The European Economic and Social Committee (EESC)

The planning aspect: safeguarding water, food and energy security through sustainable water management

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8th edition of the Day of the Liberal Professions 2024
Conference on Professional Support for the EU Blue Deal
7th May 2024, Brussels, Belgium

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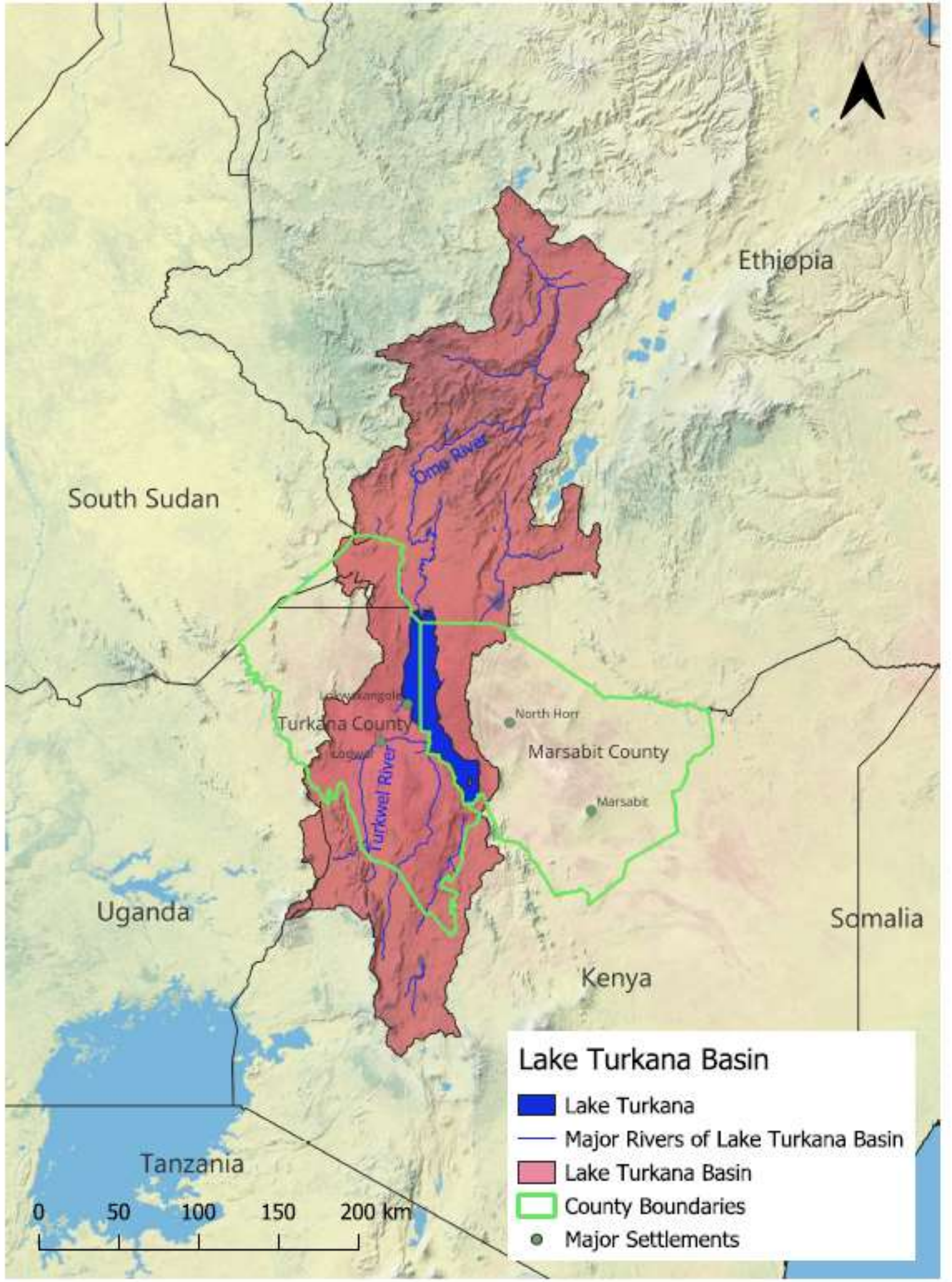
Sustainably Unlocking the Economic Potential of Lake Turkana

Background

- World’s largest permanent desert lake
- Supports 500,000 people living within the basin
- Transboundary between Kenya and Ethiopia
- Seasonal and annual fluctuations (many “unknowns”)
- Economic Analysis Study revealed 14M Euro/year loss due to lack of adequate fish value chain (cold chain + fish processing)
- One of the highest level of malnutrition
- Recent draughts impacted lives and livelihood
- 10+ years timeframe in two phases – first phase 2024-28)



EPSG:4326 - WGS 84
Author: Eleftherios Kaltsas / UNESCO MRO Nairobi

Climate-resilient livelihoods, conflict and social dynamics

Nutrition and role of fish

Economic potential – market linkages

Water and energy

Vision and approach

A systems approach that puts Lake Turkana at the heart of boosting the fish value chain, for resilient livelihoods, food and nutrition security and stability in Marsabit and Turkana Counties.

Building blocks/pillars

Integrated water resource/lake management

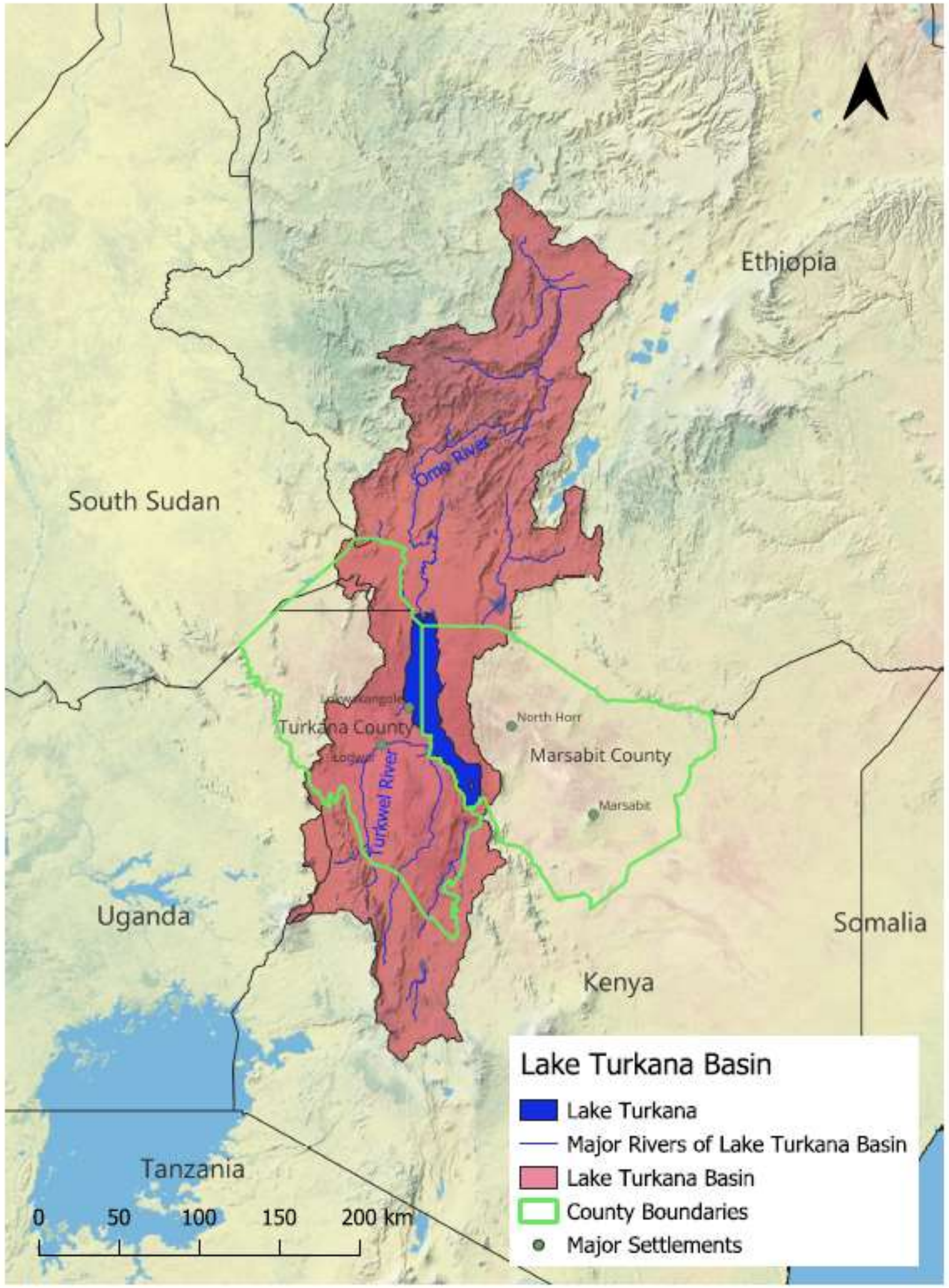
Climate-resilient livelihoods and fish value chain

Nutrition and food security

Climate - Conflict sensitivity - Community engagement – Inclusion

Pillar 1: Integrated Water Resources Management

Objective:
To develop the necessary knowledge base of the natural resource of the lake that will support decision making on future investments in fisheries and prioritization of water resources management strategies for water security and the protection of the lake ecosystem



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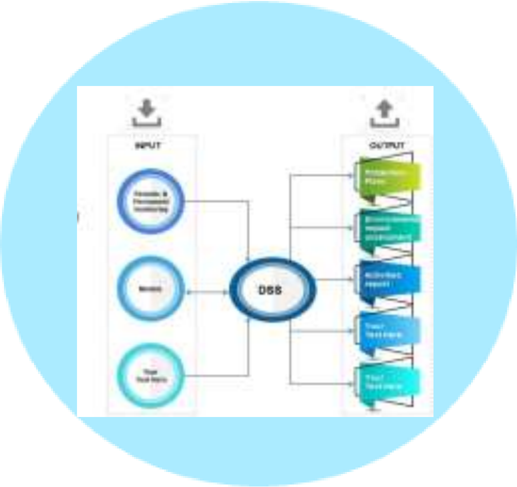
World Food Programme

PILLAR 1 - METHODOLOGY



Development of a DSS for IWRM for lake ecosystem and sustainable livelihoods

1. **CRIDA (Climate Risk Informed Decision Analysis)** for ecosystem-based water resources management planning

2. Assessment of **surface and groundwater resources** and their management & water balance

3. **Household/Individual Water Insecurity Experiences (HWISE/IWISE)**.

4. **UNESCO World Water Quality Portal for L. Turkana-** for monitoring quality and water level dynamics through earth observations

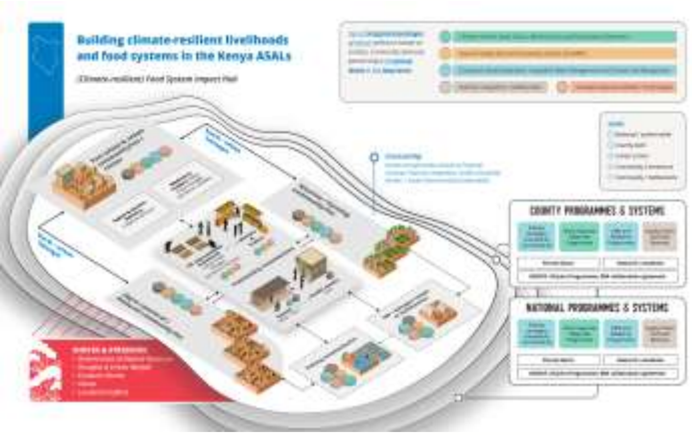
5. **Fish productivity** model based on lake dynamics and environmental factors

- Understanding Lake's **fish production capacity** through fisheries assessment and monitoring programme of the key ecological structure of the lake.

World Food Programme UNESCO

PILLAR 2 & 3 - METHODOLOGY

Guided by the methodology developed by the Foresight for Food Systems Transformation (FoSTr) Programme combined with WFP Kenya's area-based food systems and human-centred design approach



Human design: communities analyze root causes & identify solutions

Area-/(eco)system based

FoSTr: scenario-building with a 10-year timeframe in mind

Studies (Inception Phase - 2024)

UNESCO

- Experimental fishing and acoustic surveys
- Water security index
- Transboundary water resources data gap analysis

WFP

- Fish value chain systems analysis
- Root causes of malnutrition and fish consumption study
- Climate security, conflict and gender analysis

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PROMOTING A JUST TRANSITION TO GREEN HYDROGEN IN AFRICA

OVERALL PROJECT PRESENTATION

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The project is supported by the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research

Clean Hydrogen Partnership

PROJECT INTRODUCTION, MOTIVATION AND OBJECTIVES

OVERALL OBJECTIVE

Develop mutual benefit joint green hydrogen roadmaps

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UNIQUE AFRICAN HYDROGEN VALUE PROPOSITION

- **Huge Renewable Potential** (and already presence of large amount of RES power plant whose production capacity is not fully exploited – LCOH: 1.5-2.5 €/kg)

- **Presence of Gas Infrastructure** (in the North of the continent – Cost of transport: 0.2-0.25 €/kg)

- **Presence of Hard to Abate industries** (chemical industry to produce ammonia for fertilisers, followed by refining for hydrocracking and the desulphurisation of fuels – lacking of high efficient local SMR plants)

- **African focal position in many shipping routes**

- **Presence of Natural Hydrogen Reservoirs** (still to be technologically explored)

Technical potential for producing green hydrogen under USD 1.5/kg by 2050, in TWh[1]

[1] IRENA, 2022; Geopolitics of the Energy Transformation; The Hydrogen Factor

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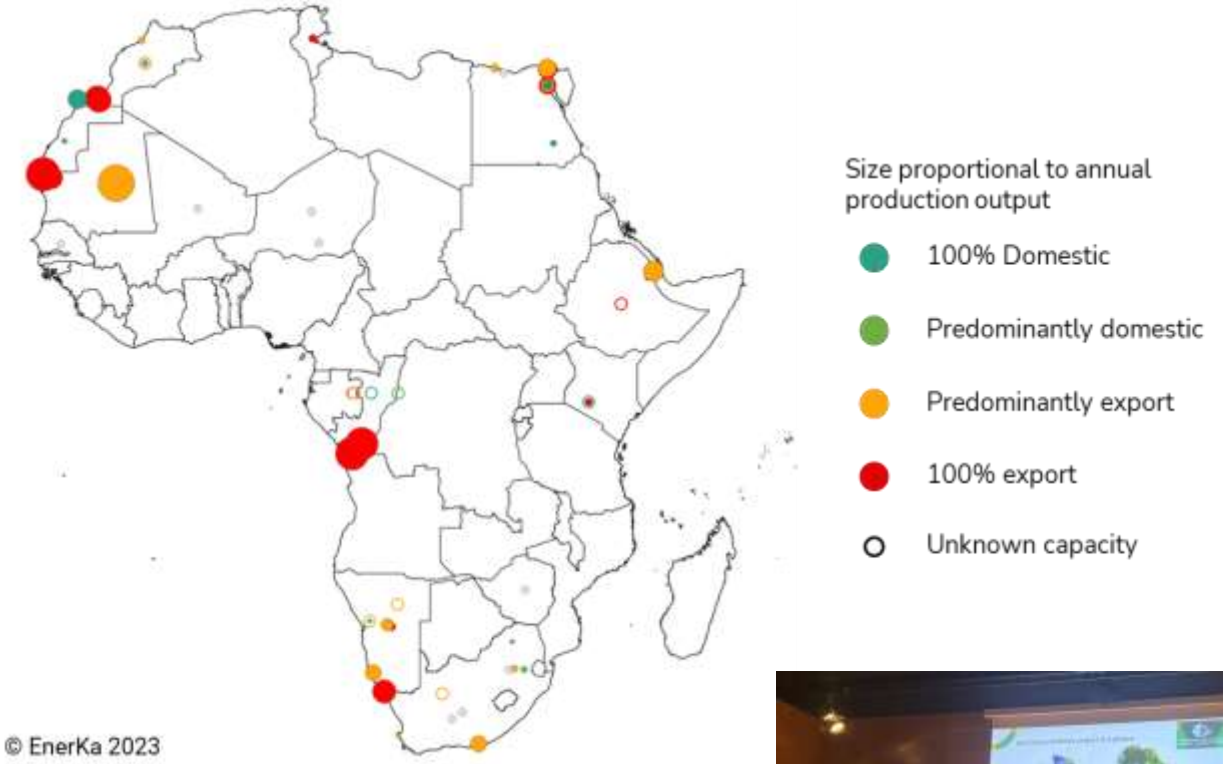
JUST GREEN AFRH2ICA YEAR ONE KEY RESULT

Understanding African H2 Potential/On-going activities

More than 30 countries deeply analysed



CHECK THE NUMBERS!
CHECK THE POLICIES!
CHECK THE ANNOUNCEMENTS!

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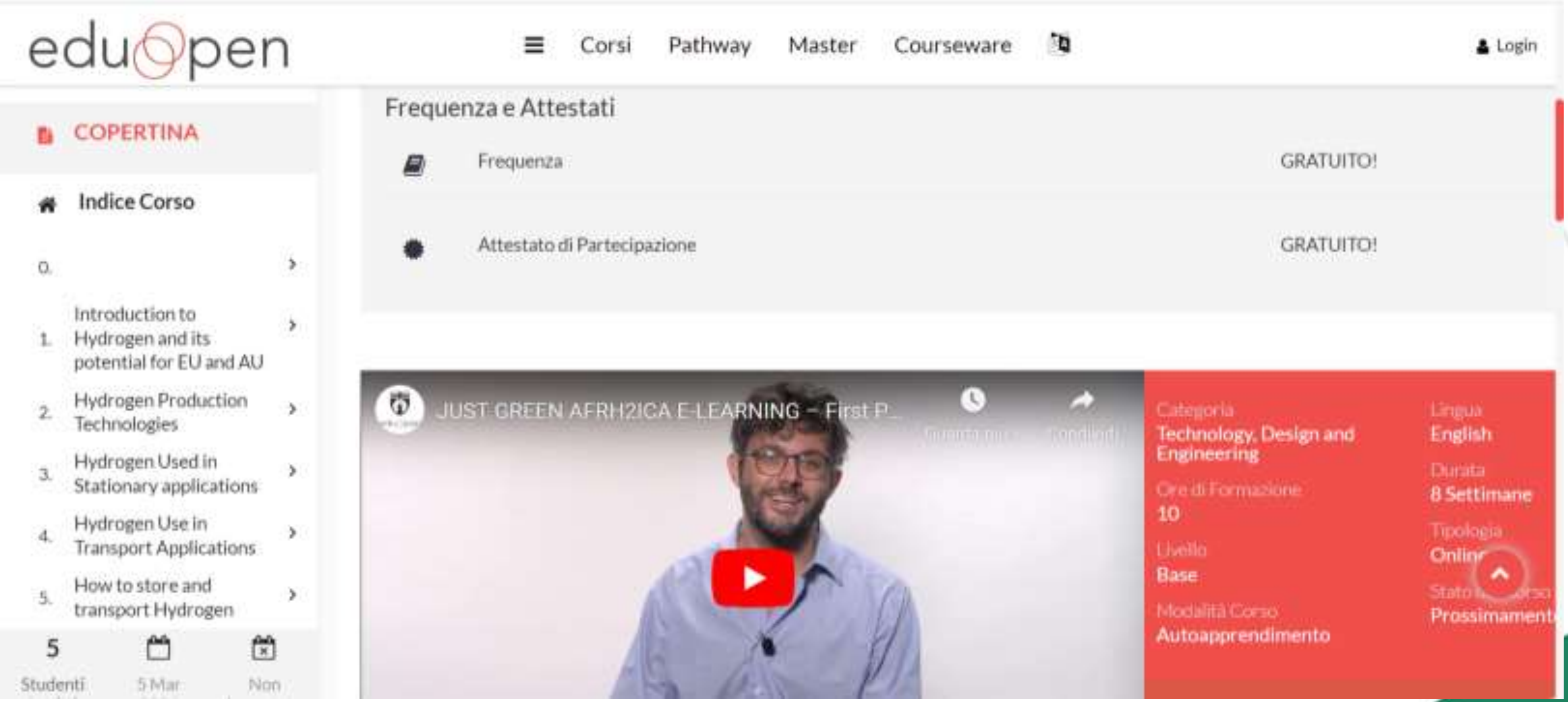
JUST GREEN AFRH2ICA TRAINING ACTIVITIES!

JUST-GREEN AFRH2ICA

More than 150 trainees so far… *(physical and virtual events)*

…and >12 hours of training material recorded



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THE HYDROGEN HOTSPOT APPROACH

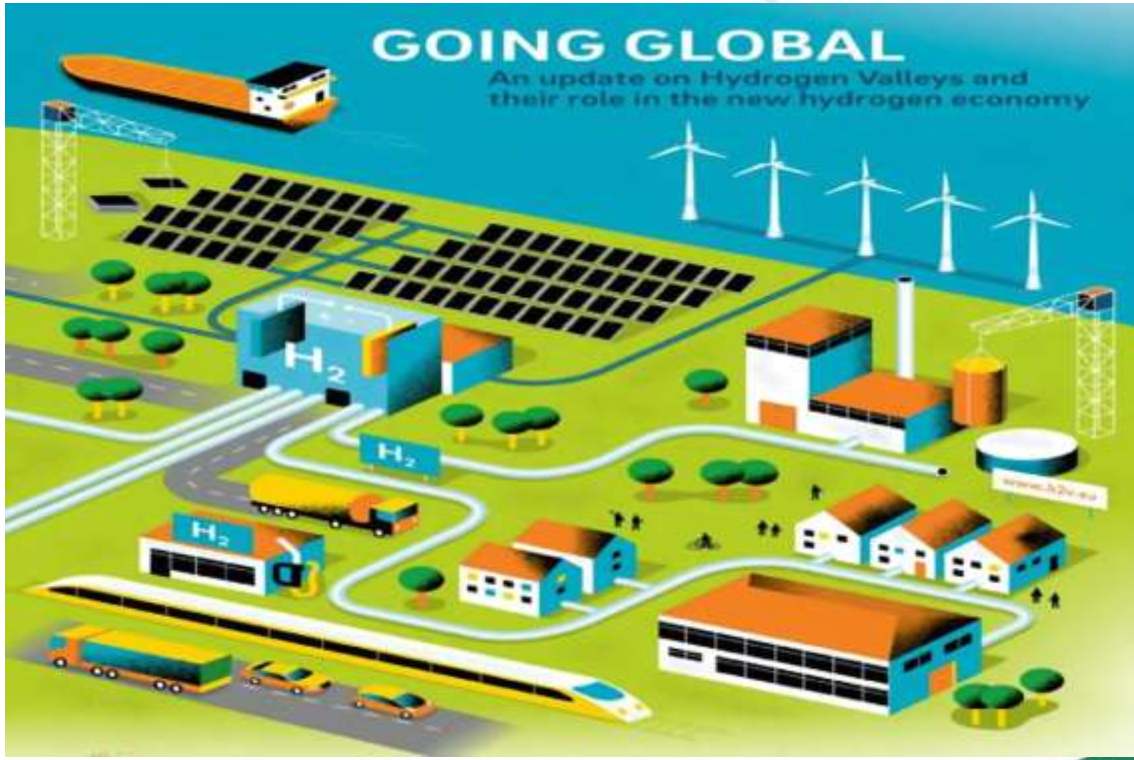
- Different role of Electrolysers from EU (not for RES penetration and grid stability): large «off-grid» RES plants fully dedicated to local low carbon H2 production

- Projects that must be bankable without any feed-in or not looking at electric market revenues

- In Africa it is more difficult to identify (and most of the time create) a systemic energy/H2 demand and then there would be a need of higher investments (e.g. Difficulty in setting up a «FCH Transport» value chain from scratch)

- Lack of energy infrastructure supporting the setup of «off-grid» large RES plants

- **WATER AVAILABILITY**



THE HYDROGEN HOTSPOT APPROACH

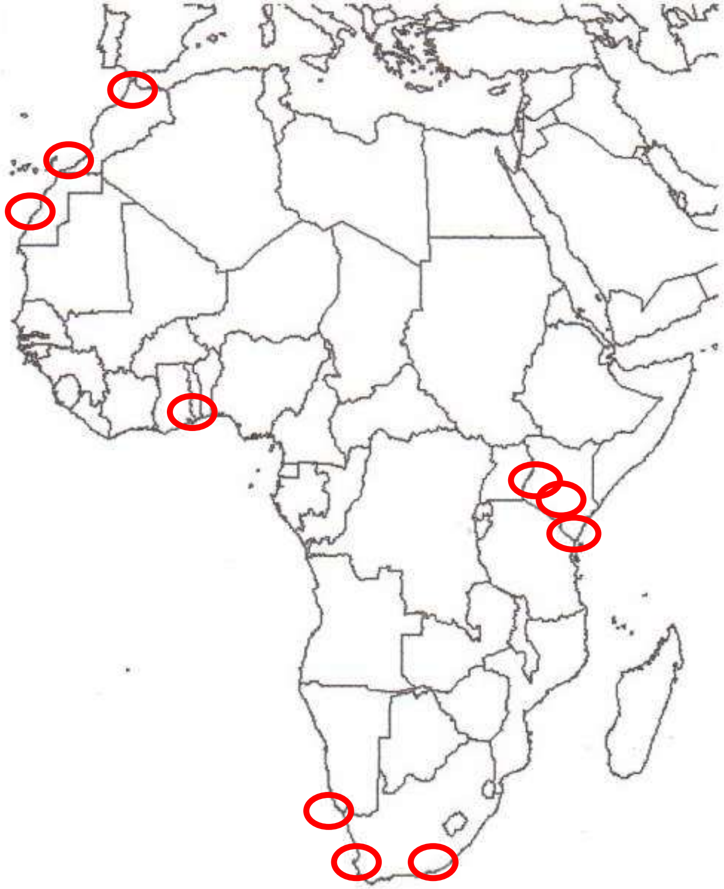
Area to be modelled in the project

- **<u>NORTHERN AFRICA:</u>** Morocco (Dakhla – Laayoune area, Tangiers area, Jorf Lasfar area…)

- **<u>CENTRAL/WESTERN AFRICA:</u>** Kenya (Rift Valley Geothermal Area, Nairobi Capital City Area. Mombasa/Tanzania Borders area…)

- **<u>WEST AFRICA:</u>** Ghana/Togo area (SekyereEast District, Accra, Lomé and Sokodé – Tema Port area)

- **<u>SOUTHERN AFRICA:</u>** South Africa (Goega Industrial Park, Saldanha Bay, Boegoebaai Bay), Namibia (Swakopmund))



<u>WHAT TO BE MODELLED:</u> RES potential, **WATER AVAILABILITY**, techno-economics and electrolyser/storage sizing, EU energy grid impact, sustainability assessment

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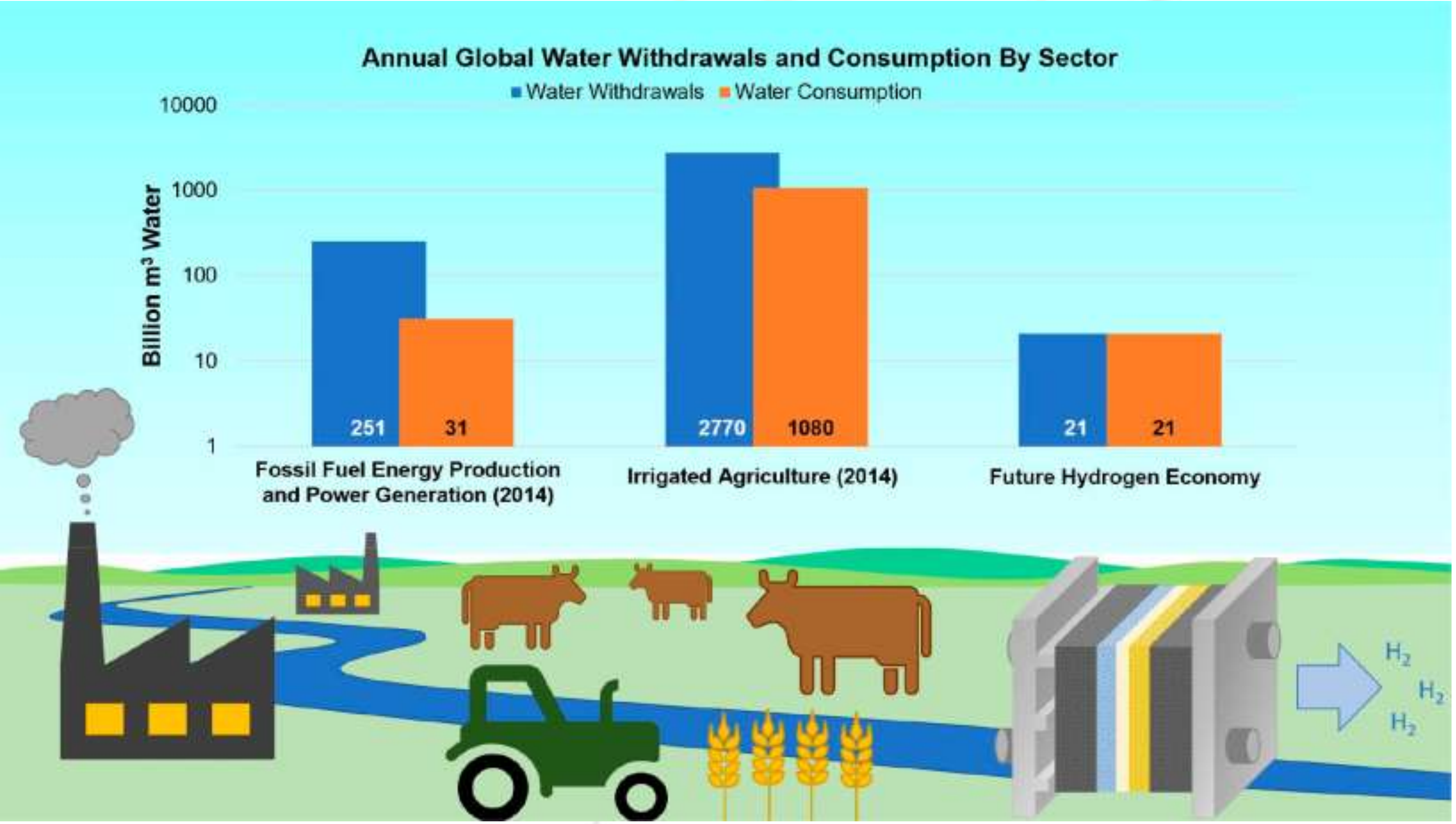
Does the Green Hydrogen Economy Have a Water Problem?



Global freshwater withdrawal and consumption of three different sectors:

- fossil fuel energy production and power generation
- Agriculture
- the implementation of a global hydrogen economy.

Based on 9kg water consumed/kg H2

Consumed: water converted into another unusable form or not returned to original water body

→ **limiting factor for electrolyzers is not Water supply, but energy efficiency of electrolyzers.**

(*ACS Energy Lett.* 2021, 6, 9, 3167-3169)

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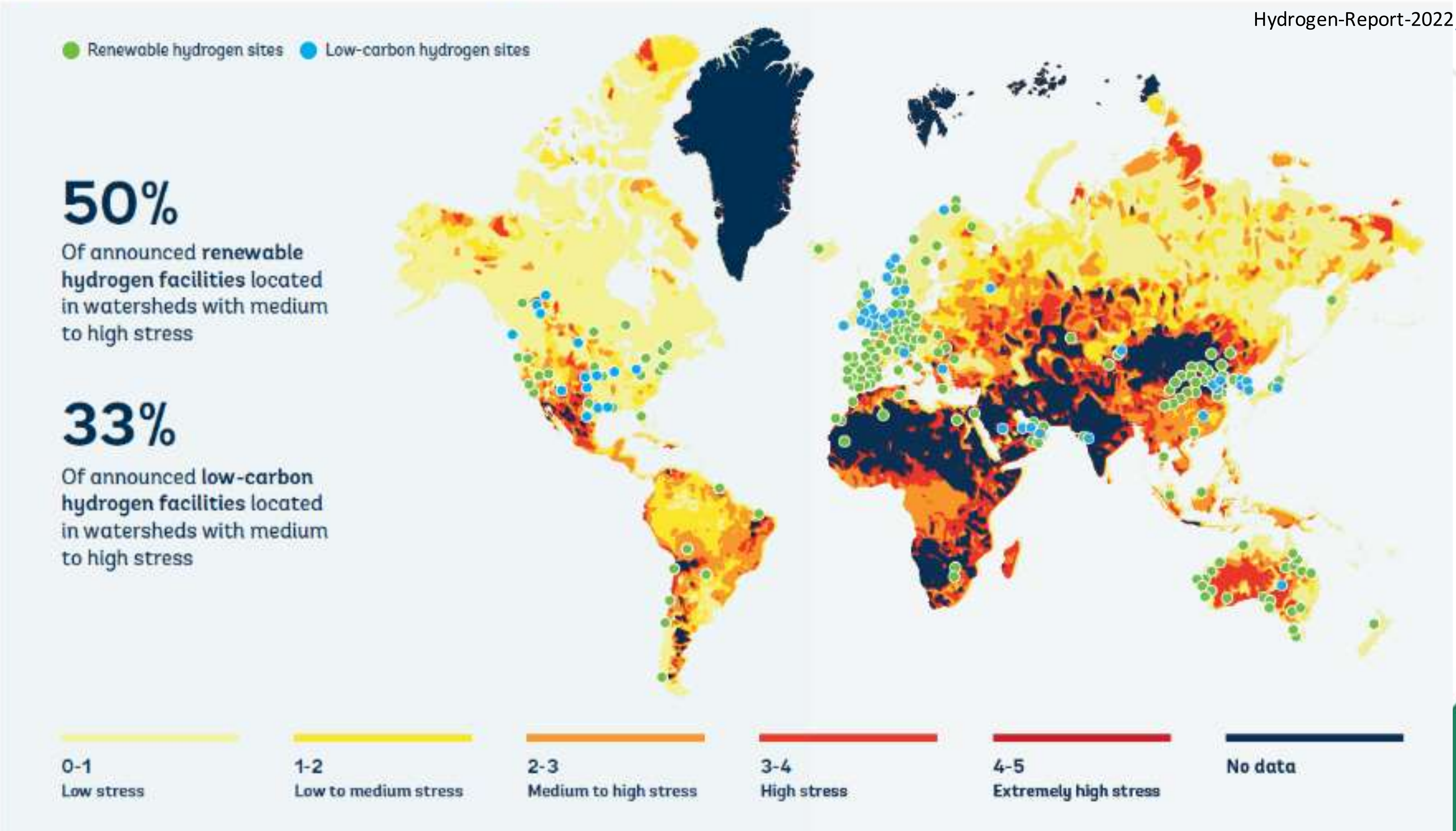
Challenges of the location of hydrogen production projects in regions with water scarcity

JUST-GREEN AFRH2ICA

Figure 18: Announced low-carbon and renewable hydrogen locations, and 2020 watershed stress

Hydrogen-Report-2022 [hydrogencouncil]



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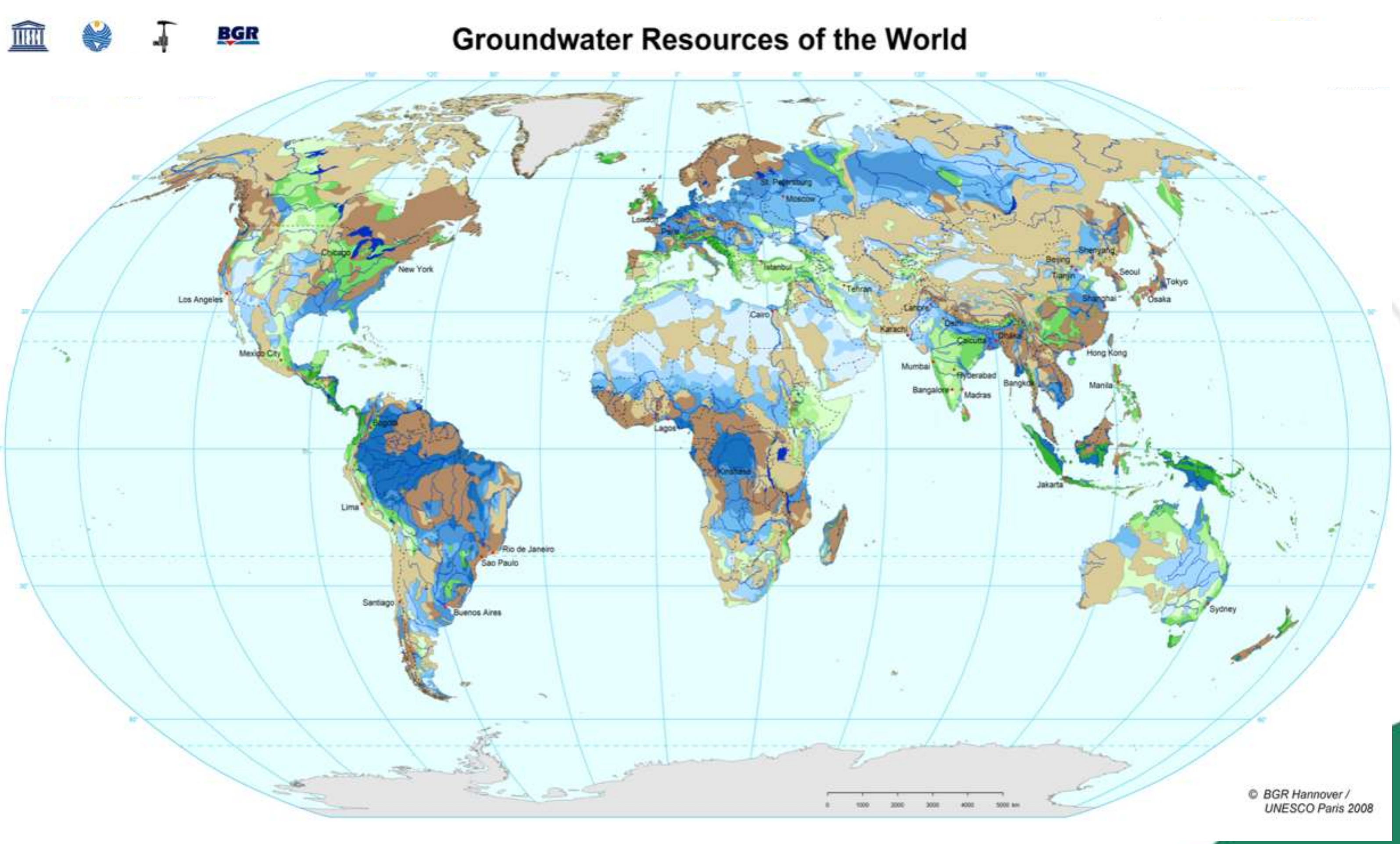
OVERVIEW OF GROUNDWATER RESOURCES IN THE WORLD

JUST-GREEN AFRH2ICA

- ✓ Most abundant source of freshwater on earth - approximately 97% of non-frozen fresh water.
- ✓ Approximately 50% of the world's population drinks groundwater daily.
- ✓ Estimated to contribute to over 40 % of the world's production of irrigated crops.
- ✓ Aquifers can also buffer impacts resulting from seasonal variability and climate change.



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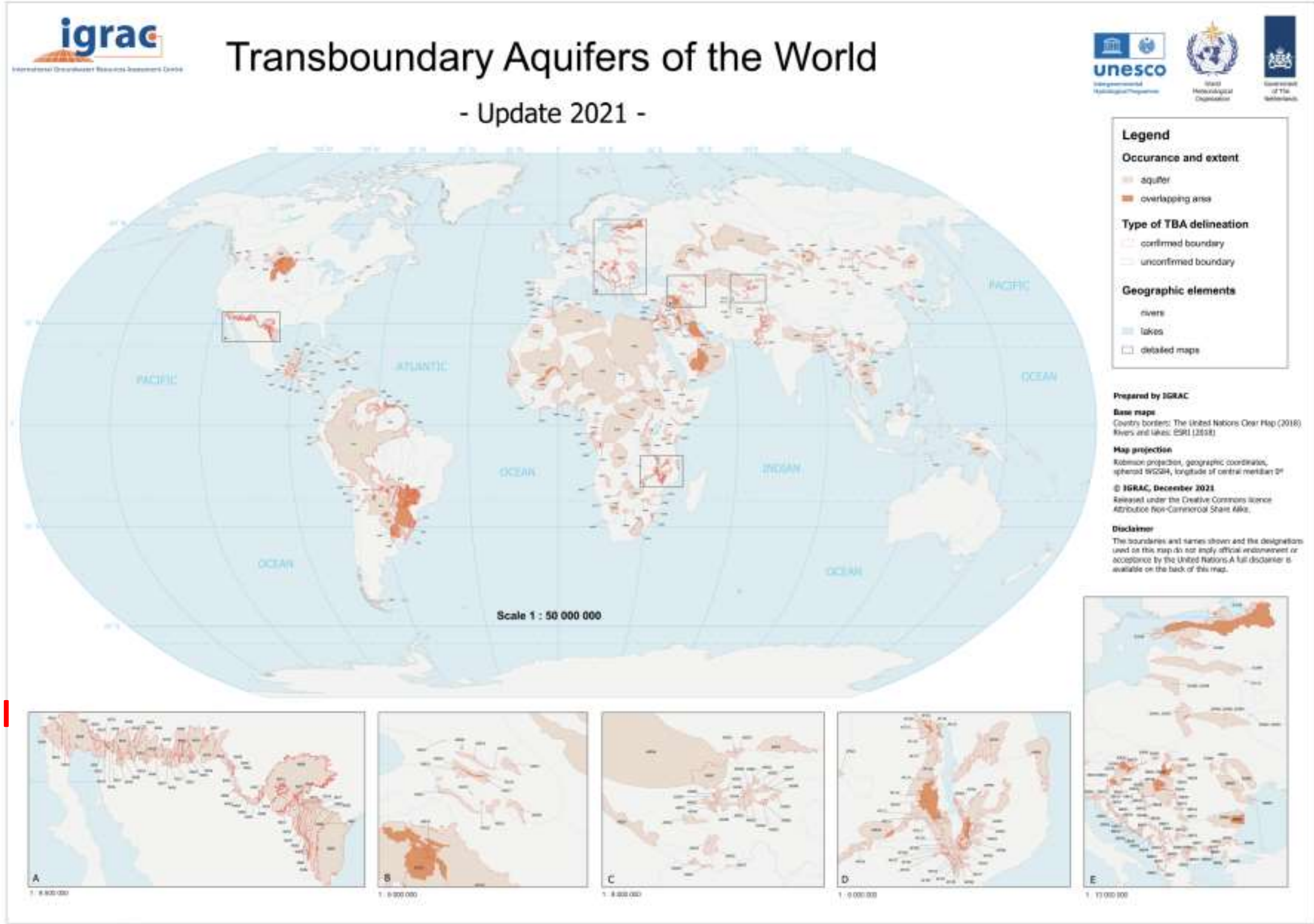
40% OF THE WORLDS AVAILABLE WATER IS TRANSBOUNDARY

- 468 identified transboundary aquifers
- New transboundary aquifers will still be identified, and that the delineation of existing ones may be refined by further studies.
- Assessment of transboundary aquifers is a specific step towards transboundary governance of environmental resources.
- **Knowledge about transboundary aquifers is still limited.**



CHALLENGES

Despite GW importance, this natural resource is often poorly understood, and consequently undervalued, mismanaged and even abused.

Groundwater storage depletion = discharge exceeds recharge. Climate variability and climate change play a role, but most cases of long-term depletion due to intensive abstraction.

Groundwater pollution is a virtually irreversible process

Governance: because groundwater is often perceived as a private resource (that is, closely connected to land ownership, and in some jurisdictions treated as privately owned), regulation and top– down governance and management are difficult.
Governments should have the role as resource custodians.

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Regional perspectives: Sub-Saharan Africa

- **Large groundwater resources**. Not all available for abstraction, but the volume is estimated to be 100 times > of the annual renewal of the region's freshwater resources.

- **About 400 million people in Sub-Saharan Africa still do not have access to even basic water services.**

- Most countries in Western and Central Africa have little groundwater storage but high annual rainfall and therefore regular recharge. Many countries in Eastern and Southern Africa have considerable groundwater storage despite very low levels of recharge.

- Only 3% of the total cultivated land in Sub-Saharan Africa is under irrigation, and only 5% of that is irrigated with groundwater.

- **The development of groundwater could act as a catalyst for economic growth** by increasing the extent of irrigated areas and therefore improving agricultural yields and crop diversity.

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HORN OF AFRICA CONTEXT

Severe drought due to successive failed rainy seasons have impacted the lives and livelihoods of more than 36 million people, with some 20 million facing emergency/catastrophe levels of food insecurity

While human mobility (pastoralists and traders) has traditionally been part of the way of life in the HoA, limited access to water, loss of livelihoods and drought-related conflict have triggered and reinforced forced displacement and acute levels of food insecurity.

Although humanitarian interventions continue to be prioritised, the need to develop more sustainable solutions is required to address endless cycle of reacting to multiple crises.

Increased frequency and severity of droughts is limiting the ability of communities to recover livelihoods.

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GROUNDWATER ASSESSEMENT - METHODOLOGY

Groundwater sustainable yield = projected groundwater availability for supplementary water usage (including green hydrogen production) after accounting for projected groundwater recharge, environmental flow (% of the simulated recharge) and all projected sectoral water consumptions in the future.

Groundwater sustainable yield = Recharge – Environmental flow – Human water use

- The **groundwater recharge** is obtained from simulations of the Community Land Model [ver. 5] (CLM5) (Lawrence et al., 2019) at 10 km spatial resolution, forced by CORDEX (https://cordex.org/) downscaled RCP2.6 (optimistic) and RCP8.5 (pessimistic) atmospheric scenario projections.

- The **environmental flow** is a certain percentage of the calculated annual recharge, which varies depending on the scenario.

- **Sectoral water use** is obtained from literature (Sutanudjaja, et al., 2018) that takes total water withdrawal for industrial, irrigation, domestic, and livestock into account.

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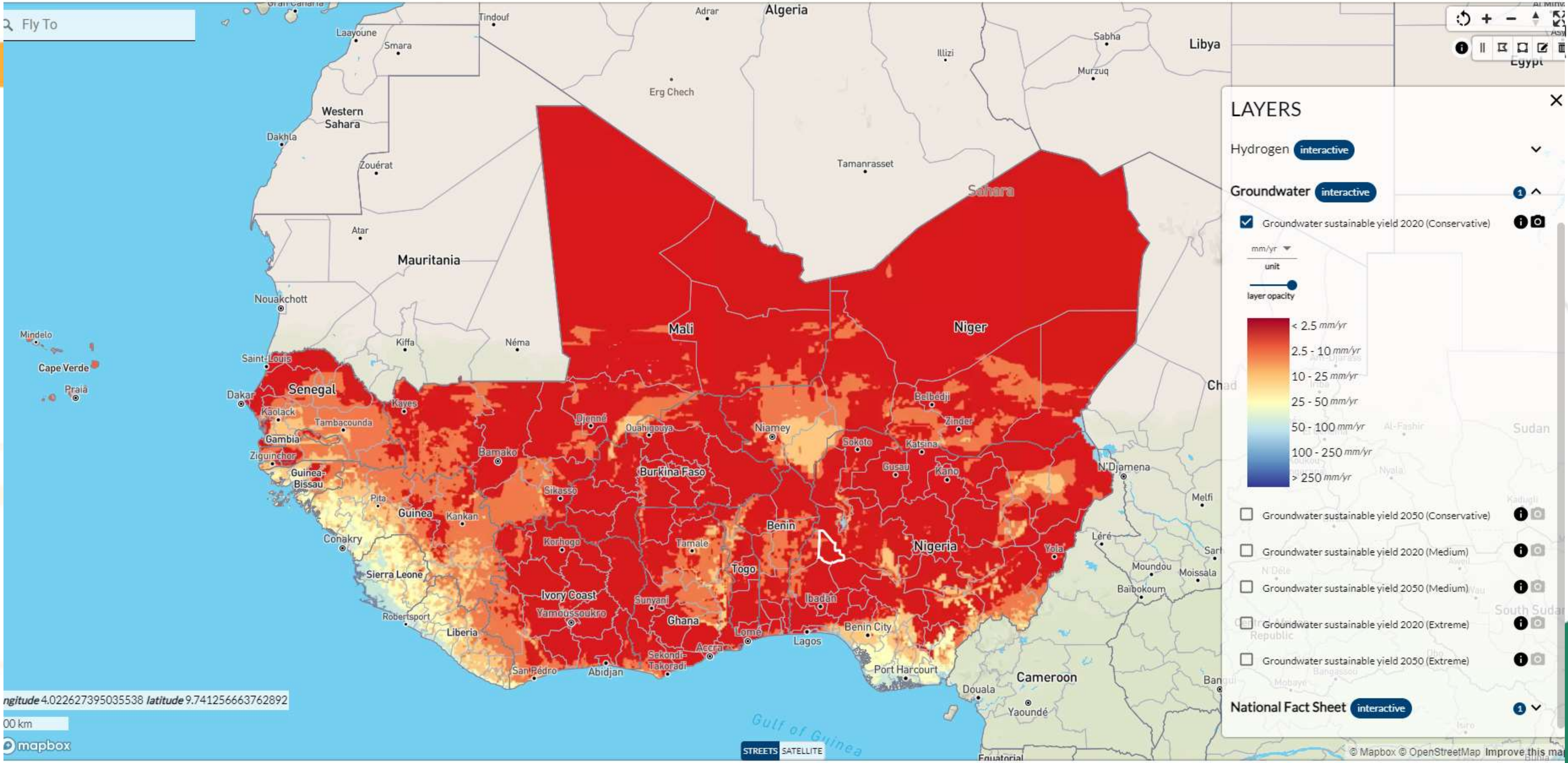

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H2ATLAS AFRICA WASCAL Federal Ministry of Education and Research

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- WATER-ENERGY NEXUS: *JUST GREEN AFRH2ICA* - Promoting a Just Transition to Green Hydrogen in Africa

- Conclusions

CONCLUSIONS (I)

The region has abundant groundwater. If this resource is harnessed and well managed has the potential to mitigate drought impact and equip communities to withstand future shock and more important to lead the way towards a more sustainable livelihood for many.

The further development of groundwater in Sub-Saharan Africa is not currently limited by a lack of groundwater, but rather by a lack of investment in infrastructure, institutions, trained professionals and knowledge of the resource.

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CONCLUSIONS (II)

JUST-GREEN AFRH2ICA

- Water is one of the key inputs for a green hydrogen plant.
- It is expected that as the green hydrogen industry comes to fruition as part of the energy transition, water for hydrogen is and will become an increasingly important part of the water industry across the world.
- A holistic approach to selection of water technologies can make a significant difference in the overall water balance and viability of a project.
- An early, integrated approach to water supply/disposal, power demand and cooling technologies, project location and consideration of carrier technology is needed to identify opportunities to optimise a project's overall site water requirements, and therefore effectively manage and reduce risks associated with sustainable water security and social and environmental concerns.
- While water and water treatment typically do not have a large cost associated with it, finding sustainable water sources and reducing the water consumption for hydrogen production will assist to lead to renewable hydrogen production obtaining a social licence to operate

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Thank you for your attention!

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