Citizen science in hydrology:

from participatory monitoring to knowledge co-generation

Wouter Buytaert, Jonathan Paul, Feng Mao, David M. Hannah, Julian Clark, Art Dewulf
and the Mountain-EVO team

Imperial College London

UNIVERSITY OF BIRMINGHAM

WAGENINGEN UR
For quality of life

mountain EVO
environmental virtual observatories

Citizen science

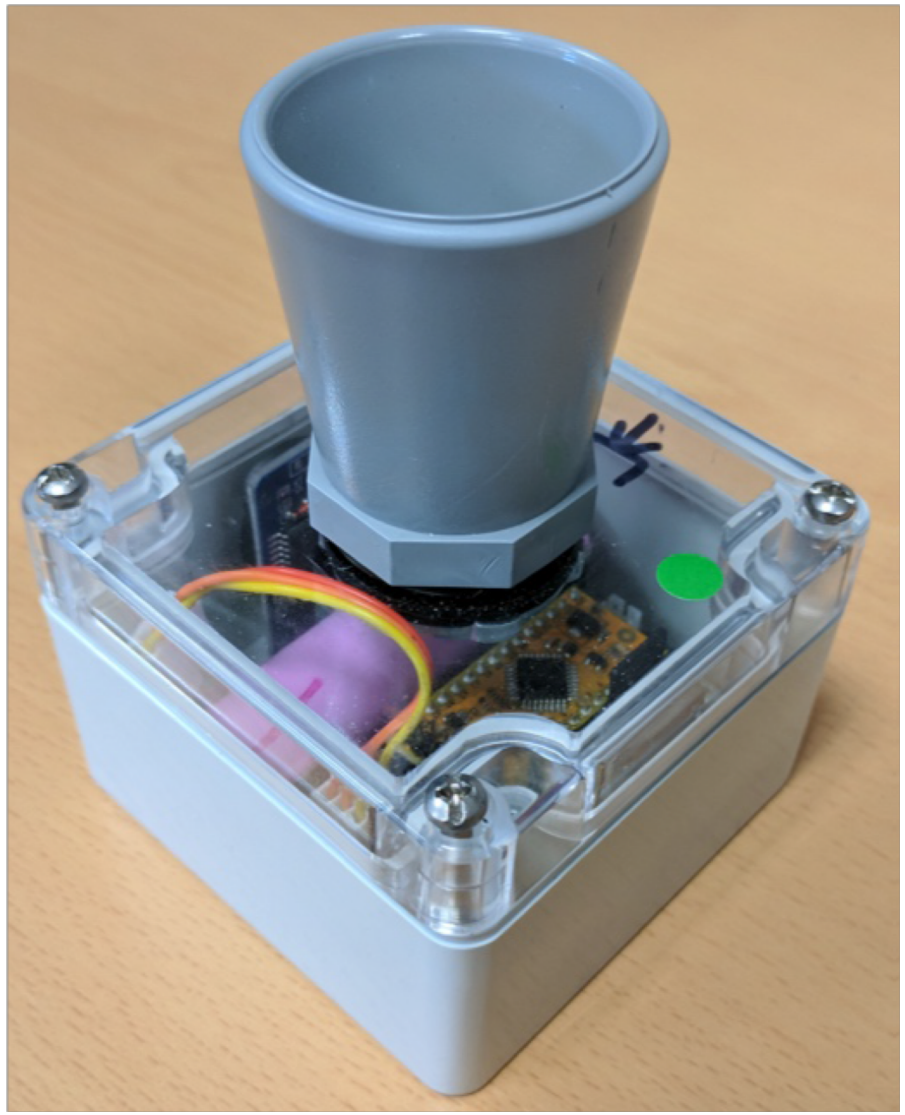
Citizen science refers to the participation of the general public (i.e., non-scientists) in the generation of new scientific knowledge

Earthwatch

Buytaert et al., 2014,
Frontiers in Earth Science

Study	Study site	Program objectives	Data collected	Level of by citize	
Macknick and Enders, 2012	Mountain region in the Nicaraguan- Honduran border	A prototyping approach for conflict management	Water quality parameters	Collabor participa	
Turner and Richter, 2011	San Pedro river, Arizona, USA	Mapping of a spatially non-continuous permanent rivers	Start and end points of spatially intermittent river reaches	Distributed intelligence	Design of monitoring program, training, data analysis, and interpretation
World Water Monitoring Challenge, 2014	Global	Water quality monitoring, education and outreach	Water quality parameters	Distributed intellegence	Design of monitoring program, training, data disemmination
Community Collaborative Rain, Hail and Snow Network, 2014	USA	Precipitation measurement	Rain, snow, hail	Distributed intelligence	Design of monitoring program, training, data disemmination

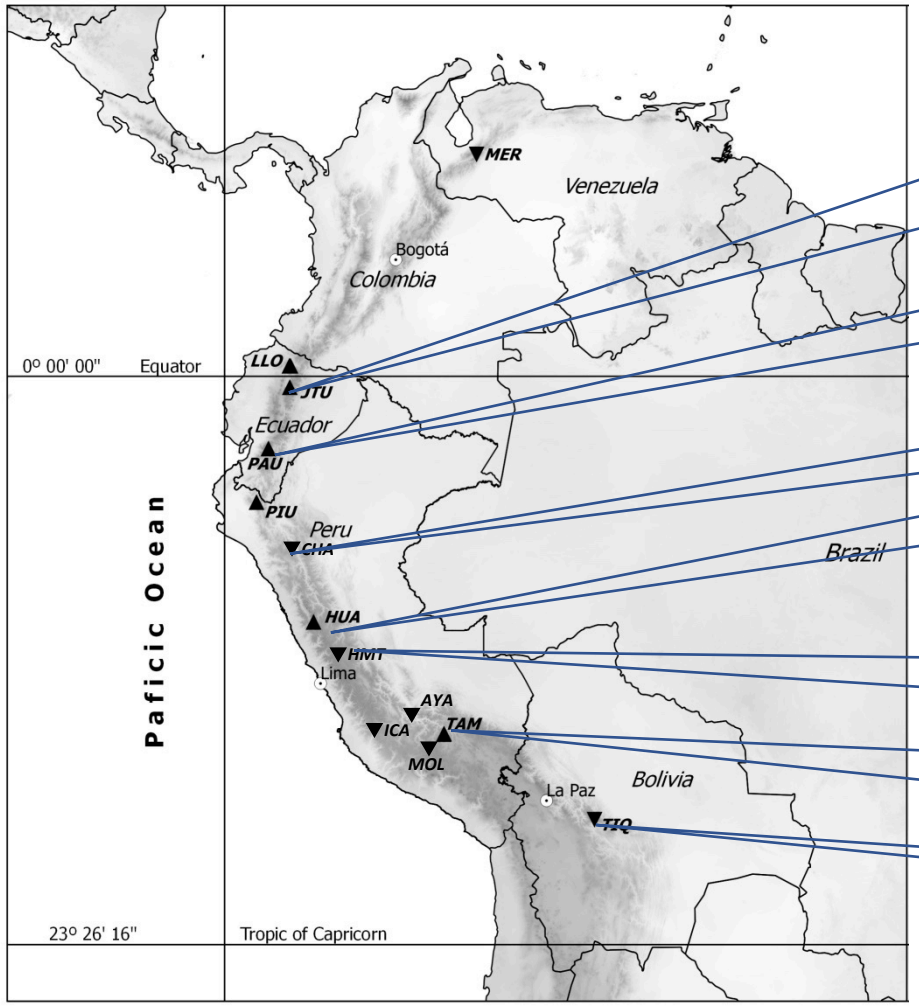
Technological opportunities



Issues with overgrazing and soil degradation

Photos: Junior Gil Ríos, Boris Ochoa Tocachi

Local questions – common bottlenecks



How the hydrological response of **degraded páramo** change under **restoration strategies** in Antisana?

What are the hydrological impacts of **human interventions** in the **humid páramos** of Paute?

What is the hydrological response after **pine forestation** of the **jalca** in Chachapoyas?

What are the hydrological benefits of **grassland restoration** in the **humid puna** of Huaraz?

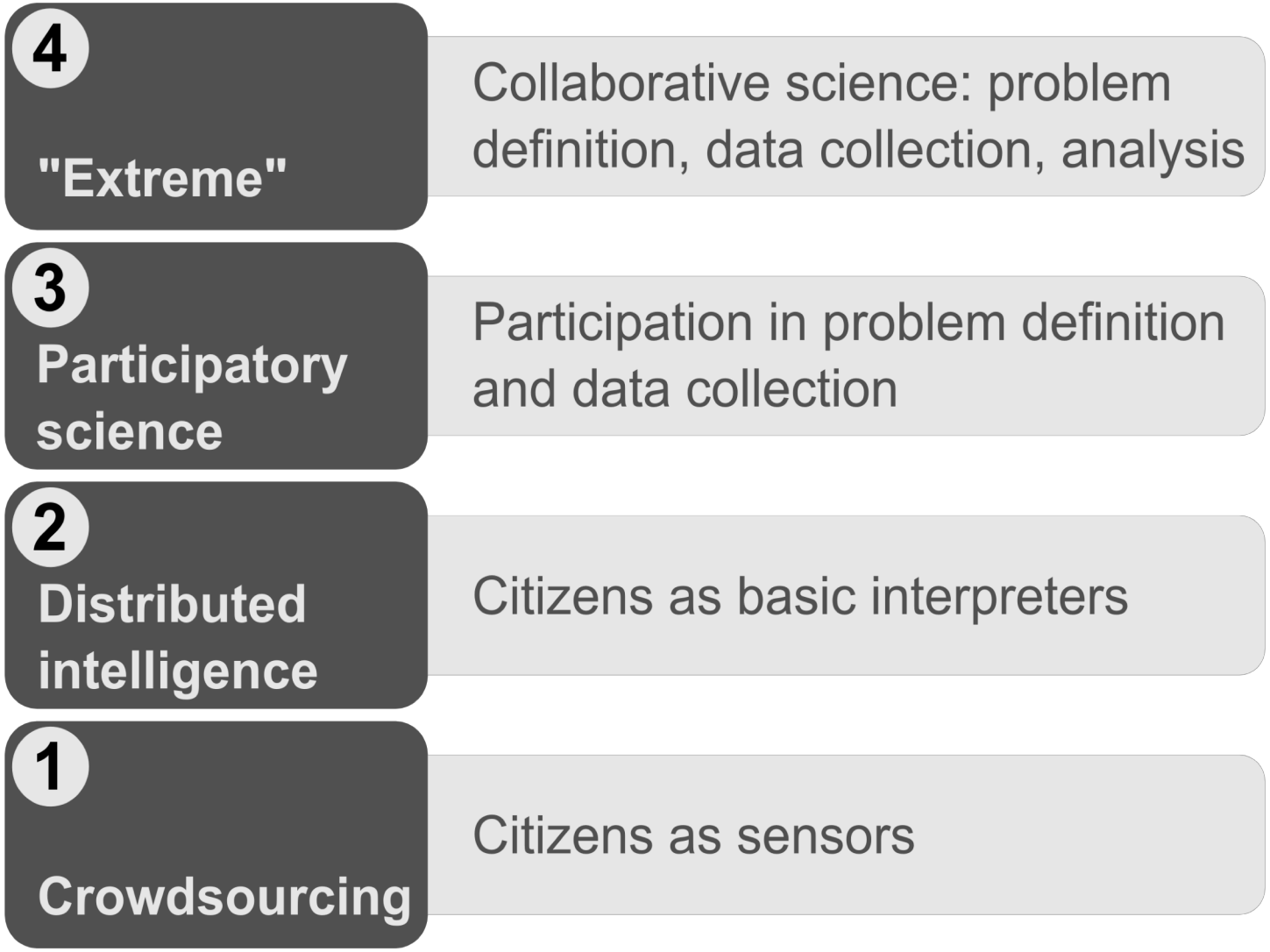
How water regulation change after **cattle grazing exclusion** in the **puna** of Huamantanga?

What is the impact of **pine afforestation and infiltration trenches** in the **puna highlands** of Tambobamba?

What is the hydrological impact of **cultivation and overgrazing** in the **puna ecosystems** of Cochabamba?

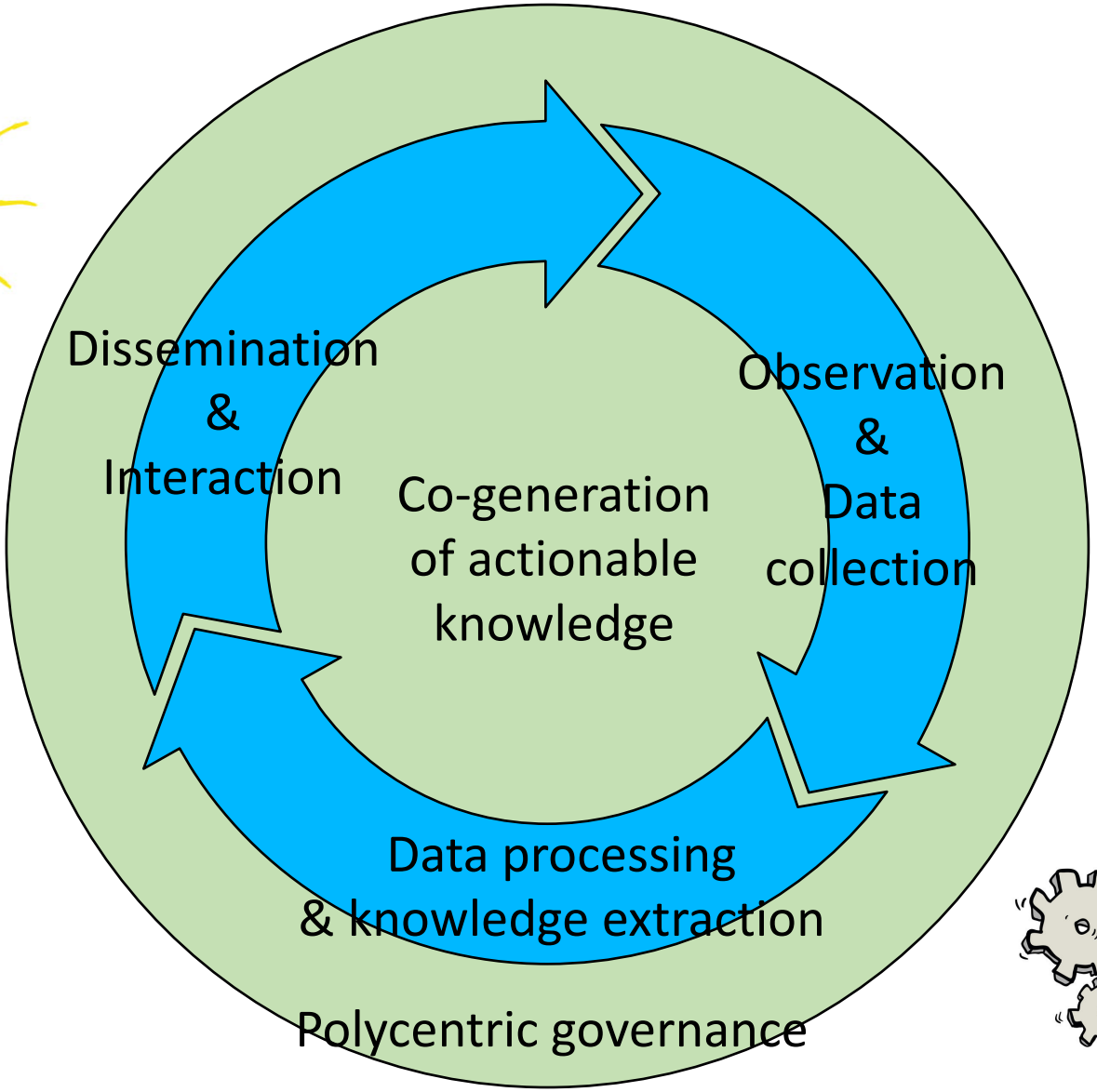
Participatory monitoring of Andean ecosystems

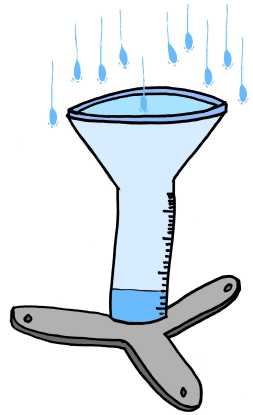
Citizen science: levels of involvement

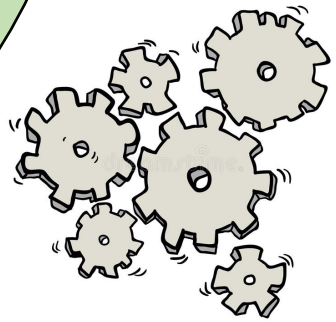


Haklay M., 2012

Our theoretical framework

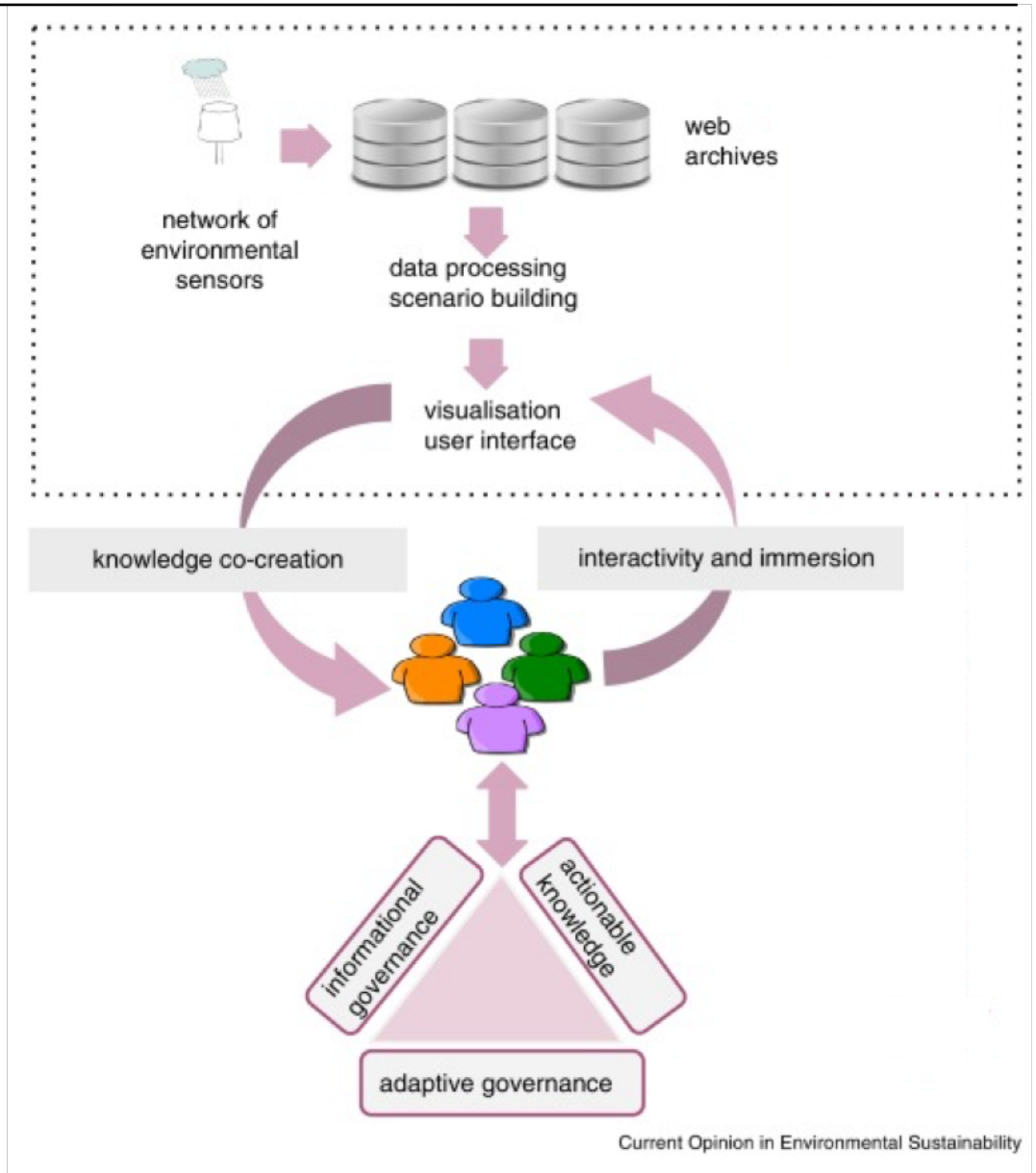






Some insights from experiments in Peru and Nepal

- Increased interest in community-based, stakeholder-centered natural resource governance
- More inclusive and democratic forms of eco-regional development
- Roots in participatory action research
- Integration of heterogeneous data & knowledge
- Polycentric models of data curation, knowledge co-creation, and governance



mountain EVO
environmental virtual observatories

iMHea

CONDESAN
Consorcio para el Desarrollo Sostenible de la Ecorregión Andina

espa
ecosystem services for poverty alleviation

USAID
FROM THE AMERICAN PEOPLE

Thank you

HUAMANTANGA'S WATER RESOURCES

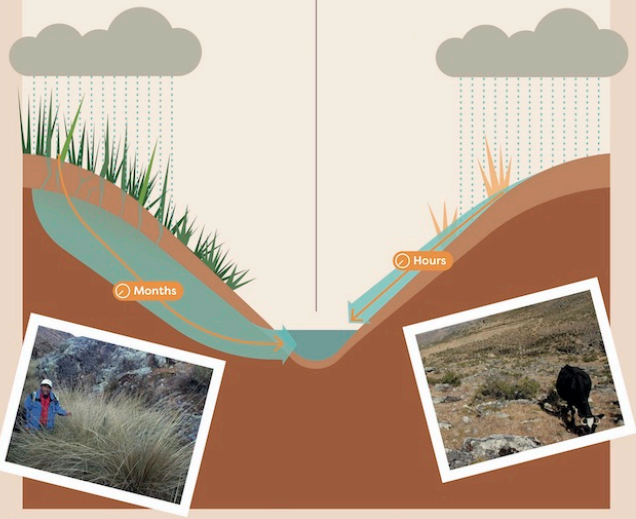
MANAGING THE HIGH PASTURES

NATURAL PASTURES

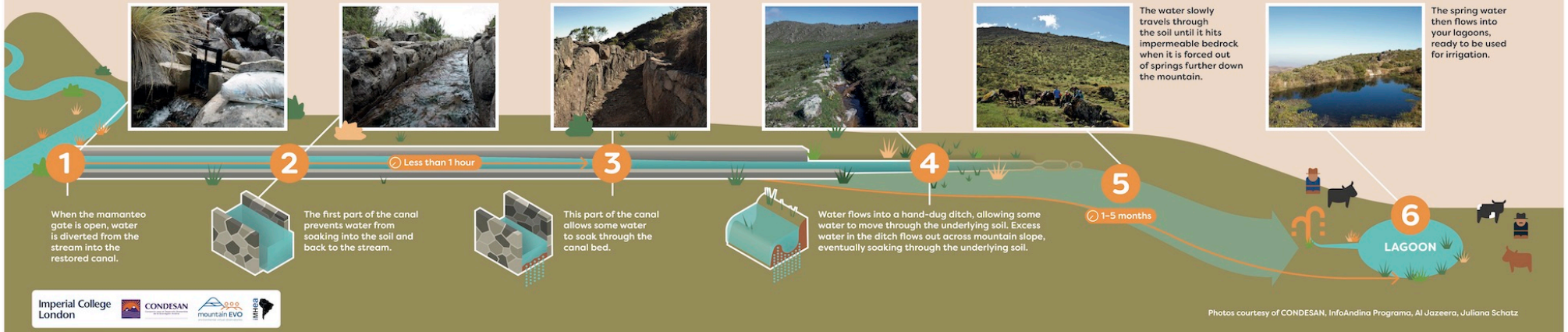
Gaps in the soil caused by grass roots allow most of the rain to soak into the soil and flow underground before resurfacing in streams months later.

OVERGRAZED PASTURES AND COMPACT SOIL

Water flows quickly into the streams and down the mountain.



HOW THE PACCHIPUCRIO MAMANTEO WORKS



Imperial College London · CONDESAN · mountain EVO · iMHea

Photos courtesy of CONDESAN, InfoAndina Programa, Al Jazeera, Juliana Schatz