

## Towards a next generation renewable energy source – a natural hydrogen solution for power supply in Africa

Hydrogen is seen as the fuel of the future, an energy vector to store intermittent wind or solar renewable energy. However, manufacturing hydrogen from electrolysis of water (green hydrogen) is expensive when compared to hydrogen derived from fossil fuels (grey hydrogen) and requires vast amount of water and land. **Natural hydrogen**, also called **white hydrogen**, is hydrogen that occurs naturally in certain geological environments and is considered renewable at a human timescale, since it is being continuously replenished by geochemical reactions in deep geological formations. It is a primary energy source, and not only a means to store energy. Although its existence has been known for some time, it is only recently that the first case of natural hydrogen exploitation was ensued with the discovery of a hydrogen rich (>90 mol% H<sub>2</sub>), pressurized (68 psi) field at the Bougou-1 well, Taoudeni Basin, Mali. This natural hydrogen stream has been in production since 2012, generating electricity for the Bourakebougou village.

**HyAfrica aims to identify and estimate natural hydrogen resources in four African countries, and evaluate the possibility of its use for power production for local communities.**

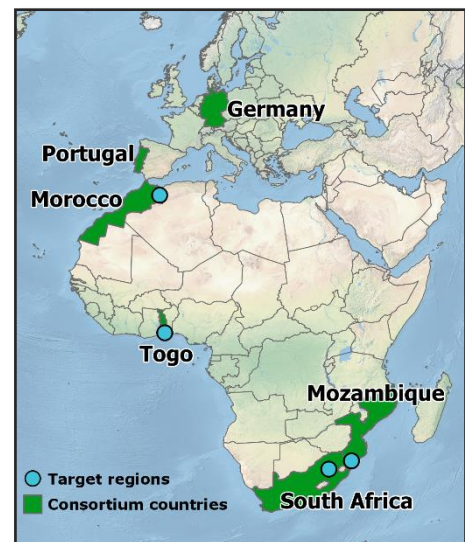
Natural hydrogen has the potential to:

- **Serve as a primary, clean and renewable energy source.**
- **Increase the reliability of the power supply in those communities.**
- **Decrease costs and energy poverty.**

The project focuses on four promising regions of Africa where natural hydrogen has already been detected, or where the geological conditions are particularly favourable for its occurrence, and where this resource assessment can bring a RES alternative to a substantial number of communities:

- Jerada and Tandrara provinces (**Morocco**)
- Bilene / Macia district (**Mozambique**)
- Nkangala district (**South Africa**)
- Lacs prefecture (**Togo**)

Besides six partners from these target regions the HyAfrica consortium also integrates three partners from Germany and Portugal.



The HyAfrica promising regions have particular interest, since natural hydrogen occurrences have been reported in South Africa in concentrations varying from 15% to 77%, while recent surveys in Morocco found numerous hydrogen seeps associated with geomorphic depressions, with concentrations as high as 2% at just 1 m depth. Favourable geologic settings have also been identified in Mozambique and Togo, that are expected to be linked to high hydrogen concentrations.

Focusing on these four prospect regions, the specific objectives of HyAfrica are to:

- i. identify and map the existing resources and increase knowledge about the controlling geological conditions;
- ii. assess the socio-economic impact and develop business models for standalone, off-grid and minigrad systems based on hydrogen;
- iii. develop roadmaps for natural hydrogen exploration and exploitation in the target countries;
- iv. build awareness of and capacity on natural hydrogen applications in standalone and mini-grid systems among the academic community and institutional stakeholders of the target countries.

HyAfrica will develop information on the expected availability and origin of natural hydrogen in the target regions and develop socio-economic and business models. This information will be used to provide regional and national authorities with strategies to exploit this new renewable energy source and to assess its relevance to local populations.

The project's methodology will address the challenges posed by the specific objectives at four levels:

- **Geological and geophysical research** to understand the relevant geology and to map the existing resources of natural hydrogen and define exploration protocols.
- **Research on local energy systems** and their economics to understand the role of natural hydrogen in standalone and off-grid systems in remote or small communities.
- **Policy and regulatory analysis** to implement regional / national roadmaps for a consistent strategy for natural hydrogen exploitation.
- **Capacity-building strategy** for knowledge transfer and for raising awareness about a novel, renewable, clean energy source amongst decision-makers and other stakeholders of target countries.

### Consortium partners



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