Research Summary: Creating an Opportunity Space for Sustainable Hydrogen in West Africa (1/2)

Key Recommendations

1. Undertake significant preparatory work in **setting up enabling conditions** and regulatory framework for successful hydrogen scaling
2. **Renewables-based hydrogen production is a more versatile option** with stronger development synergies to enhance water and energy access
3. **Start by demand centres** to minimize value chain costs and target existing H_2 users like oil refineries and ammonia/fertilizer producers as anchor buyers
4. Over the long term, scale **regional trading corridors in power, water, minerals and H_2** to drive cost-competitiveness and open opportunities for all ECOWAS members

Introduction to Renewable Hydrogen

Hydrogen is a versatile energy carrier, with a wide range of applications across sectors. Priority applications are:

1. End-uses where **hydrogen is already used in the production process**, e.g. in oil refining & ammonia production
2. End-uses where **electrification and other abatement options are scarce** (ironmaking, aluminium refining, cement production)

While the report considers CCS-based production, the primary focus is renewables-based production. The latter has lower GHG emissions and stronger development synergies: **building electricity and desalination capacity to produce H_2 can also enhance energy and water access**

West Africa Context

West Africa has **a Green Hydrogen Policy and Strategy Framework, but there is a lack of national frameworks and limited on-the-ground implementation**

ECOWAS represents only 1.8% of global GHG emissions but has 11 of the world's 45 least developed countries.

Therefore, ECOWAS presents a valuable case study to:

- **Evaluate what a hydrogen ecosystem may look like in practice** and how UNDP can support governments to take ownership of implementation
- **Understand the development opportunity from sustainable hydrogen** rather than focussing only on decarbonisation

December 2023 – May 2024
SIPA Research Team: Alex Lantos, Flore Schmerber, Wesley Garner, Jason Marshall, Thanussha Francis Xavier, Olivia Staudenmayer
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Research Summary: Creating an Opportunity Space for Sustainable Hydrogen in West Africa (2/2)

Findings: H_2 a long-term vision rather than a short-term fix

Analysis follows a framework based on leading questions:

A. Why? (End-use Goals), B. What? (Target Value Chains),
C. Who? (Participatory Planning), D. How? (Enabling Environment)

Opportunities

1. **Building excess renewable and water capacity to expand energy and water** access next to hydrogen development
2. **Scaling domestic oil refining** to enhance energy security
3. **Scaling domestic fertiliser production** to enhance food security
4. **Scaling domestic downstream industry in iron and steel, aluminium and cement** production for net-zero aligned industrialisation

Challenges

1. **Technology risks and high costs**
2. **Uncertain demand / lack of credible offtakers for end-uses**
   - **Domestic: limited industrial users in region** and **affordability constraints** from high hydrogen costs
   - **Exports: risk of being outcompeted by jurisdictions** with more favourable conditions for hydrogen production
3. **Stronger engagement with stakeholders needed** for inclusive development and equitable growth
4. **Difficulties in securing financing** due to high market and political risks

Case Studies (outside West Africa):

1. **Mauritania** AMAN project: Through low-cost hydrogen ($1.7–2/kg H_2 by 2035), expected to produce **1 Mt of green ammonia** by 2027 and **2.5Mt of iron for export** (at 10-15% lower price per ton than Europe, Asia, and America). The project showcases building excess renewable and desalination capacity to supply both renewables-based hydrogen production, as well as electricity and water needs

1. **Namibia** Hyphen project: Through low-cost hydrogen ($1.7–2.3/kg H_2 by 2030), expected to produce 1 Mt of green ammonia in 2027, and 2 Mtpa by 2029. **Production targets exports. Out of 18.000 jobs created, 90% accrue to locals. $10 billion project costs equal to Namibia's annual GDP.**

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