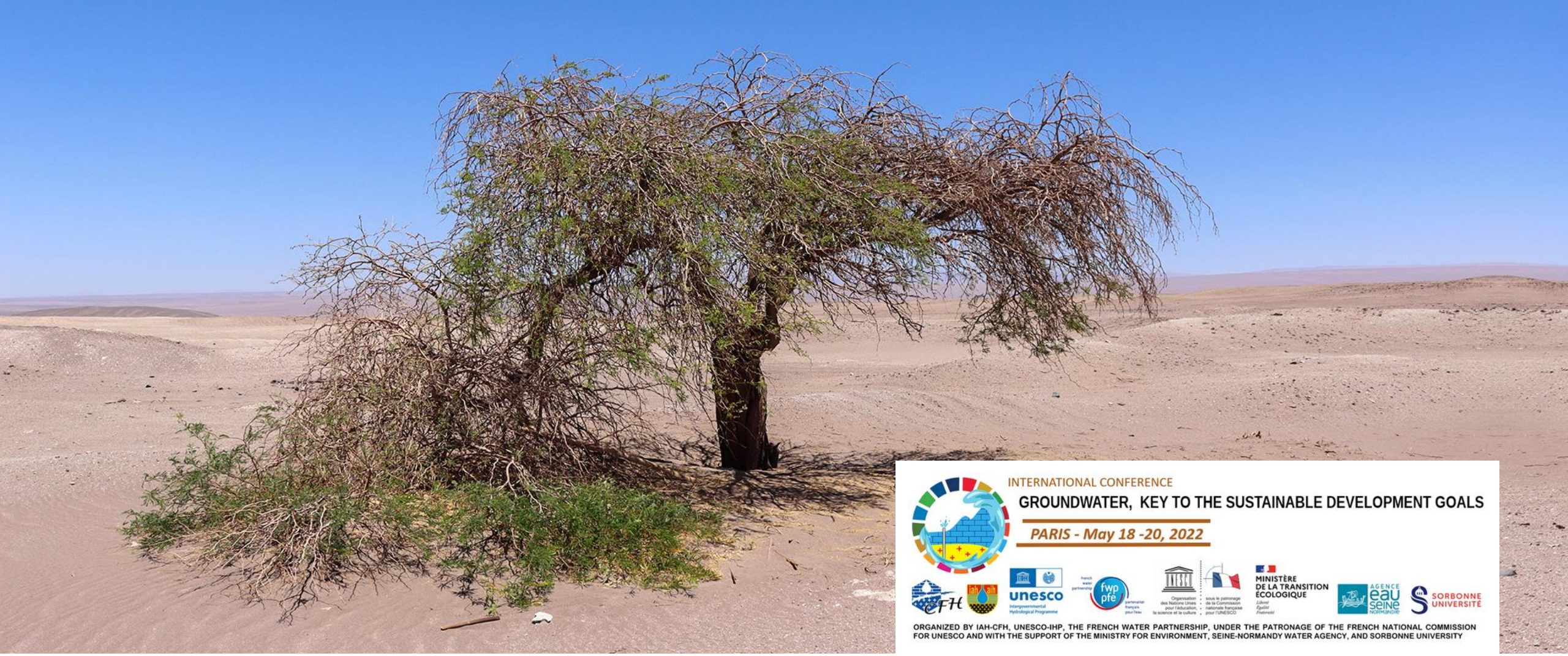

INTERNATIONAL CONFERENCE

GROUNDWATER, KEY TO THE SUSTAINABLE DEVELOPMENT GOALS

PARIS - May 18 -20, 2022

ORGANIZED BY IAH-CFH, UNESCO-IHP, THE FRENCH WATER PARTNERSHIP, UNDER THE PATRONAGE OF THE FRENCH NATIONAL COMMISSION FOR UNESCO AND WITH THE SUPPORT OF THE MINISTRY FOR ENVIRONMENT, SEINE-NORMANDY WATER AGENCY, AND SORBONNE UNIVERSITY

THE GROUNDWATER PARADOX IN ARID AREAS: CASE OF NORTHERN CHILE

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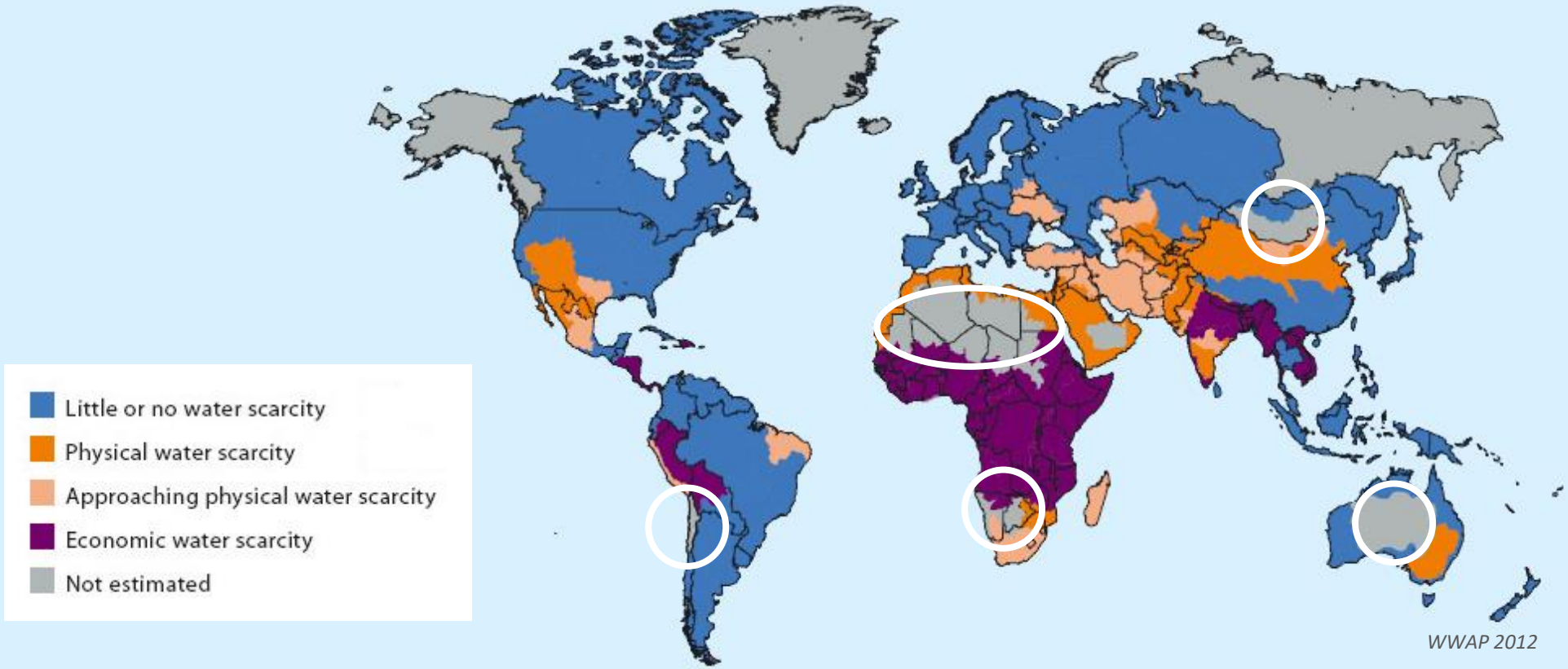
igrac

International Groundwater Resources Assessment Centre

CarpeScience

Water scarcity: The challenge of the 21st century

- 2021: 2,4 billion people (30% of the world's population)
- 2030: 2,7 billion people
- Physical scarcity vs. economic scarcity
- **Unestimated areas**



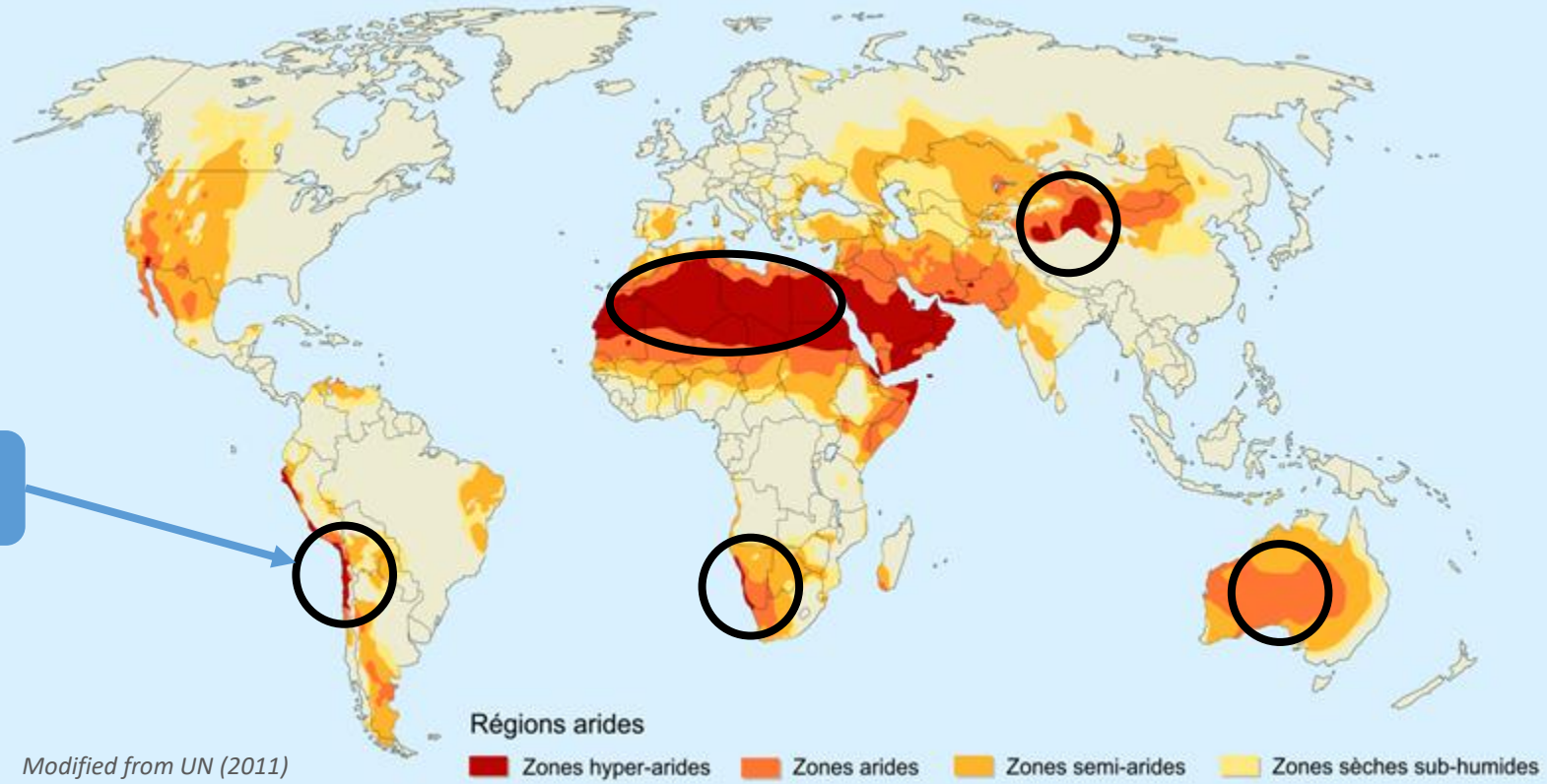
WWAP 2012

Water scarcity: The challenge of the 21st century

- 2021: 2,4 billion people (30% of the world's population)
- 2030: 2,7 billion people
- Physical scarcity vs. economic scarcity
- Unestimated areas → **Arid and hyperarid regions**
  - 40% of land area
  - 35% of the world's population
  - Of which 90% in developing countries

Access to water

Case study



Modified from UN (2011)

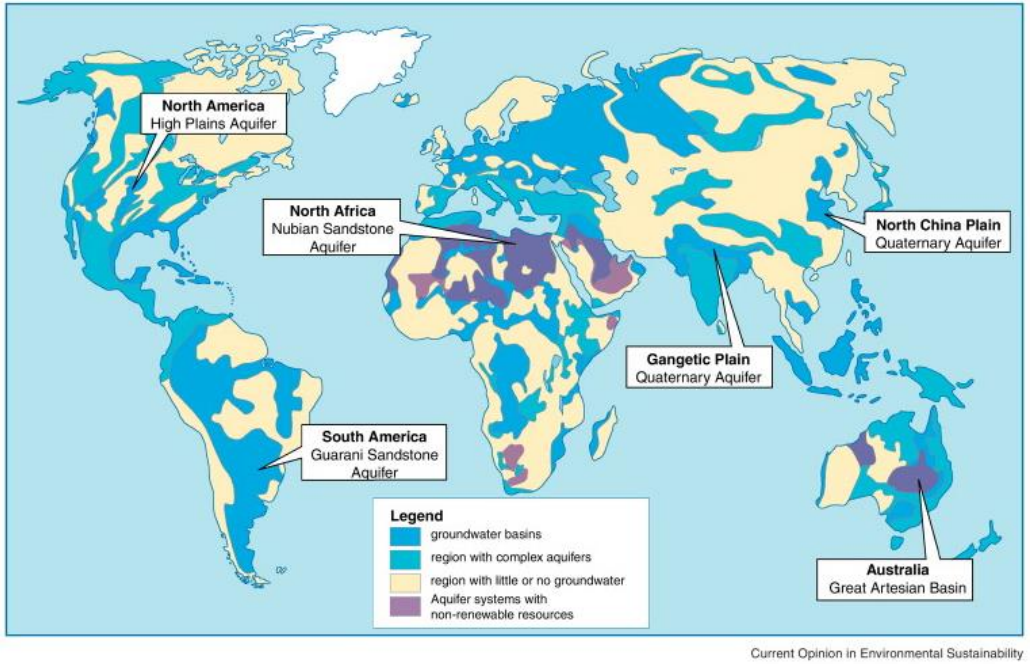
In arid areas: surface water is almost inexistent and sporadic

ecosystems are groundwater-dependant, including humans

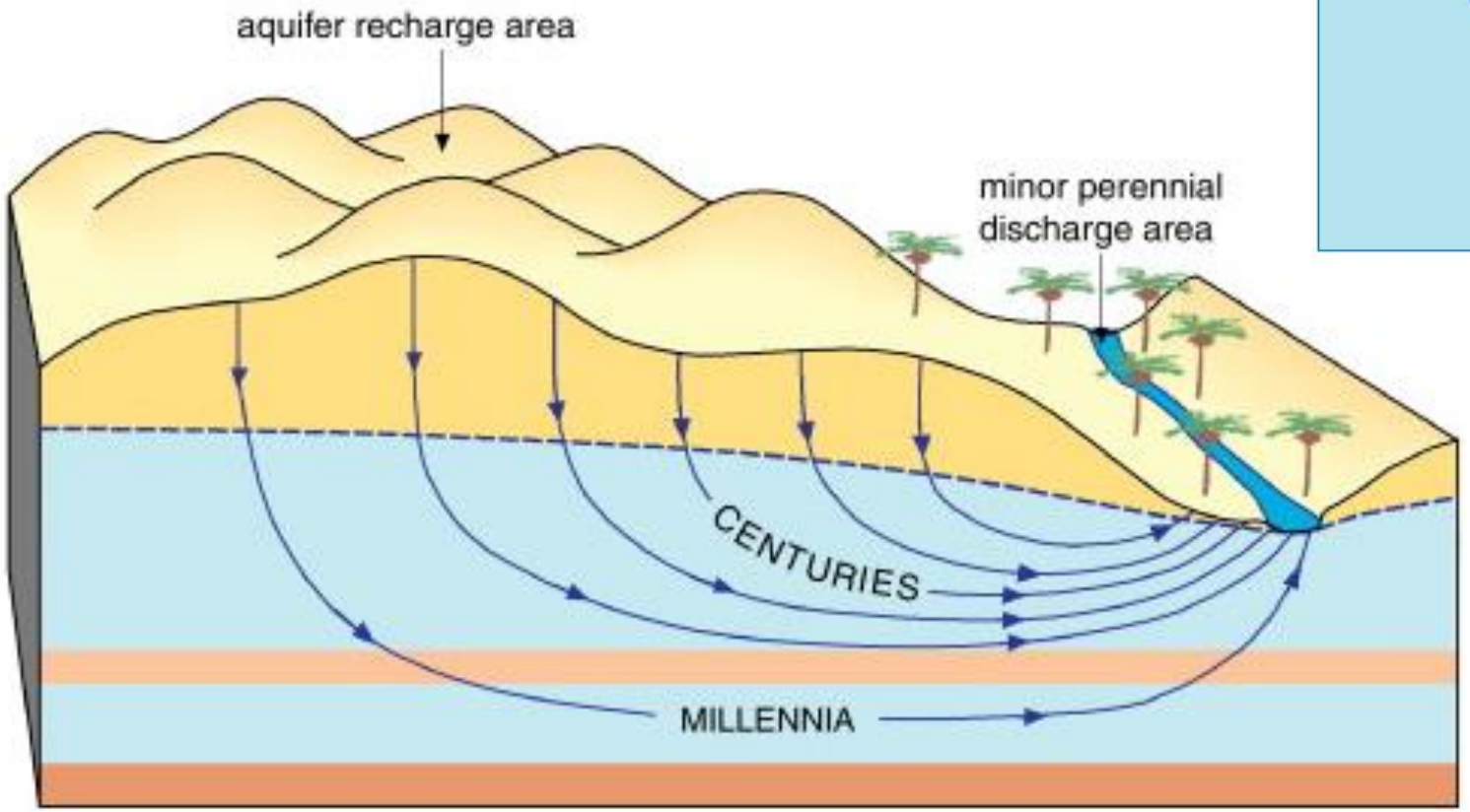
Groundwater in arid areas

⇩

Low recharge and Fossil aquifers



Current Opinion in Environmental Sustainability

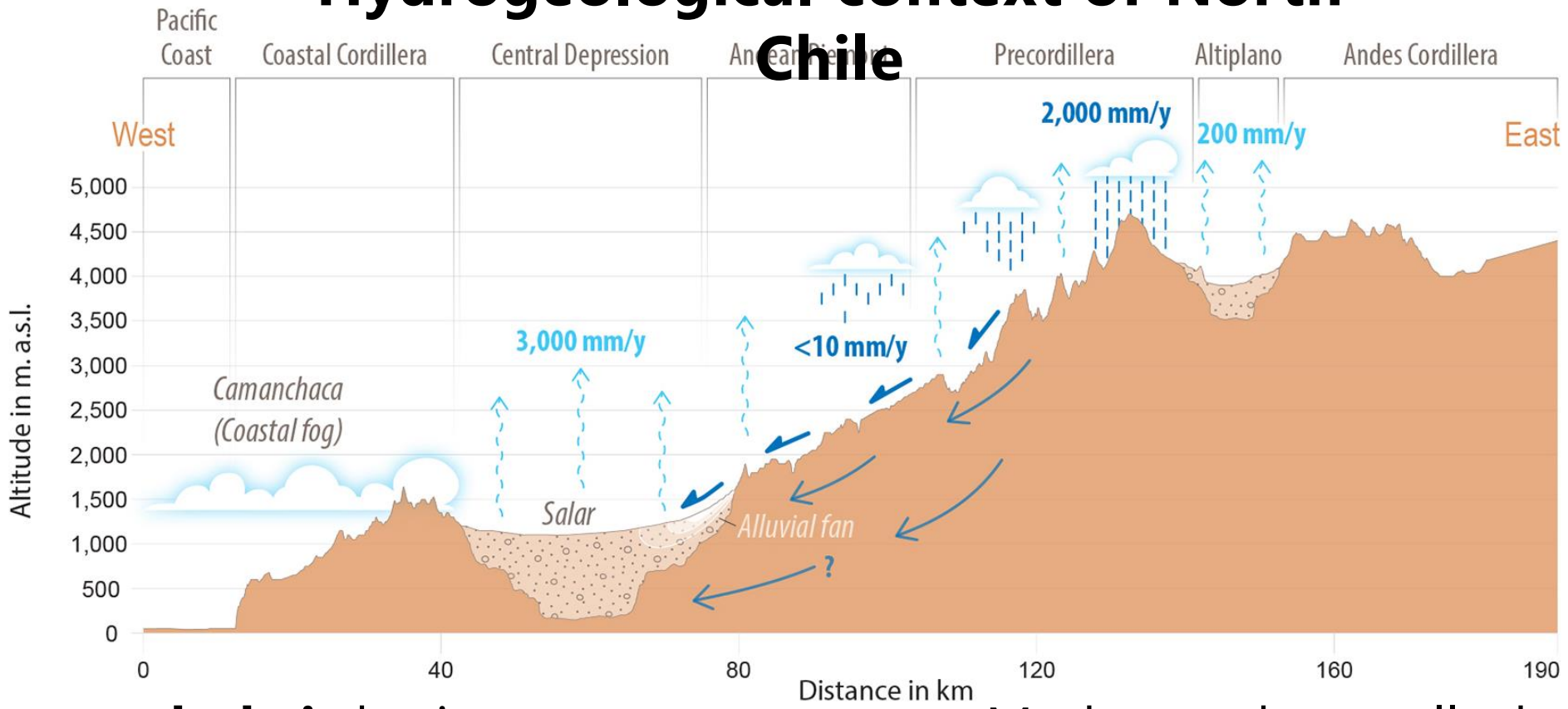


KEY

- Groundwater piezometric
- Level (with máximum and mínimum levels in the non-confined aquifer
- Aquitard (low-permeability strata)
- Aquiclude (virtually impermeable strata)

Foster et al., 2013

Hydrogeological context of North Chile



· Large **endorheic** basins

· Accumulation of detritic sediments (+500 meters)

· Late Pleistocene and Holocene main recharge

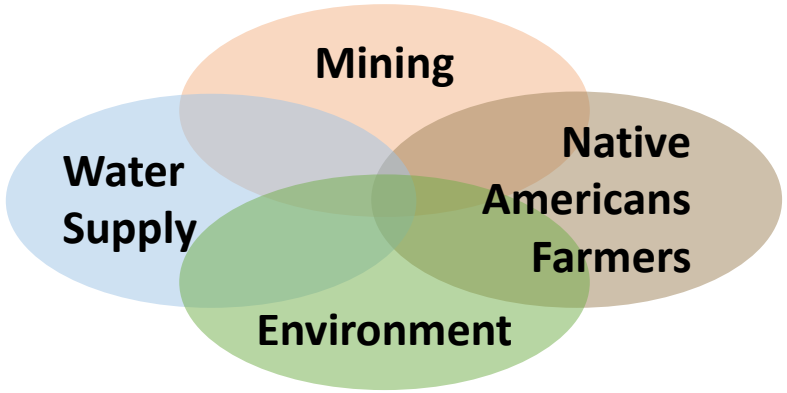
· Modern recharge allochtonous

· Precipitations <<< Evaporation

· In lower areas → very shallow & upwelling groundwater

Groundwater use

Stakeholders:

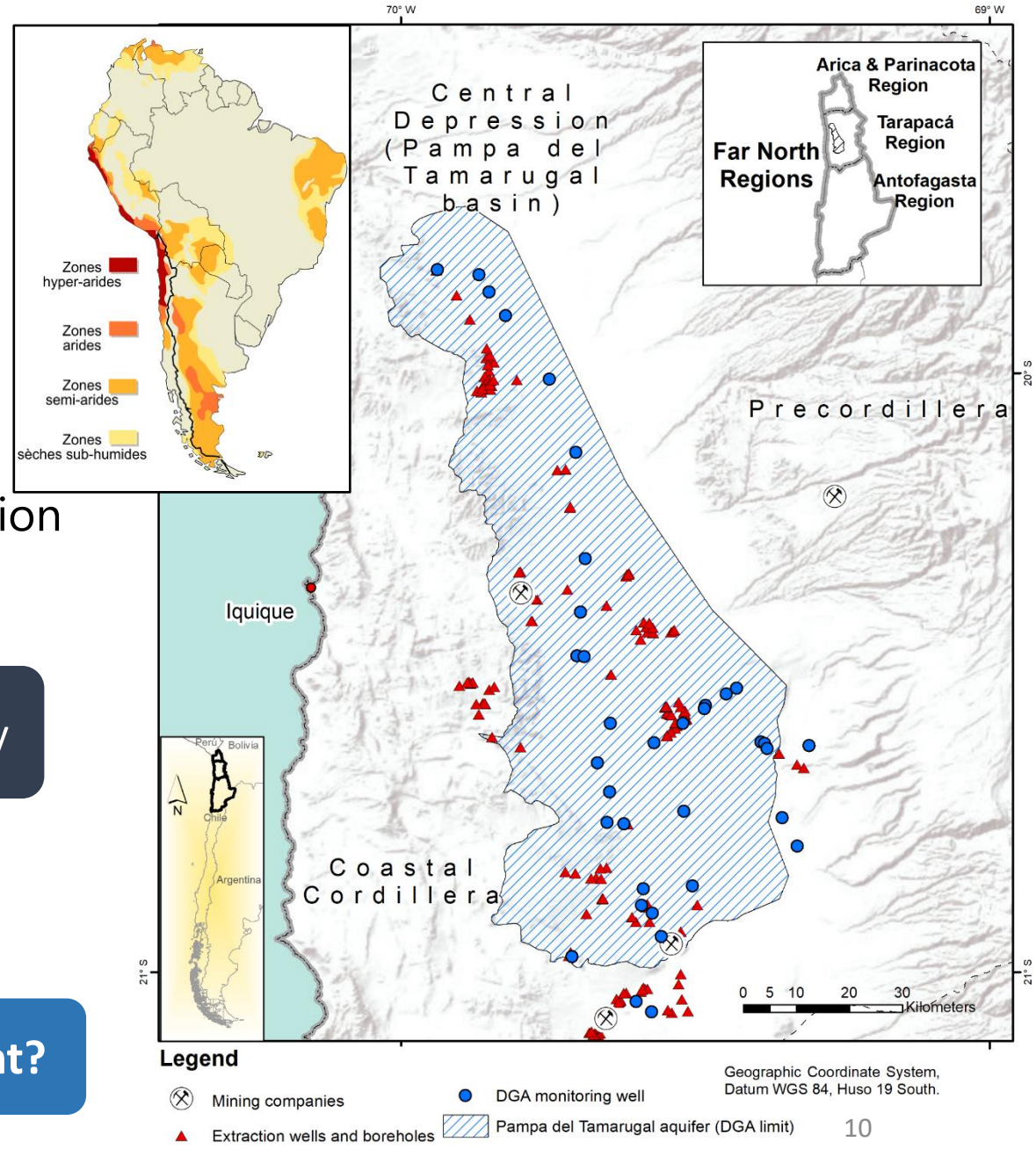


Decision-makers

General Water Directorate (DGA):

- Monitoring & assessment
- Water right allocation

Northern Chile, Hyperarid area → ↗ Mining → ↗ Demography → ↗ Water use → ↗ Conflicts → Management?



Estimation of the safe groundwater yield:

Recharge rate + 5% of volume stored over a period of 50 years

Groundwater levels evolution

- Average decline of 0.06 m/year in 20 years

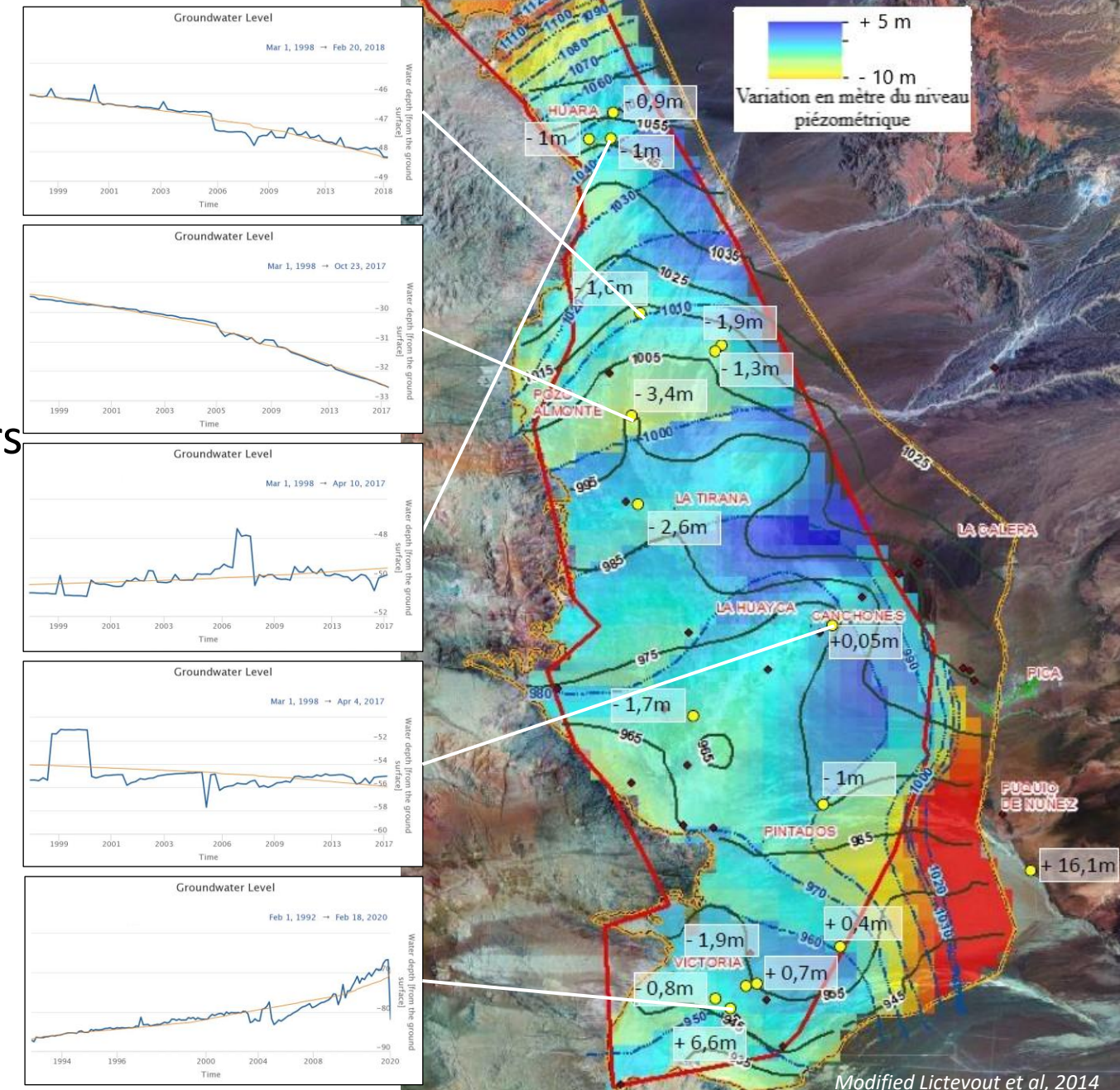
  ⇨ 1 to 2 m/2 decades

  → Aquifer declared as restricted area

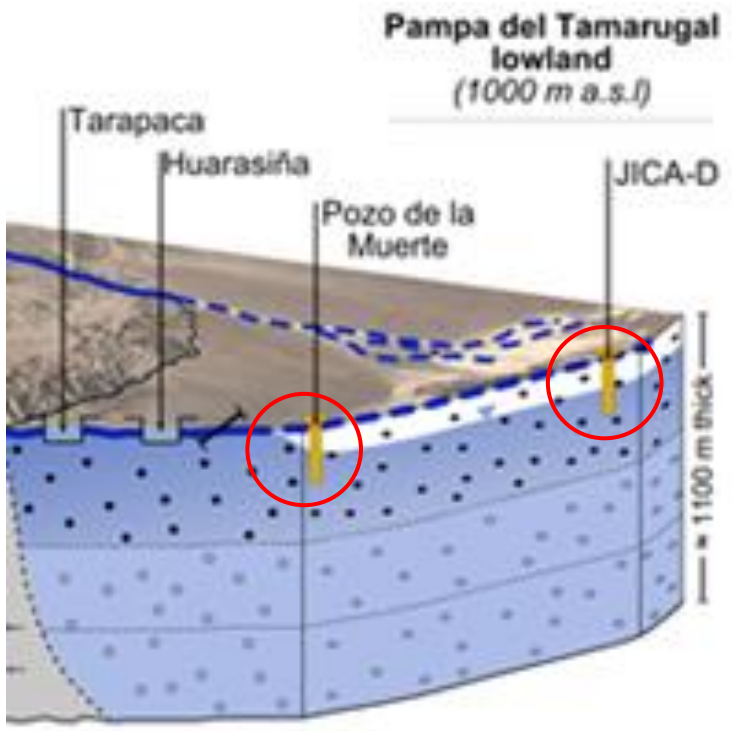
  But: high spatial and temporal variability

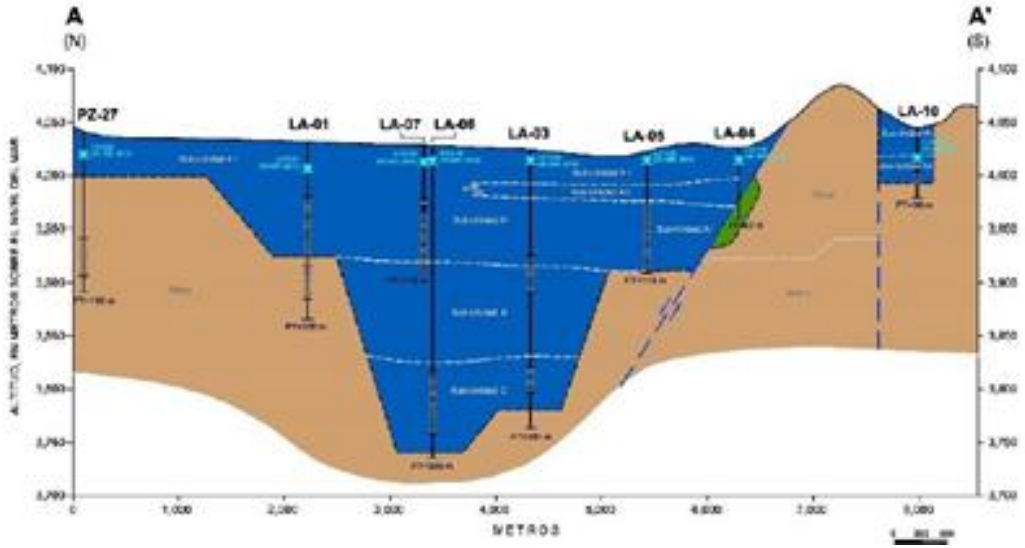
  Areas where:

  - Groundwater level stable or stabilized
  - Groundwater level increase
  - Higher decline (0.2 m/year)



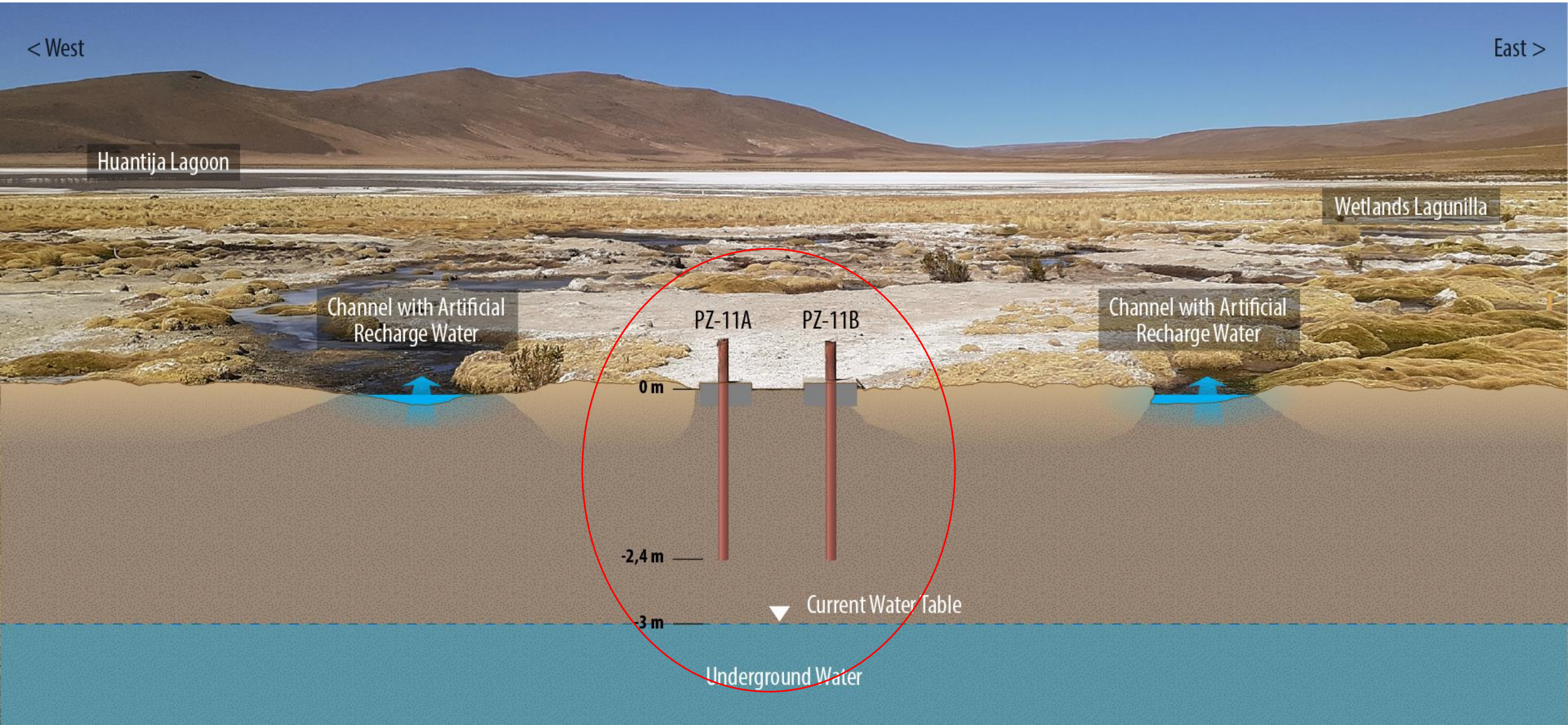
The resource is not threaten in the short and medium term



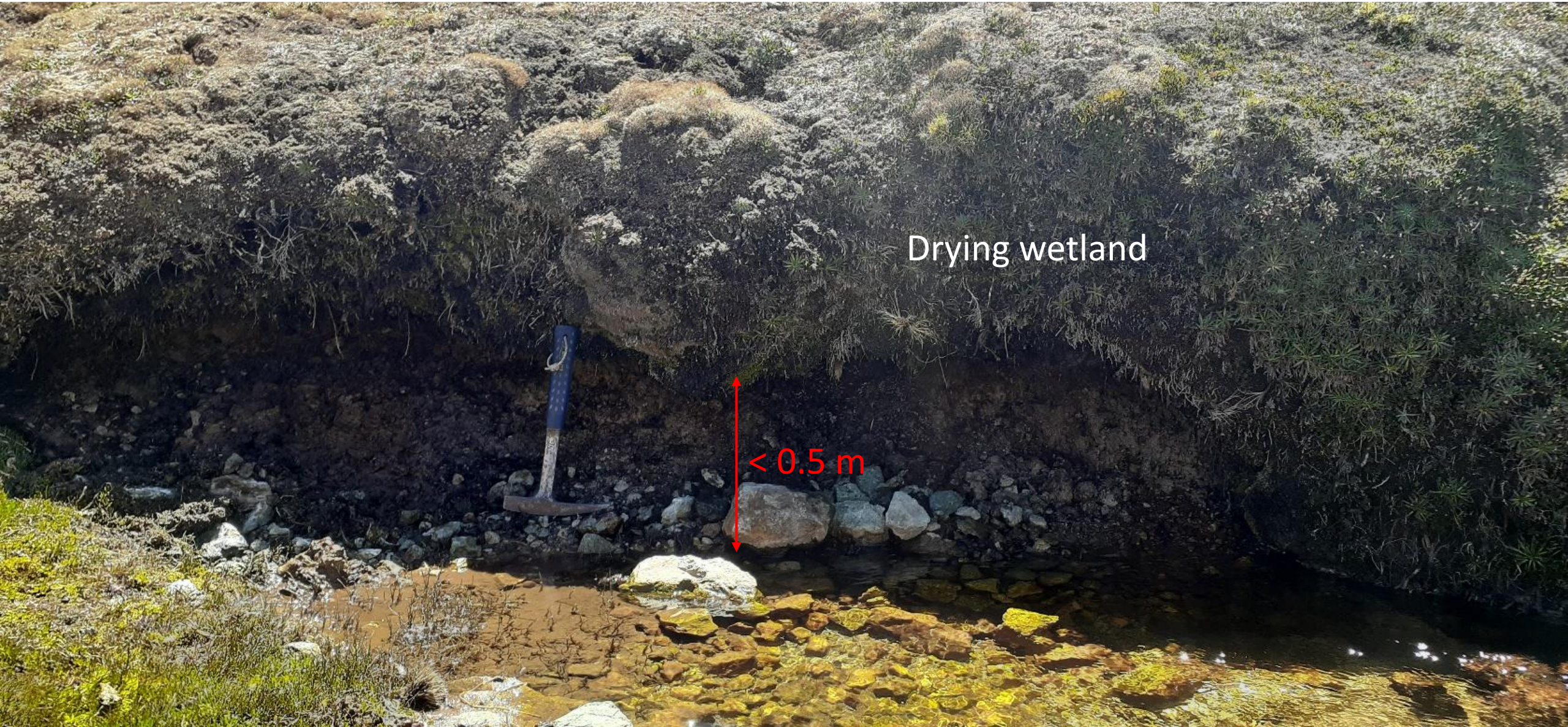


but

Small users loose access to water as water wells are drying up **and**



Local ecosystems are threaten



In this case, reaching the SDG 6 is related to:

- being able to access the groundwater resource

  not a problem of availability of the resource

- without threatening ecosystems

Using fossil groundwater can be a solution in large and heterogeneous aquifers,

if

→ Extraction wells are located far from the areas where the groundwater level is near the surface (deeper groundwater, no groundwater-dependant ecosystems)

→ On a limited period (limitation of the depression cone)

Understanding the groundwater system

A long term vision for the territory development

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International Groundwater Resources Assessment Centre

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Thank you very much for your attention