

Sustainable groundwater-based date palm farming: Lessons from a multi-stakeholder dialogue in Kebili region, southern Tunisia

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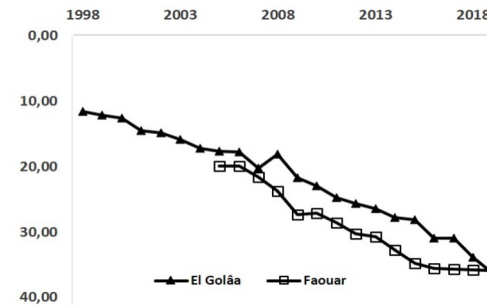
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Societal context

Increase of farmed areas under private initiatives



Overexploitation of groundwater resources



Dynamics of increase in individual illegal boreholes



Drainage deficiency and salinization hazard



Development of photovoltaic panels used for pumping



Objective

Investigate an appropriate methodology that helps the creation of conditions for dialogue between groundwater actors:

- ❑ a common representation of the issues and of actors' interventions at different spatial levels
- ❑ to motivate participation and strengthen collective multi-actor capacities for dialogue, research and testing of innovations for sustained groundwater use

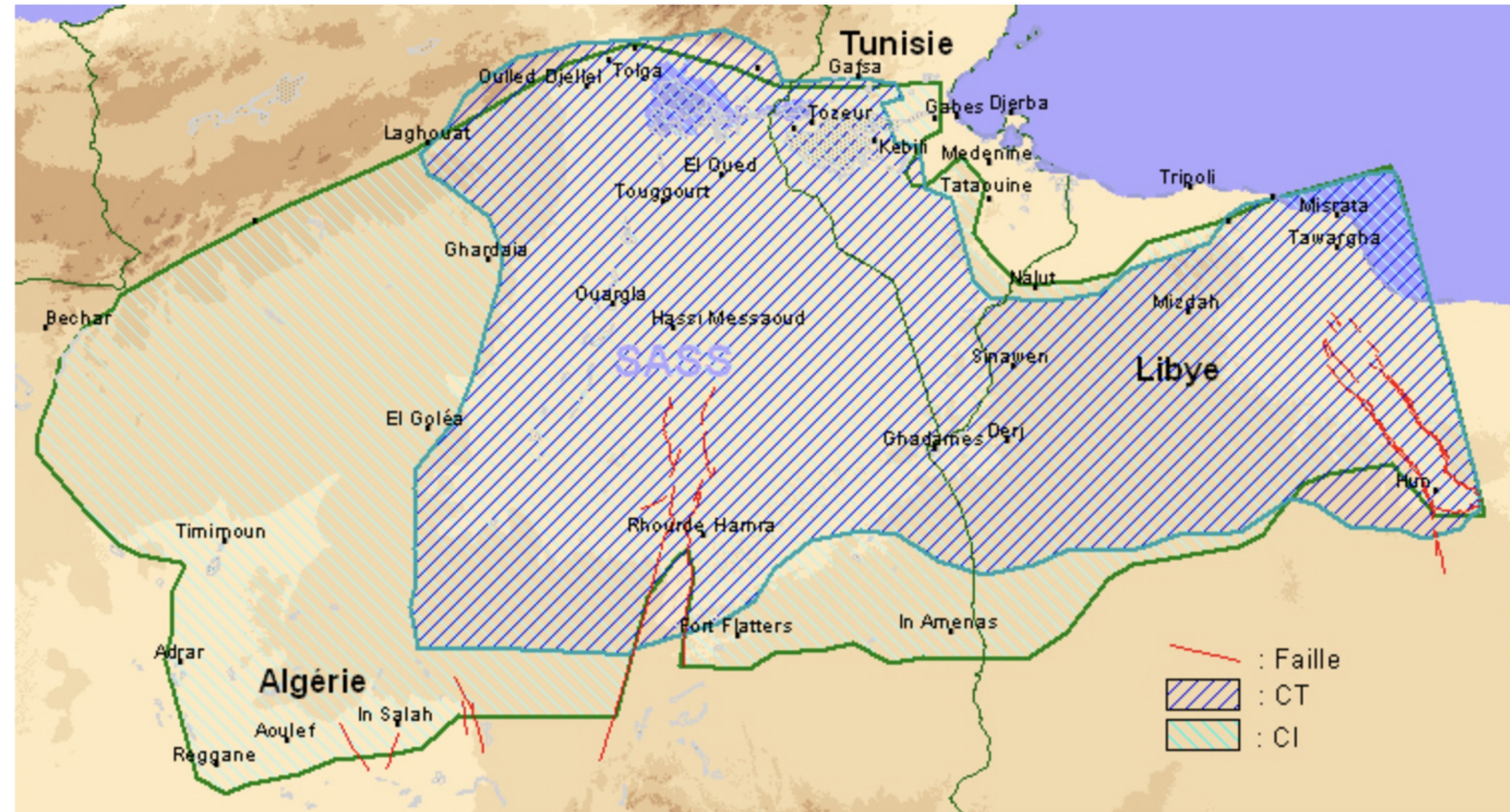
Tunisia Study area



SASS « Système
Aquifère du
Sahara
Septentrional »

Two confined aquifers:
Continental Intercalaire (CI)
Terminal Complex (CT).

Arid zone (annual rainfall of 100-200 mm,
evapotranspiration rate of 2000-2500 mm)



large aquifer shared by Algeria, Libya, and Tunisia

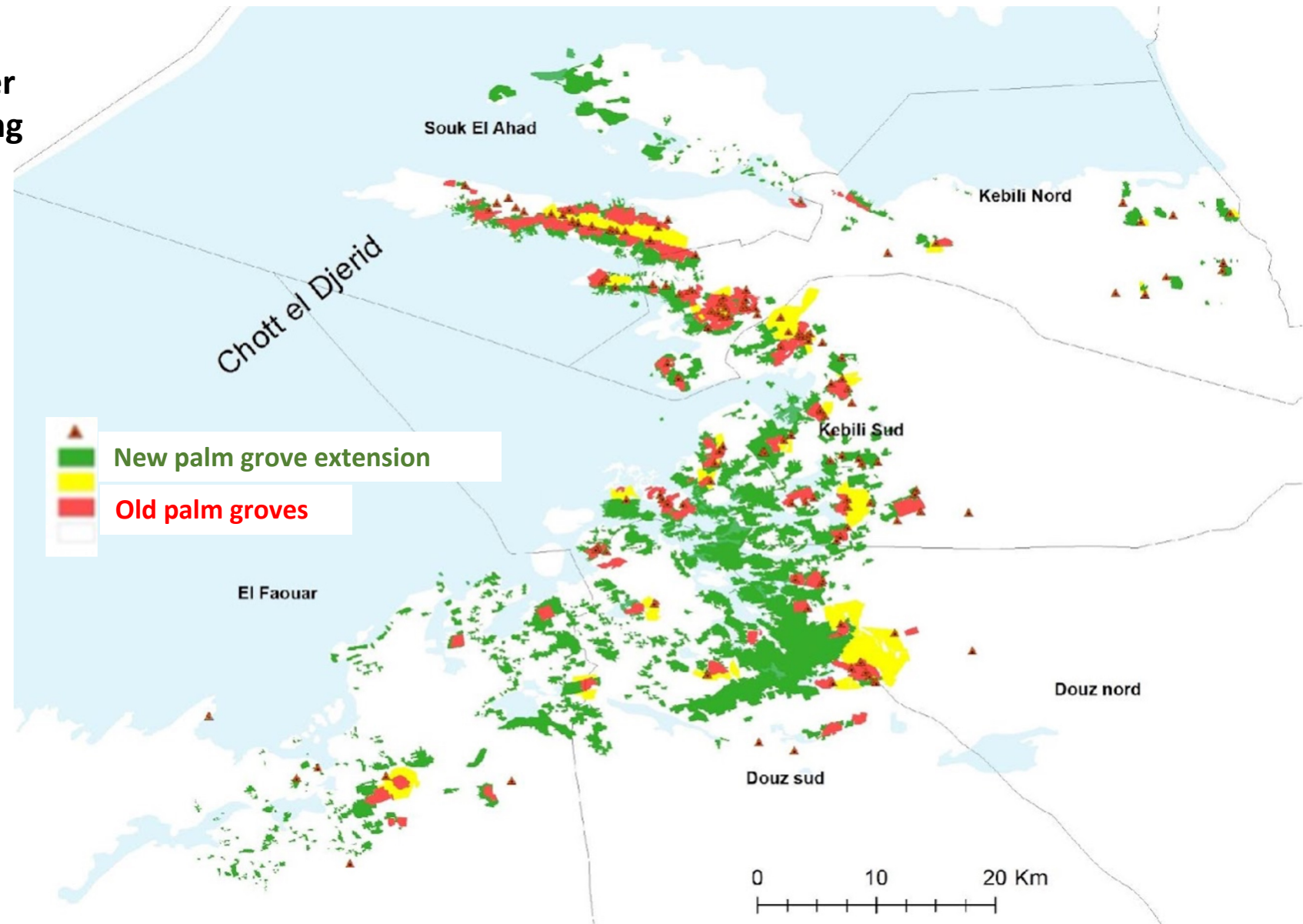
Study area



Groundwater
oases farming
systems



47% extracted by
illegal pumping
Expansion of
irrigated palm
groves "extensions"
Rapidly changing
dynamics



Extensions are both as plots around old palm groves and creation of private or illegal.

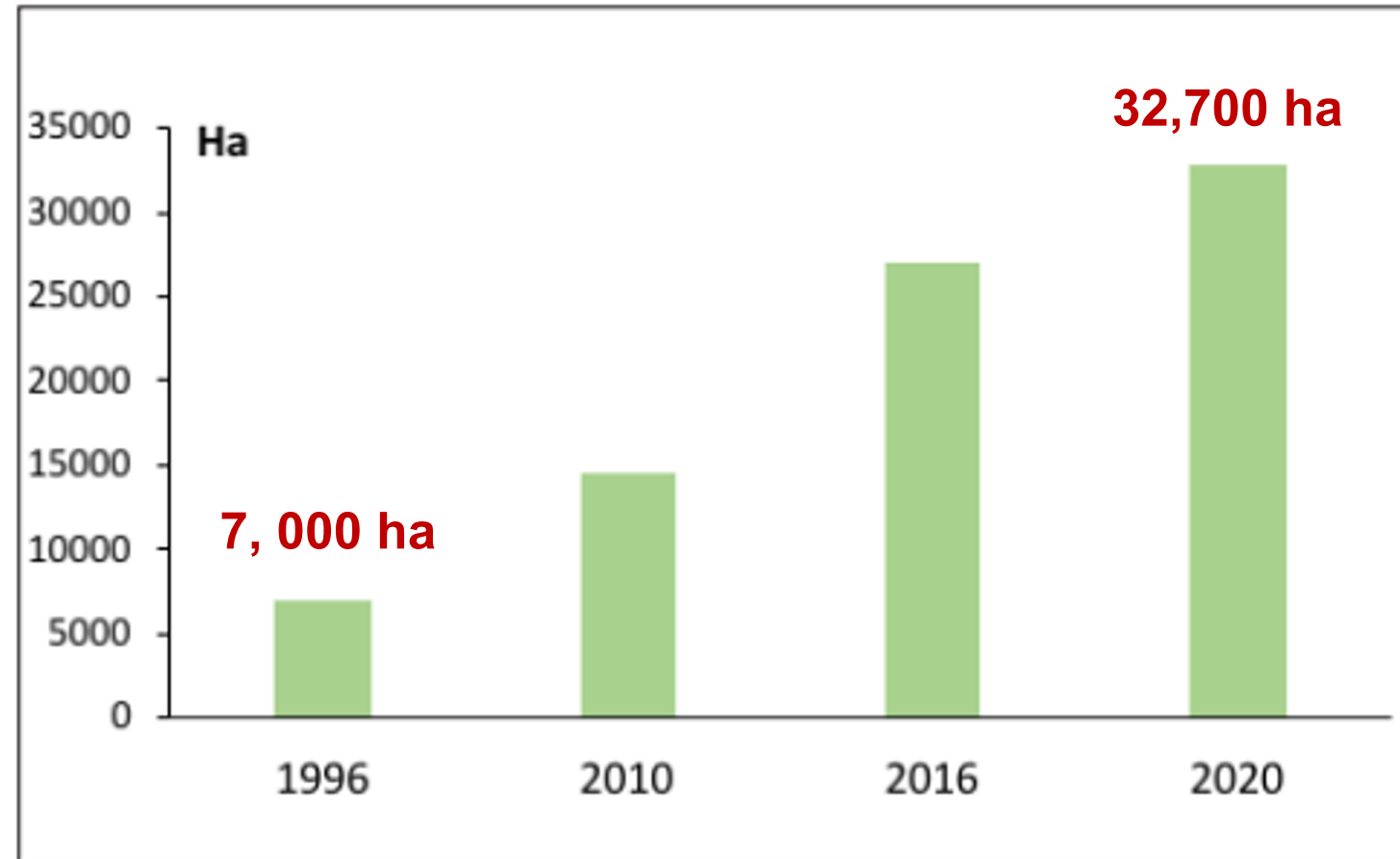
Study area



Groundwater
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47% extracted by
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Legal from the point of view of access to land;
illegal due to illicit exploitation of groundwater

Overview of the methodological strategy



Identification of groundwater governance actors

Users: Small scale, Large scale farmers
Water user associations (WUA)

Regional public authority
local organizations of the Ministry of Agriculture

National public authority

Ministries: Agriculture and the hydraulic resources, Energy

Research institutions

Competing interests, Conflicts, Coherence of policies

Identify the various strategies/rules, laws, norms

Multi-Actor participatory approach

Diagnosis

5 workshops with local actors (farmers, WUA ,) ,
1 workshop with actors at regional level

Innovation

1 local/regional workshop



Institutional

1 National workshop (regulation, laws, solar energy)
1 multi-actor workshop

What will happen in the future?

Main trajectories of change

Simulations of different groundwater governance scenarios

Problem diagnosis

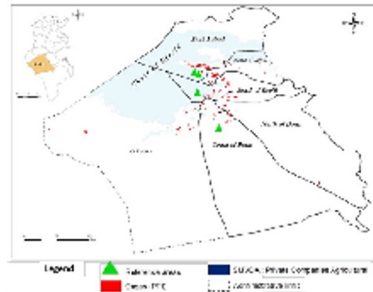


Scenarios development



- Identified measures towards sustainable future
- Elaborate actions plan
- Engagement of actors to implement the proposed measures

Spatial analysis: detection of change



Spatial information
Remote sensing images and GIS

- Survey
- Interviews
- In-situ measurements

Digitalisation, visualisation, discussion

Define Local dynamics and factors of change

Data and methods

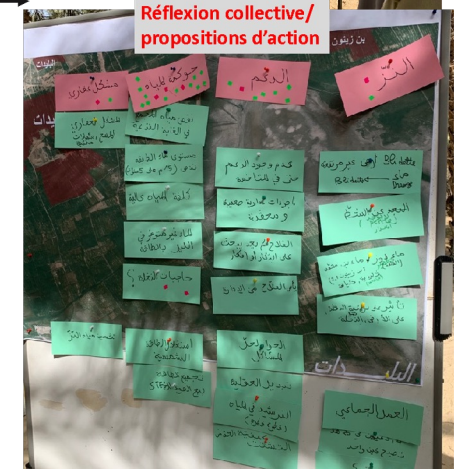
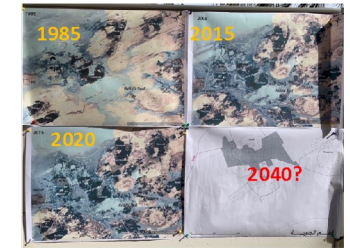
Actors mapping,

Surveys,

Semi-structured interviews (30),

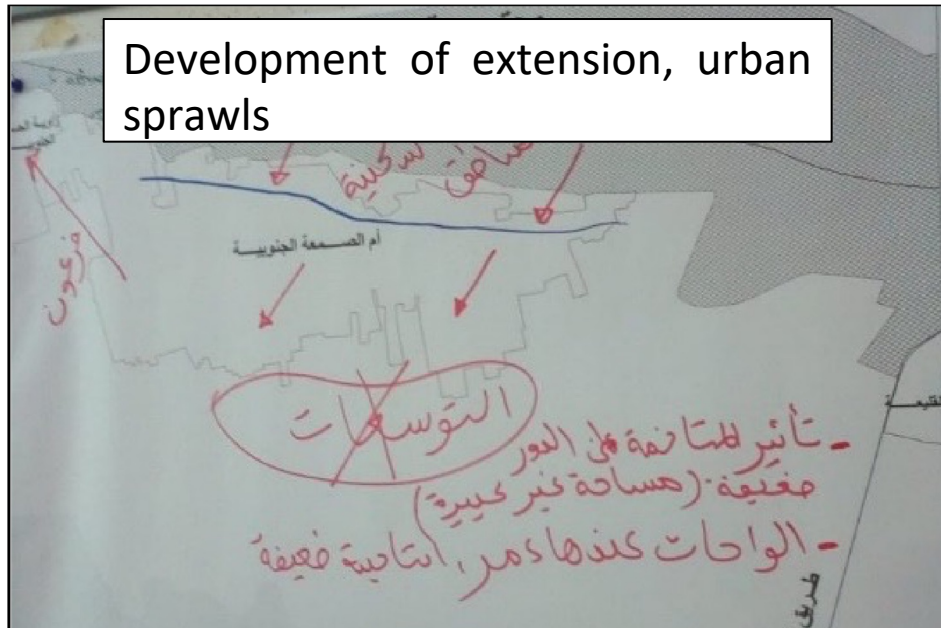
Use of maps as a tool for multi-stakeholder dialogue

9 participatory workshops
Discuss prevailing dynamics and future scenarios

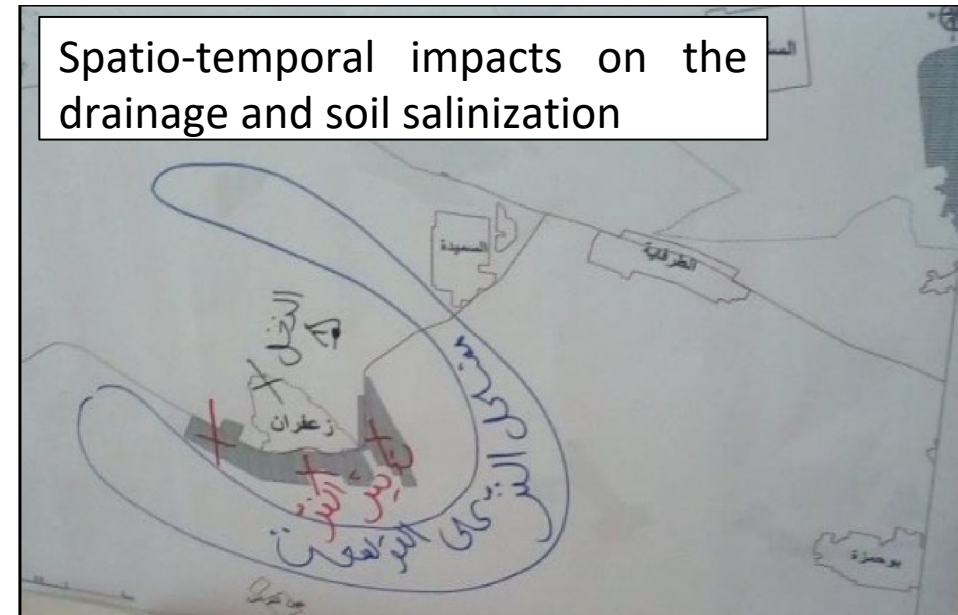


Main described dynamics

Development of extension, urban sprawls



Spatio-temporal impacts on the drainage and soil salinization



Dynamics most often described by actors are not leading to a sustainable future of the Kebili landscape

Main described dynamics/issues and measures

Thematic	Dynamics	Factors of change	Measures towards sustainable future	Actors involved	Strategies for engagement/scale
Historical oasis	Water shortage High-cost water pumping Drainage problem	Complex institutional of water management policies Dysfunction of collective water management Over-irrigation situation	Collective water management Enhance performance solar energy irrigation Assess date palm water needs Improving extension services for farmers Reclamation of drainage water	CTV Research CRDA GDA	Informing/ Legislative Organizational National/local National/local demonstration/field visit
Extensions	Overexploitation of the groundwater Degradation of water resources Drainage/salinization problem Solar Energy	Little cooperation between stakeholders' Lack of communication Development of illicit wells Problems of solar irrigation	Participatory workshops Solar energy profitability studies Awareness days for farmers on the use of solar energy Subsidies	Farmers, APIA Research CRDA Ministries	Informing/ Legislative Organizational National/local Organizational/ local

Understanding institutional role and coordination at relevant level

Implications

Successful groundwater governance needs the coordination of actors and their interactions/actions,

Spatial data provide the basis for allow discussions to emerge about groundwater governance challenges:

- ❑ improving the visibility of farmers' problems,
- ❑ informing stakeholders about the spatial impacts of the different activities,
- ❑ encourage to identify avenues for improving the dialogue.

Implications

The integration of different kinds of knowledge can be used as a guiding tool to build links between all stakeholders engaged in the transition towards sustainable groundwater “economies”.

Combining spatial analysis knowledge and a participatory process catalysed stakeholder dialogue and enabled the identification of measures and the creation of policy-based knowledge towards sustainable groundwater management.

Implications

The analytical proposed framework enabled

- ❑ better understanding of the interactions among actors and between actors and their environment in complex systems,
- ❑ contributed to addressing the conceptual gaps in terms of studying the interconnection and interdependence of different governance levels,
- ❑ explore how desirable patterns of groundwater governance and socioeconomic development can emerge.



Thank you

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