



Presentation from
**2015 World Water
Week in Stockholm**

www.worldwaterweek.org

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Integrating financial and structural disaster risk management
to
foster resilient development in a changing environment



Upmanu Lall, Columbia University

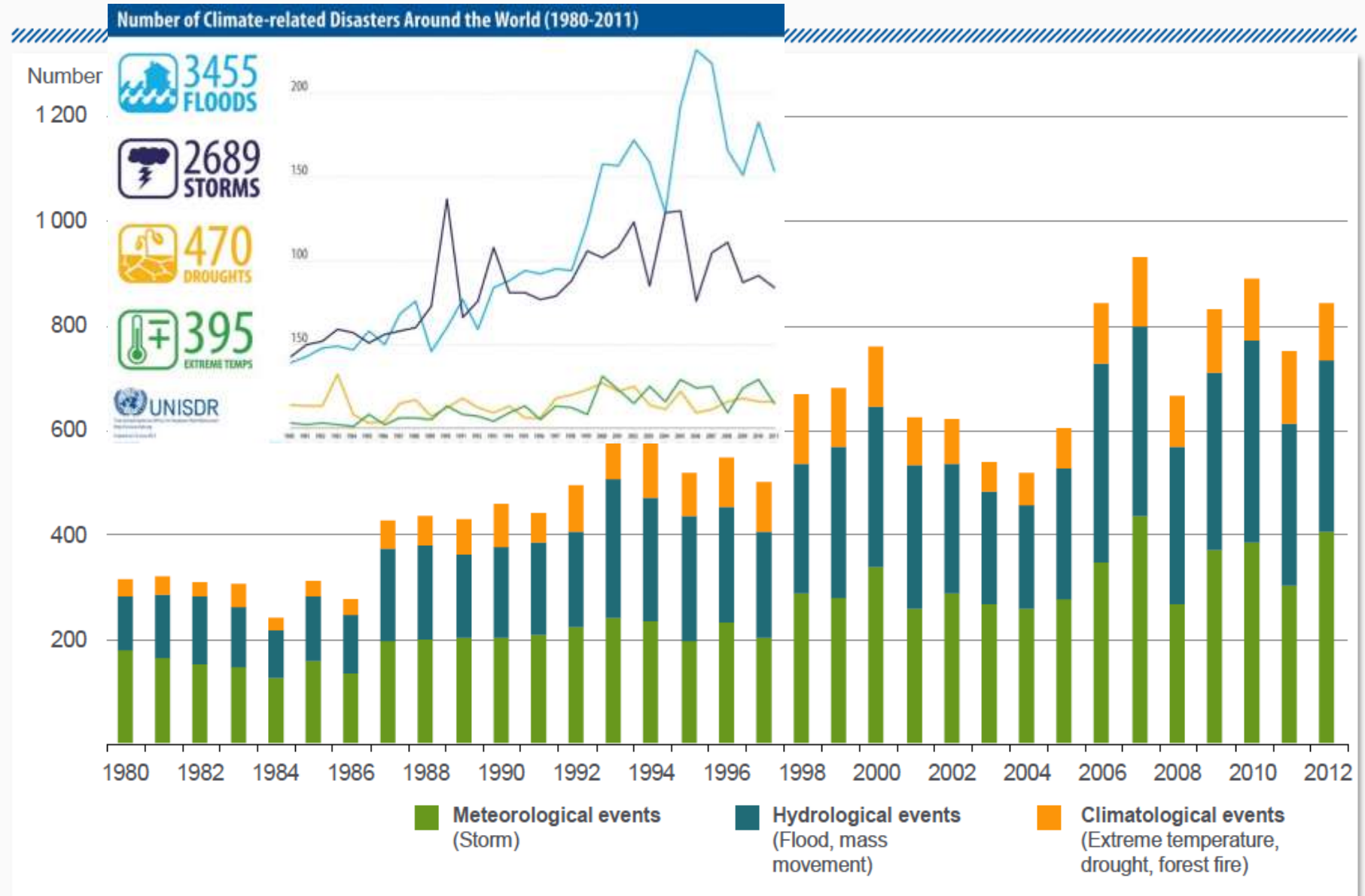
Key points

- Climate change does not mean strictly increasing drought and flood risks
- Synergistic structural (infrastructure & policy) and financial risk management innovations = Adaptation for resilient growth
- Building institutional capacity for monitoring and predicting climate impacts is a key step for the application of the innovations
- Many emerging examples → opportunity for international collaboration

A Changing Climate

- Potentially more extremes
 - Cyclical elements
- Certainly more exposure
- Economic Development =
 - reduction in loss of life
 - Increase in economic, property, ecologic and supply chain losses

Number of events



Adaptation: Climate Aspects

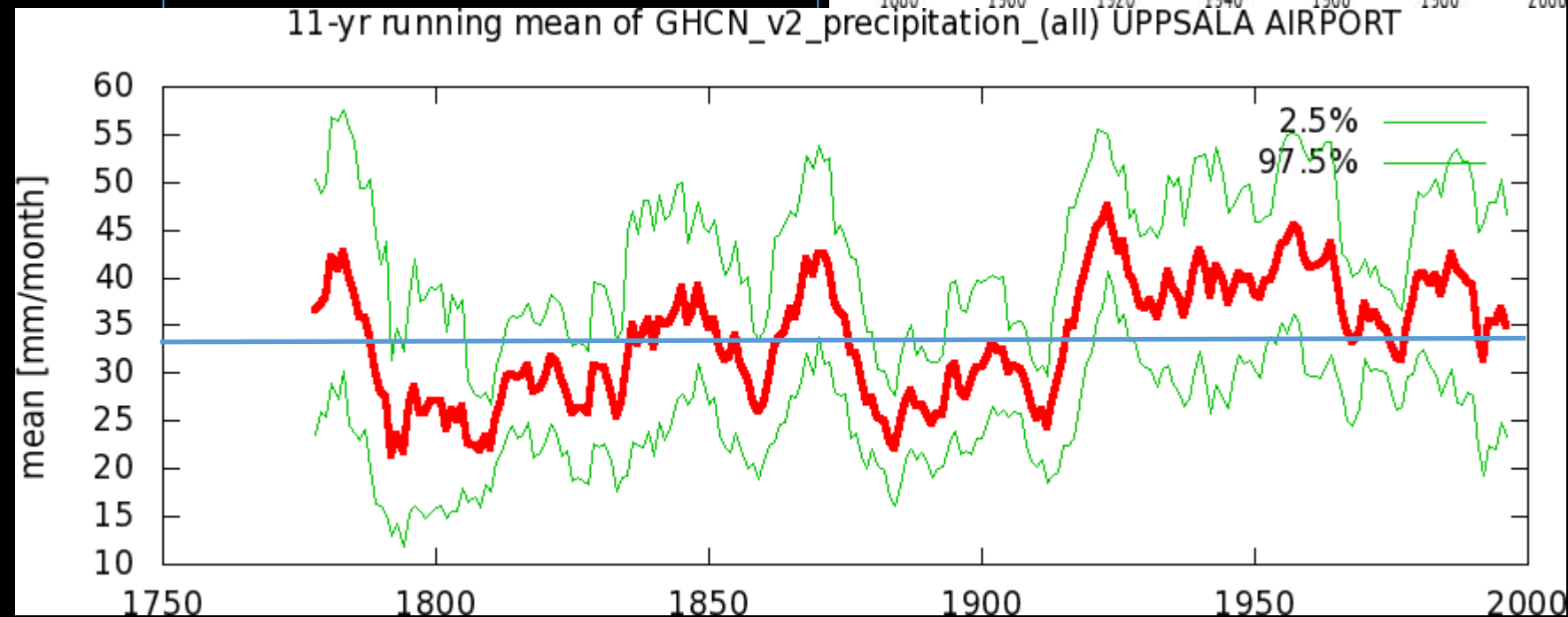
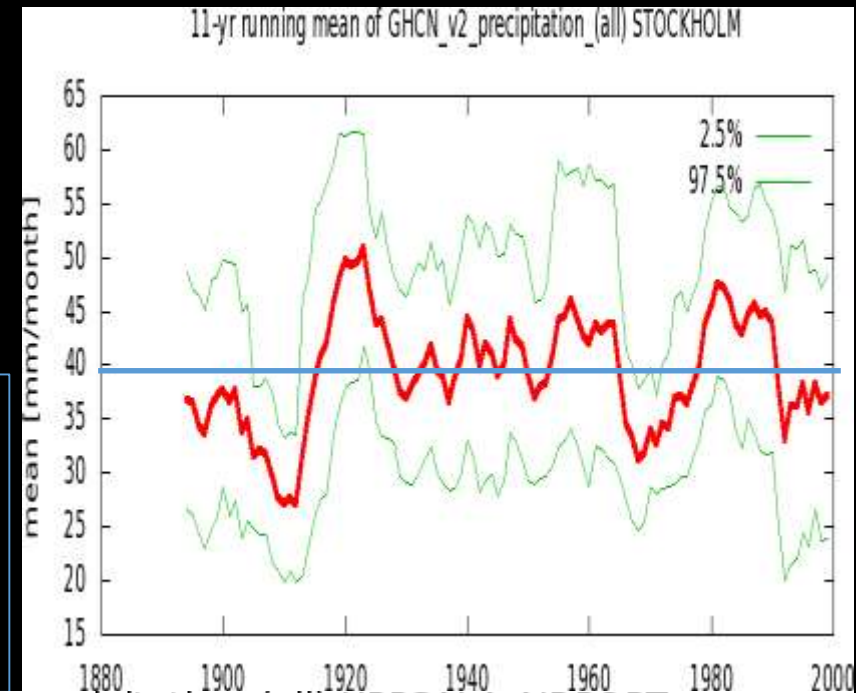
- Changing Risk
 - Decadal regimes
 - Monitoring & Near term prediction Important

Adaptation:

- **Structural Measures**
 - 5 year staging for infrastructure?
 - Institutional changes?
- **Financial Measures**
 - How to update coverage for residual risk

Nature of trends in long records of precipitation

1. Stockholm
2. Uppsala



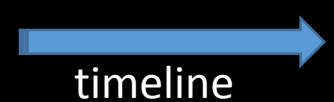
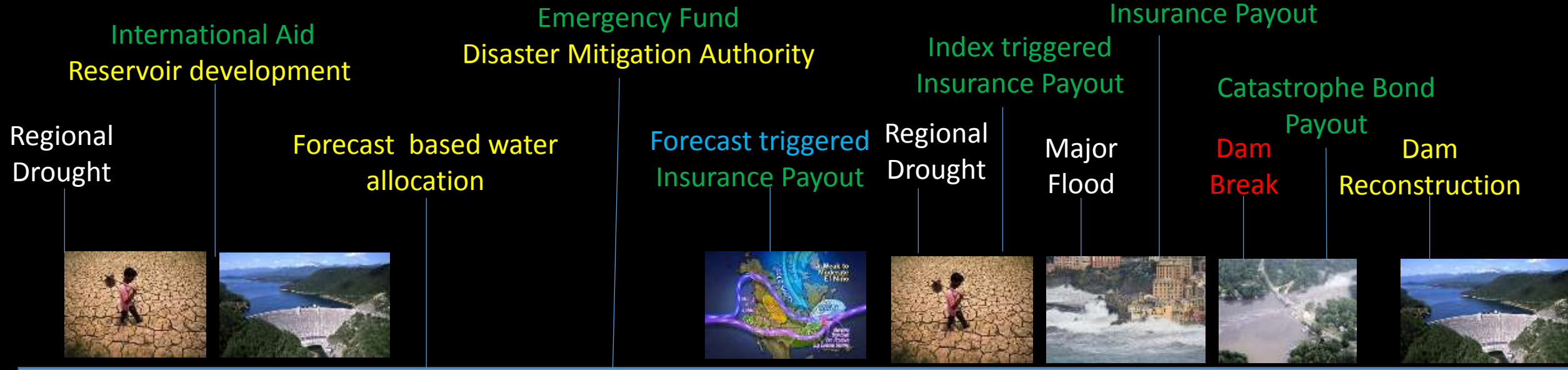
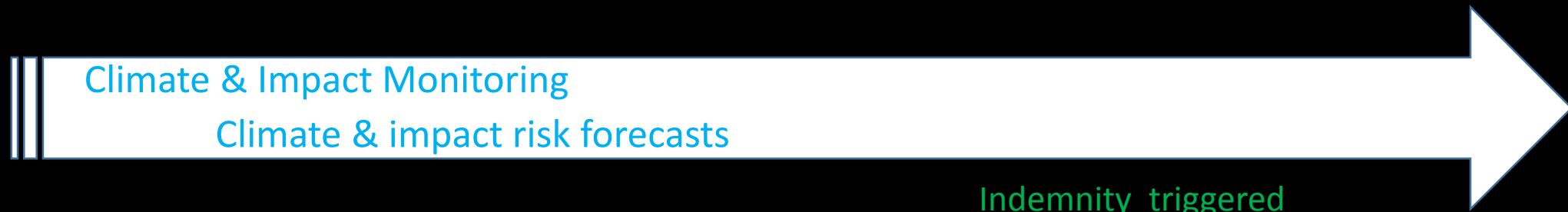
Adaptation: Financial Measures

- Emergency Fund
- Catastrophe Bond
- Insurance
 - Parametric Trigger
 - Indemnity Trigger
 - Forecast Trigger
- Weather Derivatives

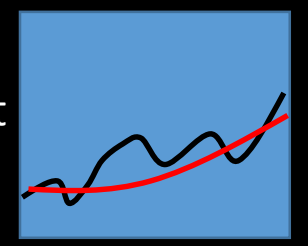
All look at relatively short to medium term into the future

- Financial Risk Facility
 - African Risk Capacity
 - Extreme Climate Facility
 - Caribbean Catastrophe Risk Insurance Facility
- Multi-year, Multi-Country Cat Bond
- Multi-Climate Extreme weighted parametric Index

Adaptation for resilient development



development



Index Insurance for Floods *Innovation in Northern Peru*



Work with Jerry Skees
GlobalAgRisk Inc
& Univ of Kentucky

Khalil, A. F., Kwon, H-H, Lall, U., Miranda, M. J.
and J. Skees (2007). **El Nino-Southern
Oscillation-based Index Insurance for Floods:
Statistical Risk Analyses and Application to Peru.**

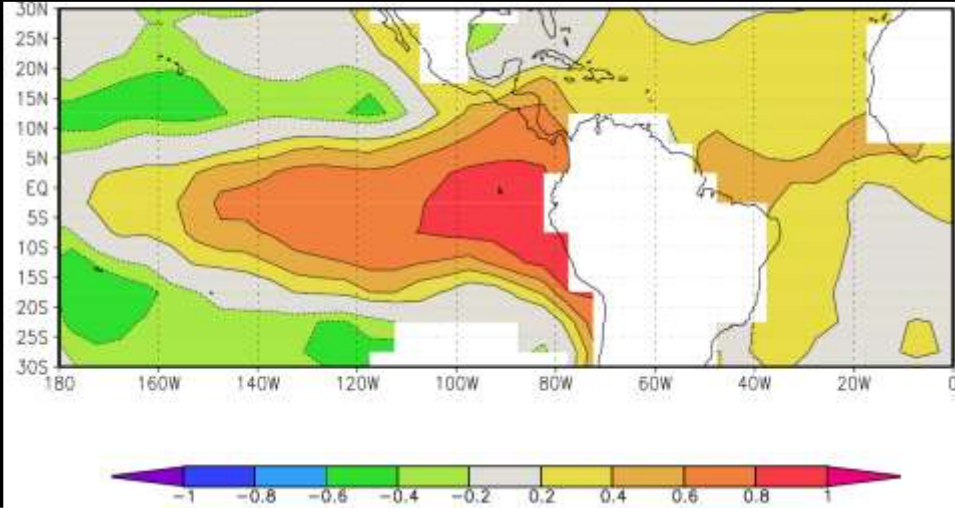


Piura and other areas in the North *Severely affected by 1998 El Niño*



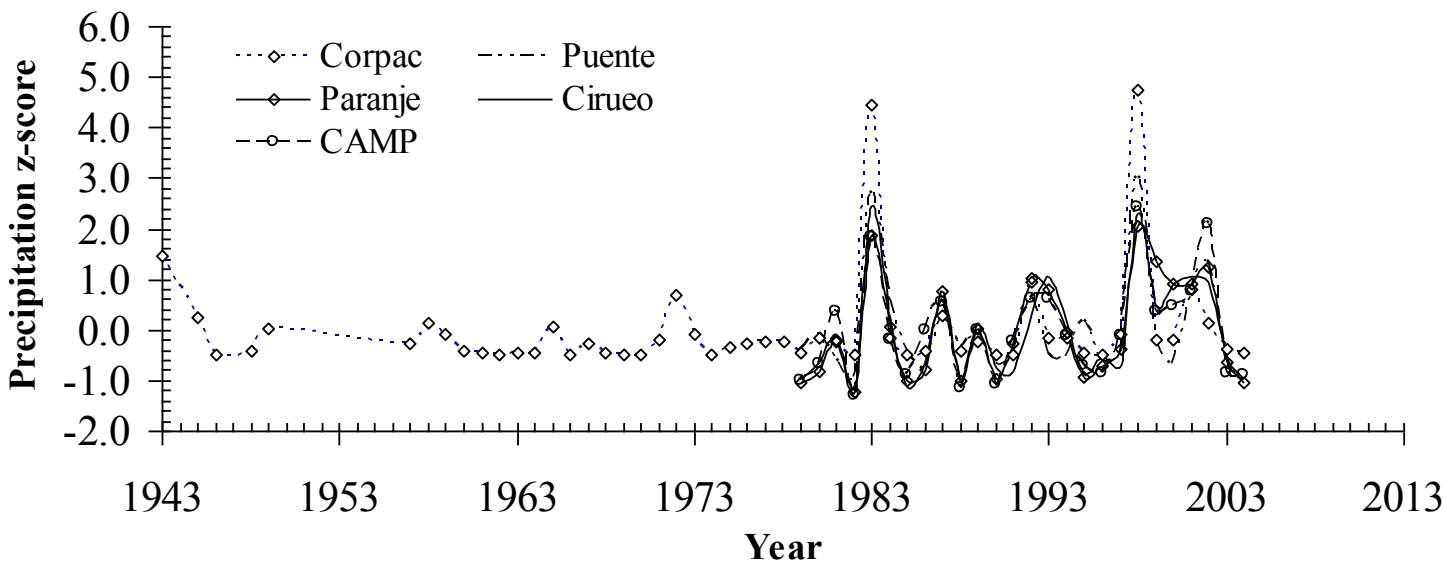
- ▶ Extreme rains (Jan – Apr 1998)
 - ▶ **40x normal rainfall**
- ▶ Severe floods
 - Widespread losses
 - Many disrupted markets
 - Agricultural production, ↓ 1/3
 - Public infrastructure losses
 - Cash-flow, debt repayment problems
 - **Total losses in Piura estimated at USD 200 million**

ENSO-Based Index Insurance: Approach and Application



ENSO influences Flood potential in Northern Peru
Reconstructed ENSO Indices are available since 1856

Use Exogenous ENSO Index with a long record + statistical model of regional floods as insurance trigger



Multiple regional rainfall stations with short records (1979 to now)

Pre-emptive Index Insurance: Forecast triggered

Timing of the Contract

Year 1			Year 2	
January	Feb–October	Nov–Dec	Early January	February–April
Marketing period with a sales closing date of January 31	The EBILL is in force for possible upcoming severe event	SST data from ENSO 1.2 is used to calculate payments	Payments can be made before 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 ENSO 1.2 (Nov–Dec)
- Payments will be made in early January as business interruptions are occurring

Message

- **Need International collaboration on design and testing of innovations in linked structural and financial solutions to adaptation**
 - Significant potential for social and development impacts
 - Field testing and updating of ideas essential
 - Build Capacity to monitor and predict climate & its impacts at multiple time scales
- **Resilience = ability absorb shocks and continue development**
 - Optimization of allocation to structural and financial instruments
 - Role of climate regimes & their prediction - Timing is important
 - Long term records – real or proxy are important
 - Target National Scale AND those exposed
 - Many examples of possible integration between financial and structural instruments are already emerging as part of **Prepare, Respond and Recover strategies**