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**Implementation and monitoring** of climate change **adaptation in water** for  
agriculture: some lessons and challenges from **PACC Peru**

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**Conducting and Monitoring  
Climate Change Adaptation  
Projects - course**

Rüttihubelbad, Switzerland,  
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PACC Peru  
HELNETAS Swiss Intercooperation  
Peru

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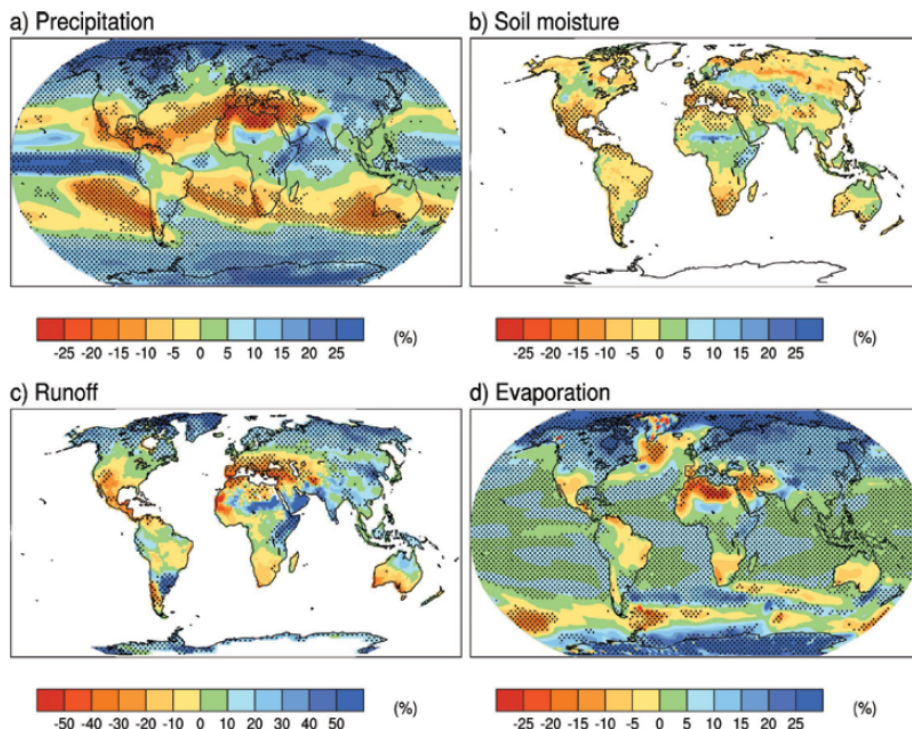
# 1. Water and global climate change impacts

## Observed and Projected changes 2100:

- Changes in P patterns-intensity-extremes, ↓ 10°S to 30°N + substantial uncertainty
- Melting of ice, decreases in water storage in mountain glaciers and snow
- Runoff varies more in time, ↓ over dry regions

## Water resources highly vulnerable...

- **Through society:**
  - Food security and increased vulnerability of rural livelihoods
  - Extremes: floods, droughts
  - Infrastructure at risk
  - Inequity, competence and conflict
- **Through ecosystems:** affected functions and services, a.o. regulation of hydrology



**Figure 2.8:** Fifteen-model mean changes in (a) precipitation (%), (b) soil moisture content (%), (c) runoff (%), and (d) evaporation (%). To indicate consistency of sign of change, regions are stippled where at least 80% of models agree on the sign of the mean change. Changes are annual means for the scenario SRES A1B for the period 2080–2099 relative to 1980–1999. Soil moisture and runoff changes are shown at land points with valid data from at least ten models. [Based on WGI Figure 10.12]

## 2. Water and climate change impacts in the Peruvian highlands



### ➤ Peru's vulnerability:

- CC threats:  $\uparrow$  Tmin,  $\downarrow$  P -10%/-20% in highlands in 2030, loss of 22% of glacier area in last 30 years, more intense Niño's, sea level rise
- **exposition:** dense population in arid coast
- **sensitivity:** poverty & inequity, climate dependent economy esp. rural poor
- **adaptive capacity:** incipient (MINAM, 2010, 2<sup>nd</sup> NC)

### ➤ Focus PACC Peru:

- rural poverty
- mountain population
- Develop adaptive capacities of communities and their local and regional governments
- water, agriculture/food security, risks

### Un proceso que aún no llega a todos

Existe una predominancia de proyectos de V&A en las regiones de Piura, Cusco y Apurímac. Le siguen los departamentos de Junín, San Martín y Cajamarca. Estos se encuentran en fase de estudio o de buenas prácticas.

Al mismo tiempo, en regiones como Huancavelica y Ayacucho, que tienen altos índices de pobreza, aún no se registra ninguna iniciativa.



16 Programa de Adaptación al Cambio Climático - PACC  
SENAMHI, Intercoperación, Predes, Libélula, Gobierno Regional de Apurímac, Gobierno Regional de Cusco, MINAM (2008-2012)



### 3. Water management in the development context in southern Peru



#### Climate change adds on to structural problems of climate dependent rural livelihoods

- ❑ **Communal organization** of NRM, especially in water supply and irrigation.
  - ❑ Observed: weakening of communal structures in the face of strong external actors (mining, hidroelectricity projects)
  - ❑ Weak presence of public water agency in rural areas
- ❑ Existing knowledge and organizational capacities for **local water management** and in general, agricultural risk management, **under pressure**
- ❑ Scarce labour and **risks** → farm families move out of cropping and into pastures & cattle
- ❑ Reduced storage and regulating capacities of **watersheds**, with a rush on irrigation water rights and increased risk of **conflicts**



## Matriz de Planificación del PACC

### FINALIDAD

Se contribuye a consolidar la base de vida y se reduce la vulnerabilidad al cambio climático de estratos sociales de mediana y alta pobreza en las áreas priorizadas por el Programa, disminuyendo la migración por afectaciones ambientales ocasionadas por el cambio climático.

### OBJETIVO PRIMERA FASE

Poblaciones e instituciones públicas y privadas de las regiones Cusco y Apurímac, implementan medidas de adaptación al cambio climático, capitalizan aprendizajes, e inciden en las políticas públicas a nivel nacional y en las negociaciones internacionales.

#### 1 Resultado Conocer las Vulnerabilidades

Diagnóstico de vulnerabilidad y adaptación ante la VC y CC, en regiones Cusco y Apurímac, desarrollada con participación de autoridades, instituciones y poblaciones afectadas.

#### 2 Resultado Monitorear e Informar

Sistema Regional de Información para la Adaptación al Cambio Climático en Cusco y Apurímac, construido y puesto a prueba en su funcionamiento

#### 3 Resultado Actuar

Medidas de adaptación priorizadas en concertación con los actores regionales y locales, en implementación en las regiones Cusco y Apurímac.

#### 4 Resultado Aprender e Incidir

Políticas públicas de nivel local, regional, nacional, recogen propuestas generadas desde la acción del programa con los actores institucionales y sociales involucrados.

### Ejes Prioritarios de Trabajo



# 4. Local observations vs. scientific data on CC



**Comparative exercises** between local observations and tendencies in meteorological data at regional and local level show:

- ❑ Severe lack of coverage, continuity and quality of registered data by NMHS in Andes
    - ❑ Apurimac: only 3 “useful” meteo stations
  - ❑ Farmers manage more meteorological variables (beyond T & P, such as snowfall, wind, electric storms) and analyse them on finer time (days, weeks) and spatial scales.
    - ❑ ↓ Q of local springs vs. analysis in large basins
- Both types: only valid for **specific localities** or observation points vs the great diversity

Where local observations in the Apurimac region and science **coincide...**

- ✓ ↓ minimum temperature
- ✓ belated start of the rains
- ✓ ↑ of rainfall intensity
- ✓ ↓ water availability

Where they **diverge.....**

- ↓ Tmax. in Abancay vs. *more heat*
- Advective frosts: period of occurrence, frequency, severity

Cuadro 28. Síntesis comparativa de observaciones de la población local y el servicio nacional meteorológico

Parámetro	Histórico		Proyección al 2030
	Cualitativamente	Cuantitativamente	Cuantitativamente
Temperatura máxima (escala anual)	<ul style="list-style-type: none"> <li>• Agricultores en Curahuasi, Chumbao y Mollebamba coinciden en su observación de cambio en los últimos 15 años hacia un calor más intenso (SENAMHI, 2011a:178)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>↓ Abancay (0,07°C/año), significativo</b></li> <li>• ↑ Curahuasi (+0,03°C/año) sin sign.</li> <li>• Chailhuasca sin tendencia fuerte, ni significativo (SENAMHI, 2010a:62, T<sub>max</sub> periodo 1965-2008).                             <ul style="list-style-type: none"> <li>○ Si bien, la tendencia es de aumento en los 44 años, entre 2007-2008, el aumento aparentemente es mayor a la ocurrida principalmente en las décadas de 1971-1980 y 1981-1990<sup>9</sup>, tema que merece mayor investigación (SENAMHI, 2010a:61).</li> </ul> </li> <li>• La variabilidad en T<sub>max</sub>, expresado por la desviación estándar de los medios por década, sugiere que los periodos de 1991-2000 y en menor grado en 2001-2008 son de mayor variabilidad frente a la normal (1971-2000), especialmente en Abancay y Chailhuasca (SENAMHI, 2010a:72-73).</li> </ul>	<p>Para las variables temperatura máxima y mínima anual, SENAMHI (2011c: 66-68) identifica aumentos:</p> <ul style="list-style-type: none"> <li>• En <b>Chailhuasca y Abancay, aumentarían ambas variables con unos 0,7°C.</b></li> <li>• En Curahuasi el aumento sería mayor, <b>+0,96 °C en T<sub>max</sub> y +0,8°C en T<sub>min</sub>.</b> (SENAMHI, 2011c:66,68).</li> <li>• El aumento se daría proporcionalmente en la misma proporción a lo largo del año en promedio, con un aumento ligeramente mayor en JJA y en MAM (SENAMHI, 2011c:72,77, 81,84).</li> </ul>
Temperatura mínima (escala anual)	<ul style="list-style-type: none"> <li>• En los últimos 15 años, los agricultores en Mollebamba y en Chumbao observan un cambio hacia <b>hielos más intensos/heladas</b> (SENAMHI, 2011a:178)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>↓ Abancay (0,05°C/año), significativo, y Chailhuasca (0,01°C/año), menos significativo.</b> Especialmente JJA y SON.</li> <li>• ↑ Curahuasi (+0,01°C/año), poca sign. (SENAMHI, 2010a:61, T<sub>min</sub> periodo 1965-2008).</li> </ul>	<p>En los extremos, SENAMHI (2011c:90-92) identificó los siguientes cambios futuros de <b>significancia estadística</b>:</p> <ul style="list-style-type: none"> <li>• para Abancay, Curahuasi y Chailhuasca <b>↓ en número de días muy fríos</b> con 3 a 4 días/década y 4-noches muy frías(4 a 5 días/década).</li> <li>• para Abancay y Curahuasi, <b>↑ número de días muy cálidos</b> con 5 días/década y para las tres estaciones, <b>↑ número de noches muy cálidas</b> con 6 días/década.</li> </ul> <p>Varios índices de extremos cambian sin <b>significancia estadística</b>:</p> <ul style="list-style-type: none"> <li>• <b>↑ intensidad de la temperatura máxima</b>, de entre 0,3 a 0,4°C/década en las tres estaciones (SENAMHI, 2011c:90)</li> <li>• <b>↑ intensidad de la temperatura mínima</b> con 0,2 a 0,27°C/década (SENAMHI, 2011c:91-92).</li> </ul>

## 4. Local observations vs. scientific data on CC



### Challenges:

- **Overcome limitations** in both technical analysis and social research, f.i. analyze P data on 10-day or monthly scales (< 3-m), solid work on recollecting local perceptions
- **High mountain regions need fine-tuned meteo data** according to territorial variations: averages won't do, as vertical variability counts
- Data gaps **call for:**
  1. an **interdisciplinary and intercultural dialogue** between **observers** to achieve **complementarity**, using precise references to space and time
  2. for **increased local observation and registration capacities** and equipment
- **CC scenarios** with greater spatial resolution and at shorter time scales are needed in order to become more relevant for planning and action at local scales
- Prepare for adaptation when there is a **reasonable agreement** on the direction of change between science and people. Elsewhere: **increase research** effort.

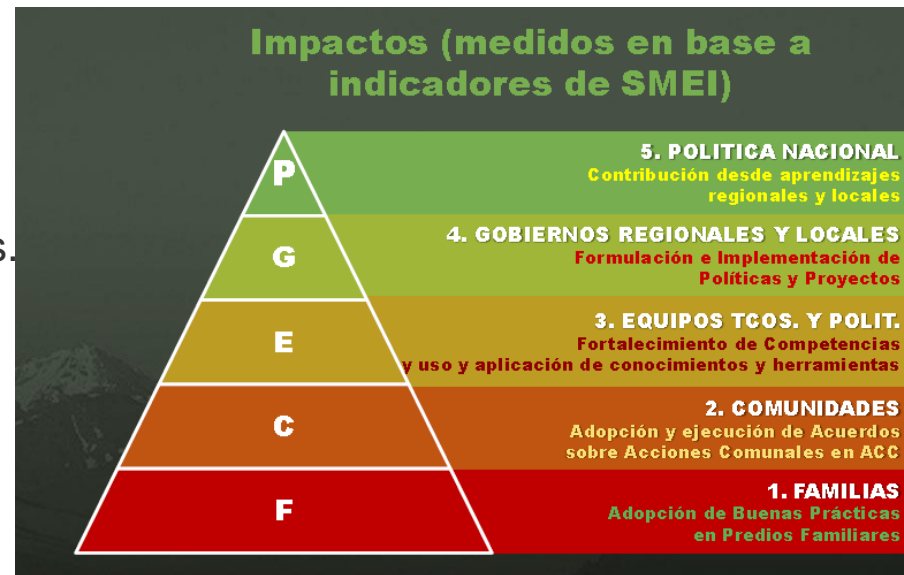




## 5. PACC promoted adaptive actions and impacts



- 1. Rural households:** Promote adoption of Good Practices for sustainable livelihoods through *Concursos Campesinos*. Ex. Measures to reduce runoff and increase infiltration at plot level. Mobilizing family investment capacity.
- 2. Rural communities: Agreements** to promote adaptation measures in watersheds. Ex. infiltration ditches, canals to increase aquifer recharge, improved management of natural lakes, (re) forestation, protection and maintenance of marches.
- 3. Technical and decisionmaking staff:** 915 trained actors on technical water & climate tools, CC and public management, community leaders on CC - water – agriculture – risk – communal planning
- 4. (Inter) National level:** lessons fed into 2<sup>nd</sup> NC, and MINAM's methodological guides, COP16



## 5. Actions taken by Regional Governments as a result of PACC



- ❑ Regional Climate Change **Strategies** (2010-2011)
  - ❑ Multi-actor participatory planning process
  - ❑ Led by Regional Technical Group
  - ❑ Thematically and territorially organized
  - ❑ Based on studies and perceptions
  - ❑ Linked to regional development plans
  - ❑ Prioritizing territories and actions (2012)
  
- ❑ **Institutions and Governance model:** regional level operative unit on CC coordinates for **integration** of CC in various thematic gov't units and coordinates between CC projects
  
- ❑ **Local and regional public planning and investment:**
  - Municipal and regional govts developed **CC strategies**
  - **Public Investment Projects** led by Municipal Governments consider CCA (water harvesting and food security)
  
- ❑ **Challenges ahead:** wider integration in public investment projects and their implementation



**14 Soles de inversión pública municipal**

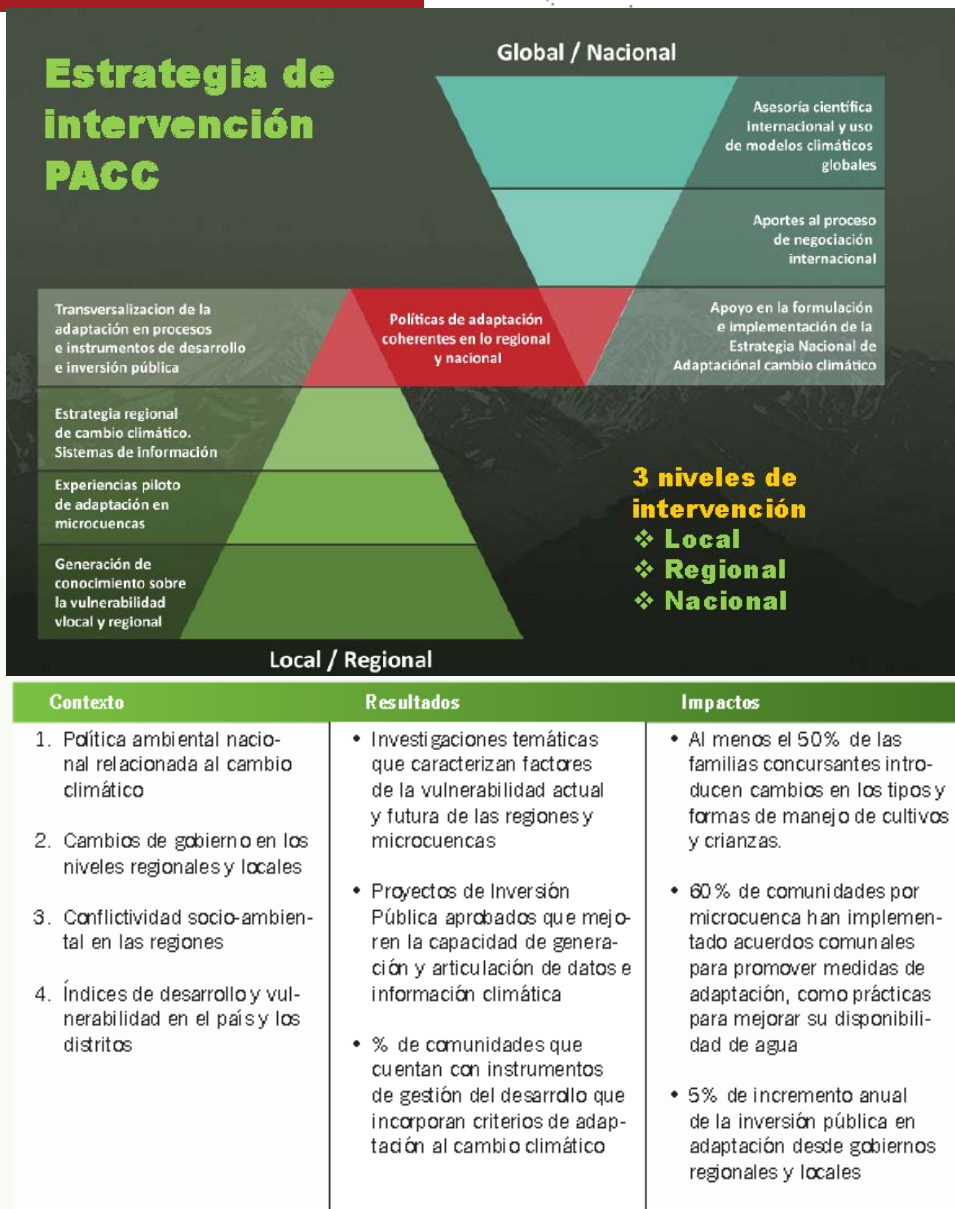
**1 Sol de cooperación catalizó**

## 6. Challenges and conclusions on monitoring

- PACC Peru has developed a monitoring system of **changes generated** by adaptation processes and measures. Measures change in 3 areas:
  - Context
  - Results
  - Impacts
- Following PACC's intervention strategy, impacts are measured at **household, community** and local-regional-national **institutional level**.

### Challenges:

- **Monitoring adaptive capacities:** evidences itself only on **medium-long run**, versus short term project implementation
- **Uncertainty in CC scenarios at local level:** insufficient to set into motion definite political, social and investment decisions. Great responsibility of development actors!
  - Requires monitoring of the CC context to extend beyond project time horizon. Actors' actions to be adapted accordingly.
  - Science to continue improving.



## 6. Challenges and conclusions on monitoring



Adaptation interventions face 3 questions related to monitoring:

1. **Which types of changes** need to be measured? 2. **How** to measure them? 3. What are **reasonable time frames** in which to expect and measure change?

Theoretically, 3 areas to be monitored:

- Increase in adaptive capacity
- Effectiveness of the *application* of adaptation measures (incl. C/B)
- The achievement of development goals (GIZ, 2011:30-31)

In practice, **projects measure** the achievement of the **results they had set out**

- Ex. V&A analysis done, measures identified, local governments involved, in short: **milestones** generally **deemed key** in adaptation processes.
- PACC measures degree of **adoption of adaptation measures promoted**. Sufficient?

Projects don't yet monitor **impacts** in terms of **changes in vulnerability**.

- The difficulty resides in the fact that vulnerability is shaped by multiple and historic causes in marginalized communities. Difficult to "separate" development and adaptive capacities in PACC's setting
- Implementation time frames are too short.
- Specific challenge: monitor changes in **natural systems**, f.i. effects of a managed natural pasture on a watershed's hydrological cycle

## 6. Challenges and conclusions on monitoring



- The **State** has an important **role in monitoring long term impacts**, both of climate change, as well as the adaptive capacity of the population and ecosystems at national level
  - Selecting proxy indicators for reduced vulnerability on which information is gathered usually in national databases and statistics
  - With scientific support
- Monitoring at **project level** needs to be participative and information gathered needs to **serve beyond** reporting purposes of donors.
  - F.i. capacity development, generate and use meteorological information.
  - Ideally: feed into a **local and regional information systems** for long term continuity
  - Project implementers should proactively relate their “project level indicators” to national statistics
- Need: **agree on indirect (proxy) indicators** for adaptive capacity between governments, project implementer and donor

## 7. Climate Change / Water: Practical Experiences from the Bangladesh F2F event, Nov. 2012



### Challenges faced around CC/DRR in the water programmes:

- Drought / Decreasing groundwater level / Drying up of water sources
- More frequent storms / Flooding / Flash floods / Hurricanes / Cyclones
- Landslides / Erosion
- Salinity
- **Loss of agricultural land** (e.g. through flooding, water logging, salinisation or erosion)
- **Difficulty to obtain drinking water** (e.g. through groundwater depletion or salt-water intrusion)
- **Conflicts / Migration**
- Linking and integration of CC/DRR into sectoral interventions like water, agriculture

## 7. Climate Change / Water: Practical Experiences from the Bangladesh F2F event, Nov. 2012



### Measures taken to meet the challenges:

- Integrated Water Resources Management
- Balanced used of groundwater and surface water resources
- Watershed management
- Early Warning Systems (EWS)
- Water source protection, plantation around source, pits above source for water retention
- Agricultural practices adaptation
- Introduction of other seeds and seedbanks
- Saline tolerant cultivars
- DRR/CC mainstreaming/integration into governance/economic aspects
- Intersectoral approach
- Rainwater harvesting (roof and ground)
- Capturing flood water for irrigation
- Water conservation
- Water-efficient irrigation techniques
- Recycling, Retention, Reuse (RRR)
- Proper drainage, embankments
- Deepening of wells, boreholes
- Water quality testing
- Biosand filters, SODIS
- Raised latrines
- Technical innovations
- Indigenous/traditional knowledge
- Capacity building for communities (e.g. mobilisation, DRR action planning)



**HELVETAS**  
Swiss Intercooperation





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## Todas las fotografías: PACC Perú

Interesting visits:

- ❑ [www.paccperu.org.pe](http://www.paccperu.org.pe)
- ❑ <http://interclima.minam.gob.pe/-Resultados-.html#527>
- ❑ <http://www.asocam.org/portal/node/42679/publicaciones> and [www.aguaycambioclimatico.info](http://www.aguaycambioclimatico.info)