

Insights Report

lab of tomorrow #20: Renewable energy and energy efficiency in Tunisia

*How might we improve energy efficiency and the use of
renewable energy in industry and services in Tunisia?*



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1. Introduction

Globalization has intensified economic and social relations worldwide and has connected the world even more. As a result, topics such as climate change and environmental degradation are issues that can no longer be negotiated or resolved at the national level alone. Interaction and cooperation between different countries and multi-layered stakeholders are becoming increasingly important for solving complex and global challenges. Especially the phase out of fossil energy and the switch to renewable energy is key for the reduction of greenhouse gas emissions. Development (cooperation) and business activities can have a joint effect here: Companies in particular play a key role in finding technical and innovative solutions and can act as solution providers in general.

However, companies require favorable market conditions in order to get active on a long-term basis. Business activities can also be an important contribution to achieving the United Nations Sustainable Development Goals (SDG). They explicitly call on the private sector to make a greater contribution to solving global challenges and emphasize the complementarity between business and development through the right framework conditions. With an estimated market potential of 12 trillion USD, the SDG offer a strong business case for private investments in sustainable development (Business & Sustainable Development Commission, 2017).

Renewable energy and energy efficiency is also anchored within the SDG (SDG 7: Affordable and clean energy) and can act as an important pillar to achieving the Agenda 2030, set by the United Nations. On the one hand, the current reliance on fossil fuels is unsustainable and harmful to the planet. Implementing new energy and energy efficiency solutions as fast as possible is essential to counter climate change, one of the biggest threats to our own survival. On the other hand, there is also great economic potential here: In order to change the way how energy is produced and consumed, new and innovative solutions need to be found. In many countries, the use of renewable energy as well as energy efficiency processes are not implemented yet, leading to untapped economic potential. The *lab of tomorrow #20* tries to contribute to the SDG, while simultaneously making use of this untapped economic potential.

Figure 1: The Sustainable Development Goals



Source: www.wasteaid.org

Tunisia has set itself the goal of covering around a third of its energy needs from renewable sources by 2030. In their *Intended Nationally Determined Contribution*, Tunisia committed itself to reduce energy intensity by 30% in addition to producing 35% of their electricity supply from renewable energies. In this context, also green hydrogen from renewable energies will play a vital role.

Considering these circumstances, the *lab of tomorrow* in Tunisia aims to create innovative solutions in the fields of energy efficiency, generation of renewable energies and the production of green hydrogen. These new business models, which are developed in a collaborative way between Tunisian and European companies, try to address the challenge of increasing energy efficiency e.g., in the sector of HVAC (heating, ventilation and air conditioning), building insulation, the cement-, fertilizer-, food- and ceramic industry, tourism, or the reusage of residual heat in industrial zones. The newly developed business models can help in reducing the overall energy dependency of Tunisia, while simultaneously creating new and sustainable business opportunities for Tunisian and European companies.

To improve energy efficiency as well as the use of renewable energy in Tunisia and to develop innovative approaches with the private sector, **ICEP/corporAID** and the **Greentech Valley Cluster**, together with its partners, have launched the second Austrian *lab of tomorrow* process (“lot”) in 2022.

To learn more about the topic and to better understand the local conditions, interviews with experts, institutions as well as companies were conducted. The primary aim was to identify

challenges and market potential in Tunisia in the field of renewable energy and energy efficiency. In addition, intensive desk research was conducted as well. The purpose of this document is to provide an overview of the *lab of tomorrow* as well as to give insights into the topic of renewable energy and energy efficiency in Tunisia. Furthermore, research results are outlined, and potential market opportunities presented.

2. The *lab of tomorrow*

A *lab of tomorrow* is a business design and incubation program for new sustainable businesses in emerging markets. To this end, the *lab of tomorrow* acts as a catalyst for the development of tailor-made, innovative business solutions for local SDG challenges over a period of 9-12 months and facilitates profitable cooperations, owned and driven by the *lab of tomorrow* participants. The *lab of tomorrow* was originally initiated by the German Federal Ministry for Economic Cooperation (BMZ) and is a novel way from the German development cooperation to engage the private sector. For this purpose, the *lab of tomorrow* provides a process and certain tools that enable entrepreneurs and companies from emerging markets and the European Union to jointly seize business potentials.

What is special about a *lab of tomorrow* process is not only the use of design thinking methods to create innovative solutions, but also the strong multi-stakeholder approach, where businesses, academia, non-profits and experts from different sectors and countries work together.

So far, nineteen *lab of tomorrow* processes have been initiated by the German development cooperation. They include for example the reduction of plastic waste in Thailand or the implementation of easier access to medicines and diagnostics with drones to rural areas in Kenya. An overview of these projects can be found here: <https://www.lab-of-tomorrow.com/>.

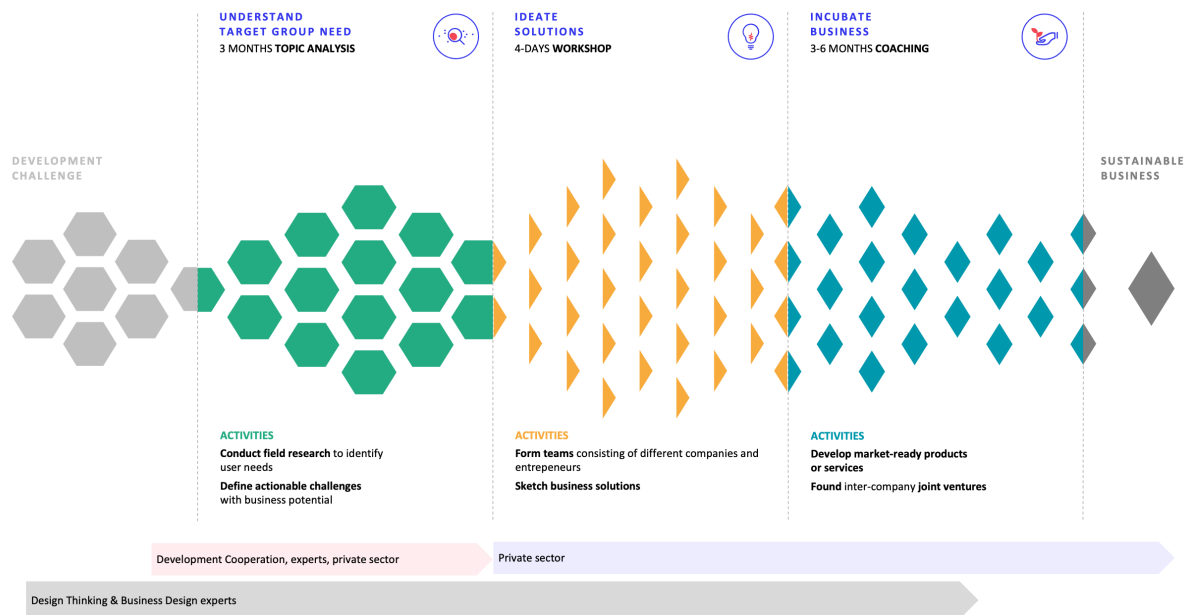
Some key facts about the *lab of tomorrow*:

- The *lab of tomorrow* aims to **create impact** and to help reach the Sustainable Development Goals (SDG) by **economic development**
- The *lab of tomorrow* facilitates a **business development & incubation program** at the interface between sustainability and business/entrepreneurship
- The venture teams will be **supported throughout** the whole process by development cooperation, design thinking experts, the public sector, civil society, and academia
- The *lab of tomorrow* has **no commercial interest of its own** in the conduction of the innovation process

2.1. The *lab of tomorrow* Process

As Figure 2 shows, a *lab of tomorrow* process contains five different phases in which participants are enabled to realize profitable business ideas with sustainable impact.

Figure 2: The *lab of tomorrow* process



Source: Deutsche Gesellschaft für Internationale Zusammenarbeit

The whole process is set for a duration of about 9-12 months. The first step (the grey area) is to form a *lab of tomorrow* project team and to identify a specific challenge or unmet need in an emerging economy.

During the second phase the focus is on user-centered research to deepen the understanding of the challenge, its underlying causes and inherent business potential (the green area). Therefore, the main challenge is split into 3-5 different business opportunities, where each business opportunity focuses on another aspect of the main topic. At the same time, the aim is to provide information about the *lab of tomorrow* process and to select suitable stakeholders such as companies, institutions, or academia within the application process. Depending on the profile and business focus of the stakeholders, they apply for a suitable business opportunity. For each business opportunity, working teams are created, consisting of approximately 4-9 participants.

Afterwards – at the heart of the process – the selected participants join the process, which happens during the *Ideation Sprint* (the yellow area). The *Ideation Sprint* is a three to five-day workshop in the selected country, where all participants come together under the guidance of design thinking coaches, creating innovative solutions for their chosen business opportunity. Each team is supported by experts throughout the process.

Subsequently, the *Incubation Phase* starts (the blue area). The *Incubation Phase* consists of two parts: Phase one starts immediately after the *Ideation Sprint* and focuses on the translation of the workshop results into business life. Coaching and consultancy on intercultural teambuilding, funding opportunities and financing is another integral part in the first weeks. The second phase of the incubation contains consultant support for roll-out and investor networking if needed.

Finally, the teams bring their newly developed products successful to the market and contribute at the same time with their sustainable business solutions to the SDG (last section in Figure 2).

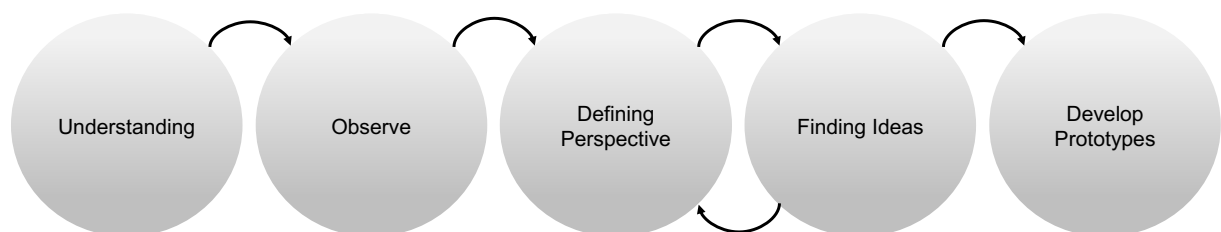
2.2. The Method of “Design Thinking“

Design thinking is a systematic approach to complex problems from all areas of life. Design thinking methods are used throughout the whole *lab of tomorrow* process - starting from research and its evaluation as well as during the *Ideation Sprint*. Design thinking is used where new and innovative solutions are needed: Complex problems need complex thinking and especially various perspectives. Design thinking therefore puts a strong focus on heterogeneous teams.

The aim of the *lab of tomorrow* process is to find solutions that are convincing from the user's point of view on one hand and market- and product-oriented on the other hand. The design thinking process is modeled on the work process that designers intuitively follow. It leads teams through five distinct phases in iterative loops:

1. **Understanding:** In the understanding phase, the team stakes out the problem space.
2. **Observe:** In the observing phase, participants look outwards and build empathy for users and stakeholders.
3. **Defining perspective:** This phase is about defining the point of view. Insights gained are compiled and condensed.
4. **Finding ideas:** In this phase, the team first develops a variety of possible solutions and then commits to one idea/approach. It is important to focus on one solution.
5. **Develop prototypes:** The prototyping that follows is used to develop concrete solutions that can be tested on the appropriate target groups.

Figure 3: Phases of the *lab of tomorrow*



Source: Author's own depiction

2.3. The *lab of tomorrow* in Austria

For the *lab of tomorrow* #20, Tunisia was chosen due to the commitment to transform its' energy generation and -sourcing towards more sustainable forms of energy. Additionally, the improvement of energy efficiency and the use of renewable energy in industry and services offer great opportunities for combining foreign trade with international development and it can positively enhance private sector engagement. New and innovative solutions in the energy sector can potentially be scaled up to other regions and countries in Northern Africa. Considering all these aspects, the challenge of “*How might we improve energy efficiency and the use of renewable energy in industry and services in Tunisia?*” was chosen by the project team.

2.4. The Implementing Organizations and Partners for the *lab of tomorrow*

- **ICEP/corporAID**

corporAID is the Austrian platform for business, development and global responsibility and was initiated by the Austrian development NGO ICEP. It supports innovative business-oriented development cooperation and corporate responsibility to create innovative solutions for sustainable global development. corporAID is responsible for the project management and is working closely with the Greentech Valley Cluster on the implementation of the *lab of tomorrow*.

- **Greentech Valley Cluster**

The Green Tech Valley Cluster is a network of companies with a focus on circular and climate solutions in southern Austria. It supports its approximately 300 partners with industry expertise and a wide range of services. The purpose of the cluster is to sustain and continuously strengthen the position of southern Austrian companies and research institutions and to grow their international know-how- and market position in the field of energy and environmental technology.

- **Austrian Development Agency**

The Austrian Development Agency (ADA) is in charge of implementing all bilateral projects and programs of the Austrian Development Cooperation, also primarily funding the lot Austria project.

- **Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)**

The Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) is operating in the field of international development cooperation and international educational work. So far, GIZ has initiated nineteen *lab of tomorrow* processes. GIZ supports the Austrian *lab of tomorrow* with its extensive expertise, its broad local and worldwide network of experts and internal and external coaching.

- **Austrian Ministry for Climate Protection**

The Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology supports various projects in the field of climate change and renewable energy, including the *lab of tomorrow*.

3. Country Profile Tunisia

3.1. Overview

Capital: Tunis

Population: 11.78 million (2021)

GDP per capita: USD 3.677,9

Languages: French (~ 53%)
Tunisian Arabic (~ 46%)
Berber language (0.1%)

HDI Ranking: 97 (of 191)



3.2. Economy

Economic Profile

Tunisia currently faces several challenges such as low investment and job creation, unemployment and informal employment, a mismatch between skills demand and supply as well as brain drain / outward migration of high-skilled professionals (Germany Trade & Invest, 2022). Regionally, compared to other countries in Northern Africa, Tunisia has an economic competitive advantage due to its high degree of industrialization, a diverse economy and a strong manufacturing sector. The automotive, electrical- and textile industry further add to the country's high competitiveness and value added. Tunisian engineers and technicians are highly skilled and operate at competitive labor costs. Lastly, digitalization offers new ways to make use of these potentials. (IHK, 2022).

Trade

Tunisia's main exports are insulated wire (\$1.83B), textiles (\$1.48B), pure olive oil (\$861M, third largest exporter worldwide), and motor vehicles, parts, and accessories (\$401M). Its' main trading partners are France (\$4.03B), Italy (\$2.36B), Germany (\$1.95B), Spain (\$716M), and the United States (\$565M).

Tunisia's main imports are refined petroleum (\$1.03B), cars (\$467M), wheat (\$467M) and low-voltage protection equipment (\$448M), importing mostly from France (\$2.9B), Italy (\$2.72B), China (\$1.43B), Germany (\$1.4B) and Turkey (\$917M) (International Trade Administration, 2022).

Development Assistance

The gross Official Development Assistance (ODA) received by Tunisia in 2020 was around USD 1.600 Mio., which amounts to 2.6% of net ODA. The donors were European Institutions (\$415.4M), Germany (\$342.1M), France (EUR 241.5M), Japan (\$119.5M), the United States (\$109.6M) and others (around \$400M). Bilateral ODA went into action relating to debt (33%), education (13%), health and population (10%) and other social infrastructures and services (34%) (OECD, 2023).

Other recent financial initiatives are the Tunisia COVID-19 Social Protection Emergency Response Support Project 2021-2024 by the World Bank (\$318M + \$400M additional financing), aims to support poor and vulnerable households affected by the COVID-19 pandemic and to support the social protection system in Tunisia (World Bank, 2022). The Macro-Financial Assistance (MFA I, II and in COVID-19 context) by the European Commission (2x EUR 300M) intends to strengthen Tunisia's economic recovery after terrorist attacks and other security developments as well as the pandemic (European Commission, 2022).

3.3. International Relations

Relations with the European Union

Tunisia plays a pioneering role in international cooperation among the southern Mediterranean states as an association agreement with the EU has been in force since 1998. In 2008, Tunisia became the first country in Northern Africa to achieve tariff exemption for industrial products (except agricultural products and foodstuffs) under the Association Agreement. Tunisia conducts more than two-thirds of its foreign trade with EU countries, mainly France, Italy and Germany. It also positions itself as a manufacturing base for Europe.

Tunisia was granted an extended agreement in 2012 as part of its association with the EU. The agreement provides a free trade area for services, free movement of capital, facilitation of direct investment and improvement of the economic framework (harmonization of legal provisions, reduction of administrative procedures) (European Commission, 2023).

Austrian Development cooperation with Tunisia

In 2012, an Agreement on Financial Cooperation between the Government of Austria represented by the Federal Minister of Finance and the Government of the Republic of Tunisia was concluded (Federal Ministry for European and International Affairs, 2023). Thus, Tunisia is eligible for Austrian soft loans.

In February 2022, Austria agreed on utilizing EUR 5 Mio. from the Foreign Disaster Fund to alleviate humanitarian needs in Ethiopia, South Sudan and Tunisia. Conflicts and crises in Ethiopia and South Sudan have led to considerable migration pressure in Tunisia (Federal Ministry for European and International Affairs, 2023).

German Development cooperation with Tunisia

Germany is increasingly committed to supporting Tunisia. Therefore, the *BMZ 2030 reform agenda* focuses on training and sustainable growth for jobs (Vocational Educational Training, private sector and financial sector development), peaceful and inclusive societies (good governance), climate and energy (renewable energy and energy efficiency) as well as protecting the environment and natural resources (water). In the Emergency COVID-19 Support Program, a some more EUR 43 Mio. were made available to help tackle the impacts of COVID-19 (medical hygiene products, emergency generators, vaccination campaigns) (Federal Ministry for Economic Cooperation and Development, 2023).

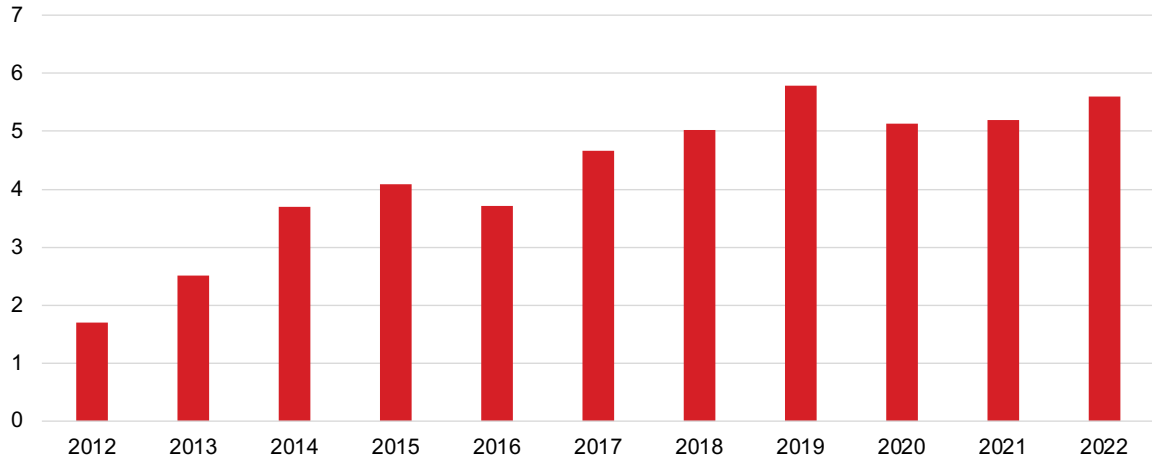
4. Energy Efficiency and Renewables in Tunisia

4.1. Current Challenges

Dependency on foreign energy sources

Tunisia relies heavily on energy imports with up to 60% of energy requirements coming from abroad, primarily in the form of natural gas and refined petroleum products. This is a sharp increase compared to an import rate for primary energy of 7% in 2010. Since then, energy demand is rising continuously by 2% annually, with a small dip in 2020 due to the Covid-pandemic. As can be seen in Table 1, since 2012 the structural energy deficit is increasing, leveling out at 5.6 Megatons:

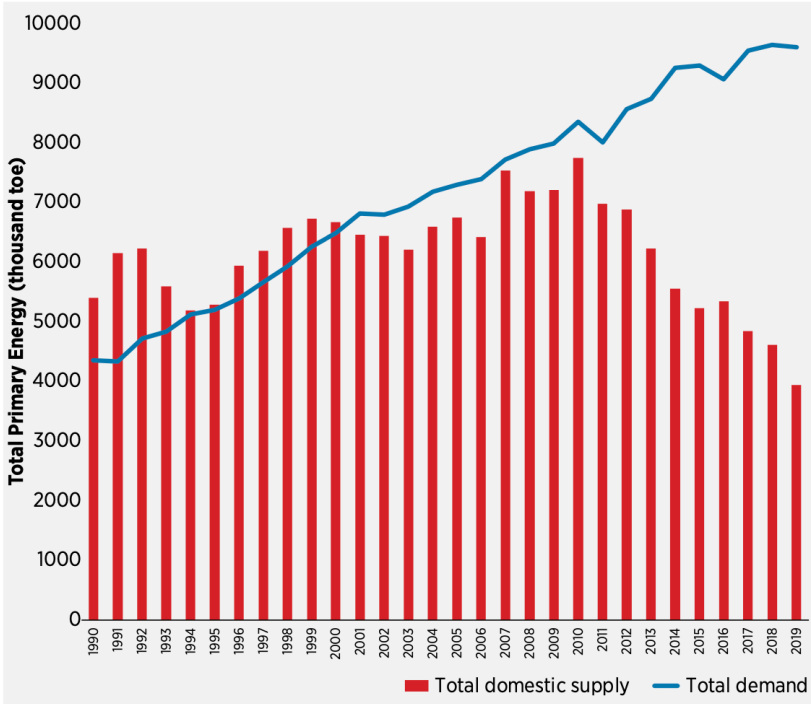
Figure 4: Primary Energy Deficit (Megatons in crude oil units)



Source: German-Tunisian Chamber of Commerce, 2022

Figure 5 shows the gap between energy demand and domestic energy supply, which has been widening considerably for more than a decade.

Figure 5: Evolution of domestic primary energy supply and demand in Tunisia, 1990-2019



Source: IRENA, 2021

About 97% of Tunisia’s electricity is generated from fossil fuels. Without intervention, Tunisia is set to further increase its energy dependency on foreign sources, mainly due to the decline in its own hydrocarbon sources and an overall increase in energy demand. In response to alleviate its energy deficit, Tunisia has begun to diversify its energy mix by heavily promoting the development of renewable energies, mainly in the form of wind- and photovoltaic energy (International Renewable Energy Agency, 2021).

Energy transition

Tunisia is committed to transform its energy generation and -sourcing towards more sustainable forms of energy. In its *Intended Nationally Determined Contribution (INDC)* handed in at the COP21, Tunisia committed to the following goals:

- Decrease of 30% in primary energy demand until 2030
- Share of renewable energy in electricity production, reaching 30% in 2030
- Creation of about 58.000 jobs from 2015 to 2030, 75% of which will stem from energy efficiency measures in the construction industry
- Reduction of subsidies and incentives for cost-effective and climate-friendly investments
- Reduction of greenhouse gas emissions by 48%

These measures are accompanied by a wide array of interventions, such as new project calls in energy generation, liberalization of energy markets by encouraging private suppliers as well as reviewed regulation (IPEMED, 2023).

4.2. Energy Consumption and Renewable Energies in Tunisia

Energy Consumption in Tunisia

As mentioned before, Tunisia is heavily dependent on imported fossil fuels which are used to generate electricity for household and industrial usage. With 74% of total natural gas supply being used for electricity production, this sector is a major leverage for substituting natural gas with renewable energy. 97% of electricity production is dependent on natural gas, while only 3% are generated by renewable sources (German-Tunisian Chamber of Commerce, 2022).

Given Tunisia's economic development and population growth, the demand for electricity is likely to increase steadily over the next decade. This applies to highly urbanized areas in and around major cities in Tunisia, but also industry. With 66% of total electricity usage, the industrial sector is the main consumer of electricity in the high and medium voltage level, followed by the services sector with 12% (German-Tunisian Chamber of Commerce, 2022).

The usage of fossil fuels, including natural gas, oil and liquefied petroleum gas has led to a steady increase in greenhouse gas emissions. They have steadily increased since 1990. With the industrial sector being the second largest consumer of energy, transforming industrial corporations and supporting them in transitioning to renewable energy sources can act as a leverage to decrease carbon emissions while simultaneously improving energy efficiency (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), 2023).

Renewable Energies in Tunisia

Currently, hydrocarbon-based power generation will continue to dominate Tunisia's overall energy supply in the near term. However, there is considerable potential for growth in the wind and solar power generation. The renewable energy law adopted by the Government of Tunisia in 2015 encourages private businesses to generate and use clean energy.

As of 2022, Tunisia has a capacity for renewable energies of 472 MW (244 MW wind power, 166 MW solar power and 62 MW hydroelectric power). To achieve the target of 30% renewable energies by 2035, substantial investments are needed, as only 3% of energy supply stems from renewable sources (International Trade Administration, 2023).

To produce green hydrogen, sufficient infrastructure for the carbon-neutral generation of electricity is required. Ideally, this is achieved by expanding infrastructure for renewable energies but also by improving energy efficiency, to reduce overall energy consumption. The lab of tomorrow is primarily focused on the second aspect.

Due to the extensive solar and wind resources and its proximity to Europe, Tunisia is an attractive location to produce green hydrogen. In early 2022, Tunisia launched the development of its national strategy for green hydrogen aiming to finalize it by 2024. By establishing a green hydrogen economy, Tunisia is reducing its greenhouse gas emissions and thereby promotes low carbon development.

4.3. Key Actors

Public Sector and Ministries

There is a range of public institutions that act as important stakeholders in the field of energy production and energy efficiency. The following institutions are central partners, as they set the regulatory framework for businesses to operate in (German-Tunisian Chamber of Commerce, 2022):

- **STEG (Société tunisienne de l'électricité et du gaz)**

State power utility company STEG oversees the production and distribution of electricity and gas in Tunisia. STEG has a monopoly position and simultaneously acts as producer, distributor and seller of energy. It is in control of 92% of Tunisia's installed power production capacity and produces 84% of all electricity. In 2015, a bill passed by the government has improved the integration of private producers of renewable energy, allowing them to sell homemade electricity up to 100% to STEG (International Trade Administration, 2023).

- **MIME (Ministry of Industry, Mines and Energy)**

The ministry is responsible for the development of new energy production sites and overseeing energy usage. It is in charge of analyzing and improving energy efficiency.

- **ANME (l'Agence Nationale de Maitrise de l'Energie)**

ANME is a public agency responsible for implementing energy-saving policies, passed by the Government of Tunisia. It is one of the main and most important institutional actors in Tunisia. ANME has been mandated by the government to set up the *Tunisian Energy Strategy*, including the large-scale *Tunisian Solar Plan*.

- **CSPV (Trade Union of the Photovoltaic)**

The main mission of CSPV is to promote the implementation of photovoltaic energy projects as well as to improve private sector development.

- **CSNER (The National Association for Renewable Energy)**

The National Association for Renewable Energy (CSNER) follows the mission to create and maintain a sustainable market for renewable energies and a strong, nationwide position representing the industry.

4.4. Potential for Economic Engagement

Due to the massive need for diversifying Tunisia's energy supply, as well as for improving energy efficiency, commercial opportunities are numerous, also for international businesses.

New tenders

First, the sale of equipment for power generation to STEG (the national power utility company) such as turbines, is one potential option for commercial cooperation. This may also be relevant for SME who work in the up- or downstream value chain of hydrogen production. Secondly,

several tenders have been launched in the past years, opening up considerable opportunities for investments (International Trade Administration, 2023):

- **2017:** launch of first IPP (Independent Power Producer) projects
- **2018:** Call by the Ministry of Energy and Mines for private projects to build renewable power plants with a total capacity of 1.000 MW
- **2019:** Installation of a pilot smart grid power distribution system of 400.000 smart meters. The project was awarded to several foreign bidders in April 2022.
- **2022:** Launch of a tender for the construction of a combined-cycle power plant with a capacity of 470-550 MW.
- **2023:** Tender for 1.000 MW of solar energy and 600 MW wind energy, launched by the Ministry for Industry, Mines and Renewable Energies.
- **2022-2025:** Plan for additional project calls with an approximate value of USD 3.5 billion by 2030. One third will be wind power and two thirds for solar photovoltaics.

While these projects are rather large-scale, they offer opportunities for smaller companies located in the upstream- or downstream value chain.

Energy Measures by ANME

ANME (Tunisia's Energy Agency) created a program with the mission to accompany businesses in conducting energy audits. An energy audit includes all measures to identify energy consumption within a business. ANME's program includes supporting activities for businesses to implement heat pumps and the certification of an Energy Management System (EMS), according to ISO 50001. For the application of ISO 50001, ANME offers trainings and consulting services for businesses. The activities launched by ANME could open up connecting points for European corporations specialized in executing energy audits. The German GIZ has launched a project to build a pool of Tunisian specialists for energy audits (German-Tunisian Chamber of Commerce, 2022).

4.5. Recent Developments

Reviewed Regulation

In the past few years, the Tunisian government has reviewed legislation to improve conditions for businesses. These measures include the following improvements (German-Tunisian Chamber of Commerce, 2022):

- **Formation of new businesses:** Tunisia has improved the creation of new businesses by creating a one-stop-shop for services needed in the start-up phase of a business. In addition, fees have been reduced as well.
- **Registration of property:** The process of transferring property from one owner to another has been improved. Tunisia also increased the transparency of land administration by publishing statistics that record land transactions in the land registry.

- **Tax payments and -exemptions:** By launching a risk-based tax audit system, the Tunisian government has improved the process of paying taxes. In addition, the government has set up tax incentives for locally manufactured raw materials and semi-finished products used to produce equipment needed in the fields of energy efficiency and renewable energies.

Energy Transition Program

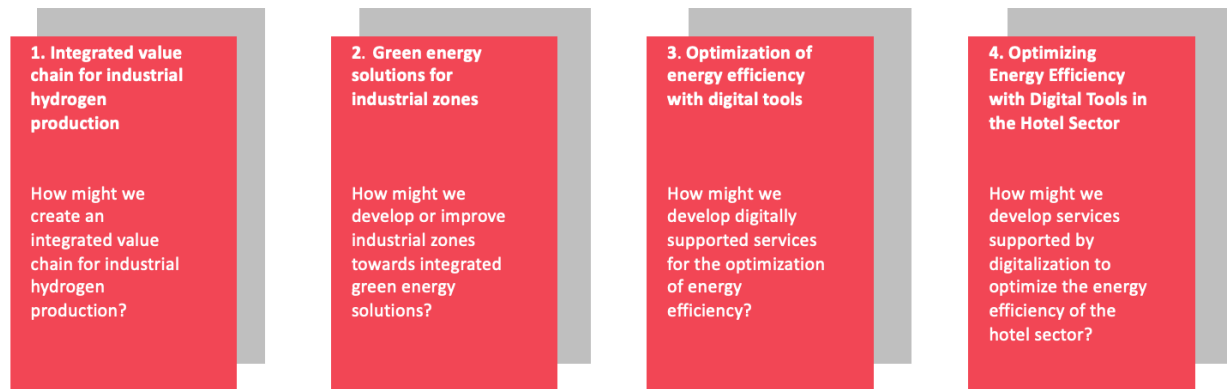
In 2014, the Tunisian government has passed the *Energy Transition Program*, including important measures to improve the conditions for the implementation and production of renewable energies (German-Tunisian Chamber of Commerce, 2022):

- **Action Plan Strategy 30/30:** The action plan includes the diversification of the energy mix to reduce primary energy demand by 30% until 2030. In addition, 30% of electricity production should stem from renewables by 2030.
- **Financial incentives:** These include new incentives for investments in energy, renewables and energy efficiency measures such as direct subsidies for tangible and intangible investments or loans and grants.
- **Energy Transition Fund (FTE):** The FTE is one of the most important tools for improving energy efficiency in Tunisia. It provides new financing options for investments in the area of renewables.
- **SUNREF-Program:** The program has the objective to implement public policies for energy production and environmental protection in Tunisia, by consolidating the market for green financing instruments.

5. Solutions to Explore

The following chapter aims to translate the existing information into practical business opportunities so that they can provide adequate solutions that combine market expansion with sustainable development. These business opportunities are the main pillars for the *lab of tomorrow #20* process, and they break down the overall challenge into more operational topics, as can be seen in Figure 6.

Figure 6: Business Opportunities in the lab of tomorrow #20



Source: Author's own depiction

5.1. Integrated Value Chain for Industrial Hydrogen Production

How might we create an integrated value chain for industrial hydrogen production?

Background

Tunisia's share of renewable energy is currently at 3%. The government of Tunisia plans to substantially diversify its energy mix by improving the conditions to produce renewable energies, primarily in the sector of solar and wind. These resources are abundant and offer great potential for competitive renewable energy production. In addition, Tunisia has improved regulatory, technical and professional conditions for developing a value chain for green hydrogen, with a focus on including the private sector. Several international consortia started projects for the production of green hydrogen, e.g. GIZ ("*Promoting a green hydrogen economy in Tunisia*") or the Bavarian State Ministry of Environment and Consumer Protection ("*Bavarian-Tunisian hub for green hydrogen*"). Establishing a hydrogen value chain can also help in reducing CO₂ emissions and decarbonizing carbon-intensive industries such as steel- and concrete production.

Business Opportunity

The Business Opportunity aims to create new innovative solutions for the up- or downstream value chain of green hydrogen production. Tunisia in collaboration with international partners plans to invest USD 3.5 billion in renewable energies until 2030, resulting in a total capacity of 3.5 GW. This offers substantial market potential for the private sector. Interviews with local experts have confirmed a high demand for solenoid valves, high-capacity boilers and engines for industrial use as well as insulation. Combining this demand with new, innovative ideas can further maximize the positive impact.

Possible Business Cases/Business potential

- Engagement in the up- or downstream value chain for green hydrogen production (construction of composite pipes, tubes, valves, compressors, storage tanks, measuring instruments or energy management systems)
- Treatment and desalination of seawater for the use in green hydrogen production

Possible audience/customers

- Large producers, providers and distributors of green hydrogen
- Industrial clients such as manufacturers of steel and concrete/cement

5.2. Green Energy Solutions for Industrial Zones

How might we develop or improve industrial zones towards integrated green energy solutions?

Background

Industrial zones and -clusters typically consist of a community of businesses, which are active in similar industries and economic sectors. This physical, technical and economic proximity (by working in the same line of business) can be a perfect breeding ground for cooperation within the boundaries of an industrial park, mainly by sharing facilities, knowledge and networks. Currently, the industrial sector is the largest consumer of electricity by using 66% of medium- and high voltage electricity supply. Improving energy usage and efficiency within an industrial zone can therefore work as a leverage to decarbonization, while simultaneously fostering cooperation within the industrial zone.

Business Opportunity

This business opportunity aims to create new innovations for improving energy efficiency in existing or planned industrial zones and/or -parks. There are six industrial zones in and around Tunis, with different specializations, such as biotechnology, pharmaceuticals, communication- or agricultural technologies. In total, 157 zones are registered in Tunisia. They are distributed as follows:

- 35 zones in Greater Tunis covering 1.900 ha, i.e. 38% of the total area.
- 63 zones in the coastal regions covering 1.100 ha, i.e. 22% of the total area.
- 59 zones in regional development zones covering 2.000 ha, i.e. 40% of the total area.

In addition, 69 industrial zones are planned, with a total area of 2.254 ha. Optimizing energy flows within the boundaries of these industrial parks and within the community of companies is the main objective of this business opportunity.

Possible Business Cases/Business potential

- Using residual heat, steam, or wastewater from industrial processes for other purposes
- Upfront integration of energy efficiency measures (architecture, layout of industrial zones, insulation of buildings, etc.) during the development and conceptualization of new industrial parks
- Modernization of existing industrial zones (energy management systems, heat pumps, insulation, heat exchangers, etc.)

- Energy cooperation within the industrial zone
- Software solutions for shared procurement of goods and services

Possible audience/customers

- Developers of new industrial zones and -parks
- Businesses within an industrial zone

5.3. Optimization of Energy Efficiency with Digital Tools

How might we develop digitally supported services for the optimization of energy efficiency?

Background

Unrecognized energy loss and undefined high-energy consuming activities may result in unused energy savings potential. Digitalization offers technologies and tools that can help to collect, monitor and analyze data on energy usage, or to manage energy consumption within a business. This includes areas such as automation, the optimization of load curves, real-time tracking of energy consumption or the measurement of current energy demand, also by using Artificial Intelligence. Public and private institutions are increasingly realizing the potential of improving energy efficiency with digitalization. For example, STEG has recently established the *M&D Center* with the purpose of integrating software and data analytics mechanisms in the industrial sector. The main objective is to use these tools to modernize the electricity generation sector (zawya, 2021).

Business Opportunity

This business opportunity aims to identify new ways to improve energy efficiency within a business, by using digital tools. This could include software solutions, the usage of artificial intelligence or machine learning concepts.

Possible Business Cases/Business potential

- Implementation of smart grids for electricity management
- Software solutions for energy management within businesses
- Solutions in automatization (e.g. remote monitoring, smart grids)
- Monitoring and real-time tracking of energy usage within a business
- Creating energy-optimized workflows

Possible audience/customers

- 3.000 – 4.000 independent power producers (SMEs, hospitals, cafes, restaurants, etc.)
- Industrial corporations
- Private consumers
- Tourist industry
- Industrial parks

5.4. Optimizing Energy Efficiency with Digital Tools in the Hotel Sector

How might we develop services supported by digitalization to optimize the energy efficiency of the hotel sector?

Background Information

Energy supply and management are key economic and environmental issues for the tourism sector in Tunisia. This translates in high energy costs for the hotels that receive tourists, but also high expenses for the State which subsidizes electricity and gas. According to an ANME study on "Consumption patterns and sustainable production in Tunisia", heating, air conditioning and lighting alone account for an average of nearly 60% of a hotel's energy consumption. There are several possible areas of development in terms of energy, notably thanks to the introduction of IoT and ICT helping hoteliers to optimize their operating modes to minimize energy impact through efficient and affordable solutions.

Customer experience and satisfaction are essential elements to be considered when implementing solutions for the optimization of energy efficiency in the hotel sector in Tunisia. Indeed, guests are increasingly sensitive to environmental and sustainability issues and expect hotels to implement concrete measures to reduce their ecological impact. Therefore, the creation of optimized workflows to improve energy efficiency must be thought through in such a way that it does not affect the guest experience and satisfaction within the hotel and contribute to the promotion of Tunisia as a sustainable tourism destination.

Business Opportunity

This business opportunity aims to identify new ways of optimizing energy efficiency with simple tools and connected platforms adapted to the hotel sector in Tunisia while considering the customer experience and satisfaction. These solutions will enable hotels to improve their energy efficiency, reduce their energy supply costs and increase their profitability while providing a quality customer experience.

Possible Business Cases/Business potential

- Implementation of smart IoT networks and energy efficiency/effectiveness detection systems in key consumption areas,
- Smart platform for real-time monitoring and tracking of energy consumption in a hotel,
- Automation solutions (room thermostats, motion sensors, ...)

Possible audience/customers

- Hotels and institutions in the tourism sector

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