



Groundwater

Key resource for adaptation



Introduction



Mr. Eric Tardieu, Secretary General of
the International Network of Basin
Organizations and Director General of
the International Office for Water

Opening



Dr. Florika Fink-Hooijer

Director General, Directorate General for
the Environment, European Commission

Keynote



H.E. Serigne Mbaye Thiam
Minister of Water and Sanitation,
Senegal

Keynote



Ms. Barbara Pompili

Chair of OECD Water Governance
Initiative, Former Minister of Ecological
Transition of France and French
Parliamentarian

Session's Moderator



Ms. Marie-Laure Vercambre

Director General, French Water
Partnership

Panel



Ms. Elodie Giuglaris
Hydrogeologist
Engineer, French
Geological Survey
(BRGM), French
Hydrogeology
Committee (IAH)



Mr. Abdelkader Dodo
Coordinator of the
Water
Department,
Sahara and Sahel
Observatory



Ms. Jehanne Fabre
Sustainability,
Water Director,
Danone



Dr. Vaibhav Chaturvedi
Fellow, Council on
Energy,
Environment and
Water (India)



Ms. Mayná Coutinho Morais
General Director of
the Committee for
Guandu Water
Reserve, CEDAE
(Brazil)

UPPER RHINE TRANSBOUNDARY AQUIFER : EVOLUTION OF QUANTITATIVE GROUNDWATER MANAGEMENT & CLIMATE CHANGE

Giuglaris Elodie
15/11/2022

Rhine transboundary aquifer

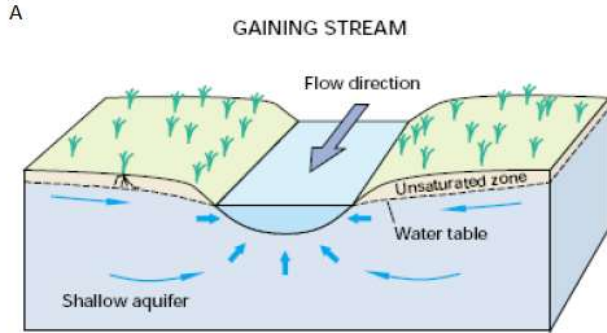
The most important resource for drinking water in Western Europe

- Volume estimation of 60 – 85 billions of cubic meters
- Shallow water depth : subsurface / only few meters
- ➔ Very easy to use
- ➔ Account 80 % of the water consumption in France & Germany in this area
 - First record in 1920's
 - Transboundary inventory of the quality since the 1990's
 - Aims: reducing the pollution due to agriculture (mainly nitrates)



Until a few years ago, there were no quantity issues

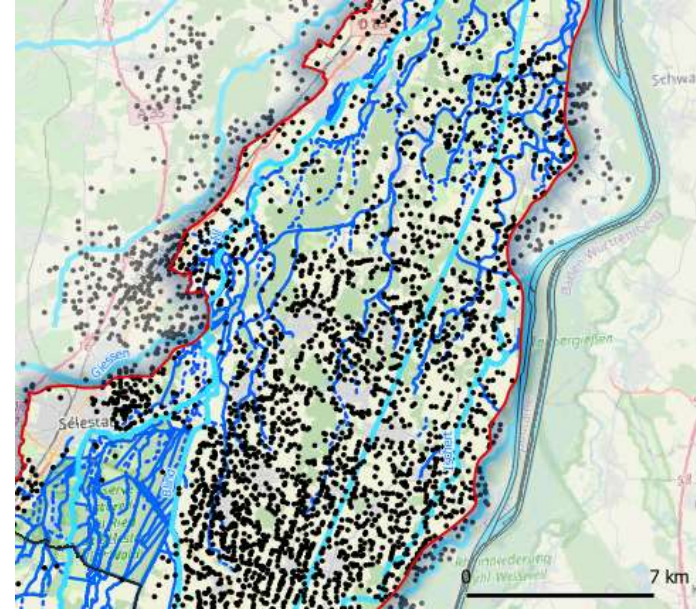
Groundwater and rivers



Boreholes for
agriculture and
proximity with rivers



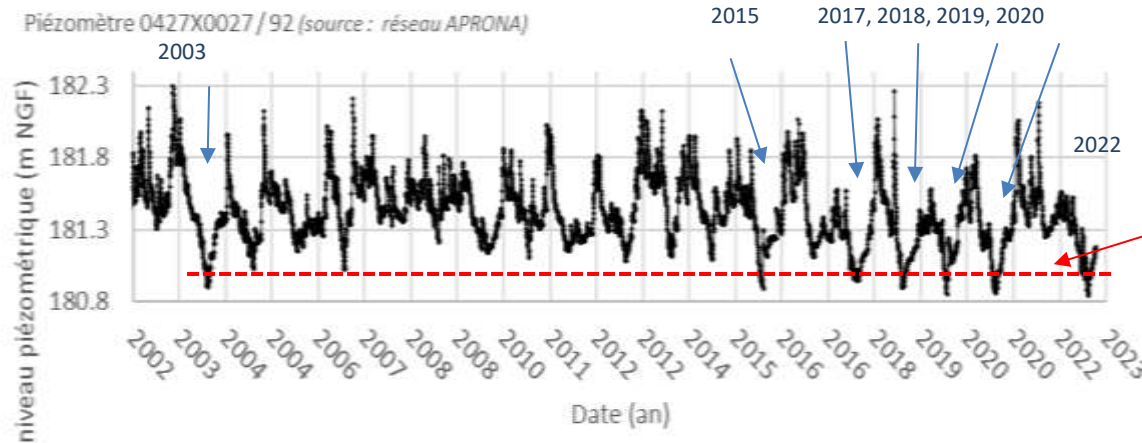
Drying up of a river
in 2019



Global withdrawal in
groundwater = main
mechanism of drying up
the rivers



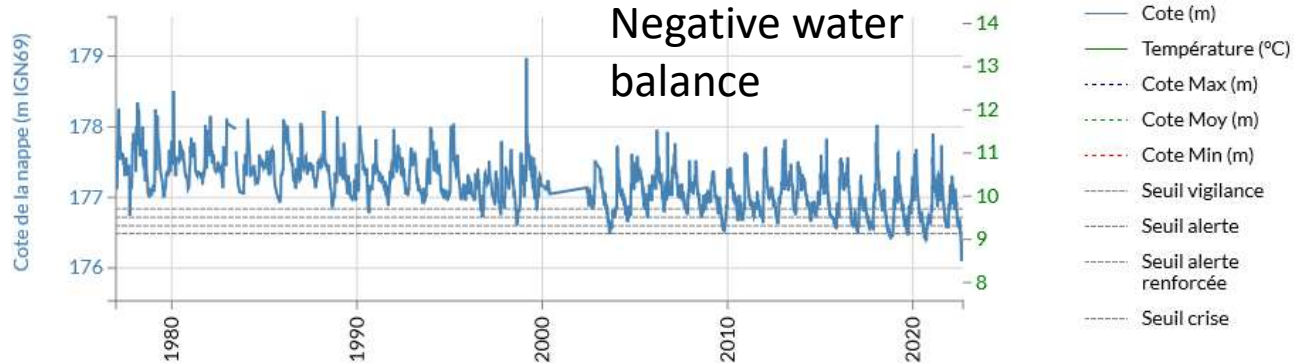
Long term impact on groundwater resources



In the river plain (last 20 years) – indirect impact by increasing demands (maintaining river flows in summer)

Impacts also at some kms of the river plain on a longer term

Climat



Groundwater management challenges

- Groundwater - a very useful resource at local, national and global scales
 - Impacted by local pressures (withdrawals) and global changes (climate)
 - Sustainable management:
 - What is really useable vs sustainability of the hydrosystem for the future? What can be really withdraw?
 - Time to recover from different pressures (both quantity and quality)?
- **Solutions**
 - ➔ Management at different scales including the local scales
 - ➔ Development of new approach and decision-making tools which include uncertainties appraisal



Already started with transboundary cooperation

Cooperation at different levels:

- Conference Upper Rhine (Political level -> Transboundary cooperation on the river)
- Scientific LOGAR network (Groundwater model construction)

>>> Similar observation frameworks (river, GW) between Germany and France

Based on current identified challenges, new cooperation for long term management

- New tools to manage groundwater at several scales (local / regional / local management scale)
- Anticipate future challenges in the area with predictive modelling (both quantitative and quality)



For MORE:

MANY THANKS FOR YOUR ATTENTION



Official UNFCCC Side Event

Groundwater : key resource for adaptation

Gestion des ressources en eau transfrontalières: Actions de l'OSS

Charm El Sheikh, le 14 novembre 2022

Abdel Kader DODO

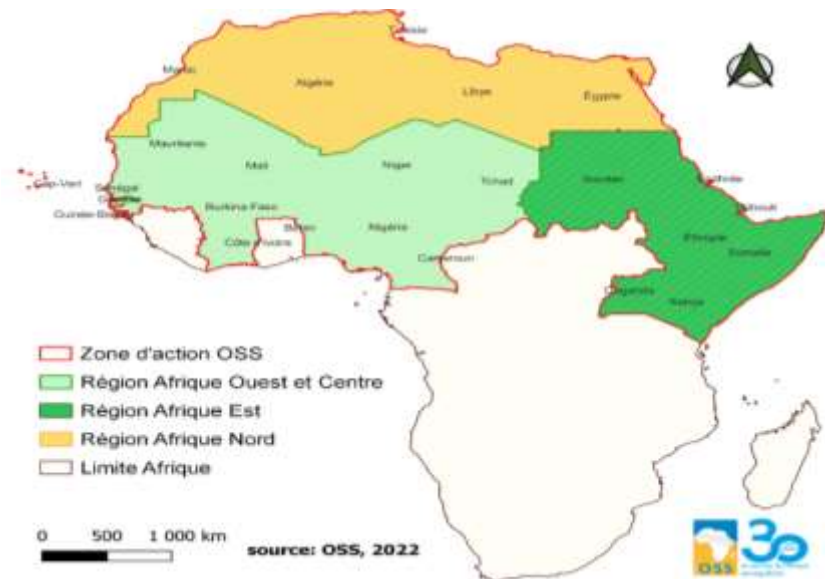
Directeur du Département Eau/OSS

Depuis 1992

- **26 pays africains membres**
- **7 pays du Nord** : Allemagne, Belgique, Canada, France, Italie, Luxembourg et Suisse;
- **7 organisations S/R africaines** : APMGV, CBLT, CEN-SAD, CILSS, CRTEAN, IGAD et UMA ;
- **3 organisations partenaires**

Nos services..

- ✓ **Plateforme de partenariats Nord-Sud-Sud**
- ✓ **Interface d'articulations science-politiques**
- ✓ **Instrument de collaboration** à la disposition des pays membres et autres



L'eau en Afrique : ... Mais une grande disparité

Précipitations

- de moins de 100 mm à plus de 4000 mm

Disponibilité en eau (m³/hab./an)

Des pays en situation de:

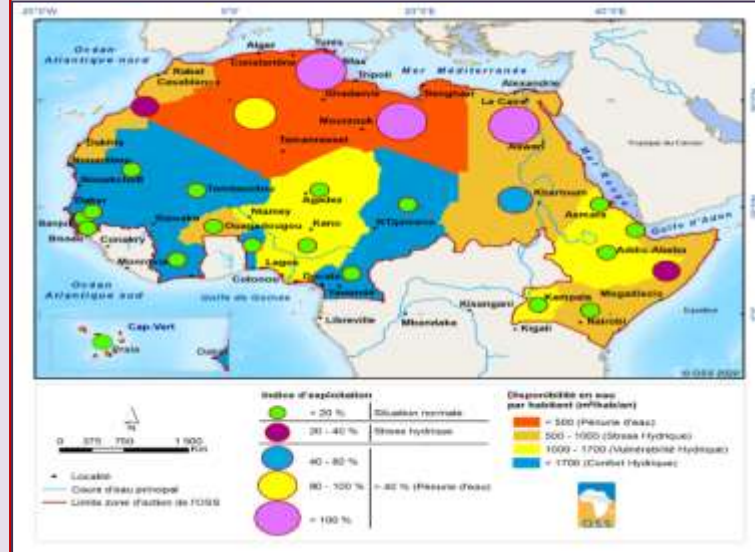
- pénurie d'eau < 500 (60 Mhab.)
- stress hydrique: 500 - 1 000 (258 Mhab.)
- vulnérabilité hydrique: 1 000 - 1 700 (365 Mhab.)
- confort > 1 700 (120 Mhab.)

Impact des variabilités/Changement climatiques

- Baisse de la recharge
- Erosion hydrique (ensablement des cours d'eau et aires de

Démographie

- 1,4 million d'habitants en 2022 → 2,1 milliards en 2040
- 59% de sa population vivra en zone urbaine (en 2050)
- près de 900 millions d'habitants urbains supplémentaires d'ici 2050



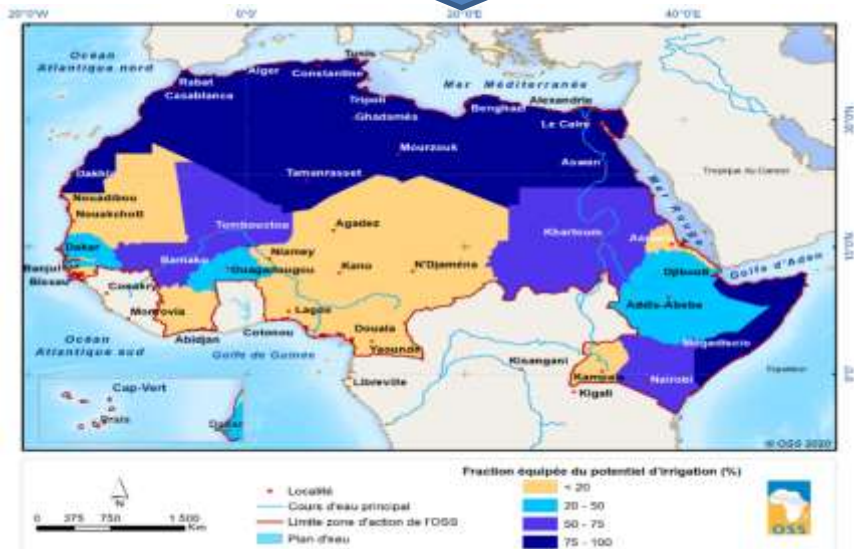
→ Augmentation de la Demande en eau (De l'ordre 1% par an)

- Eau potable: 70% de la population (90% Afrique du Nord & 65% au Sud du Sahara)
- Assainissement : 45% de la population



Disponibilité & Accès à l'eau

Fraction exploitée (en %) du potentiel d'irrigation



Potentiels d'irrigation et fractions aménagées par région



	Afrique du Nord	Afrique l'Ouest et du Centre	Afrique de l'Est	TOTAL (ha)
Potentiel d'irrigation (ha)	8 000 000	6 000 000	6 000 000	20 000 000
Superficies irriguées (ha)	7 500 000	3 000 000	1 000 000	11 500 000
Fraction moyenne exploitée du potentiel (%)	93,7	50	16,6	57,5

Source des données : FAO-Aquastat, 2019

Affectation des eaux souterraines pour l'agriculture dans la zone

Afrique du Nord: près de 70% des prélèvements en eaux souterraines

Afrique Ouest et Est: 5 à 10% des prélèvements en eaux souterraines



OBSERVATOIRE DU SAHARA ET DU SAHEL
SAHARA AND SAHEL OBSERVATORY

Mobilisation des ressources en eau

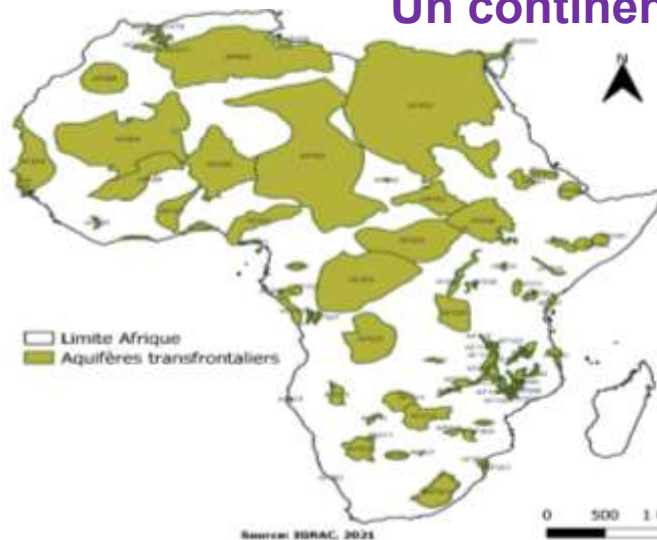
Pressions actuelles sur les ressources en eau renouvelables moyennes	Sous-régions d'Afrique			Ensemble
	Nord	Ouest	Est	
Ressources en eau renouvelables (km ³ /an)	98 (13%)	387 (51%)	273 (36%)	759
Prélèvements actuels (km ³ /an)	92	13	40	145
Indice d'exploitation moyen (%)	93	3	15	19

Source: OSS eau-pop, 2016; AQUASTAT, FAO, 2012-2013

- ❑ En Afrique du Nord, l'essentiel des Ressources en eau Renouvelables est exploité nécessitant le recours à d'autres alternatives
 - ❑ Dans la zone subsaharienne, les prélèvements sont très faibles au regard du potentiel en ressources renouvelables:
 - Serait-ce à dire que les besoins sont satisfaits ?
 - Serait-ce à dire qu'il y a des difficultés d'accès à la ressource disponible ?
- Une bonne partie de ces Eaux sont partagées (Eaux de surface & Eaux souterraines)*



Un continent doté d'importantes ressources en eau...

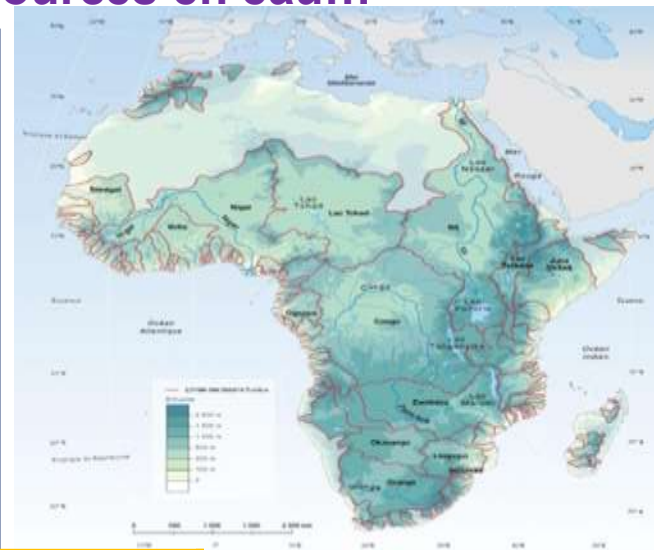


Eaux souterraines:

- 83 Systèmes aquifères transfrontaliers
- 660 000 milliards m³

Eaux de surface :

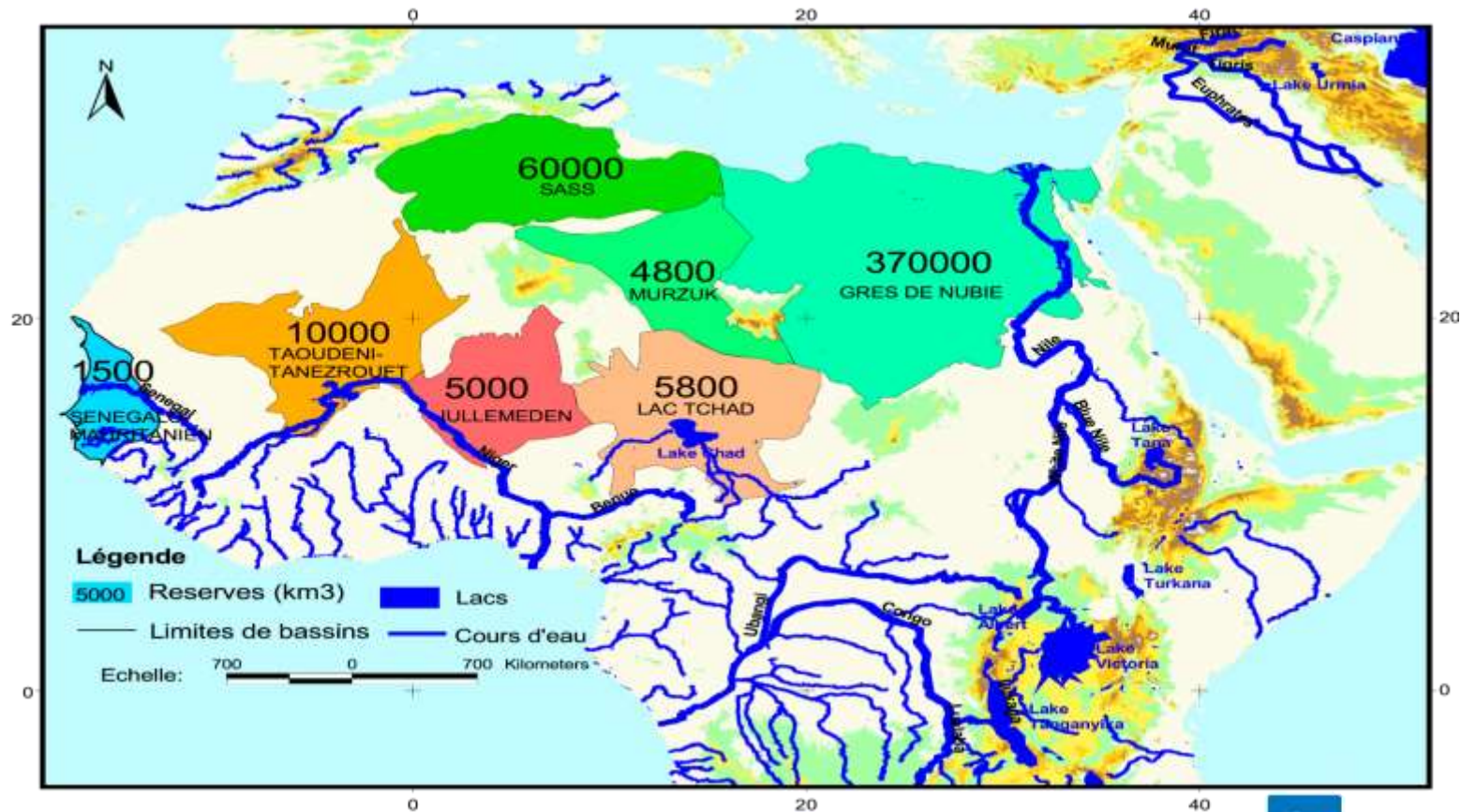
80 bassins fluviaux transfrontaliers



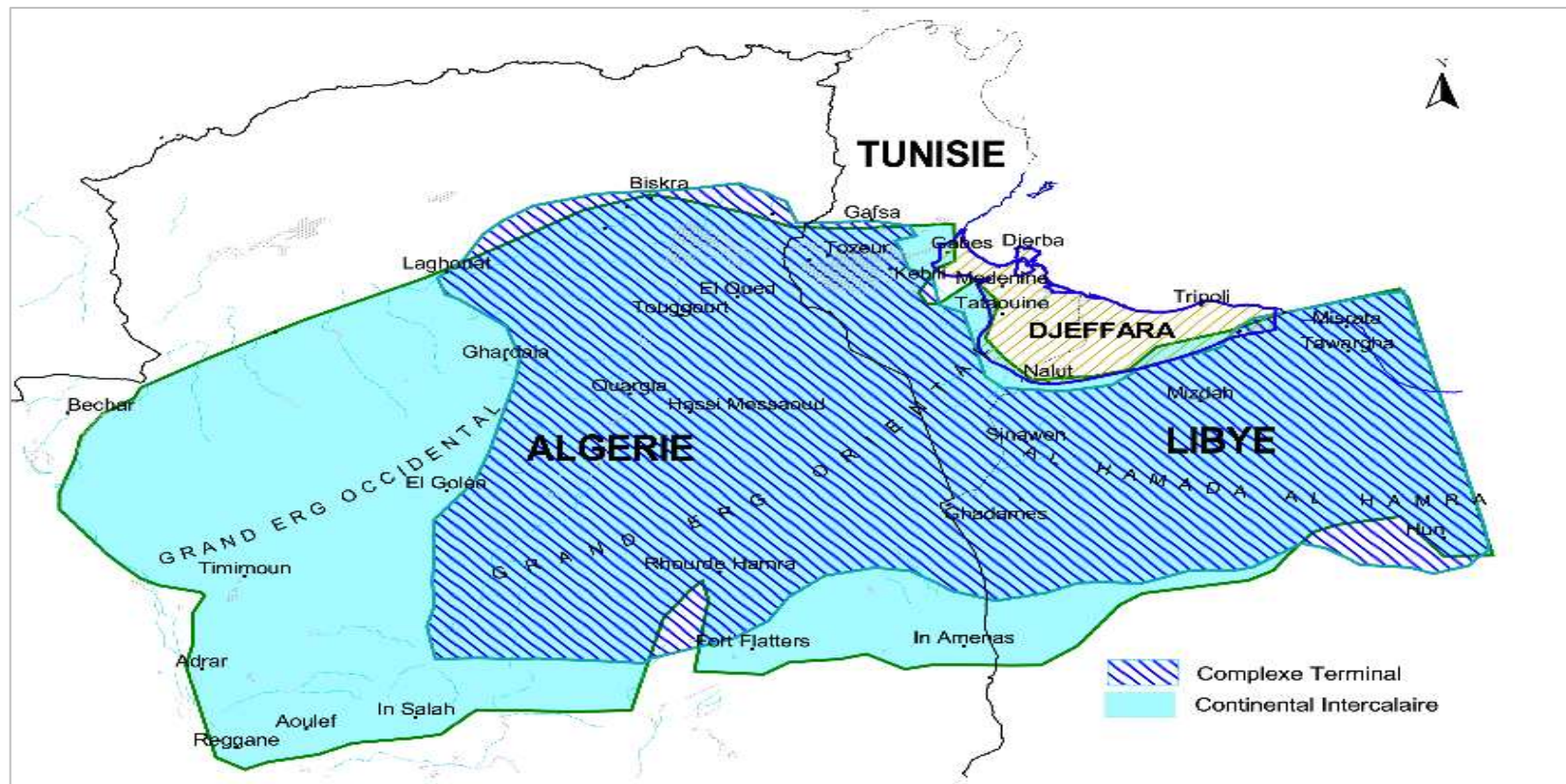
Sous-région	Eaux souterraines (milliards m ³)	Eaux de surface (milliards m ³ /an)	Total	Proportion
Afrique du Nord	357 355	91	357 446	54%
Afrique de l'Ouest et Centrale	56 178	943	57 121	9%
Afrique de l'Est	47 807	268	48 075	7%
Afrique Equatoriale et Australe	198 660	2 698	201 358	30%



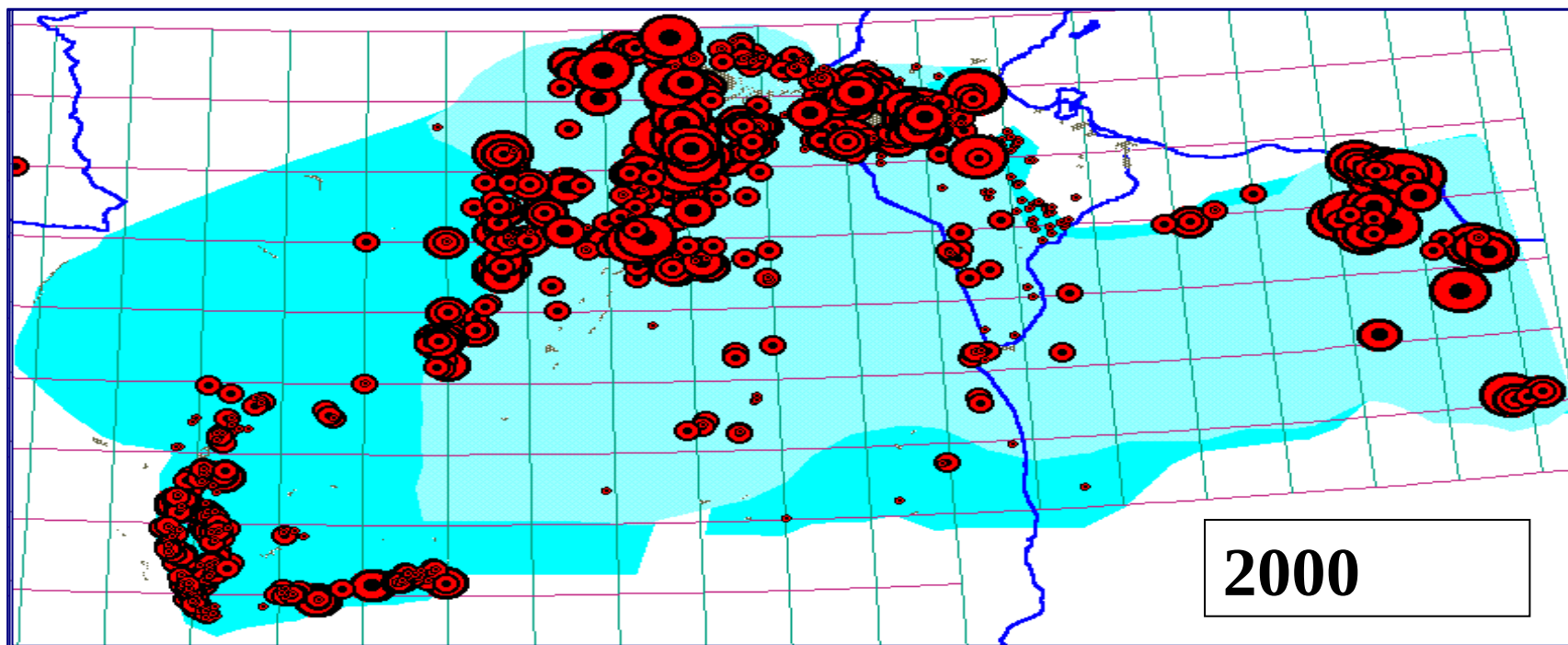
Principaux aquifères partagés (AN, AO, AE)



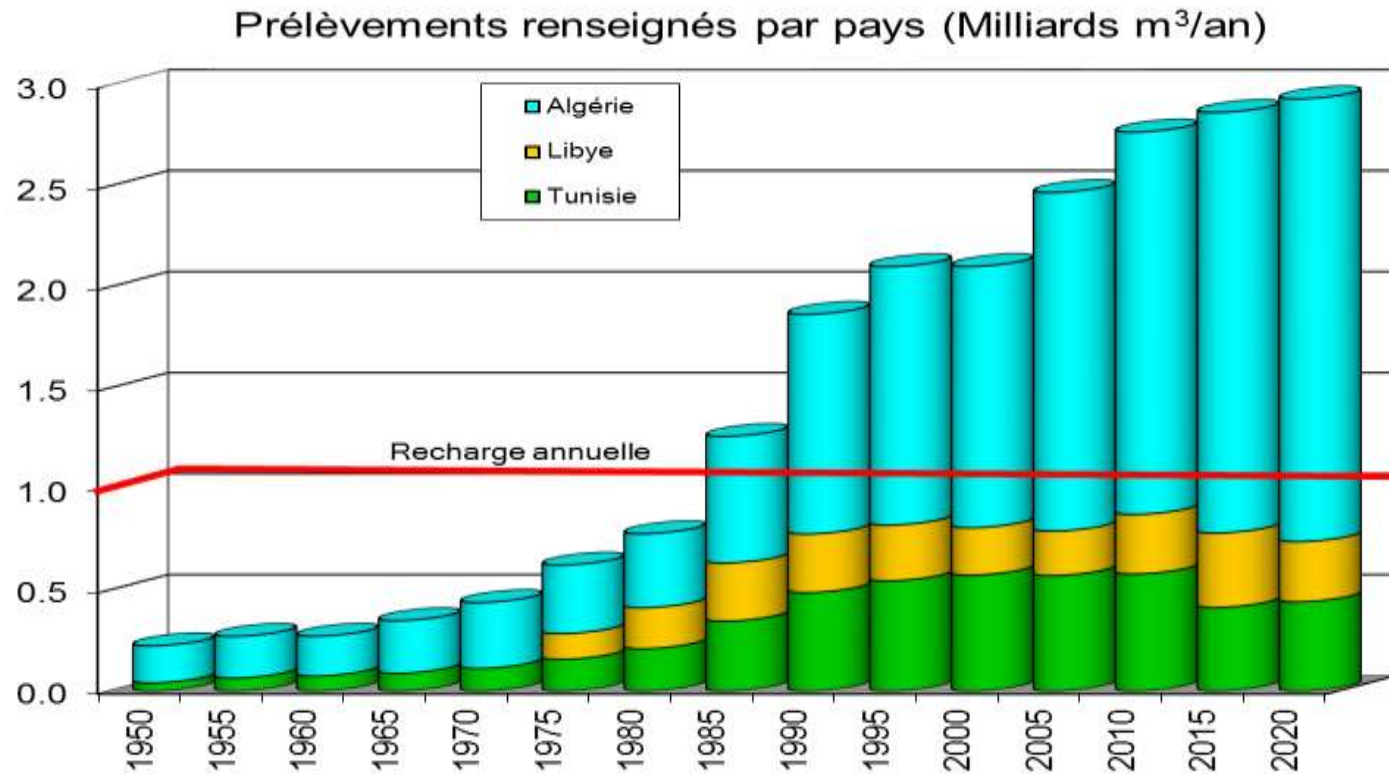
Système Aquifère du Sahara Septentrional



Evolution des points d'eau

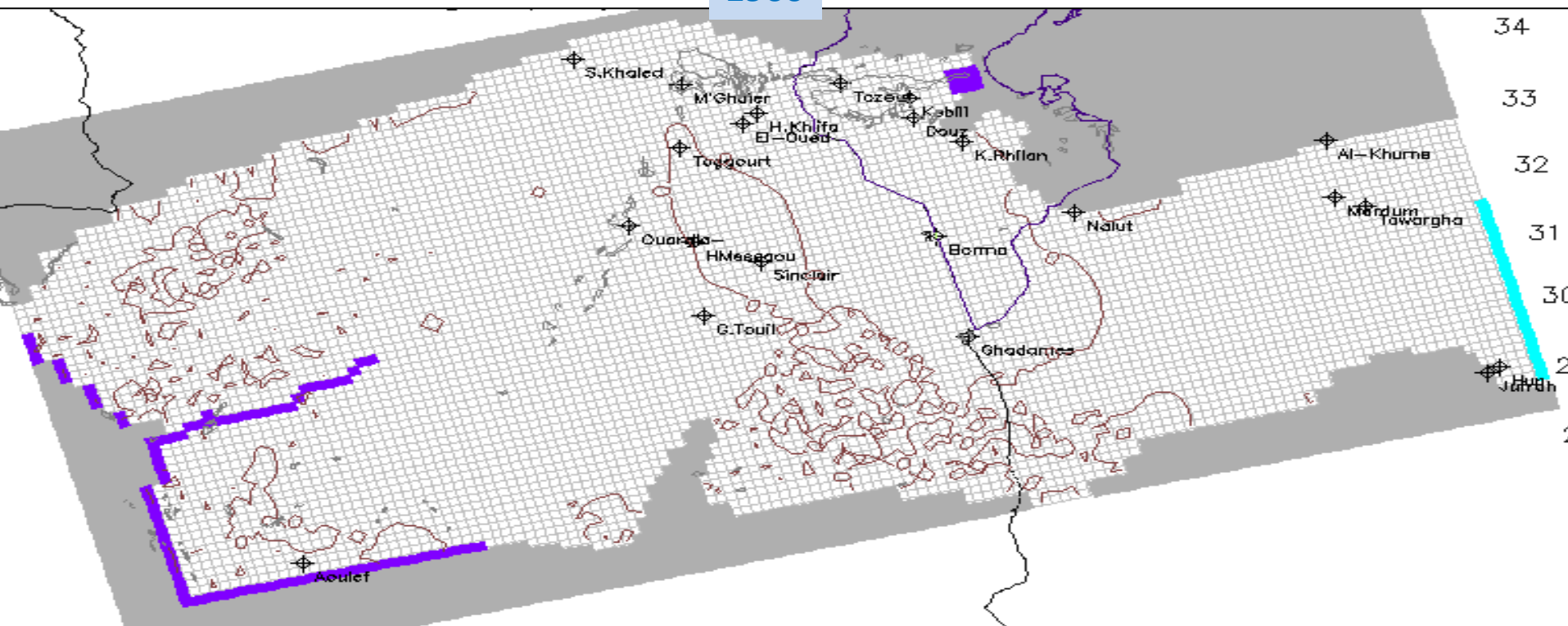


Historique des prélèvements



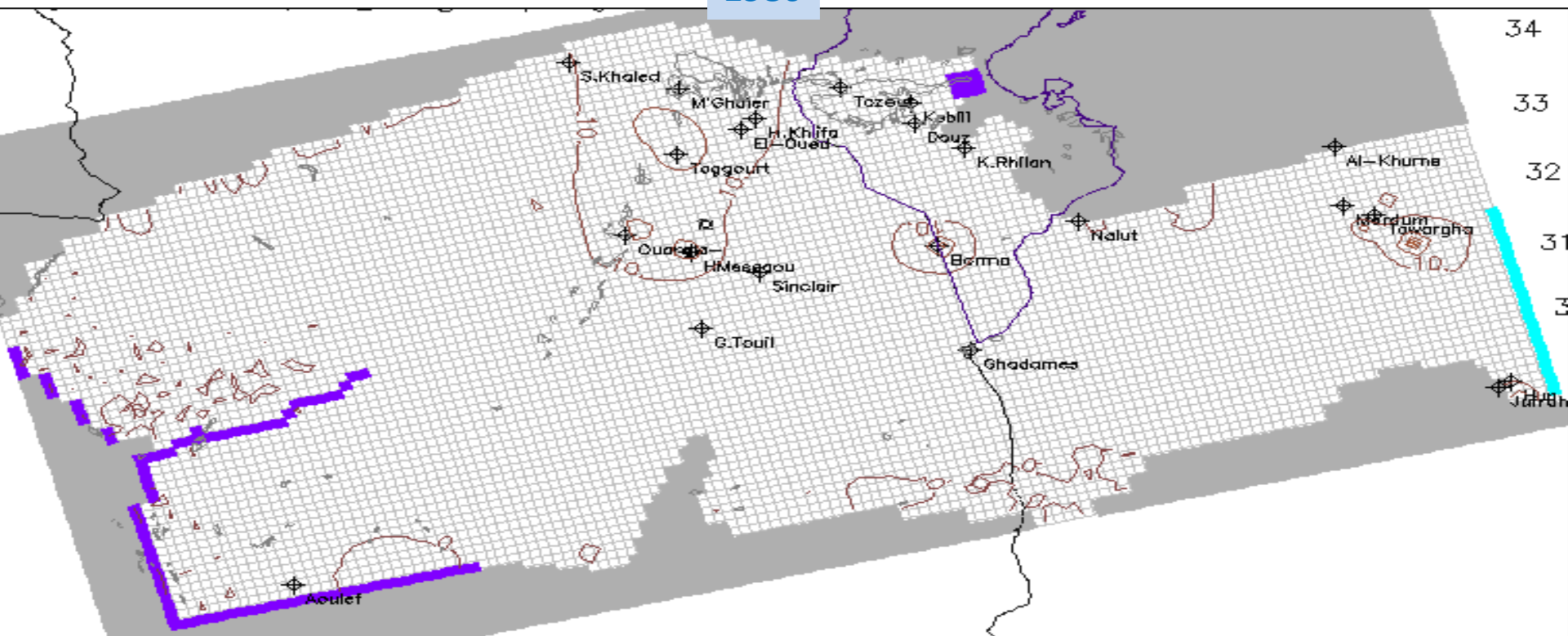
Evolution des rabattements

1960



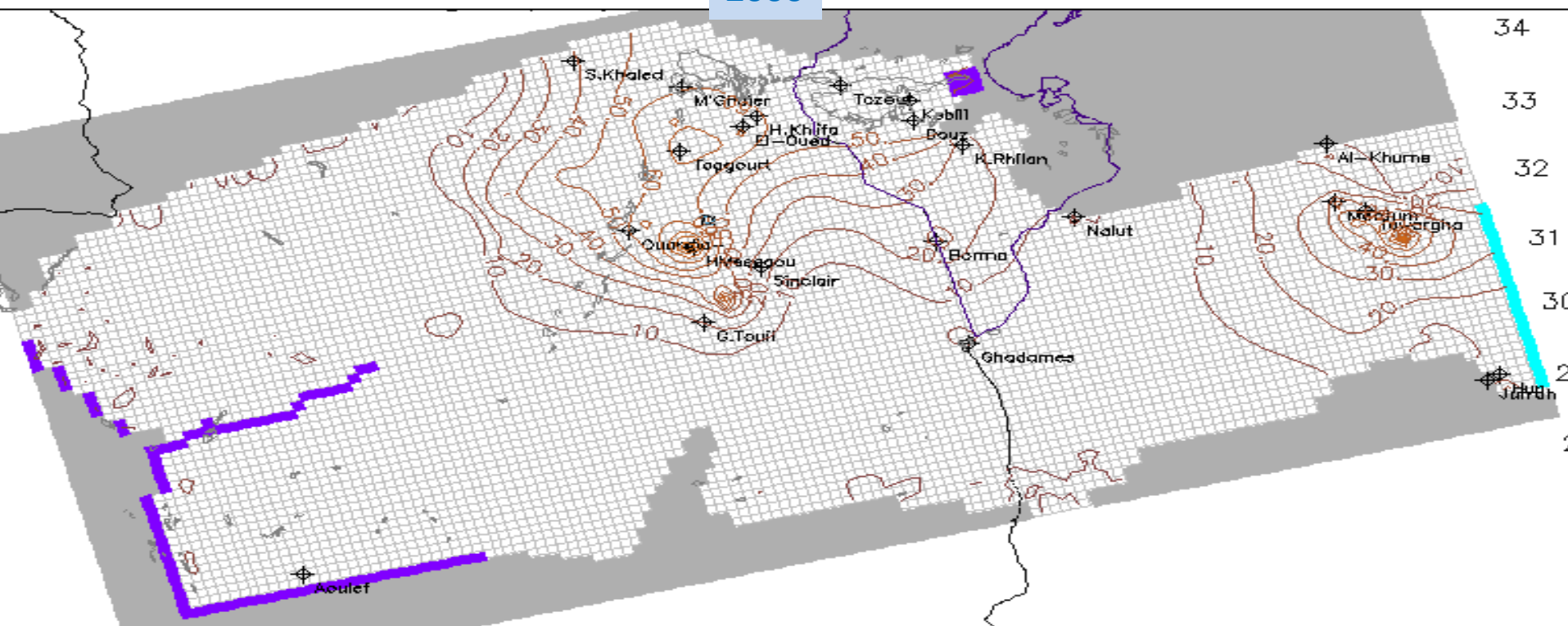
Evolution des rabattements

1980



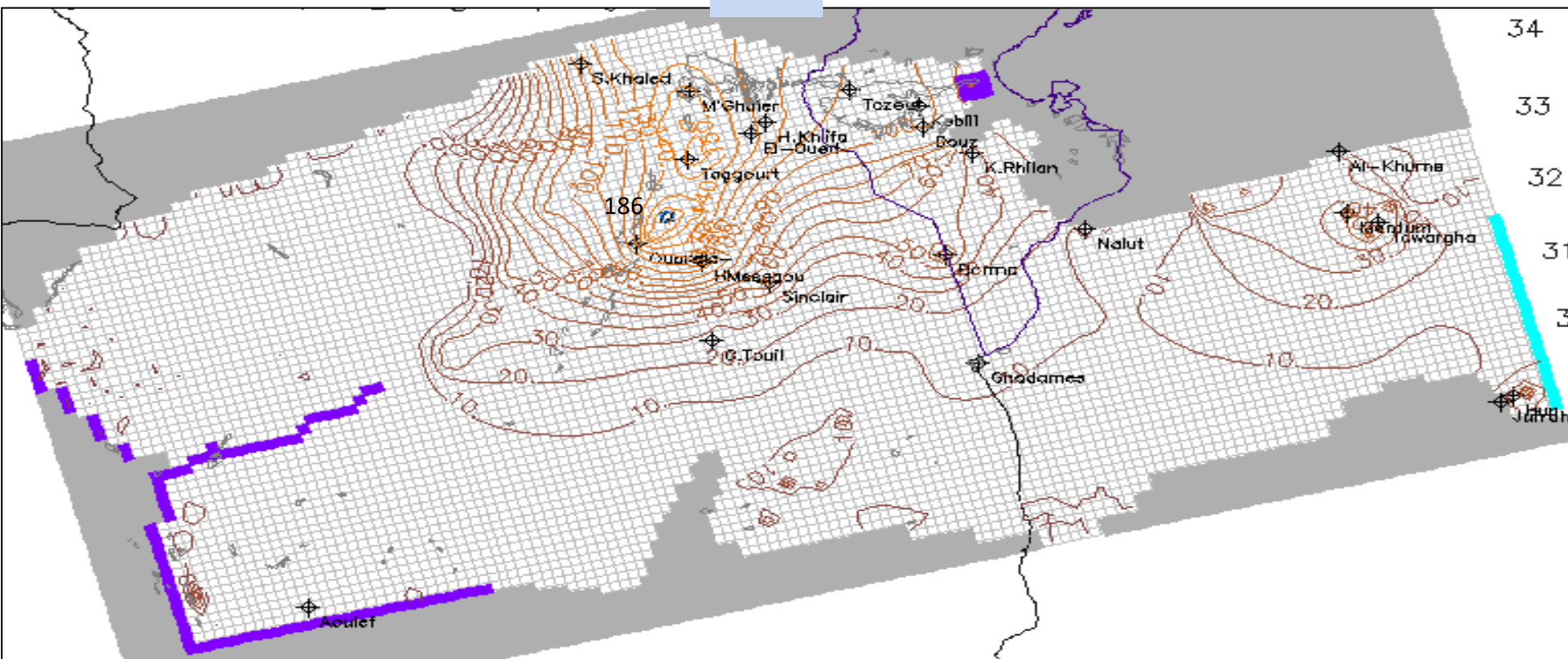
Evolution des rabattements

2000



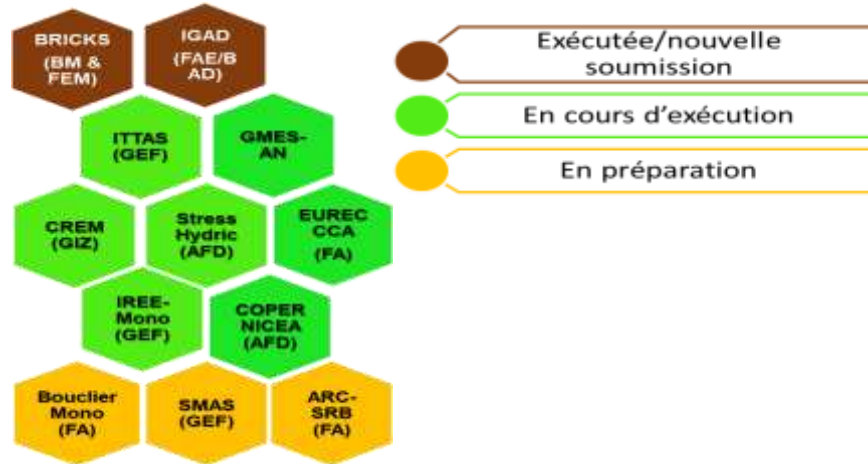
Evolution des rabattements

2020



- **Une meilleure connaissance du potentiel en ressources en eau en quantité et en qualité** : « nous ne pouvons gérer que ce que nous connaissons », en effet,
 - sur les 83 systèmes aquifères transfrontaliers, 12 bien connus et documentés ; et
 - 80 bassins-versants, 20 dotés d'Organismes de bassins ;
- **La Gouvernance de l'Eau** : Eviter les conflits entre Secteurs et entre Usagers de l'eau & Renforcer la Coopération autour des eaux transfrontalières
- **Le renforcement des capacités et la sensibilisation**: les Acteurs concernés y compris Non-étatiques notamment, à la culture du risque environnemental ;
- **Des outils ou mécanisme de financement sous forme de DON**: Sur l'ensemble des financements climat publics déclarés pour la région, **62 %** prennent la forme de **PRÊTS (et autres instruments de dette)**, tandis que seuls **38 %** sont des **DONS** (OXFAM, 2022).

Principaux projets



Aquifères transfrontaliers concernés



OBSERVATOIRE DU SAHARA ET DU SAHEL
SAHARA AND SAHEL OBSERVATORY

- 2,2 milliards de personnes vivent sans accès à l'eau salubre.
- **Toutes les interventions concourent à la réalisation de l'ODD6:** Eau propre et assainissement pour tous d'ici à 2030, l'un des principaux objectifs de la **Journée Mondiale de l'Eau** (22 mars 2022).
- Cette Année 2022, l'attention se focalise sur les **eaux souterraines**, une ressource invisible dont l'impact est



Merci de votre attention

Thank you for your attention



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère du Développement durable
et des Infrastructures
Département de l'environnement



WORLD BANK GROUP



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra





Co-management of groundwater and energy use in India's Agriculture

Vaibhav Chaturvedi

Nitin Bassi

Official UNFCCC Side Event 'Groundwater: Key Resource for Adaptation'

By French Water Partnership (FWP)

COP 27, Sharm El Sheikh, Egypt, 15 November 2022

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Impacting sustainable development at scale with data, integrated analysis, and strategic outreach

TRANSFORMATIONS

Low-carbon Economy

Energy Transitions

Power Markets

Industrial Sustainability

Sustainable Livelihoods

QUALITY OF LIFE

Clean Air

Sustainable Water

Sustainable Food Systems

Sustainable Cooling

Sustainable Mobility

ENABLER

Sustainable Finance

Technology Futures

Circular Economy

Climate Resilience

International Cooperation

200+

Multidisciplinary team

320+

Peer-reviewed publications

160+

Instances of increased data transparency

460+

Roundtables & conferences

22

Indian states engaged

110+

Bilateral & multilateral initiatives promoted

SPECIAL INITIATIVES

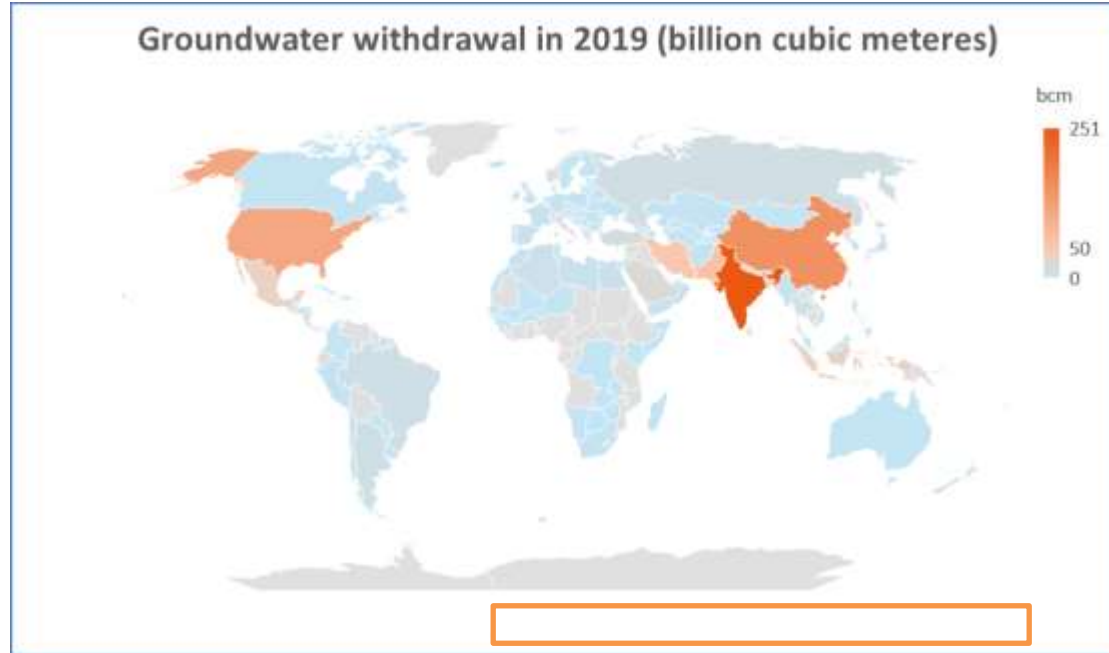
CEEW Centre for Energy
Finance

Powering
Livelihoods

Emerging Economies

UP State Office

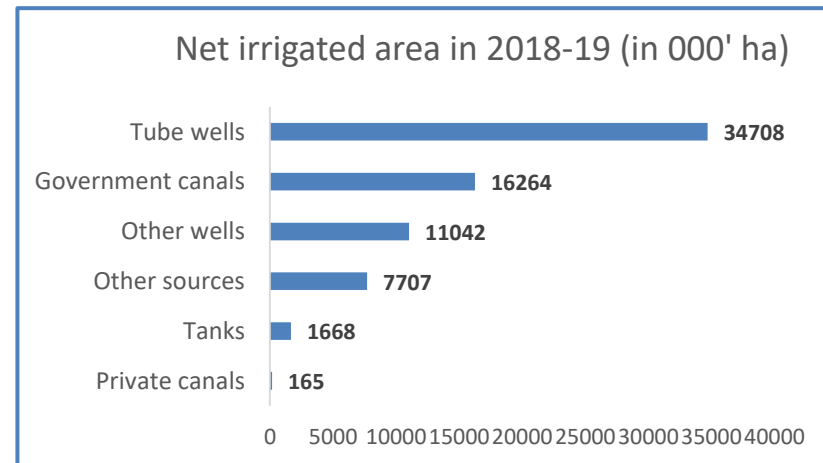
India is the largest user of groundwater in the world



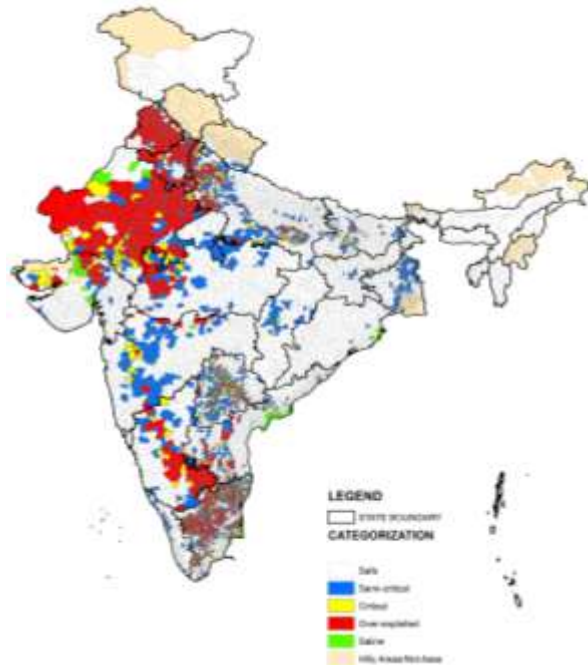
India uses about **250 billion cubic meters (BCM)** of groundwater/annum which is **27%** of the **global groundwater withdrawals**

Groundwater contributes substantially to the value added by agriculture to the Indian economy

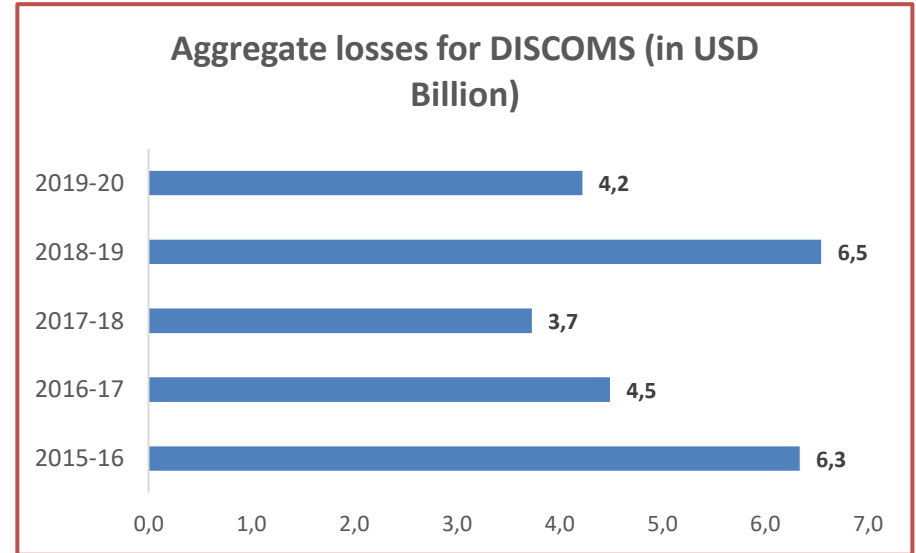
- In 2021-22, gross value added (GVA at basic prices) by the agriculture sector to the Indian economy was about **USD 530 billion (current prices), 18.6% of the total GVA.**
- As groundwater is the major source of irrigation, its contribution to GVA added by agriculture is substantial.
 - 87% of the groundwater use is for irrigation.
 - Out of the 71.5 million ha of net irrigation in India, about 64% is by wells and tube wells.



Subsidised or free electricity supply for irrigation has led to groundwater overexploitation, inefficient use of energy, and poor financial health of the DISCOMS



In 2017, 1186 out of the 6881 (**17%**) groundwater assessment units were overexploited



Estimated energy subsidies to agriculture are USD 1.9-6.5 billion/yr, and **DISCOMS commercial losses USD 5.1 billion/yr**

Regulatory interventions for groundwater use in irrigation

- **Model Groundwater (Control and Regulation) Bill**
 - First proposed in 1970.
 - Deals with well permits, water metering, and withdrawal limits.
 - Does not specify water rights.
 - Updated several times thereafter (1992, 1996, 2005, 2017).
- **Only a few States and UTs in India have Groundwater Regulation Act**
 - Andhra Pradesh
 - Assam
 - Goa
 - Bihar
 - Delhi
 - Himachal Pradesh
 - Maharashtra
 - Karnataka
 - Kerala
 - Lakshadweep
 - Puducherry
 - West Bengal

Major technical interventions targeted towards co-management of groundwater and electricity use in irrigation

‘Per drop more crop through micro-irrigation adoption’

Objective is to enhance water use efficiency by reducing water application for irrigation

Will lead to a reduction in energy use wherever groundwater is used for irrigation

Since 2015, about 6.7 million ha of irrigated area in India has been brought under drip and sprinkler irrigation

Metering of electricity connections to wells in selected states

Objective is to account for energy use and groundwater abstracted for irrigation

Electricity supply continues to be subsidised

‘KUSUM scheme’ for the promotion of solar irrigation pumps

Target is to install 1.75 million solar irrigation pumps in off-grid areas and solarise 1 million grid-connected agriculture pumps with net metering

Objective is to reduce carbon emissions through transition towards clean energy, and promote efficient water use by offering incentives to farmers

About 150,000 solar pumps have been installed. 60% of the capital cost provided by the government and 40% to be shared by the beneficiary

Way forward for better management of nexus

- **Regulations on groundwater abstraction need to be framed and adopted by all states and UTs.**
 - Ensure their proper implementation, especially in areas experiencing ground over-exploitation.
- **Water rights need to be defined.**
 - One way is through assigning the electricity quota to each farmer based on the agro-climatic zone, groundwater depth, and crop type.
 - Water rights can be made tradable to encourage efficient water use.
- **The practice of free electricity supply for irrigation needs to be reviewed.**
 - Electricity to be priced on a pro-rata basis for farmers having large land holdings.
 - Small and marginal farmers can be provided with subsidy support.
- **The welfare benefit** of the replacement of fossil fuel-based irrigation pumps with solar irrigation pumps, in terms of reduction in carbon emission, needs to be assessed.

CEEW's ongoing engagements on groundwater-energy management

Support to the Government of Rajasthan in Drafting State 'Energy Policy'

A separate chapter on agriculture with a vision:
Ensuring equitable access to affordable, clean, and quality energy to all agriculture value chain actors while managing the water-energy-food nexus

Support to the Government of Punjab for Operationalising 'Integrated State Water Plan'

The focus is on improving irrigation efficiency and crop diversification

Study to propose a strategy for transforming India's food system toward sustainability

One of the objectives is to identify linkages between the water, energy, and food systems

Thank you

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COP27
SHARM EL-SHEIKH
EGYPT 2022

CEDAE

COP27

UN CLIMATE CHANGE CONFERENCE





Groundwater Capture

CEDAE operates 19 wells to supply quality water. An essential source of water when surface sources are not sufficient.

WATER SAFETY



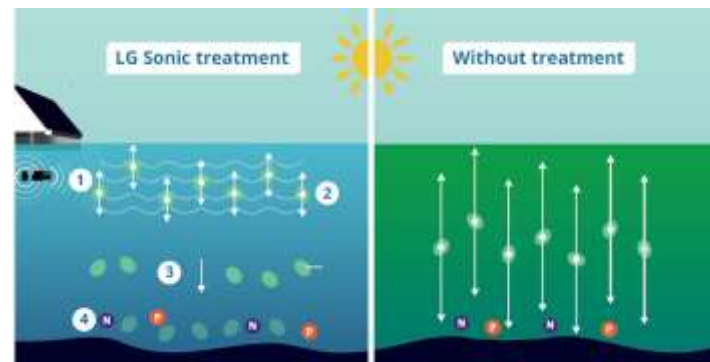


River Water Treatment Structures in “Poços” and Queimados Rivers



LG SONIC FLOATERS

Sustainable ultrasonic treatment





Energy Efficiency Plan

- Launched in September.
- **Goal:** saving 40% of the energy consumed in the production units with the use of photovoltaic panels

CEDAE OF THE FUTURE





Replantando
Vida





REPLANTING LIFE

The project combines sustainability and re-socialization

- Seven forest nurseries in the state of Rio de Janeiro
- Annual production capacity of one million, eight hundred thousand Atlantic Forest native seedlings
- 40 endangered species
- 1 million seedlings in 5 years in the riparian forests of the Caramuru

Guandu, Lameirão and Laranjal Modernization





**GOV
RJ**

Conclusion



Mr. Eric Tardieu, Secretary General of the International Network of Basin Organizations and Director General of the International Office for Water



Thank you!