast insurance that pays *before* the event, to our knowledge



# El Niño Southern Oscillation (ENSO) 1.2

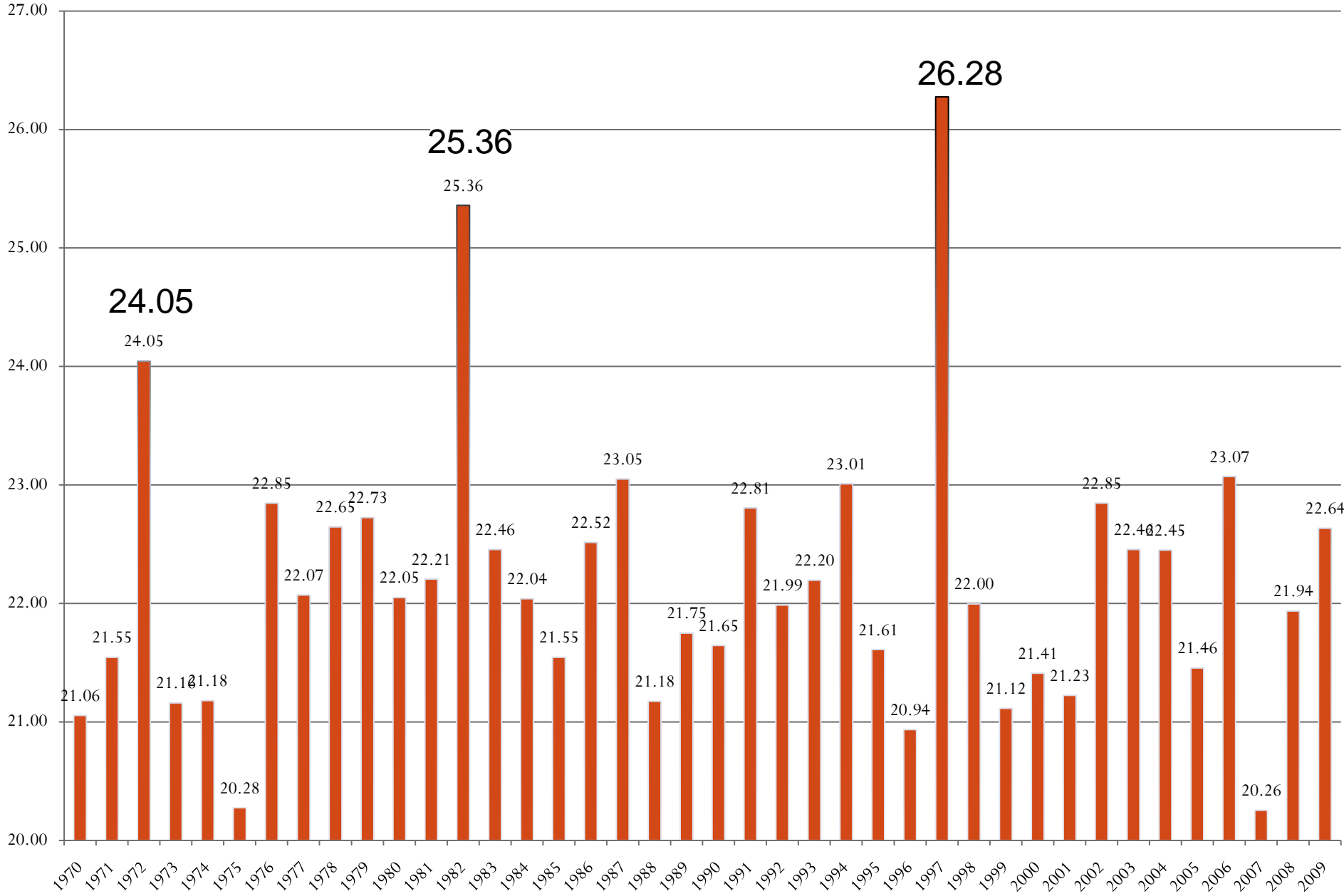
---

- ▶ Measured and reported by the NOAA Climate Prediction Center for over 50 years
- ▶ ENSO Region 1.2
  - ▶ ( $0^{\circ}$ - $5^{\circ}$ S,  $90^{\circ}$ W- $80^{\circ}$ W and  $5^{\circ}$ S- $10^{\circ}$ S,  $90^{\circ}$ W- $80^{\circ}$ W)



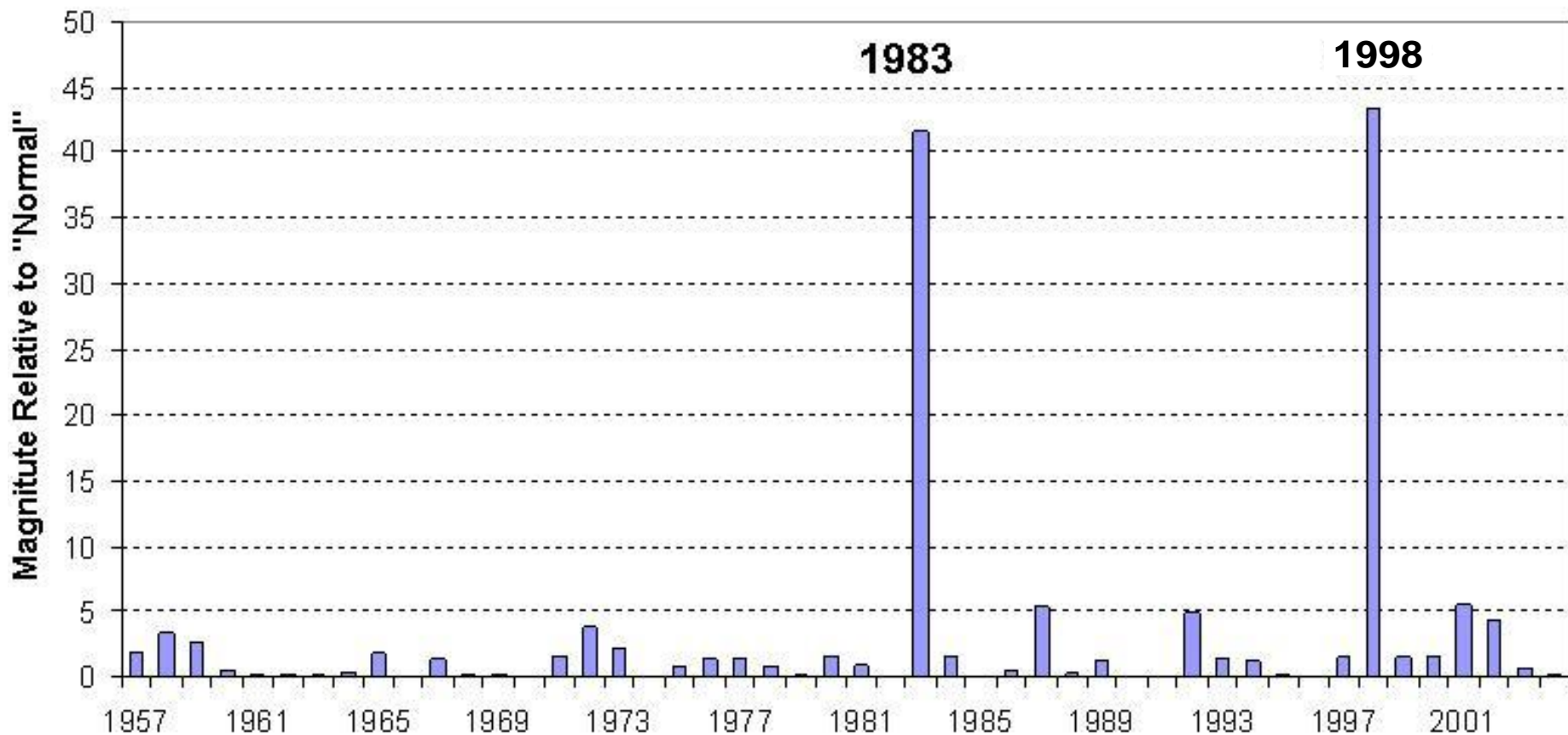


# El Niño Index for 1970 al 2009

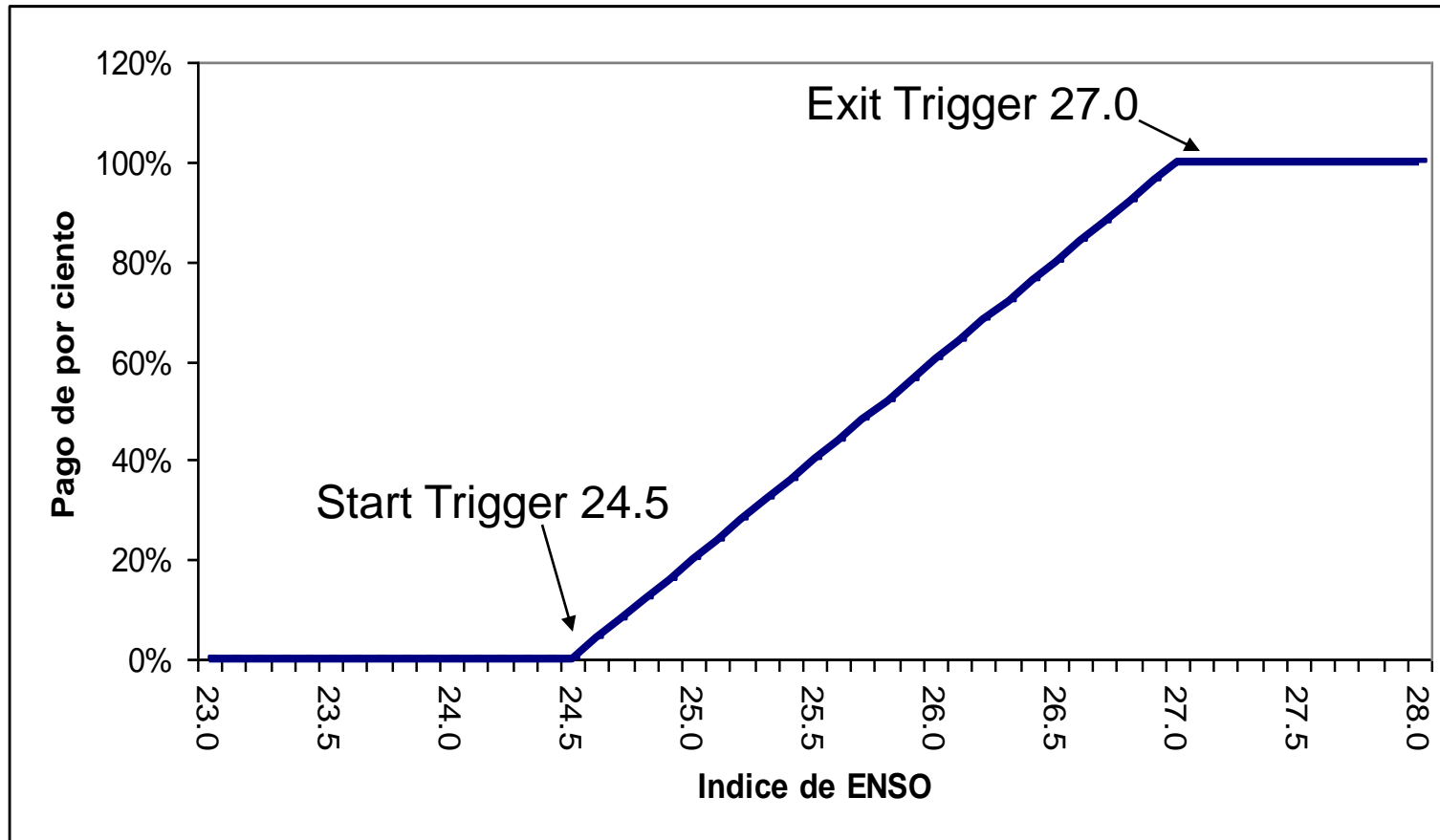


# Extreme Rainfall Associated with Extreme El Niño Events

**Total January-April Rainfall at CORPAC Piura (1957-2004)**



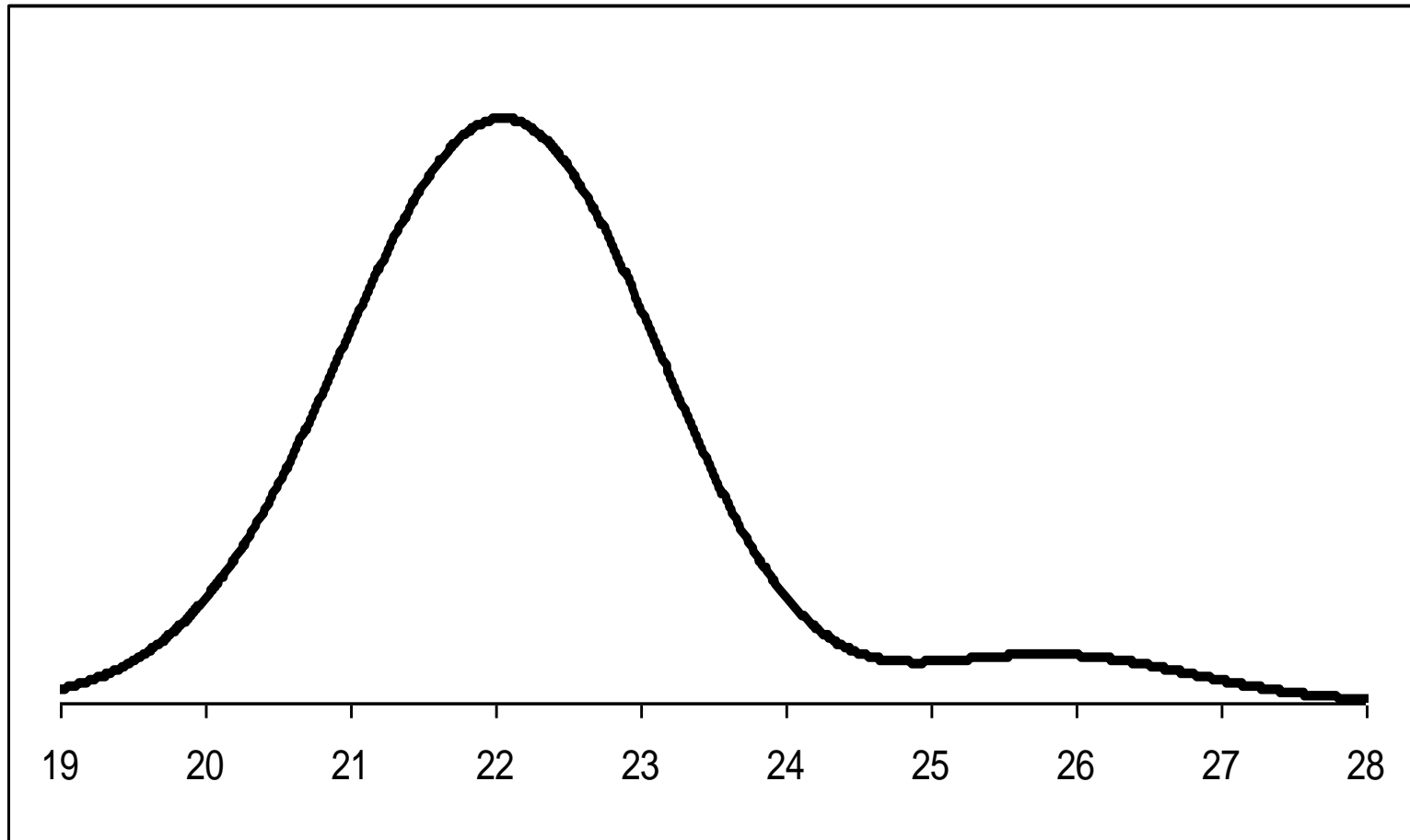
# Example Payout Structure for El Niño Insurance



Linear payout so that if temperature is  $\frac{1}{2}$  the way between 24.5 and 27 or 25.75, the payout rate is 50 percent

# Estimated Probability Density Function for El Niño Index Using Data 1979 to 2007

---



Events in excess of 24 may occur as frequently as 1 in 11 years

---

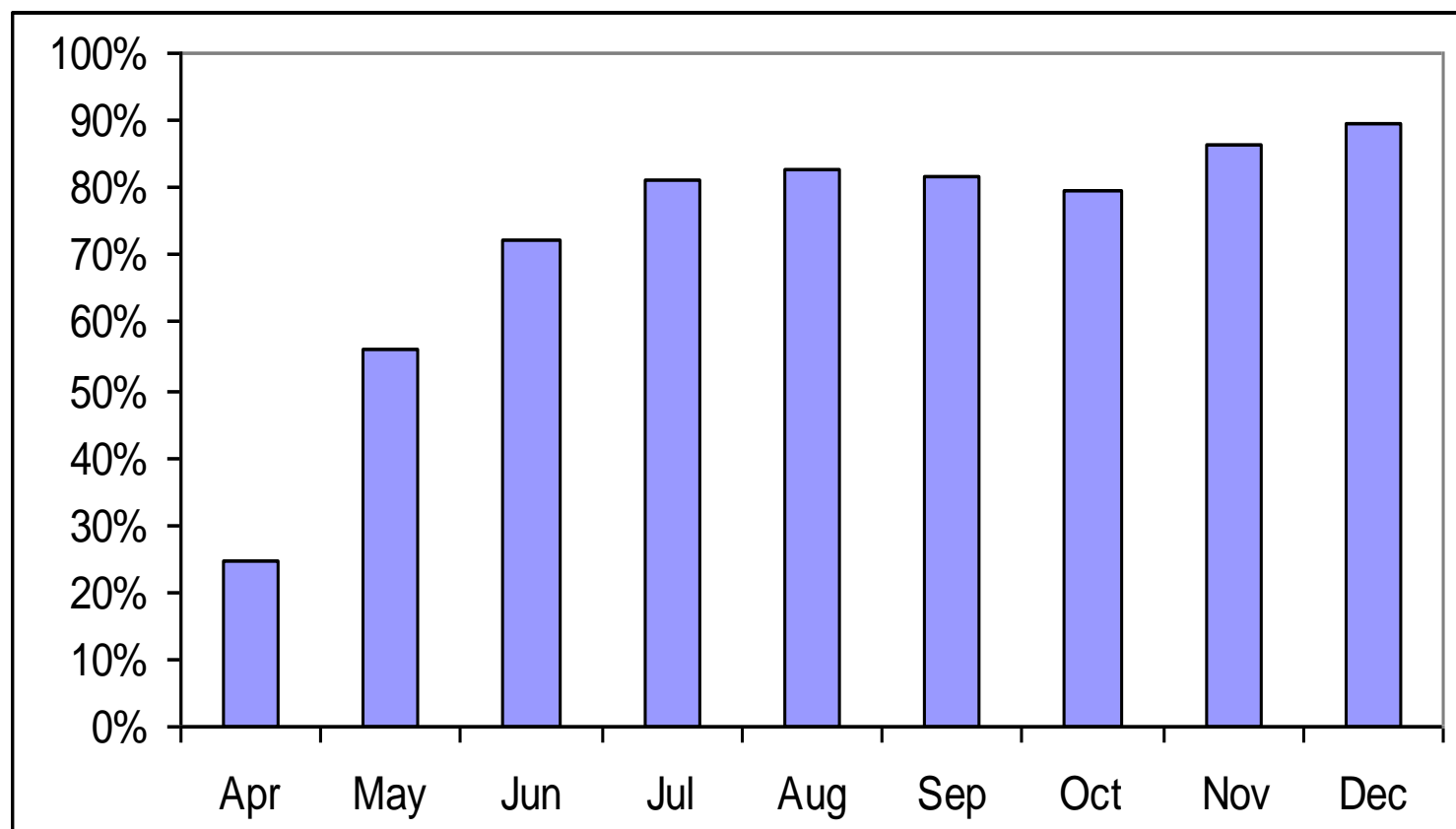
# Timing of the Contract

Year 1			Year 2	
January	May–October	Nov–Dec	Early January	February–April
Marketing period with a sales closing date of January 31	The EBIII is in force for possible upcoming severe event	SST data from El Niño 1.2 is used to calculate payments	Payments can be made <i>before</i> flooding as lenders begin to incur costs	Catastrophic flooding in the region

- ▶ Sales closing date must occur before buyers can predict an El Niño — target January 31
- ▶ Insurance contract covers El Niño 1.2 (Nov–Dec)
- ▶ Payments will be made in early January as business interruptions are occurring

# El Niño Forecast Can Be Made in April

Simple correlation between Jan–March El Niño 1.2 and previous year by month using only Jan–March El Niño 1.2 average values above the median



# Stakeholders interested in El Niño Insurance

---

- ▶ Households
- ▶ Farmer associations
- ▶ Local government
- ▶ Regional government
- ▶ Microfinance institutions
- ▶ Firms in the value chain
- ▶ Transportation
- ▶ Fisheries
- ▶ Tourism

# Objectives of Work with Households and Governments

---

- ▶ Increase the risk coping capacity of local groups and their household members in managing and coping with the immediate consequences of catastrophic flooding brought on by a severe El Niño event;
- ▶ Improve the economic resilience and adaptive capacity of local groups and their household members to extreme El Niño events. These events are likely to increase in severity and frequency as a result of climate change at the global and regional level; and
- ▶ Increase the risk coping and adaptive capacity of local and regional government to manage the immediate consequences of catastrophic flooding brought on by a severe El Niño event and to respond to climate change at the global and regional level



# Associations and Households

## *Goals for El Niño Insurance*

---

- ▶ **Short term goal: Manage acute needs associated with the catastrophe**
  - ▶ Association can invest in collective action that reduces damages
  - ▶ Households could prepare home and other assets for the storm
- ▶ **Long term goal: Facilitate adaptation and development through improved risk management**
  - ▶ Improve resilience to climate change
  - ▶ Increase adaptation investments in production
  - ▶ Improve access to credit for households and associations

# Farmer Associations: Possible Uses and Benefits of El Niño Insurance

---

- ▶ Pre-emergency actions such as reinforcing irrigation infrastructures, cleaning drainage systems, and reinforcing access to roads;
- ▶ Renting heavy equipment to get crops out and supplies into the impassable areas;
- ▶ Distribution of the funds to families most in need for food and medicines; and
- ▶ Flexible use of the funds based on where the biggest needs are at the time rather than making a stipulated *ex ante* plan for how to use them

# Irrigation Commissions: Possible Uses and Benefits of El Niño Insurance

---

- ▶ **Water User Boards and Irrigation Commissions** also favor using the money in a collective fashion with many of the same ideas as farmer associations:
- ▶ Protect and reinforce weakened irrigation infrastructures, canals, and drainage systems; and
- ▶ Rent or buy machinery for cleaning drains

# Households and El Niño Insurance

---

- ▶ Households could use insurance to
  - ▶ Offset the loss of assets
  - ▶ Manage a production period with low income and high costs
  - ▶ Prevent distressed asset sales
  - ▶ Prevent macronutrient consumption losses
- ▶ Having insurance can also contribute to economic growth
  - ▶ Increase household specialization in high return activities
  - ▶ Increase access to inputs
  - ▶ Increase access to financial services

# Households, Credit, and Insurance

---

- ▶ Disaster risk can limit access to credit
  - ▶ Banks increase interest rates
  - ▶ Banks ration credit to risky regions
- ▶ Limited access to credit limits household production opportunities
- ▶ Insurance reduces risk of borrowing household
  - ▶ Can motivate bank to lower interest rate
  - ▶ Can increase access for households in risky regions
- ▶ Linking insurance and credit
  - ▶ Reduce delivery cost of the insurance
  - ▶ Improve bank monitoring of risk reduction

# Challenges of Working with Associations and Households

---

## ▶ Associations

- ▶ Decentralized decision process – very difficult to get many members to agree on buying insurance and how much to buy
- ▶ Institutional structure that will allow quick use of the insurance payout to mitigate losses

## ▶ Households

- ▶ Timing of insurance is difficult – premium due 1 year before possible payout
  - ▶ High opportunity cost for households
  - ▶ May not match household cashflow
  - ▶ Does not reduce risk of shorter term loans
- ▶ Cost of building household capacity to use insurance is high

## Objectives with Government

---

- ▶ Documented *ex ante* risk management strategies by local and/or regional government agencies that specifically address how the El Niño insurance payout would be used to improve risk coping strategies
- ▶ Analysis of how El Niño insurance could be used to facilitate adaptation and infrastructure protection
- ▶ Capacity building for risk management strategies by local and regional governments that use risk coping and risk adaptation strategies based on El Niño insurance

# Regional Government

## *Vulnerabilities to El Niño*

---

- ▶ Much strong technical work has been done in Piura
  - ▶ Many agencies have many needs
  - ▶ Insufficient funding
- ▶ Competitive advantage of the project is to build capacity on the most efficient use of insurance
- ▶ Overwhelming needs and insufficient funds can lead to no action taken
- ▶ El Niño Insurance
  - ▶ Government will not buy El Niño Insurance to replace infrastructure
  - ▶ Instead, consider El Niño Insurance for marginal benefits of intervening before, during, or closely after the catastrophe



# Regional Government

## *Role for El Niño Insurance*

---

- ▶ No one can predict how next extreme El Niño will present itself
  - ▶ Which year it will occur
  - ▶ Where rains will be heaviest
  - ▶ Which government assets will be most affected
- ▶ What is certain: next extreme El Niño will create significant losses for government
- ▶ What is needed
  - ▶ Clear plans for how indemnity could be used
    - ▶ What assets are most vulnerable and socially valuable?
    - ▶ Where would early indemnity create the most benefit in loss reduction?
  - ▶ Clear plans for how indemnity will be allocated

# Demonstration of Principles

## *Poechos Reservoir Example*

---

- ▶ Poechos Reservoir has already been identified as particularly vulnerable to extreme El Niño
  - ▶ Building a new reservoir currently considered too expensive
- ▶ How can El Niño Insurance help?
  - ▶ Indemnity used for cleaning canals for early water release
  - ▶ Helps maintain reservoir during disaster
  - ▶ Can insure for losses and costs that are uninsurable with traditional insurance for the reservoir
- ▶ How does this help community/region?
  - ▶ Reduces risk to roads and bridges
  - ▶ Helps maintain drinking water
  - ▶ Helps maintain irrigation infrastructure

# Demonstration of Principals

## *Disaster Response by Civil Defense*

---

- Disaster response without *ex ante* planning is likely to be ineffective and inefficient
  - Ineffective targeting to groups in most need
  - Significant delays in response time
  - Inequitable outcomes, poorest are most affected but receive disproportionately small assistance
  - Increased opportunity for corruption due to little oversight and political pressure
  - Higher administrative costs due to inefficiencies
  - Lower economic return for public expenditure

# Demonstration of Principals

## *Disaster Response by Civil Defense (cont).*

---

- ▶ Combining El Niño Insurance with careful disaster relief planning can create significant improvements
  - ▶ Early payout does not require waiting on political process to deploy resources
  - ▶ Early payout allows mobilization of disaster supplies before conditions are critical
  - ▶ Flexibility of insurance payout could allow channeling of resources to greatest needs based on *ex ante* strategy
  - ▶ Effective and timely disaster response can reduce overall losses
- ▶ El Niño Insurance can also smooth budget expenditures across years for disaster relief through ongoing premium payments

# Challenges to Working with Governments

---

- ▶ **Sales cycle and Budgeting process can slow uptake**
  - ▶ El Niño Insurance sales cycle requires 1 year before coverage begins
  - ▶ Budgeting cycle can take up to 1 year before premium is approved in budget
- ▶ **Election cycle can challenge capacity building**
  - ▶ Local and regional elections in 4<sup>th</sup> quarter of 2010 changed landscape of public officials in Piura
- ▶ **Government rules for insurance limit purchase of El Niño Insurance**
  - ▶ Local officials stated that insurance can only be purchased for a specific asset. Legal and regulatory review is needed

# Conclusion and Next Steps

---

## ▶ Conclusion

- ▶ Insurance markets facilitate stakeholder investment and planning for climate change
- ▶ Insurance against natural disasters is relevant to many stakeholders (households, governments, firms)
- ▶ Capacity building and risk management planning are needed to support market development

## ▶ Next steps for El Niño Insurance

- ▶ Specialize product to better meet target market needs
- ▶ Create more flexible linkages to other financial services to increase benefits to households
- ▶ Consider longer term contracts that facilitate consistent uptake by stakeholders

# Contact Information

---

- ▶ **GlobalAgRisk**

- ▶ Benjamin Collier

- ▶ [benjamin@globalagrisk.com](mailto:benjamin@globalagrisk.com)

- ▶ **UNDP**

- ▶ Pradeep Kurukulasuriya

- ▶ [pradeep.kurukulasuriya@undp.org](mailto:pradeep.kurukulasuriya@undp.org)