
ENVIRONMENTAL POLICIES SERIES

# WHO BENEFITS FROM TUNISIA'S GREEN HYDROGEN STRATEGY?

HEINRICH BÖLL STIFTUNG
TUNISIE

Arab Reform Initiative

*Aïda Delpuech*

## About the Author

Aïda Delpuech is a freelance journalist based in Tunis. Passionate about ecology, she mostly covers and investigates themes related to the environment, agriculture, pollution, and agri-food. In November 2021, Aïda was selected to cover the COP26 negotiations in Glasgow for the media outlet Inkyfada with the help of a grant from the Earth Journalism Network and the Stanley Center for Peace and Security.



Cover photo: ©petrmalinak/Shutterstock

**October 2022**

# Abstract

Tunisia is currently developing a national strategy for the development of green hydrogen. While the global energy sector is being revamped, the "clean" fuel approach is often hailed as the flagship solution for the challenges of energy deficits and the decarbonization of the economy.

Efforts are under way on a global scale to develop strategies for green hydrogen to play an important role to decarbonize the industrial and transport sector[1,2,3].

However, this new energy strategy raises several questions for Tunisia– both in terms of the persisting dominance of dependence in the economic and trade relations between Tunisia and Europe[4], as well as the social and ecological risks it entails.

This new approach is currently being developed by the Ministry of Industry, Mines and Energy in the framework of a project implemented by GIZ with finance from the German Federal Ministry of Economic Cooperation and Development (BMZ)[5]. This strategy is planned to be finalised by end of 2024. So far, discussions have been launched without involvement of civil society, the later being very concerned about safeguards for the affected local communities and the use of resources that are necessary for this emerging large scale development.

1 McKinsey & Company, Net-Zero Europe Decarbonization pathways and socioeconomic implications, November 2020.

2 Accenture,Decarbonizing Energy, Oil and Gas, 2020.

3 Deloitte,The 2030 decarbonization challenge, The path to the future of energy, 2020.

4 Such domination is anchored in the unilaterally preferential trade agreements (such as the Tunisian-European partnership agreement of 1996 and the free trade area "FTA").

5 See https://www.giz.de/en/worldwide/109262.html

# Introduction

As the global energy sector sought to revamp itself over recent years, several countries around the world have joined a race toward green hydrogen –labelled "energy of the future". Unlike grey hydrogen, made by fossil fuels (natural gas) and a significant source of greenhouse gases,[6,7] green hydrogen is generated by electrolysis whereby water is split using electricity from renewable energy sources. The combustion of one kilogram of this gas produces almost four times more energy than one kilogram of gasoline.[8] In 2021, the production of green hydrogen produced represents only 5% of the 94 million tons of overall produced hydrogen globally.[9] However, this quantity is bound to rise, given the various strategies developed in the post-Covid economic recovery plans or by strategies to power Europe with alternatives to Russian gas[10].

While a global market for green hydrogen is being shaped, Tunisia launched in early 2022 the development of its very own national strategy for green hydrogen to be finalized by 2024. The country has already announced that it will prioritise export[11] of this green fuel over local use.[12] "Promoting green hydrogen, a growing market in today's world, is very important to Tunisia," affirmed GIZ, [13] the Tunisian government's lead partner in this strategy development project.

Although the Tunisian Ministry of Energy has made green hydrogen one of its projects of high importance, civil society, scientists, and potentially affected communities have so far been left out of all conversations. Hence, the country misses a chance to map out eventual risks, environmental and social concerns and to address emerging concerns from the outset.

The large-scale production – powered by solar and wind energy megaprojects – requires vast mobilization of several types of resources along the entire production chain of this fuel. When the Ministry of Energy asserts that: "these projects do not entail obvious negative impacts on the environment," nothing is less verified than such statement. Current discussions focus mainly on Tunisia's position in this emerging global market, but they rarely touch on the social and environmental costs of this type of major projects. Nonetheless, multiple studies[14] were published more recently, warning of the impact of these projects on natural resources – water, land, etc. – in countries heavily affected by climate change.

6 The production of a single kilogram of grey hydrogen from natural gas emits around 11kg of CO2 (source: « Hydrogène gris: l'hydrogène produit à partir d'hydrocarbures »,

7 Grey hydrogen production from fossil energies accounts for almost 830 million tons of CO2 emissions annually, i.e. 2.2% of all global emissions, IEA 2020

8 L'essentiel sur l'hydrogène (What to know about Hydrogen), French Alternative Energies and Atomic Energy Commission (CEA), 30/09/2021

9 Global Hydrogen review 2022

10 Anna Skowron and Joachim Fuenfgelt, Regulating the Hype: Renewable Hydrogen in the global South, WFC 2020

11 Tunisia, future exporter of energy to Europe!, African Manaager, 13/05/2022

12 Développement de l'hydrogène vert : la Tunisie sur la bonne voie, La Presse, 10 septembre 2022

13 Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), German organization for international cooperation

14 Teske S., Niklas S., Mey F., (2022), Renewable Hydrogen in the Global South – Opportunities and risks, July 2022, University of Technology Sydney – Institute for Sustainable Futures (UTS-ISF); Ann Waters-Bayer and Hussein Tadicha Wario, "Pastoralism and large-scale REnewable energy and green hydrogen projects. Potential & Threats", Heinrich Böll Stiftung, 2022.

In addition, the benefit of this new sector is questionable in terms of Tunisia's climate commitments. To this day, the country depends as much as 97% on Algerian gas to produce electricity[15] and the energy transition has stagnated. However, it plans to export the bulk of the green hydrogen potentially produced on Tunisian soil mainly to Europe, This was confirmed in interviews and meetings in the context of this report.

While green hydrogen is a more preferable alternative than more polluting options, its mass production would primarily benefit the energy needs of Europe. This raises another fundamental issue as it is replicating an extractivist model oriented towards international export markets and build on the overexploitation of natural resources.

To develop a green hydrogen production strategy, Tunisian authorities along with their European partners, namely Germany, seek to prolong the exploitation of resources of neighbouring countries without sufficiently considering the energy needs of locals, the social and environmental risks, the fact that Tunisia is a water stressed country or the financial debt resulting from such investments.

15 Tunisia: natural gas purchase deals with Algeria have increased by 25% between February 2021 and February 2022, Énergies Media, 16/04/2022

# Green Hydrogen in Tunisia: A Project from Abroad

## European Strategy for Green Hydrogen

On 15 December 2021, Brussels presented its first series of metrics through the Green New Deal aimed at reducing greenhouse gases by 55% by 2030[16]. Low-carbon hydrogen was cited as a top priority. To achieve this objective, the European plan intends to rely on North Africa and Ukraine for half of its production.

On this side of the Mediterranean, climate commitments and geopolitical tensions tied to the Russian Invasion of Ukraine have prompted European countries to reconsider energy strategies. Given its high dependence on Russian gas, the EU has spared no effort to break the habit. As of August 2022, the 27 countries have announced their intention to do without Russian coal and reduce their imports of Russian petrol by 90% by the end of the year 2022. The EU seeks to turn to other providers like Algeria[17], as well as investing billions of euros in a "clean" new energy source.

Publicly announced on 18 May 2022, the "RepowerEU" plan, envisions to double green hydrogen imports by 2030, boosting the estimates to an expected 10 million tons per year. The EU had planned to heavily rely on Ukrainian green hydrogen, it has also reached out to Australia, Chile, Brazil, Namibia or the Arab Peninsula and has more recently set its eyes on neighbouring North Africa.

Thanks to its geographic proximity, low-cost renewable energy resources, and existing gas pipelines, North Africa is seen by the EU[18] as the most efficient and competitive solution for green energy production since green hydrogen production is still four to five times more expensive than fossil energies.[19]

Like Morocco, Tunisia seems like a favourable partner. With rich solar and wind resources and ambitious climate objectives – 35%[20] of the energy mix to be renewable by 2030 and carbon neutrality by 2050 – the country seeks to expedite renewable ventures on its territory and plans to enter the green hydrogen market. In December 2020, the Tunisian and German governments signed a 31-million-euro cooperation agreement to develop this new sector.

## The Tunisian-German Green Hydrogen Agreement

"The idea to develop a green hydrogen sector in Tunisia was suggested by Germany. That is where this technology started to develop," said a senior official at the Tunisian Ministry of Industry, Mines and Energy.[21] In 2020, during its term at the helm of the EU Council. Berlin announced its intent to allocate nine billion euro to develop this emerging sector with the aim to "become the world's leading power in hydrogen technologies," as stated by the former German Minister of Economy, Peter Altmaier.[22] By 2030, Germany intends to produce 5GW of hydrogen from renewable energies, promising 9 billion euros, two billion of which would be allocated to international projects.

Germany is highly reliant on Russian gas and coal. While the German Greens have been striving unsuccessfully for many years to speed up the energy transition towards renewables to phase out coal and to free the country from these energy ties, the country's renewable resources do by far not meet its green hydrogen production needs. In its 2020 national green hydrogen strategy, Germany assessed its annual needs around 90 to 110 TWh by 2030. However, the strategy states that national production of green hydrogen will not cover all of these needs, which requires the bulk of the needed hydrogen to be imported.

Since 2020, Berlin has multiplied bilateral partnerships for the development of green hydrogen beyond its borders, taking a particular interest in Africa and the MENA region. Like Morocco, Namibia, Chili, UAE and many other countries, Tunisia wishes to find its place in this nascent market. Therefore, the North African nation signed in December 2020 a memorandum of understanding to establish the Tunisian

16 Delivering the European Green Deal, Commission Européenne,

17 Frédéric Bobin, « L'Algérie, bénéficiaire ambiguë de la guerre en Ukraine », Le Monde, 3 juin 2022,

18 See joint communication to the European Parliament, to the EU council and some commissions :"The South of the Mediterranian has great potential for the production of renewable hydrogen », EU external energy engagement in a changing world, 18/05/2022

19 Michael Barnard, Assessing EU plans to import hydrogen from North Africa, The cases of Morocco, Algeria and Egypt Corporate Europe Observatory and Transnational Institute, Mai 2022

20 According to information by Mr. Belhassen Chiboub, Director General of Energy Transition at the Ministry of Energy and Mining, during a seminar on 28 June 2022 at hotel Sheraton.

21 In a talk in April 2022

22 Ninon Renaud, « L'hydrogène, le pari à 9 milliards de l'Allemagne », Les Échos, 10 juin 2020,

German Coalition for Green Hydrogen[23]. Ever since, four inter-ministerial discussions to this effect have been organized between 2021 and 2022. "To set the stage, we have convened high level officials, as well as private sector stakeholders and researchers," explained the GIZ project officer.[24]

The agreement between Tunis and Berlin focuses on three key aims. The first, launched in February 2022, seeks to establish a Tunisian national strategy for green hydrogen to be elaborated by multiple parties, namely the Ministry of Energy, the Tunisian Company of Electricity and Gas (STEG), National Agency for Energy Management (ANME), Ministry of Agriculture, Ministry of State Domains and Land Affairs, the Ministry of Environment, the Instance for Public Private Partnerships of the Ministry for Higher Eduction and Research and the Group Chimique Gabes.

"The next three years will focus on strategy and research so that in 2025, the green hydrogen production is ready in Tunisia," announced the Ministry of Energy. Foreign and Tunisian experts jointly recruited by the Ministry of Energy and the GIZ will develop the Tunisian green hydrogen strategy, as well as an action plan for its implementation.

Second, the agreement intends to simultaneously set the stage for future foreign investments in green hydrogen in Tunisia, in other words to relax the rules on renewable energy production projects. "We want Tunisia to attract investors," explained an expert from the Ministry of Energy.[25] A Green Hydrogen Observatory is planned to be established under the Ministry of Energy, dedicated to guide newcomers to the Tunisian energy market.
Lastly, research and development efforts will be undertaken, in order to include specific courses on green hydrogen technology in universities. A roadmap should be presented by research institutions showing the manner in which they intend to embed these new components in their curriculum.

These are generally all laudable building blocks for Tunisia to advance its pathway towards renewables. Yet, it needs to be done right, and to be based on a comprehensive environmental and social risk assessment with the question of water availability at its core to prove economic viability of such efforts in the first place.

In order to bring about this new energy sector, the German ministry of economic cooperation and development (BMZ) has decided to allocate[26] six million euros to GIZ to fund the development of the green hydrogen strategy. The remaining 25 million euros will be used for a pilot project [27] managed by the KFW, the German development bank.

With its national hydrogen strategy, Germany is relying on external resources to provide some of its future needs in green hydrogen, while Tunisia sees it as an opportunity to reserve a place in this emerging market, keeping the environmental impact studies to a later date. "There is a global trend. This market has a grand future ahead and we must reserve a place", said a Ministry of Energy official[28].

A global market is blooming and the Tunisian government wants its stake by focusing on the export of this green fuel as it can provide a significant flow of income, which explains the interest of Tunisian authorities prior to assessing real environmental risks or the issue of national energy sovereignty. Some even dream to see the country take its place as "a founding and influencing member of the Organization of Hydrogen Exporting Countries (OHEC),"[29] in reference the very influential Organization of Petroleum Exporting Countries (OPEC), thus continuing the pattern of the existing extractive model.

## Green Hydrogen: Speeding up or Slowing down the Renewable Energy Deployment in Tunisia?

Despite its high potential in solar and wind power, so far, renewable energies contribute only 3% of the electricity produced in Tunisia. Indeed, 95% of national electricity is currently produced by natural gas combustion. To reduce its dependence on fossil fuels and to strengthen energy security, the country hopes to ensure a 35% share for clean energy by 2030.[30]

23 Signature MoU Germany and Tunisia

24 During a meeting in March 2022

25 During a meeting in April 2022

26 Bulletin d´Information, September 2022, Partenariat de recherches sur l'hydrogène vert avec l'Allemagne

27 Gabes is among potential sites, according to Mr. Belhassen Chiboub, Director General of Energy Transition at the Ministry of Industry, Energy, and Mines, during a seminar on 28 June 2022 at the Sheraton. Similarly, the Ministry of Industry, Energy, and Mines identifies the Beni Khedache region in governorate of Medenine, as a site with strong potential.

28 During a meeting in April 2022

29 L'hydrogène vert, une manne providentielle pour la Tunisie ? (Green Hydrogen, a heavenly manna for Tunisia), Leaders, 12/07/2021

30 Updated Nationally Determined Contribution - Tunisia, September 2021

Will introducing green hydrogen in Tunisia further the goals set by the country to reduce greenhouse gases? For now, the Ministry of Energy – being in charge of this new "green gold" – has yet to draw the link. "We will focus on the climate objective once the strategy is achieved," ensured an official at the Ministry of Energy involved in its development[31]. As such, even though the explicit intention is to increase Tunisian climate objectives through green hydrogen, there are a number of details about building an industry for export of GH2, but very little on how it will be used locally, if at all, thereby indicating that these objectives are not a priority concern, unlike exports, source of income etc.

"We have not yet decided whether or not the renewable energy needed to produce green hydrogen would be added to the existing renewable facilities. However, this should not affect the energy transition," asserts the Ministry of Energy[32]. On the other hand, the GIZ in Tunis recognizes the risk of overlapping infrastructures and thereby risking a slowdown of the Tunisian energy transition and insists in additionality[33]. The mere doubt as to whether or not the infrastructure dedicated to green hydrogen production would complement those used for the energy transition, brings into question the merits of developing this new resource in Tunisia. This question remains unless the potential for an export market is critically assessed and a deliberate strategy being developed to bootstrap renewables production for domestic use without compromising social and environmental standards for current and future generations.

# Absence of the Ministry of Environment

The strategies of the Ministry of Energy and Ministry of Environment are intersecting, but seem not treated complementary. The carbon neutrality and climate change resilience strategy by 2050[34], issued by the Ministry of Environment, occasionally mentions green hydrogen as a low-carbon resource. However, neither the reform plan for the energy sector (TUNEREP), developed in 2019, nor the 2018 Tunisian solar plan mentioned green hydrogen, despite pointing to the establishment of a grey hydrogen production facility to develop the only petrol refinery in Tunisia.[35]

Therefore, the regulations governing renewable energies will also include the green hydrogen framework developed by the Ministry of Energy and not the Ministry of Environment, thus questioning its intention to contribute to emission reduction and hence Tunisia's climate targets.

According to talks in March and April 2022, the Ministry of Environment seemed not taking part in discussions on the national green hydrogen strategy. "For the moment, discussions are mainly focusing on technical issues. We will include them later on, once the strategy is more advanced," according to the Ministry of Energy. A representative from the Ministry of Environment confirmed, "We do not have a lot of information on the subject, we have suggested some directions, but not at the technical level."[36] The GIZ has nevertheless denied these information in October 2022[37] commenting on the draft of this paper, confirming that a representative of the Ministry of Environment (MoE) is a member of the pilot steering group (COPIL) securing the link to the mitigation efforts of Green house gaz emissions under the guidance of the MoE.

This national commission in the process of being established will monitor the various stages of green hydrogen deployment in the country. It should also provide for the systematic participation of independent Civil Society actors.

# Poor Coordination and Transparency

To develop a strategy, one must clearly draw the line between theoretical ambition and actual reality, between ideal-scenario benefits and the required risk management. To ensure the utmost democratic and transparent process, especially for projects with as many facets as risks, deliberations with concerned parties deserve a high priority. Does the Tunisian green hydrogen strategy currently devised integrates the principle of prior consultations with the different stakeholders systematically? If not, wouldn't this stir conflicts and clashes between strategies being developed and respective stakeholders at a later stage?

The goal to reach 35% renewable energy in the energy share by 2030 is relevant to the Tunisian State as a whole. It should not be compromised, as seems currently the case with the Ministry of Energy favouring primarily an export market orientation.

Furthermore, the process of development of the Tunisian green hydrogen strategy lacks transparency in terms of civil

31 During a meeting in April 2022

32 During a meeting in April 2022

33 Stressed by the representative of GIZ during the Breakfast Talk on 12 October 2022 at the Cité des Sciences in Tunis.

34 Stratégie de neutralité carbone et de résilience au changement climatique à l'horizon 2050

35 Comment développer une économie verte ou comment l'hydrogène vert pourrait être l'élixir des maux de la Tunisie ? Le problème de l'énergie, (How to develop a green economy or how could green hydrogen be the panacea for Tunisia's condition? The Energy Issue.) Leaders, 28/01/2022

36 Interview with representatives from the Ministry of Energy, 11/04/2022

37 The GIZ denied this information by commenting on the report.

society consultation and information of the larger public and risks to be a top-down process. Referencing updates by the press as to discussions around green hydrogen shall not be considered a measure of sufficient transparency as is sometimes being argued by some responsible individuals to defend themselves.

# A New Energy Source: for Whom?

## Green Hydrogen to Decarbonize the Industry

Green hydrogen is often promoted as a panacea for decarbonizing Europe, mainly its polluting industries.[38] The German strategy for this "green revolution" makes it clear that even if hydrogen is used in an efficient and targeted manner, a considerable amount – around 80% – will have to be imported to usher Germany towards sustainable development and climate neutrality across all sectors.

The green hydrogen produced will almost entirely be used to decarbonize highly emitting industries. "It is a solution for decarbonizing industries that cannot switch to electricity, such as air transportation or certain chemical industries," explains Jörg Haas from the Heinrich Böll Foundation, Berlin.

Derivatives, in other words, chemical substances produced from green hydrogen, should be directed towards sectors of petroleum refining, metallurgy, fertilizers, microelectronics or air mobility.[39] In fact, hydrogen can serve as a feedstock for these industries, where electricity can not be used. Today, most of these large industries use grey hydrogen, generated from natural gas.

"These are the industries that are fighting hard for the production of green hydrogen in Europe. They have started testing these new methods since 2017 and are greatly influencing policy-making in Brussels," explains Pascoe Sabido from the Corporate Europe Observatory.

According to Chokri Aslouj, member of the Tunisian Engineers Association and an active participant in the workshops aimed at preparing the Tunisian National Green Hydrogen Strategy, the mobility sector, especially the aeronautical sector, is the economically most interesting option, since this fuel is hardly taxed. In a document outlining its hydrogen strategy, the Tunisian Company of Electricity and Gas (STEG) forecasts significant demand in the transportation sector by 2030.[40] Although negotiations have begun with the Tunisian National Railway Company to include green hydrogen in the Tunisian railway network, it seems that most of the hydrogen intended for transport purposes will be sent to Europe.[41] "We are focusing on exportation because the Tunisian market is not sufficiently large and developed to be able to process the amount of green hydrogen that we intend to produce," explains the Ministry of Energy.

In Tunisia, the industrial sector is the second largest consumer of final energy in[42], it represents one third of total energy consumption, almost all imported. Therefore, an economic study should assess the question whether it would be wiser to break loose from its dependence through local production of green hydrogen and the question could even stretch further: is it wise to power a polluting and devastating industry with "clean" energy?

The Tunisian Chemical Group (GCT) in Gabes for example – a highly polluting industry responsible for several health and ecological disasters[43] that transforms phosphate into chemical products such as phosphoric acid or fertilizers – is also actively involved in discussions on green hydrogen.

The GCT, a top consumer of fully imported ammonia, claims that it is currently experiencing difficulties due to worldwide stock shortages caused by the war in Ukraine. Russia is currently the world's second largest exporter of this necessary ingredient for the production of nitrogen fertilizers. There are talks of creating a small local market to supply the GCT with green ammonia, a derivative of green hydrogen, in order to reduce the chemical industry's dependence on this fully imported substance. "The bulk of the Tunisian green hydrogen will be exported to Europe, but we plan to use it for the benefit of the GCT, covering 5% or even 20% of its needs, but that is yet to be determined," according to

38 Hydrogen – driving the green revolution, European Commission, 14/04/2021

39 L'hydrogène vert : un levier pour décarboner l'industrie? (Green Hydrogen: A Lever to Decarbonize The Industry?), Energy solutions, 22/03/2021

40 La stratégie de la STEG pour le développement de PTX en Tunisie (STEG's Strategy For The Development of PTX In Tunisia), 10/11/2021

41 One of the pilot project proposals underway to test small-scale production in Tunisia is the creation of a methanol manufacturing plant in Bizerte. According to a project member, the fuel, derived from green hydrogen, would be exported to Hamburg, Germany, home to the second largest Airbus plant, after the one in Toulouse.

42 L'efficacité énergétique dans l'industrie, une véritable manne pour les entreprises tunisiennes (Energy Efficiency In The Industry, A Real Plus For Tunisian Companies), Webmanager, 24/09/2019

43 Hortense Lac, Autour du Groupe chimique de Gabès, une population sacrifiée (Sacrified Population Surrounding The Chemical Group Of Gabes), Inkyfada, 12/11/2019

the Ministry of Energy[44]. However, if the declared idea is to partially decarbonize this sector, the intention to use "clean" energy to serve this extremely polluting extractive chemical industry is paradoxical. The production of green hydrogen for the phosphate chemical industry will only serve to maintain the status quo in Gabes, where the GCT is responsible for 95% of the city's air polluting emissions, classified by the United Nations as a "pollution hotspot" in the Mediterranean since 2004.[45] Unless decarbonising the energy supply does not go hand in hand with depollution measures, such a strategy is not convincing and will only upset the population of Gabes further.

Ammonia, green or not, is also an extremely toxic gas that can be fatal if inhaled – even at very low doses.

# The Mediterranean: An Energy Nexus between Europe and North Africa

According to representatives or the renewable energy sector and of the Ministry of Energy the objective of Tunisia's strategy is to carry the Tunisian sun and wind to Europe with green hydrogen.[46] A particularly volatile gas, green hydrogen storage and transportation is a challenge. In this context, two options are being considered: a pipeline or maritime transport.

The country has an important gas network used to supply the domestic and European markets – via Italy – with Algerian natural gas. From Fyrianah at the Algerian border, to Al Huwariyah at Cape Bon, the Trans-Tunisian Gas Network transforms into an underwater pipeline to reach the Italian coast in Sicily. This underwater section consists of five pipelines, operated by both, ENI, the leading Italian hydrocarbon company, and Sonatrach, the Algerian oil and gaz company.

Ideas circulate to reinforce this existing network designed for natural gas to accommodate a certain percentage of green hydrogen in gaseous form. The technique is called blending, meaning mixing different gases. Once on the other side of the Mediterranean, the hydrogen would again be separated from the natural gas, which is expensive.
Therefore, according to Chokri Aslouj, "based on market demands, pipelines dedicated to hydrogen could eventually be installed,"[47] In its gaseous state, hydrogen is a very light element and occupies a substantial volume, making it particularly difficult and expensive to transport.

According to some observers, gas transport companies have fostered and stoked the hydrogen hype to demand more gas infrastructure, although many factors prove that the current networks are more than sufficient.[48] "This only allows certain factories to continue extracting and transporting fossil fuels, not to mention the climate impacts of methane leaks from gas extraction and transportation," criticizes Pascoe Sabido of the think tank Corporate Europe Observatory.

Another transportation option is via gas tankers, which are vessels dedicated to transporting gas in liquid form. For transport in a liquid state, cryogenic tanks that keep gas at -253°C are needed, thus demanding a considerable amount of energy and heavy infrastructures.[49] "This mode of transportation is extremely expensive. Many studies say that it is unlikely to be implemented," said Jörg Haas from the Heinrich Böll Foundation in Berlin.

If green hydrogen is transported by ship, it will be in the form of ammonia, highly coveted by factories. "However, all these transformation processes are very energy-intensive and sometimes even polluting," warns Pasco Sabido.

# Ecological and Social Costs of Green Hydrogen

Large-scale green hydrogen production requires significant mobilization of several types of resources, along the whole production line. To date, only a preliminary study on "Opportunities of Power-to-X in Tunisia", commissioned by GIZ, briefly addresses the environmental and social risks that a massive implementation of renewable energy production modules could cause. A study that entails more indebt sectorial assessments is needed to better understand the environmental and social risks of the development of this new sector or its limits. It is particularly important to assess the amount of water needed to be desalinated for this purpose, the amount of desalination waste produced and how this relates to other ambitions to use desalinated water in other areas such as industry, agriculture and the tourism

44 During a meeting in April 2022

45 Plan to reduce by 50%, by 2010, the inputs of BOD from industrial origin in the Mediterranean region UNEP/MAP Report, 2004.

46 Belhassen Chiboub expressed during a seminar on 28 June 2022: Green hydrogen replaces oil and our ambition is to export it to Europe

47 During a meeting in March 2022

48 The hydrogen hype : gas industry fairy tale or climate horror story ?, Corporate Europe Observatory, 07/12/2020

49 Storage: a major hurdle for the hydrogen industry, 08/07/2021

sector. (see also recommendations below).

According to our interviews with the Ministry of Energy, no environmental or social impact studies are being planned ahead of the implementation of the National Green Hydrogen Strategy. "These will only be required at the time of project implementation," claims a senior official at the Ministry of Energy. "There are truly no risks linked to green hydrogen. The donors have requested these studies, but these projects do not entail any negative impact on the environment a priority," he assures[50].

In reality, nothing is less certain. Multiple studies[51] warn of the repercussions that such projects could have on natural resources, in the case of Tunisia it is primarily water as a very scarce resource and its availability is threatened even further by climate change.

# "We Expect Mega-Projects": Facing Land Issues

For the installation of renewable energy sites needed for hydrogen production, the land issue is a particularly sensitive matter in Tunisia. "When we talk about green hydrogen, we are talking about mega projects, which will cover huge areas," warns an energy expert at GIZ. "For example: a Frankfurt-Tunis flight powered by green hydrogen will require the use of 1GW of renewable electricity. This represents 1500-1800 ha surface area needed for solar panels to produce this amount of energy, which is a considerate amount of space to be reallocated for this type of use.

Despite an official rhetoric that aims to reassure by guaranteeing the inclusion of local populations in projects located on their land, the current framework tends to encourage foreign investments in marginalized areas, exploiting land resources without appropriate compensation for local communities. In Tunisia, the few existing renewable energy projects have left a bad taste for the hosting populations. In Borj Essalhi, a fishing village located at the northern tip of Tunisia, locals have been fighting for over ten years to obtain compensation, following the installation of the first Tunisian wind farm in the 2000s on their land. Some of the land for the installation of wind turbines has initially been owned by the villagers. They used it for agriculture. However, for the wind farm project, these lands have forcibly been appropriated by the State and registered under the authority of the Directorate General of Forestry.[52]

The Borj Essalhi case is current proof that to this day, the participation and rights of local communities, as well as the environmental sustainability of renewable energy projects, are far from being guaranteed when it comes to business interests. As Tunisia prepares to host renewable energy projects of an entirely different scale, the impact on social and environmental rights of local communities should be closely monitored, both on paper and in practice.

At Segdoud, a small village in the Gafsa region, a mega solar project with the capacity to produce 100 MWh will also see the light by 2023, carried out by the French-Moroccan consortium Engie-Nareva. To provide these investors with the 150 hectares[53] necessary for the installation of solar panels, the Tunisian government arbitrarily seized originally collective land, thereby turning them to State property. The Redeyef collective land management council, which is normally in charge of these lands, is laying claim to their possession and seeks to take them back.

Thus, some "green" energy projects have led to land dispossession and reduced access to grazing and agricultural land for many local communities. Therefore, land grabbing has aggravated the marginalization and poverty of these populations, in the name of energy transition, thus fuelling conflicts and pushing people to migrate.[54]

# Green Hydrogen: A Water-Intensive Resource

Hydrogen is produced by water electrolysis, which consists of passing an electric current through pure water to break down its molecules (H2O) and extract hydrogen.

"From a purely stoichiometric approach, in order to produce 1 kg of hydrogen 9 kg of water is needed. However, after taking process inefficiencies and the process of water de-mineralization into consideration, the typical water consumption amounts to between 18-24 kg of water per kilogram of hydrogen"[55]

50 During a meeting in April 2022

51 Morocco, Egypt, Algeria: assessing EU plans to import hydrogen from North Africa,Transnational Institute, May 2022; Pastoralism and large-scale Renewable energy and green hydrogen projects, potential & threats, Heinrich Böll Stiftung, May 2022

52 Borj Essalhi: The High Costs of Wind Turbines, Inkyfada, 20/04/2021

53 The equivalent of 105 soccer fields

54 Pastoralism and large-scale Renewable energy and green hydrogen projects, Heinrich Böll- Stiftung, 2022

55 Analysing future demand, supply, and transport of hydrogen, European Hydrogen Backbone, June 2021.

Tunisia is among the driest countries in the Mediterranean basin. With 380 $m^3$ of water available per capita per year, the country is considered well below the critical threshold of 500 $m^3$ set at the international level to be considered a country with extreme water scarcity. Desalination by reverse osmosis[56] is therefore considered the only solution to supply the water needed for large-scale green hydrogen production. "The desalination process will also be powered by renewable energy," confirms GIZ.

However, the ecological repercussions of desalination raise several questions. Various international studies point at the disadvantages and impact of desalination, which turns out to be a more polluting, more or less energy-consuming (depending on which technology being used) , and costly technique then initially assumed. One litre of desalinated water requires two litrers of seawater.[57] The liquid discharge resulting from this process, the brine, contains a very high salt concentration.

According to a study conducted by the United Nations Institute for Water, Environment and Health (UNU-INWEH),[58] desalination plants produce more brine than freshwater plants, discharging nearly 142 million cubic meters of brine into seas and oceans every day, compared to daily freshwater production of less than 96 million cubic meters. The same study claims that the problems associated with brine discharges have been underestimated by 50%, and that when mixed with chemicals designed to prevent the systems from clogging, the brine becomes toxic and causes even more serious pollution in marine ecosystems, along with the rise in water temperature already caused by climate change and existing pollution.

"The degradation of biodiversity resulting from these discharges is irreversible," warns Tunisian water expert Raoudha Gafrej. "Marine ecosystems are accustomed to a concentration of about 30g of salt per liter, while the concentration of brine can exceed 100g of salt per liter. Imagine the impact this could have if these discharges last for decades, with desalination sites spread throughout our coastline", she said. Brine dilution and diffusion or mixed techniques can reduce this risk, but nothing guarantees that they will be respected. Furthermore, we think that there is a need to determine the limit to brine disposal into the sea without doing harm.

It would be extremely important to study in great detail the quantity of water needed to be desalinated, the amount of brine being produced and consequently exposed along with the anti-clocking chemical residues per coastal area to assess the feasibility and economic viability of larger investments into the production of green hydrogen in Tunisia. This is even more vital considering that the vision is mainly to export to Europe, and not for domestic consumption.

## Green Hydrogen: A Greenhouse Gas Twice More Powerful than Anticipated

Lastly, a new concern has recently been raised regarding hydrogen's impact on the climate. While the development of this new fuel is presented as the optimal solution to keep global warming at 1.5°C, there is a new concern as to the significant greenhouse gas emissions associated with the transport of hydrogen.

A recently published study[59] by the UK Department for Business, Energy and Industrial Strategy (BEIS) found that hydrogen is a greenhouse gas twice as strong as previously assumed. In reaction to other greenhouse gases present in the atmosphere such as methane or ozone, the hydrogen molecule would increase its global warming potential (GWP). Therefore, "any hydrogen leakage will indirectly lead to increased global warming," the report warns.[60]

The hydrogen molecule, the smallest of the gaseous molecules, is very volatile and can therefore easily escape from facilities such as pipelines and conduits, already considered for its transport. It is difficult to make tanks and pipes containing hydrogen completely leak proof, especially when the hydrogen is compressed at very high pressure. The other risk associated with hydrogen leaks is the high flammability of this gas, which has already led to accidents at hydrogen distribution stations.

56 Reverse osmosis is a process used to separate water and dissolved salts by means of semi-permeable membranes under pressure.

57 As water scarcity increases, desalination plants are on the rise, Yale Environment 360, 11/06/2019

58 The state of desalination and brine production: A global outlook, Science of the total environments, 20/10/2018

59 Atmospheric implications of increased hydrogen use, UK Department for Business, Energy & Industrial Strategy, 08/04/2022

60 The global warming potential or GWP is a conversion factor that makes it possible to compare the influence of different greenhouse gases on global warming.

# Exporting Green Hydrogen produced in Tunisia: A neo-extractivist ambition

Although green hydrogen is emerging as a much more desirable alternative to other polluting options such as blue or grey hydrogen (from capturing CO2 and natural gas, respectively), its production, largely planned outside Europe's borders and on its behalf, raises questions.

For Hamza Hamouchene, an energy researcher at the Transnational Institute in London, the relocation of parts of Europe's energy production is "green neo-colonialism", as the social and environmental costs of these projects are rarely considered. Apart from the usual land grabbing practices, this "extractivism" is based on the overexploitation of water as a key natural resource for the survival of Tunisia's future generations.

Even in case the water used for the hydrolysis is generated by desalination process (as a polluting and costly it may be), and therefore does not pose a direct competition with agricultural or consumer water, it remains a risky enterprise for social and environmental justice, and more so if primarily destined to be exported to world markets. This had once more been confirmed by a high official of the Ministry of Energy during a workshop on energy transition in October 2022.[61]

"Renewable energies are not immaterial, they rely on the use of resources to build them (rare metals), implant them (land) and maintain or produce them (water) without the local communities benefiting. This is why these projects are extractivist," says Benjamin Schütze, researcher at the Arnold Bergstraesser Institute in Freiburg (Germany) and author of a study on the socio-economic impacts of solar energy in the Middle East and North Africa.[62] The pursuit of this extractivism, based on the over-exploitation of natural resources for export to world markets, seems to be the main modus operandi of the Tunisian authorities, who perceive the opportunity to generate foreign exchange without sufficiently considering the social, environmental and other consequences of such projects.

While the gas exporting option seems to prevail in Tunisia, this new plan for green hydrogen risks to reproduce the same approach taken to fossil fuel extraction being in place for decades, through which European countries benefit from the resources of their poorer neighbours to satisfy their own interests. "The countries with which the EU negotiates energy agreements perpetuate the exploitation of their resources for the sole benefit of the EU energy model,"[63] with little consideration to energy needs of the host countries, their social and environmental costs, and the financial debt resulting from these projects.

In Brussels, green MEPs and activists took up the cause against the EU's green hydrogen roadmap. Sascha Müller-Kraenner, executive director of Deutsche Umwelthilfe, one of Germany's powerful environmental associations, described the European strategy as "a Christmas present to the gas industry."

Therefore, the current European strategy for green hydrogen seems to perpetuate the same extractive model, blocking the transition towards a more democratic and sustainable energy system. As a multitude of examples of development projects in Tunisia and elsewhere show, civil society and local populations are very rarely - even never - involved or consulted in these projects often limited to public-private partnerships.[64]Despite what private actors call 'very heavy' obligations for environmental and social impact studies, risk forecasting should not be started only once the strategic direction has already been taken. Moreover, consultations with local stakeholders should not be restricted to local institutional actors but should extend to the affected poeple themselves.

# For Fair and Equitable Green Hydrogen

The development strategy of green hydrogen and the needed solar and wind power capacity in the Global South – especially in Africa – could be a significant opportunity to meet local needs and to decarbonize some industrial sectors, if only the plans are well thought through and planned out based on multi-stakeholder consultations. For suppliers in the energy market, the new developments could provide jobs and sustainable income, provided sovereignty of the population vis à vis these projects is maintained and benefits

61 Tunis accueille le 1er Salon de la transition énergétique international, Kapitalis, 6 octobre 2022

62 Benjamin Schuetze, The Socio-Economic Effects of Solar Energy in the Middle East and North Africa, , Friedrich Ebert Stiftung, 2021

63 The hydrogen hype : gas industry fairy tale or climate horror story ?, Corporate Europe Observatory, 07/12/2020

64 Debt-stricken Tunisian farmers 'ignored' as government rolls out solar megaproject, Climate Home News, 11/02/2022

are shared. However, the majority of investment projects in different sectors currently underway are export-oriented and mirror the old exploitative economic relations and terms of trade. There exist the risk that hydrogen production will come at the expense of national development efforts, such as carbon neutrality or basic services such as electricity or water for livelihood sustenance.

Tunisia has nine cement plants, whose energy combustion generates the largest CO2 emissions in the country. The transportation sector is also highly energy intensive and represents a significant source of greenhouse gases, which the Ministry of Environment seeks to decarbonize rapidly by 2030.[65]

However, given the orientation the Tunisian government's green hydrogen strategy currently appears to take, does not seem to address these highly important local issues.

A just and democratic transition should be able to empower households and communities to produce their own electricity based on small-scale renewable projects, reducing capital needs, and fostering the development of local actors that generate jobs. Globally, many civil society actors have embarked on an endeavour to reclaim public ownership of services, regaining control over local resources, and directing them to communities, as is the case in South Africa.[66] In Tunisia, a network, the Working Group on Energy Democracy, is being established gathering various operational actors and civil society, promoting concepts of democratic participation and ownership as well as energy sovereignty in communities where mega projects are planned.[67]

In light of the resulting resource control and unequal relationships, privatization should not be considered in the current Tunisian context. While foreign private investment is needed, it often tends to exclude local companies. Basing its selection criteria on experience and available financial resources, the Tunisian government most often calls on foreign companies that have already developed large-scale projects elsewhere.[68] Furthermore, the liberalization of the renewable energy sector in its current state risks the withdrawal of the Tunisian government as the key regulator for the benefit of foreign investors, which primarily want to export while neglecting the national energy security of Tunisia.

By promoting the installation of renewable energies at a local level, these projects would provide more rights, but also autonomy to local communities, guaranteeing greater energy security.[69] In Tunisia, the self-generation on rooftops allows individuals to produce their own green electricity, but to date it is not sufficiently encouraged or made public. As an alternative to public-private partnerships, the Tunisian Platform of Alternatives, together with trade unionists from STEG, suggest to the communities of southern Tunisia the creation of energy cooperatives, through which citizens would be masters of the energy produced on their land. Inspired by the social and solidarity economy model through self-generation, the idea is to access a credit line that would allow them to build their own solar power plants, and to sell the electricity surplus to STEG.

An equitable production of green hydrogen would therefore require that the decarbonization objectives of exporting countries – in parallel with the needs of their populations – be the starting point of a sustainable strategy, without forgetting the historical responsibility of (currently) developed countries in the climate crisis.[70] Furthermore, the "clean" energy projects to be implemented are not without risk, as described in this report. It is imperative that transparency mechanisms and guarantees for local populations are established.

65 Carbon neutrality and climate change resilience strategy for 2050

66 Community-led socially-owned renewable energy solutions - A learning process, Gourndwork, 08/04/2022

67 "C'est notre soleil" : À Segdoud, la lutte pour la souveraineté énergétique ("C'est notre soleil": The fight for energy sovereignty in Segdoud), Inkyfada, 22/04/2022

68 ' Chafik Ben Rouine et Flavie Roche, Renewable' energy in Tunisia: an unjust transition, Transnational Institute, 31 March 2022,

69 Ibid

70 Fair, Green Hydrogen?, Rosa-Luxemburg-Stiftung, 04/2022

# Recommendations for Policymakers:

## General recommendations for decision makers:

- Green hydrogen production has to follow strict social and sustainability standards and respect human rights.
- Green hydrogen production should be oriented towards the prioritization of local value creation and access of local users to energy supply.
- Green hydrogen production shall not compromise the national renewable energy transition strategy or national de-carbonization goals in general.

## Recommendations for Tunisian decision-makers:

- Developing standardized national and regional stakeholder (communities, independent researchers, civil society) consultation processes enshrining the principle of prior and informed consent, which particularly include local land users, moving users and other affected people as integral part of a Tunisian green hydrogen strategy.
- Guaranteeing the right of local communities to say no to renewable energy projects on their lands, while investing early stage into transparency and information sharing and to plan a win-win scenario and benefit sharing with the locals to win their support and avoid conflict.
- Establishing a national framework that defines the parameters of local community participation and benefits (monetary or other) from renewable energy facilities.
- Ensuring that communities using the land have legal support to negotiate with investors, energy companies or relevant stakeholders and access to independent mediation in case of conflict.
- Considering alternatives to the public-private partnership model, encouraging and facilitating the financing of decentralized energy cooperatives or public-community-partnerships (public-public-partnerships) by keeping the size of plants and potentially negative impact manageable and network such smaller units for larger capacity provision.
- Ensuring better coordination between the Ministries and relevant bodies already in the strategy building process to harmonize efforts and enforce cohesion of relevant actors and their particular goals.
- Establish a map of sites potentially concerned by the installation of green hydrogen production projects and inform early stage if considered a viable option.

# Recommendations for international development partners:

- Commissioning an in depth study on the total amount of water required for the production of one kilogram of green hydrogen in Tunisia, the brine and toxic waste residues to be handled if desalinated water is to be used and exploring the possibility for hydrogen to be alternatively generated from wastewater.[71]

- Assessing ecological risks by conducting environmental impact studies that inform the development of the national GH2 strategy.

- Countries that import hydrogen should be required to certify that the green hydrogen procured comes from projects that meet international human rights standards.

71 Hydrogen from wastewater by photocatalytic and photoelectrochemical treatment. Rioja-Cabanillas et al, January 2021.

**Heinrich Böll Foundation**

The Heinrich Böll Foundation is a catalyst for green visions and projects. We share the ideas of the German political party “Alliance 90/Greens”, while maintaining organisational independence. We work with project partners in over 60 countries and currently maintain 34 international offices, including in Tunis. We defend human rights and work towards a healthy environment for future generations.

---

**About the Arab Reform Initiative**

The Arab Reform Initiative is an independent Arab think tank working with expert partners in the Middle East and North Africa and beyond to articulate a home-grown agenda for democratic change and social justice. It conducts research and policy analysis and provides a platform for inspirational voices based on the principles of diversity, impartiality, and gender equality.

---

contact@arab-reform.net
Paris - Beirut - Tunis