TERMS OF REFERENCE FOR A DIRECTED WRC PROJECT

THEME	Water Advisory
TITLE	Mapping water use, availability and quality requirements for transitioning to a sustainable green hydrogen economy in South Africa.
TOR NUMBER	1010028

Rationale

The Department of Science and Innovation (DSI) as the custodian of science and innovation has developed a Hydrogen Society Roadmap (HSRM) to guide the transition to a hydrogen economy in South Africa. Following approval of the HSRM by Cabinet in 2021, the DSI further embarked on enhancing and strengthening the institutional capacity of South Africa in coordinating the implementation of the HSRM in partnership with the United Nations Industrial Development Organization (UNIDO).

As part of the current DSI HSRM, the green hydrogen economy holds significant potential to contribute towards South Africa's energy security. Furthermore, this is in support of economic development and global decarbonization efforts. However, for a water scarce country such as South Africa, the water- intensive nature of green hydrogen production and its potential impact on water resources requires thorough assessment and consideration of water use, availability and quality requirements before large scale implementation of the green hydrogen economy.

This therefore calls for an urgent investigation into the water use, availability and quality requirements for large scale implementation of the green hydrogen economy in order to support a sustainable transition to a successful green hydrogen economy in South Africa.

Scope

The study should encompass the following key aspects:

- Mapping the national water resources that can support transitioning to a green hydrogen economy in South Africa.
- Reviewing of existing literature and data related to water use and wastewater management for the green hydrogen production value chain.
- Evaluating potential impacts of transitioning to a green hydrogen economy and sustainability analysis of current GHVHs.
- Reviewing and evaluation sustainable water management practices, approaches and technologies enhancing water use efficiency in support of green hydrogen production.

- Developing a set of guidelines for determination of sustainable water use, availability and quality requirements for a sustainable green hydrogen economy in South Africa.

Methodology

The study should employ a multi-disciplinary approach, involving, *inter alia*, review of literature, data collection, analysis, modelling and case studies review. The methodology should include, *inter alia*, the following:

- Mapping various water resources in South Africa, including surface water, groundwater, municipal wastewater, mining-influenced water, etc. and provide an assessment of their quantity and quality to support a sustainable green hydrogen economy.
- Collection and analysis of literature data on water use and wastewater management at various stages of the green hydrogen production process focusing on current GHVH as case studies.
- Using modelling to assess impacts of transitioning to a green hydrogen economy in South Africa.
- Using case studies of current green hydrogen valley hubs to conduct sustainability analyses.
- Reviewing of management practices, approaches and technologies supporting transitioning to a green hydrogen economy.
- Identifying and reviewing critical information useful in providing guidance for determination of sustainable water use, availability and quality requirements in support of green hydrogen economy implementation.

Objectives

The primary aim of this study is to map the national water use, availability and quality requirements as well as the implications of large scale implementation of the green hydrogen economy in South Africa.

Specific Objectives

1. Identify and map the national water resources that can support the green hydrogen economy, focusing on both quantity and quality of the resources.
2. Evaluate the water use and wastewater management requirements for the green hydrogen production value chain using current green hydrogen valley hubs (GHVH) as case studies.
3. Analyze the sustainability of implementing the green hydrogen economy within the context of current GHVH.
4. Assess the potential environmental, social, and economic impacts for transitioning to a green hydrogen economy in South Africa.
5. Identify and review sustainable water management practices, approaches and technologies

that can support a green hydrogen economy in South Africa.

6. Develop guidelines for determination of required sustainable water use, availability and quality for a successful transition to a green hydrogen economy in South Africa.

Note:

Based on the multi-disciplinary nature of the project, submission from collaborative research groups using a work package approach for different project phases is encouraged. The proposers are required to initially submit a concept note using the provided template outlining, *inter alia*, all project phases, key milestones, and deliverables. The concept note should also indicate timelines for each activity, dependencies, and any critical deadlines, to allow adequate assessment of the concept note's potential for a full proposal.

Expected Deliverables:

1. Inception report, outlining the project implementation approach, targeted milestones and expected outputs and outcomes.
2. National water resources map showing various resources quantities and qualities.
3. Report outlining water use, wastewater management requirements for the green hydrogen value chain and sustainability analyses studies using GHVHs as case studies.
4. Report on the environmental, social, and economic impacts of transitioning to a green hydrogen economy.
5. Report on management practices, approaches and technologies enhancing transition to a green hydrogen economy
6. Guidelines for determination of sustainable water use, availability and quality requirements in support of a green hydrogen economy in a water scarce country.

Total Funds: R 3 000 000.00 (Including VAT)
Year 1: R 2 000 000.00 (Including VAT)
Duration: 3 years