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of Education
and Research

ANIS

INDICATOR-BASED ANALYSIS OF
NATIONAL INNOVATION SYSTEMS



Tunisia

Summarising report on the determinants of the Tunisian innovation system with special focus on the sectors “water” and “energy”

 INSTITUTE FOR
INNOVATION AND
TECHNOLOGY





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Preface

As a result of accelerated globalisation and the advancement of high-technology, world-wide competition has risen to new heights. Growth – perhaps even survival – depends even more on innovation than ever. Nowadays, innovation is no longer mainly about science and technology. Industry today has to innovate in other ways since innovation is increasingly driven by co-creation, user involvement, environmental and societal challenges. Key enabling technologies open a completely new dimension of functional attribution of products and processes. Collaborative, global networking and new public private partnerships are becoming crucial elements in companies' innovation processes.

Existing and well-functioning regional or national innovation systems designed to support science- and technology-based innovation have to be further developed in order to be able to meet new challenges from emerging global markets for technology and new forms of global knowledge sharing. Across all countries, governments have recently been involved in research and education; hence a need for new knowledge and new business skills will also have to involve governments. Governments have been continuously calling up to react accordingly to adopt framework conditions to innovations according to their new way of origin. New policy tools have been created to be able to better meet this challenge.

The regional dimension has also become more and more important. Nowadays, regions have built their innovation strategies on regional strengths instead of spreading public investments thinly across several frontier technology research fields and, as a consequence, not making much of an impact in anyone.

Innovation policy has to acknowledge that traditional boundaries between manufacturing and services are increasingly being blurred. The success of manufacturing depends, for instance, very much on innovative services, such as design, marketing and logistics as well as on product related after-sales services and vice versa. More and more service firms are manufacturing goods that build upon or are related to their service offerings or distribution channels. But regional and industrial development policies and tools still do not often take sufficient account of these changes.

Service innovation is in fact a driver of growth and structural change across the entire economy. It helps to make the entire economy more productive and provides fuel for innovation in other industries. It even has the potential to create new growth poles and lead markets that have a macro-economic impact.

The so called systematic innovation policy approach, which has been introduced in many industrialised countries recently, is based on the assumption that a corresponding innovation policy has to improve all determinants, which influence a given sector specific innovation system.

The indicator-based Analysis of National Innovation Systems approach (ANIS), developed by the Institute for Innovation and Technology (iit), includes a comprehensive examination and evaluation of the status of national innovation systems. It is mainly intended for emerging and developing countries for which standard innovation benchmarking and monitoring approaches might not be sufficient as statistical data is often missing or outdated. Policy makers of these countries can benefit from clear advice with regard to overcoming weaknesses within their national innovation system and to identify those determinants that should receive special attention.

We are convinced that the ANIS approach will serve as a fact-based platform initiating discussions on how to improve innovation capabilities and competitiveness.

The conduction of this specific ANIS study on Tunisia would not have been possible without the support of the experts **Prof. Slim Choura** (General Director of International Cooperation at the



Ministry of Higher Education and Scientific Research, Tunisia), **Prof. Brahim Bessais** (General Director of CRTEn), **Prof. Mohamed Ben Youssef** (General Director of CERTE), **Prof. Mohamed Ben Amor** (Director of Laboratory of Natural water treatment, CERTE), **Mr. Zied Kbaier** (Principal Engineer at the Research and Technology Centre of Energy og Borj-Cedria (CRTEn)) and **Mr. Mohamed Kefi** (Scientific Researcher at the Water Researches and Technologies Centre of Borj-Cedria (CERTE)). Owing to their proficiency, it was easy to establish trust among the participants of the study. We are therefore very grateful to them for making this project a success.

Berlin, October 2013

Dr. Gerd Meier zu Köcker

Director Institute for Innovation and Technology (iit), Berlin



1 The Concept of National Innovation Systems

Innovation may be considered as one of the main drivers for economic competitiveness, growth and wealth creation. Therefore, innovation policy has become an important part of economic policy. The design of suitable framework conditions for innovation reflected by the maturity level of an innovation system (at national, local or sector level) has been given high priority worldwide.

Looking back in the past, innovation happened different than today. One of the first (conceptual) frameworks developed for understanding the relation of science and technology within an economy has been the linear model of innovation.

The model postulated that innovation starts with basic research, followed by applied research and development, and ends with production and diffusion. The precise source of the model remains nebulous, having never been documented. This model was taken for granted. All research activities were completely disconnected by the market demands. Once a new idea was considered to be promising, additional developing activities were conducted to further develop the idea towards a prototype. In a next step, the prototype was further developed into a commercial product. Once the product or technology was matured, the inventors started to think how to commercialise the product and technology. It was the time for creating the term of “technology transfer”.

Many technologies and products have been created by inventors and then had to be put on the market. The majority of inventions had never been commercialised, since the functional attribution did not react to the market demands, or there was simply no market need.

In the emerging new nature of innovation multi-faceted skills are required for solving complex challenges. They are needed to support the development of partnerships and collaborative networks and the creation of symbiotic relationships among transnational companies, micro companies and public institutions.

External sources have always been prevalent in the ranking of the most significant sources of ideas. Thus, they comprised a substantial portion of the overall quantity of ideas. Industry started to react accordingly. Today, companies have become more open and transparent and engaged in a dialogue with their customers providing them the access to more information and to share risks with them; and accomplishing it through co-creation with individual customers by involving users in the innovation process. Working together with customers and users in entirely new ways the conditions have been changed in business culture and at company skills too.

The following definitions may help to clarify the concept of innovation and innovation systems:

Innovation may be defined as new solutions adding value to both customers and firms (Nordic Innovation Monitor, 2009). One distinguishes between incremental innovations (e.g. further development of existing products and technologies, often realised by SME without involving any R&D institutions) and radical innovations (completely new



solutions, technologies or products not yet available on the market, usually involving R&D institutions).

A national innovation system may be defined as “a network of institutions in public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies” (Freeman in OECD 1997, p. 10). The main elements of innovation systems are education and research institutes, firms, industrial parks, incubators, governmental institutions. The maturity of an innovation system depends on how these actors are coordinated.

Innovation policy may be defined as the creation of framework conditions aiming at supporting innovation capabilities of companies and public entities (OECD, 1997).

Hence, an innovation system describes the relations between the actors of the different levels of an economy. For an effective innovation system it is crucial that all “parts” of the system, i.e. **policy makers** (those that set the framework conditions on which innovation can develop), **innovation supporters** (those that support research and development activities, and **innovation producers** (those that invent, build and sell), cooperate, communicate, create, exchange and transfer knowledge and thus support dissemination and market penetration of new products and services. Hence, the economic and institutional regime, the information and communications infrastructure, and education are the key enablers of the innovation climate (World Bank 2010). A well-functioning innovation system can influence the country’s economy in a positive way (OECD 1997).

The number of theoretical models, reports and analyses of innovation systems has been increasing since the beginning of the 21st century. Due to the various factors impacting national innovation capacities, the assessment of a country’s innovation system remains a challenging exercise.

For years, economists have tried to identify the reasons leading to the nations’ competitiveness and growth, and as a consequence many reports on innovation systems have been generated. Despite the high quality of these reports which describe the essential features of an innovation system and summarise its main strengths and weaknesses, the benefits in terms of usable results were limited unfortunately. This is explained by the fact that the implemented methodologies did not sufficiently consider the way policy makers think and operate. Recommendations are neither prioritised nor ranked according to their complexity when turned into practice.

Instead of receiving mere scientific models of innovation systems, policy makers especially in emerging and developing countries look for descriptions of an innovation system and clear recommendations of how to improve the functionality thereof including a description of specific measures. The ANIS (Analysis of National Innovations Systems) approach aims at filling this gap.



2 Scope and Methodology of the ANIS Approach

The aim of the following analysis within the ANIS-framework is to provide a screening of the current status of the Tunisian innovation system and its main determinants with special focus on the sectors energy and water technologies. We assume that these sectors are two of the most prevailing sectors that rank high on the Tunisian and European policy agendas.

Besides assessing and benchmarking important determinants of the innovation system, policy makers are often interested in receiving guidance for action. Therefore, the ANIS report provides comprehensive recommendations for improvement. At the end of the report, after having presented the key results, areas for policy interventions are pointed out. These areas may range from those providing a high impact on the national innovation system to those that do not require much public investments or political intervention for a successful implementation. In the following, the methodology of the ANIS approach is presented first in order to give an overview of its core elements.

The major objectives of the ANIS studies are:

- Analysing of existing literature regarding the specific innovation system
- Conducting interviews with experts regarding the specific innovation system
- Evaluating and measuring of the outcomes
- Identifying determinants that have a high impact with little costs
- Formulating recommendations to improve the prioritised determinants

2.1 The three level hierarchy

The study provides an indicator based assessment of many different determinants, each of which reflects one aspect of the complex innovation system. The determinants may be grouped according to a three level hierarchy which includes macro, meso and micro level. Table 1 describes the different dimensions and its actors.

- Macro Level: Innovation Policy Level
- Meso Level:
 - Institutional Innovation Support Level
 - Programmatic Innovation Support Level
- Micro Level: Innovation Capacity Level

Macro Level – Innovation Policy Level

In the macro dimension, national and regional innovation policies influence the framework conditions of an innovation system directly. At that level laws, decrees and regulations, etc. may often be ground breaking, in a positive or also in a negative way. Public investment in innovation directly relies on decisions made at a policy level. However, such political decisions may only influence the framework conditions for innovation and might not turn innovation into practice.



Meso Level - Institutional Innovation Support Level

Institutions operating at meso level are typically technology transfer centres, clusters, innovation service providers and funding agencies. They may be considered as the relevant tools to turn any political decision regarding innovation into practice. In emerging countries such institutions are often publicly owned. They mainly aim at fostering the stakeholders' competitiveness and capability to innovate. Rather than setting up programmes to support innovation, those institutions usually provide in-kind contributions such as training, consultation, conducting applied R&D or products' improvement. These institutions remain a key instrument for improving and encouraging the innovation capabilities of firms, especially in countries where public investment is limited.

Meso Level: Programmatic Innovation Support Level

Programmatic innovation support includes public funding programmes and initiatives which aim at turning innovation policy into practice. This represents the second pillar in improving the innovation capabilities of stakeholders in an innovation system. Such programmes might be managed either by policy makers or by innovation support institutions. Any measures at this level would require significant public investments.

Micro Level: Innovation Capacity Level

The micro level provides an umbrella for the main actors and enablers within an innovation system such as SMEs, entrepreneurs, universities, public or private R&D institutions, innovators or financial organisations.

	Level	Actors	Functionality within an NIS
Macro	Policy	Public authorities, policy makers	Governing and setting up framework conditions of an innovation system
Meso	Institutional innovation support Programmatic innovation support	Institutional innovation support organisations or public funded initiatives / programmes	Institutions and initiatives are tools to turn innovation policies into practice
Micro	Innovation capacity	Firms, academia, educational institutions, etc.	Main beneficiaries of support measures and main producers of knowledge, innovation, technologies, products

Table 1 Levels and actors within a national innovation system



As shown in Figure 1 the ANIS approach is based on the assumption that an innovation system is mainly influenced by 30 determinants¹, each of which reflects an aspect of the complex reality of the innovation system. These determinants are of dedicated interest for our analyses since all of them directly influence the efficiency of an innovation system. They can be influenced and improved by appropriate measures.

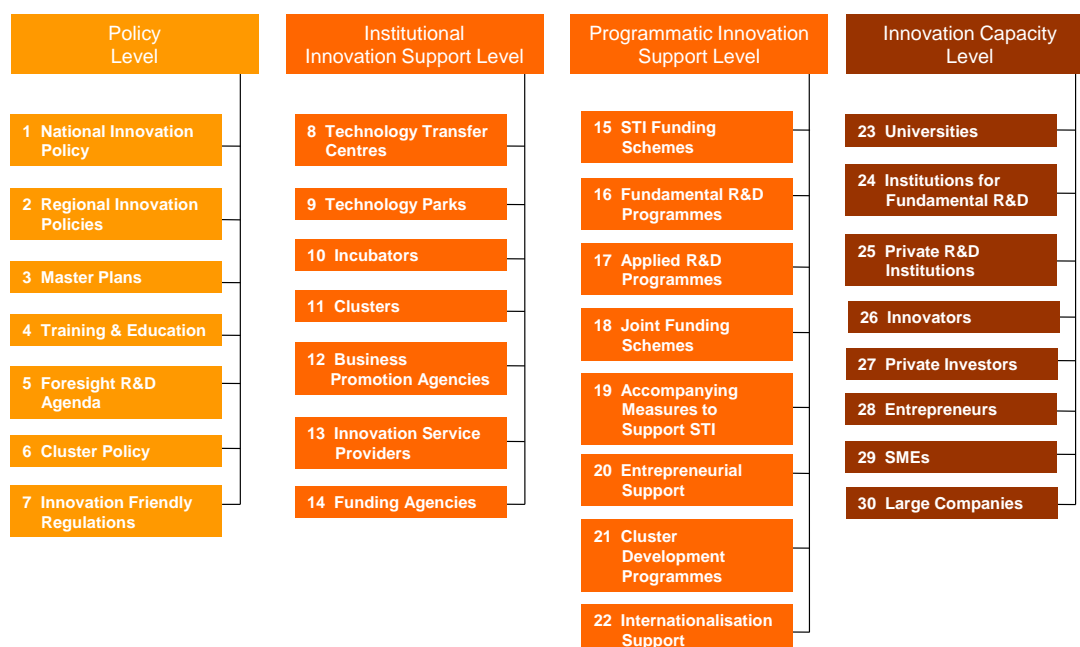


Figure 1 Main determinants of a national innovation system

A comparison between the determinants of these different levels allows the identification of key policy areas requiring a potential intervention to strengthen the innovation system. All determinants within the three different levels can directly be addressed by different measures. Some of them may be addressed in short-term and with low efforts, others may need long periods of time for improvements, combined with significant investments. Improving a certain determinant can have manifold positive impacts.

In order to assess the stage of development of all determinants, we have designed questions (Expert Opinion Survey) for characterising the 30 determinants accordingly. The onsite assessments are done by national experts as well as by the expert team of VDI/VDE-IT as explained below.

2.2 Expert Opinion Survey (EOS)

The model used draws on a wide range of data from the Expert Opinion Survey (EOS). The EOS meets the need for up-to-date and far-reaching data, providing valuable

¹ We are aware of the fact that an innovation system is also influenced by determinants outside of the country. However, as these determinants need a different approach of adjustment, they are not regarded in our analysis.



qualitative information for which hard data sources are scarce or non-existent. The survey is completed by at least 20 national experts per country. We asked the experts to provide their opinions on various aspects of innovation and the innovation environment in which they operate. The data gathered thus provides a unique source of insight and a qualitative portrait of each nation's innovation concept and how it compares with the situation in other countries.

The questions in the study follow a structure that asks the interviewees to evaluate, on a scale of 1 to 4, the current conditions of their particular operating innovation environment. At one end of the scale, value 1 represents the worst possible operating condition or situation and at the other end of the scale, value 4 represents the best conditions. Thus, the interviews consist of questions describing a situation and environment within a well-established innovation system (positive statement) and a contradicting statement (negative statement). The experts are asked to give their opinion whether they

- Fully agree with the positive statement (4 points)
- Partly agree with the positive statement (3 points)
- Partly agree with the negative statement (2 points)
- Fully agree with the negative statement (1 point)
- Statement that this issue does not exist at all (0 points).

It is also allowed to leave out certain questions if the expert is not able to answer. The experts are classified according to their relationship to and responsibility for the four different levels of the innovation system (macro, meso institutional, meso programmatic, micro).

In the following, the main findings from the EOS conducted in Tunisia are described, based on the assessed 30 determinants, and analysed in total.

The experts that were consulted in the context of the present study were identified by the local partner The Tunisian Ministry of Higher Education and Scientific Research. The interviews were carried out with the Expert Opinion Survey in French language, which was adapted to suit to the two sectors energy and water.

2.3 The Indicator Approach

The ANIS approach fits into the new tradition of indicator-based studies relying on quantitative data generated by the evaluation of expert interviews. Such an approach differs from traditional benchmarking studies on innovation performance. The Global Competitiveness Report, the European Scoreboard and the Nordic Innovation Monitor are excellent approaches for measuring or benchmarking innovation-related performance indicators. However, since the statistical base of emerging and developing countries is often insufficient, the Nordic Innovation Monitor is rather intended for well-matured economies than for developing or emerging countries' issues. The Global Competitiveness Report uses a mix of statistical data and expert interviews. However, since it focuses on the competitiveness of nations, the issue of innovation is not sufficiently targeted. Therefore, the Institute for Innovation and Technology (iit) developed the ANIS approach.

Based on the findings of the questionnaire and on the evaluation of the questions we then calculated the appropriate indicators for the respective determinants (see Figure 1). A scale with the following indicators was designed:



- Indicator “1” represents the determinant at its worst operating condition or situation, emphasising that it is poorly developed or non-existent.
- Indicator “2” means that a determinant basically exists and has shown first positive impacts. Nevertheless, there is a strong need to improve its efficiency or functionality.
- Indicator “3” means that a determinant is mature and has shown positive impact on the performance of an innovation system over a long period of time. Nevertheless there is still room for further improvement to reach excellent performance.
- Indicator “4” corresponds to the determinant which is at its best operating condition. Although with improvements might still be possible, this determinant has proved to be strongly developed and well performing over a long period of time.

Indicator values above 3 usually apply to well-developed industrial countries where all determinants are well established and efficient even though some are performing better than others.

Values between 1.5 and 2.5 indicate that the determinant already exists, but need to be further developed. Values below 1.5 mean that a specific determinant may exist but is not yet operational.

2.4 The Comparative Portfolio

The comparative portfolio is an integrated element of the ANIS approach. It consists of the corresponding data of countries having similar comparative economies. According to the Global Competitiveness Report (GCR) of 2010-2011 Tunisia possesses an efficiency-driven economy. The GCR defines three different stages of economies. These are:

- factor-driven economy (stage 1)
- efficiency-driven economy (stage 2)
- innovation-driven economy (stage 3).

According to the GCR, the efficiency-driven countries are characterised through products with better quality, mainly due to more efficient production processes. Economic advancement is achieved through “higher education and training [...], efficient goods markets [...], well-functioning labor markets [...], developed financial markets [...], the ability to harness the benefits of existing technologies [...], and a large domestic or foreign market [...]” (Schwab 2010, p. 9).

In the present study, the determinants of the Tunisian innovation system are benchmarked against the data of Jordan, Namibia, and Indonesia. These countries, just as Tunisia, possess efficiency-driven economies.² Furthermore, we have included

² Of course, the GCR includes more countries categorised as efficiency-driven economies than those mentioned in this report. However, the countries Jordan, Namibia and Indonesia have already been analysed with the ANIS-tool.



Egypt in the comparative portfolio. It is defined by the GCR as transition country³ but we included it in the comparative portfolio because even though Tunisia has been considered as efficiency-driven country, it is clear that due to the revolution and political uncertainties during the last years, it can be considered as a “moving” country between different stages similar to Egypt.⁴ The countries Jordan, Namibia, Indonesia and Egypt have been analysed with the ANIS tool and are therefore chosen as comparative portfolio.

2.5 Data Generation

This report was drawn up based on expert interviews conducted with the help of the Expert Opinion Survey. The data was gathered in April 2013 during a 2-days-workshop with 2 expert groups – one group for the energy sector, one for the water sector.⁵ 40 experts participated in the workshop. 21 experts filled in the Expert Opinion Survey.

The Tunisian Ministry for Higher Education and Scientific Research invited experts from the policy level, the innovation support level and the innovation capacity level in order to join the workshop. The event was opened by the Tunisian Minister of Higher Education and Scientific Research.

The workshop started with a general introduction about the situation of the water and energy sector in Tunisia and in Germany and Europe. With this information the participants received input for the group work that followed. The participants were separated into two groups – one for the energy sector, one for the water sector. In order to familiarise with the scope of the workshop the participants mapped the institutional structures in Tunisia by listing all stakeholder organisations within their sector at policy, support and innovation level (see Figure 6 and Figure 7).

Concerning the energy sector the Expert Opinion Survey (see chapter 2.2) was completed by selected key experts (11 experts in total):

- 9 experts from the innovation support level (thus representatives of public and private institutions support innovations, funding agencies, multipliers, e. g. chamber of commerce, public institutions dealing with energy and water technology related issues),
- 2 experts from the innovation capacity level (thus representatives from the research and industry, being active in the energy and water technology sectors).

³ Transition countries are those from factor-driven to transition-driven countries. Countries in between these two stages have developed some of the characteristics of the efficiency-driven economies but are still struggling with some of the features of the factor-driven economies.

⁴ The latest Global Competitiveness Report (2012-2013) has not included an analysis of Tunisia because of the political unrest and the subsequent break in the data. This is why this ANIS study refers to the data of 2010-2011.

⁵ Please see Figure 6 and Figure 7 for the stakeholders and the appendix for the participants' lists.



Concerning the water sector the Expert Opinion Survey was completed by 10 experts:

- 3 experts from the policy level (national and regional policy makers being active in innovation and / or energy / water technology matters, relevant stakeholders),
- 7 experts from the innovation capacity level.

All key experts were very much experienced in their respective field of expertise and very much familiar with the Tunisian innovation system (in the sectors energy and water).

The following chapters provide an overview of the Tunisian innovation system with special focus on energy and water mainly from the point of view of experts from the innovation support level and innovation capacity level.



3 Tunisia's Economic & Innovation Background

Before moving on to the detailed analysis of the sectors energy and water technologies within the Tunisian innovation system, a brief look at its economic situation will be helpful for understanding the status quo.

Since the Arab Revolts in 2011 and its affiliated economic downturn Tunisia's newly elected government has been active in ensuring political stability and in elevating the economic and social situation by several political reforms. Tunisia aims at transparent processes, good governance and economic welfare (OECD 2012b). Current Tunisian policy making therefore consists of the reestablishment of trust among the participants of the innovation system in order to increase the transparency, enhance the knowledge flows among the stakeholders, and elevate the business climate of Tunisia and thus cushioning its economic downturn. However, Tunisia's gross domestic product growth has declined by 4.2% from 2011 to 2012 mainly due to dropping tourism. As such, Tunisia had a negative growth of around 1% in 2011 (AfDB et al. 2012). Furthermore, investment from abroad has decreased. Another problem is the high unemployment rate among young people, which is currently at 70% of all people under the age of 30. For 2013 a GDP of 45.6 billion US-Dollars and a moderate growth rate of 3.7% are expected (AfDB et al. 2012, GTAI 2012).

3.1 The Water Situation in Tunisia

Tunisia covers an area of 163.610 square kilometres and has a population of 10.8 million inhabitants, whereof 68% live in cities. (AfDB et al. 2012).

Tunisia is located in the north of the African continent and has a 1.300 kilometres coast alongside the Mediterranean Sea (Figure 2). While northern areas are influenced by a Mediterranean climate, the middle and southern inland areas are subject to a more continental climate with hot summers and cold winters. Approximately 40% of the Tunisian territory belongs to the desert Sahara. The temperatures range from minimum 7°C in winter time up to 32°C in summer time. Tunisia has only 24 rain days per year. The volume accounts for 456 mm per square meter on an average and is not evenly distributed in space and time. Droughts and floods pose a severe risk for the regional and national water supply if not minimised by an effective water management system (Louati, M.E.H. & Bucknall, J. 2009).



Figure 2 Tunisia's topographic landscape (Wikimedia Commons, 2009)

More than half of the water supply in Tunisia is provided by the Medjerda basin located in the mountainous northwest of the country (Figure 2). Its valley is the most productive farming area in Tunisia. Since the river has its origin in Algeria, an agreement on the utilisation of this resource has been signed by both states. The northeast of the country is also very fruitful and famous for its olive plantations due to rainy winds from the east. Major groundwater resources in the central and southern arid zones of Tunisia are essential for the existence of 30.000 ha of oases. These oases have to be protected because the groundwater recharge rate in this area is below 15 mm/y, but the oases are increasingly used for irrigation purposes. Most of the groundwater resources have to be shared with the neighbouring countries Algeria and Libya on the basis of a political agreement. Nevertheless, the established Tunisian groundwater resources are growing because better monitoring and exploration technologies have been applied in the last years. Using these resources in a sustainable and affordable manner is challenging under the existing circumstances. More than 50% of the available water in Tunisia is affected by a high salinity (Louati, M.E.H. & Bucknall, J. 2009).

Currently, there are 21 dams operating in Tunisia. They ensure the water supply of the constantly growing urban population especially during droughts. Yet, altogether 80% of the water consumption is caused by irrigation. Despite the scarcity, Tunisia has managed to utilise 95% of its water resources and realised a 100% access to drinking water in cities and an 85% access in rural areas (Hydra Project, 2013). Due to the growing Tunisian population, the changing habitation and lifestyle in cities as well as the poor maintenance of water infrastructures the water consumption jumped to 685 litres per day and capita. Without ambitious efforts to change the current development, Tunisia is facing a serious drinking water problem until 2025 (Global Water Partnership Africa, 2011). Technical measures, such as water desalination, wastewater treatment - currently there are already 98 sewage treatment plants in



operation – and artificial groundwater recharge have been applied in Tunisia since the 1970's and are the only means of choice in the long term. Likewise initial success is noticeable by subsidised water conservation measures in irrigated areas (World Bank, 2009).

In Tunisia, the water sector is managed and controlled by the Ministry of Agriculture and its general directorate responsible of water used for irrigation purposes. Furthermore, two government agencies are involved in the process. These are SONEDE (Société Nationale d'Exploitation et de Distribution des Eaux) that is responsible for the supply of drinking water and the maintenance of the pipelines and ONAS (Office National de l'Assainissement) that is responsible for the waste water management (Pérard 2008). The Tunisian government also supports private investments in desalination projects. Most of them are to produce drinking water for the tourism sector.

3.2 The Energy Situation in Tunisia

The Tunisian population will grow up to 13 million people until 2050. As a consequence the energy demand will further increase. Currently, there is an electricity demand of 14 TWh/y (AfDB et al. 2012). The per capita consumption amounted to 1.400 kWh in 2011. According to the Desertec Power 2050 Connected Scenario, the demand will increase up to 38 TWh/y. The scenario draws a picture for Tunisia using approximately 75% wind power, 20% solar energy and 5% natural gas contributing to the national energy supply in 2050 (Dii, 2013).

Today, the Tunisian energy supply is still dominated by fossil fuels like oil (35%) and gas (63%), which partly have to be imported. Renewable energies accounts for only 2% at an installed capacity of 240 MW wind power and 70 MW hydropower (OECD, 2012b; WEC, 2010). According to OECD figures the renewable energy share of the produced electricity amounted up to 0.6 % in the year 2009 with tendency to rise (Figure 3).

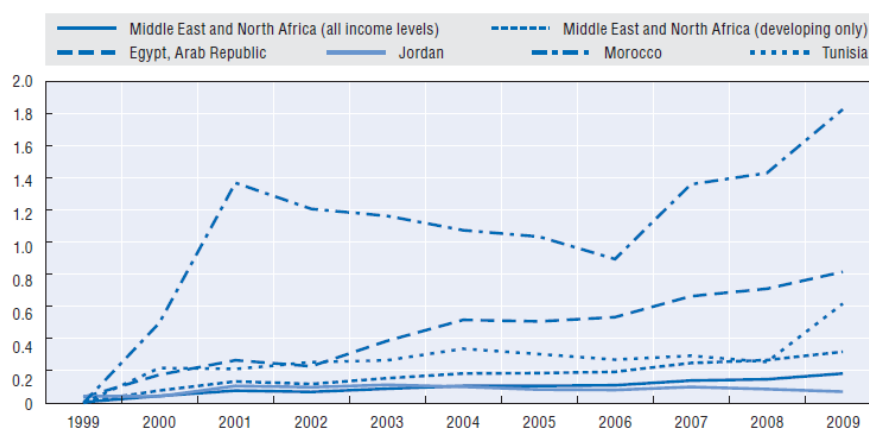


Figure 3 Electricity production from renewable sources (% of total) (copied from OECD 2013b, p. 31)⁶

⁶ Electricity production excludes hydro-electric and includes geothermal, solar, tidal, wind, biomass and bio fuels (OECD 2013b, p. 31)



In order to increase the renewable energy share, the Tunisian government has issued a strategic plan (Plan Solaire Tunisien) in 2009, which envisages the installation of 4.7 GW renewable power plant capacities and a 40% renewable share by 2030 (Figure 4). The Tunisian Solar Plan comprises a portfolio of 40 complementary projects covering not only solar energy (PV, CSP) but also wind energy, bioenergy, energy efficiency, a power interconnection with Italy and the manufacture of photovoltaic panels. The Tunisian Solar Plan is in line with similar international projects, e.g. the Mediterranean Solar Plan and the Desertec concept (ANME, 2012).

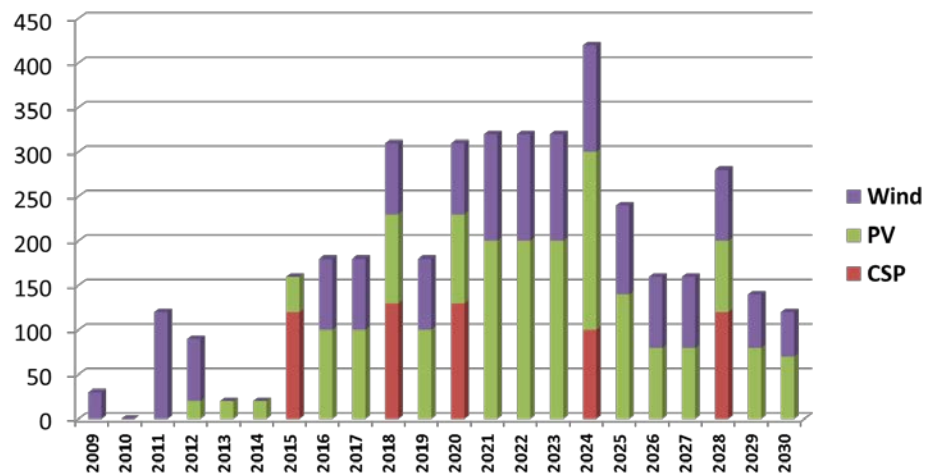


Figure 4 New planned capacity per year in the scope of the Tunisian Solar Plan (total numbers for Wind: 1.520 MW, PV: 1.930 MW, CSP: 600 MW (ANME, 2012)

On the short term, Tunisia aims at using “10% of its primary energy from renewable energy sources by 2016” (OECD 2013b, p. 71). As stated by the biggest national energy supplier and only network operator STEG (Société Tunisienne de l’Electricité et du Gaz), the erection of 120 MW of wind power plants is already planned. Furthermore, STEG intends to invest 400 Million Euro into new gas pipelines and the municipal gas supply (gtai, 2013). From the governmental side the authority ANME (Agence Nationale pour la Maîtrise de l’Energie) is in charge for the planning and coordination of the renewable energy use in Tunisia.



Figure 5 Tunisia's electricity network (GENI, 2013)

The technical solar energy potential of Tunisia's territory exceeds the local energy demand notably. However, large-scale projects require huge investments, and Tunisia does not provide feed-in-tariffs. Furthermore, the existing electricity network (Figure 5) needs to be readjusted. Therefore, the right policy framework for the export of solar electricity from the MENA-Region (Middle East and North Africa) to the European Union has been discussed since 2008. At that time the Mediterranean Solar Plan was initiated by the Union of the Mediterranean (UfM).

Currently, several feasibility studies are on-going for the development of solar power plants and the export of electricity. A next step will be the erection of the 2 GW solar thermal power plant "Tunur" under the auspices of the private NGO Desertec Foundation. The produced electricity is planned to be exported via a 400 kV submarine cable to Europe (El-Med-Link). Another idea for making the installation of solar power plants more competitive is to combine them with fossil plants in order to save fuels (Dii, 2013).

Investments in green projects are dominated by government-funds. In 2012 Tunisia has committed itself to develop an improved framework for private investments in areas such as renewable energy, energy efficiency, water infrastructure and management. This strategy has been named Green Growth Strategy. Moreover, in 2009 the self-generation of electricity using renewable energies was authorised by the energy conservation law. Private investors have since then the right to sell up to 30% of the power generated to STEG at a price equivalent to the STEG selling price excluding tax. Other incentives have been established with regard to tax reduction and bonuses on investment cost (OECD, 2012b).

Research and development is often conducted using co-financing from the European Union. As an example, the Research and Technology Centre of Energy (CRTEn)



could successfully acquire funding from the 7th EU Framework Programme for two renewable energy projects (ETRERA⁷; OPEN GAIN⁸). Joint R&D projects with participation of the local industry are still seldom (CRTEⁿ, 2013).

⁷ ETRERA = Empowering Tunisian Renewable Energy Research Activities

⁸ OPEN GAIN = OPTimal ENgineering Design for Dependable Water and Power Generation in Remote Areas Using Renewable Energies and INtelligent Automation



4 Organisations within the Tunisian Innovation System

The Tunisian innovation system has numerous actors on the different levels (macro-, meso- and micro level⁹) as shown in Figure 6 and Figure 7 on the next pages. These actors were identified as key actors / stakeholders and classified according to their tasks and activities within the innovation system by the participating experts during the workshop. Thus, the experts in the workshop gathered all institutions that play a major role for the Tunisian economy and arranged them according to their function.

It was not intended to have a complete list of stakeholders. It was rather the aim to identify the most relevant ones. The stakeholders were grouped according to the different levels of the innovation system. Looking at Figure 6 and Figure 7 it becomes clear that there are numerous relevant stakeholders existing in Tunisia for both sectors. As a consequence, many innovation support initiatives exist. However, during the workshop, it was discussed, in how far these innovation support initiatives are visible and in how far they are promotive for the Tunisian economy. The results of this discussion are laid down in chapter 5.

⁹ The description of these levels is to be found in chapter 2.



4.1 The Organisations of the Tunisian Innovation System of the Energy Sector

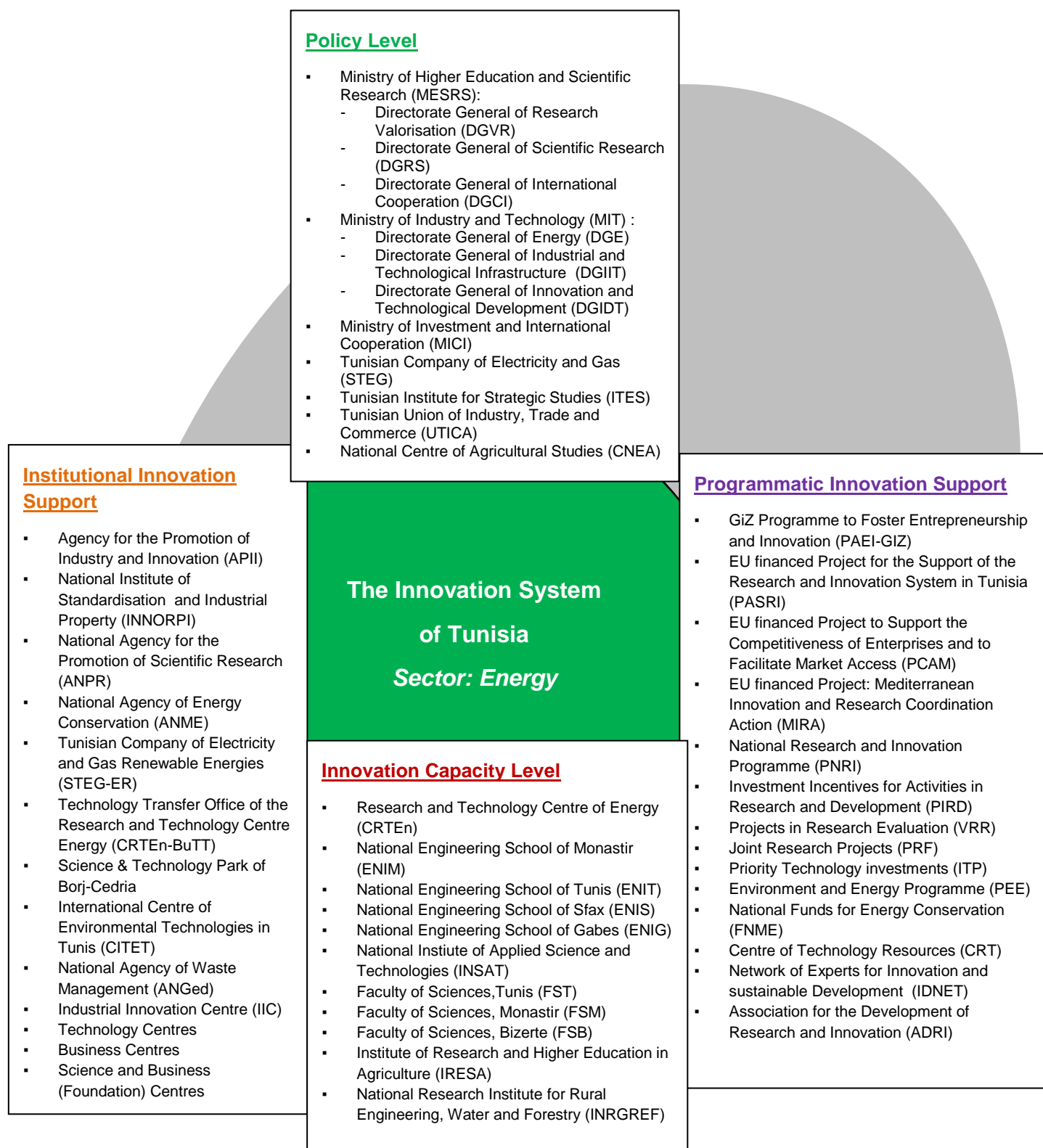


Figure 6 The main players in the Tunisian innovation system relevant to the sector “energy”

4.2 The Organisations of the Tunisian Innovation System of the Water Sector

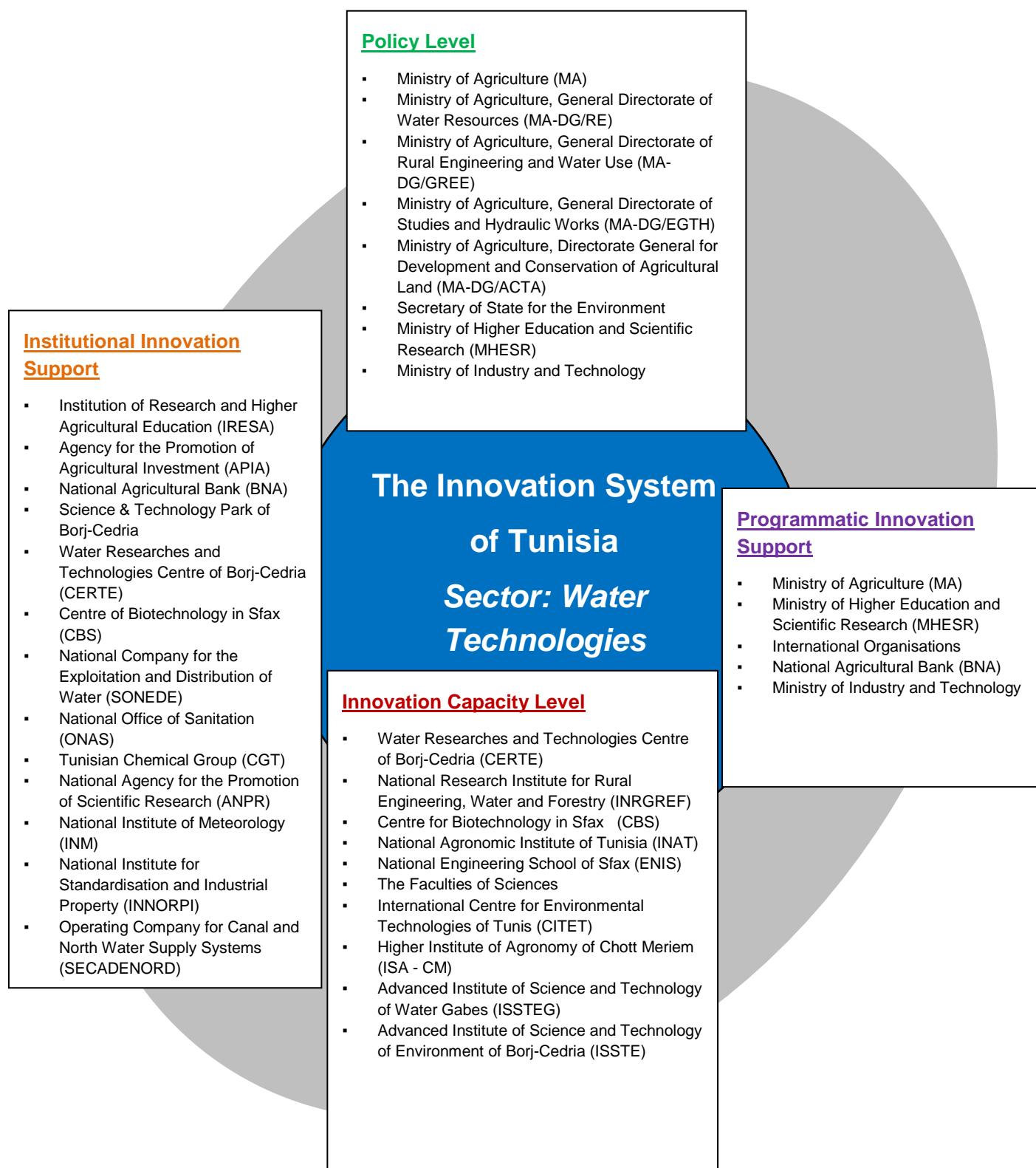


Figure 7 The main players of the Tunisian innovation system relevant to the sector “water technologies”



5 Assessment Results for Tunisia

The following chapters present the main outcomes of the assessment of the 30 determinants according to the ANIS approach separately for each sector. This assessment has been conducted based on the Expert Opinion Survey methodology described in chapter 2.2. Selected key experts participated and contributed by providing the expertise in the relevant fields. Although the total number of experts was lower than expected, the experts well covered all relevant topics. Since the variety of the opinions of the individual experts was comparably low (no extreme values), the assessment resulted in a temporarily consistent picture of the sectors water and energy in Tunisia.

Before reading the results, it is important to know that due to the current political conditions in Tunisia the risk perception of this country is relatively high. This uncertainty is amplified by sector specific obstacles, such as little transparency and little public dissemination with regard to national energy policies, innovation support activities and investment incentives (OECD 2013b). Hence, Tunisia suffers from a relatively volatile situation at the moment which is mirrored by the very critical assessment of the energy sector and the water sector by the experts as demonstrated in the following subchapters.

5.1 Results of the Analysis of the Energy Sector

The following subchapters (chapter 5.1.1 – chapter 5.1.4) show the results of the expert opinion surveys. They are based on the interviews by the experts. Thus, the values reflect the opinion of the interviewed experts who are aware of the strategy plans, master plans and innovation policy agendas relevant for the energy sector in Tunisia.

In order to easily depict the maturity of the determinants within the energy sector at each level of the Tunisian innovation system the key findings are presented by radar charts and bar charts.

The radar chart figures give an overall impression of the maturity of the individual determinants for each level of the energy sector. Well matured and weakly developed determinants can thus be depicted easily.

The bar chart figures show the particular average of each level, which has been taken as orientation to point out which of the determinants are at a very low state and which of them are at least above the country specific and level specific average.

5.1.1 Macro Level: Innovation Policy Level – Energy Sector

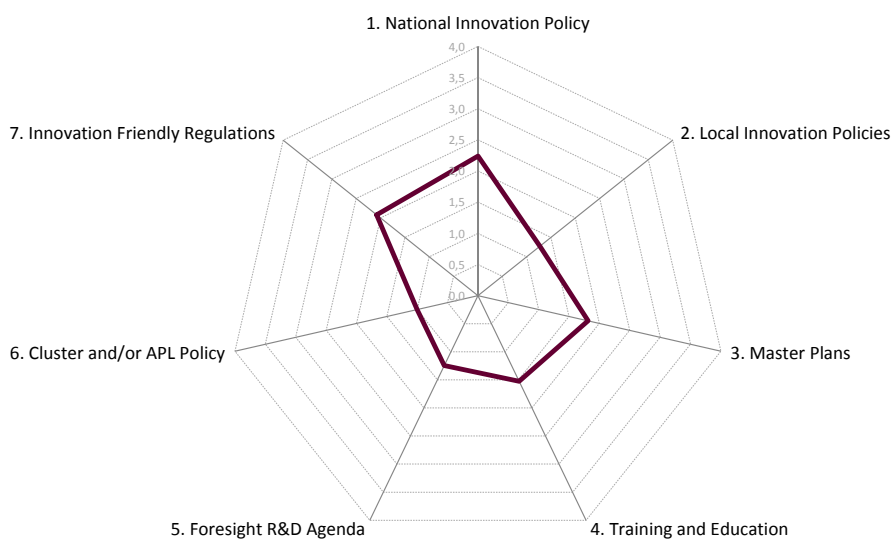


Figure 8 Determinants of the innovation policy level (energy sector)

Figure 8 shows the results of the assessment of the innovation policy level of the Tunisian energy sector. Notably, the determinants *National Innovation Policy*, *Master Plans* and *Innovation Friendly Regulations* are at a comparable good state of maturity. They rank above a value of 2.0, meaning that they basically exist and reveal first positive impacts. However, other determinants *Local Innovation Policies*, *Training and Education*, *Foresight R&D Agenda* and *Cluster Policy* are in a more embryonic status, ranking significantly below the 2.0 value.

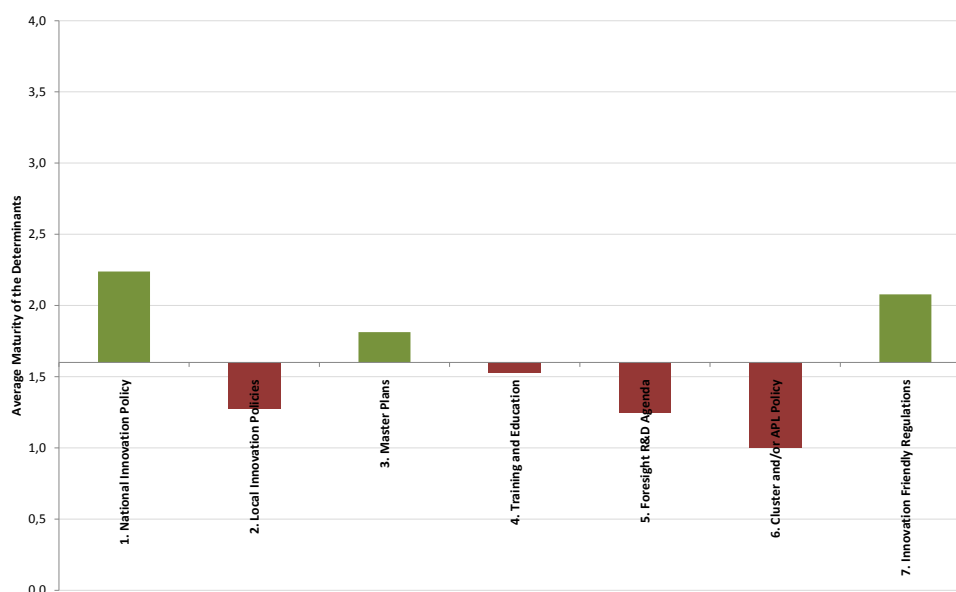


Figure 9 Determinants of the innovation policy level compared to this level's average (energy sector)



Figure 9 shows the values of the individual determinants of the innovation policy level of the Tunisian energy sector and their relation to the average value of all determinants of the innovation policy level of the Tunisian energy sector.

The average value for the seven key determinants of the policy level was calculated with 1.6 on a scale from 0 to 4 (cf. chapter 2.2). The policy level with regard to the sector energy is thus quite weakly developed. This comparably low average is characteristic for an immature innovation policy level. However the individual determinants which characterise the policy level reveal a different status of maturity. The overall *National Innovation Policy* was ranked comparably high (value 2.3), whereas *Cluster Policy* still has an embryonic status (value of 1.0).

Findings: National Innovation Policy

Tunisia has a *National Innovation Policy* which includes energy related innovation issues. It is available to all interested parties, sets clear thematic priorities according to the national demand and is turned into practice through significant efforts of public engagement in innovation, science and technology. Relevant stakeholders were actively involved in the design of the innovation policy; the implementation process is relatively well co-ordinated among the actors. Moreover, energy related innovation projects in Tunisia can benefit from the National Fund for Energy Management (Fonds National de Maîtrise de l'Énergie, FNME) that contains private resources and credit lines in order to support projects within the energy sector (OECD 2013b). However, the sector energy in particular and its possibilities for innovation are not yet sufficiently considered.

Findings: Local Innovation Policy

Local Innovation Policies exist to some extent but they rarely contain thematic priorities according to regional needs in the energy sector and are not sufficiently linked to or harmonised with the national innovation policy.

Findings: Master Plans

The most important innovation fields and technologies in the energy sector are identified and described by *Master Plans*. Hence, the framework for implementing measures in the energy sector is established. However, the interfaces between the policy level that set up the master plans and the innovation capacity level that should benefit from the master plans are not sufficiently developed. Thus, many information concerning innovation projects and innovation strategy does not find its recipient.

Findings: Training and Education

Education Schemes and Curricula in Science and Technology within the energy sector are moderately developed. There are training and education schemes available to improve the knowledge on innovation. However, the quality thereof related to innovation issues has not yet reached a satisfying level.

Findings: Foresight R&D Agenda

With regard to *Forecasting or Foresight Studies*, e.g. long-term visions and detailed projections of technological developments, products or environments in the future the



energy sector in Tunisia has not yet fully embraced these aspects as relevant. Policy measures are rather short-term oriented than long-term.

Findings: National Cluster Policy

A *National Cluster Policy* that includes aspects of the energy sector has not yet been set into force. Cluster policy needs to acquire a more important role as part of the Tunisian innovation support schemes. The interviewees who almost exclusively belonged to the innovation support level emphasised the importance of setting up a cluster policy in Tunisia.

Findings: Innovation Friendly Regulations

The impact of *Innovation Friendly Regulations* on the energy sector has not yet reached a satisfying level. Most of them are not relevant for innovation but rather hindering due to causing too much administrative burden. However, they are understood by policy makers as a tool to stimulate innovation.

5.1.2 Meso Level: Institutional Innovation Support – Energy Sector

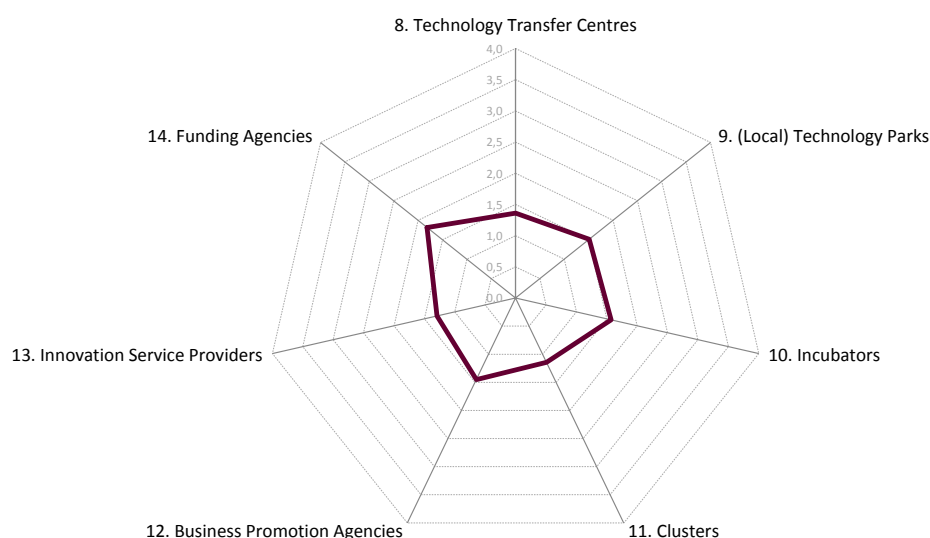


Figure 10 Determinants of the institutional innovation support level (energy sector)

Figure 10 shows that institutional innovation support in the energy sector in Tunisia is not well advanced. All respective determinants are on a comparable same low level. The values for *Technology Transfer Centres*, *Local Technology Parks*, *Incubators*, *Clusters*, *Business Promotion Agencies*, and *Innovation Service Providers* are even lower 1.5. This means that they almost do not exist or are operated on a poor level.

This observation is very much in line with the comparatively weak development of the innovation policy in Tunisia. It seems to be that innovation support institutions in the energy sector suffer from too little political support by the government or that there are no adequate policy actions for sustainable implementation.

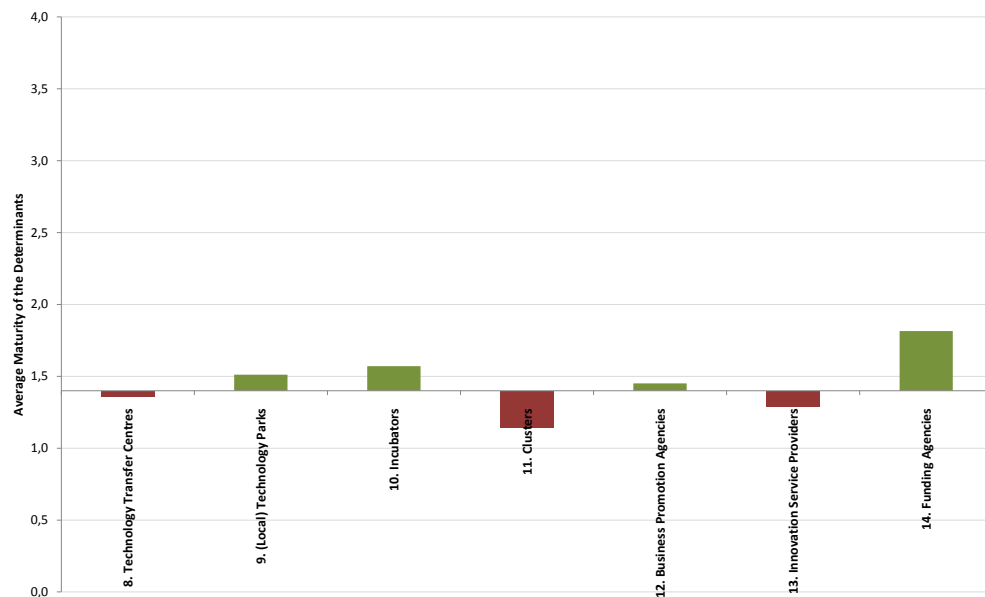


Figure 11 Determinants of the institutional innovation support level compared to this level's average (energy sector)

The average value shown in Figure 11, based on the seven key determinants for the institutional innovation support level was assessed with 1.4, which is even lower than for the policy level.

The discussion among the experts revealed that basically all institutions that provide innovation support can be found in the Tunisian innovation system, such as *Technology Parks*, *Incubators*, *Business Promotion Agencies* or *Funding Agencies*. However, most of them are comparatively low developed as shown in Figure 11. Due to a low developed *Cluster Policy* (see relevant determinant in Figure 8) it is not surprising that *Clusters* and *Regional Networks* are ranking worst among the innovation support institutions (value of 1.3). For several years, foreign donors support the Tunisian government in supporting cluster and network developments, but with limited success. The lack of trust and openness for mutual cooperation are still the main barriers to unleash the full potential clusters in Tunisia could have.

Findings: Technology Transfer Centres

The implementation of the overall *Technology Transfer Centres* approach is not very successful so far. Often, neither the main objectives are defined for these institutions nor are they adequately equipped.¹⁰

In Tunisia only one *Technology Transfer Centre* specialised in energy has been established. It is the *Technology Transfer Centre* at the Research and Technology Centre of Energy (CRTE) of the Borj-Cedria Science & Technology Park.

¹⁰ Currently, there are several studies and support actions on-going in Tunisia to identify key success factors for a better implementation of the Technology Transfer Centre approach.



One of the main tasks of this *Technology Transfer Centre* is to develop so-called detection sheets that depict innovative projects. However, many policy makers do not seem to be aware of this centre and its value. For example when a researcher publishes two patents he/she receives an upgrade in his function (e.g. from junior to senior researcher). Yet, after this upgrade the process is stopped. The patent is rarely used for technology transfer or validation and products for market.

Here, the policy level, the innovation support level and the capacity level has not yet find solutions that help to better interact with each other in order to enhance the knowledge flow between them. This knowledge exchange would lead to an appraisal by the political level of the achievements at capacity level – a valuation which is currently perceived by the actors at capacity level as non-existent.

Findings: Technology Parks

There are several *Technology Parks* in Tunisia. The Borj-Cedria Science & Technology Park is one of them. It includes research facilities for the sectors water and energy. The CRTEn was founded in 2005. It has partnerships with the OME (Mediterranean Observatory of Energy) and CITEF (Conférence Internationale des Formation d'Ingénieurs et Techniciens d'expression Française).

The recognition of the *Technology Parks* in Tunisia is at medium level. They are known as service providers to support innovation. However, they strongly depend on public institutions. As such, often the freedom of science is not given. The impact they have on innovation is still low. The equipment and the number of staff members are not satisfactory.

Generally, it can be said that with regard to *Technology Transfer Centres*, *Clusters*, and *Innovation Service Providers* the status of maturity has not yet reached a satisfying level.

Findings: Incubators

Incubators exist in the energy sector, for example at the Borj-Cedria Science & Technology Park. However, often they work isolated and do not have the networking capacities that are needed for business start-ups. The connection to universities is relatively low.

Findings: Clusters

The concept “cluster” is quite new in Tunisia. *Clusters* are considered to be an important determinant to improve the networking between the different stakeholders in the energy sector. However, the status of cluster development is very low, especially in the energy sector. The emergence of some clusters in other sectors has been supported by the GiZ and other donors. However, so far, they have not really contributed to strengthening innovation capabilities among the actors. A lack of trust and a lack of ideas on how to cooperate within these clusters are the main reasons for insufficient innovation capabilities of clusters.

Especially the industry does not see the added value of the cluster approach yet. Some actions just have started to upgrade the competence of the respective cluster managers of these clusters. The European Foundation for Cluster Excellence is about



to implement a training programme for cluster managers. In addition, benchmarking exercises are planned to compare Tunisian clusters with peers from other countries. All these measures aim at strengthening innovation capabilities and competitiveness of the respective industry.

Findings: Business Promotion Agencies

Business Promotion Agencies were appraised as “lagging behind”. The interviewees answered that often *Business Promotion Agencies* are understaffed and do not really represent the interests of the industry.

Findings: Innovation Service Providers

The *Innovation Service Providers* have not been assessed as very successful. Many of the interviewees answered that *Innovation Service Providers* do not exist or many of the interviewees did not know that *Innovation Service Providers* exist, even though there are several functioning *Innovation Service Providers* in Tunisia (e.g. Agency for the Promotion of Industry and Innovation¹¹). This gap between reality and perception probably exists because of the different expectations the interviewees have towards *Innovation Service Providers*.

Findings: Funding Agencies

Tunisia's *Funding Agencies* in the energy sector are developed at a fair level. Usually, *Funding Agencies* are responsible for the design and implementation of innovation support measures and are actively involved in transnational innovation support schemes on behalf of the funding ministries and apply up to date tools in day-to-day business, such as impact assessments, evaluation and foresight. Yet in Tunisia, these services can still be improved in order to make them more useful for the beneficiaries.

¹¹ For more information see: <http://www.tunisianindustry.nat.tn/en/home.asp>



5.1.3 Meso Level: Programmatic Innovation Support – Energy Sector

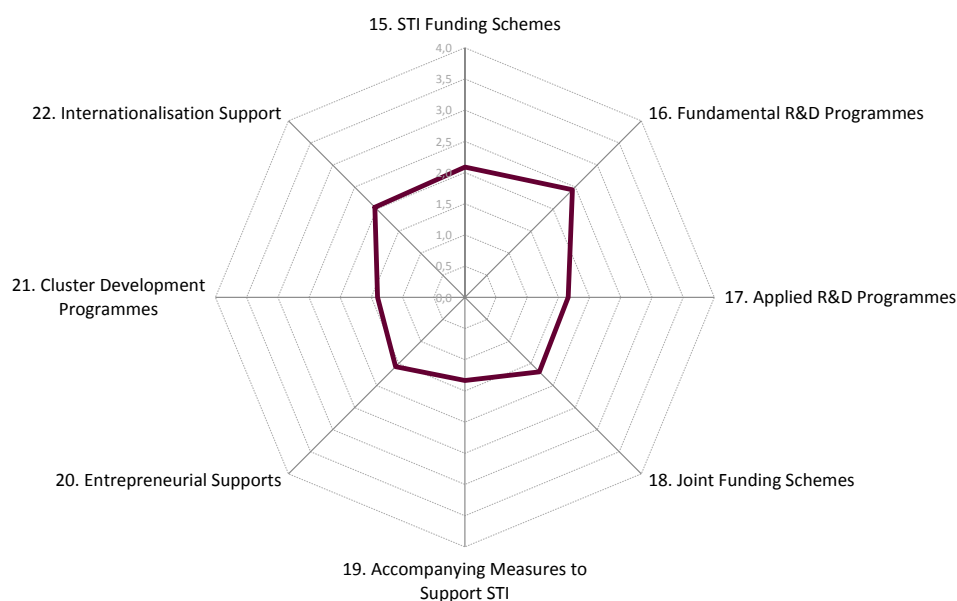


Figure 12 Determinants of the programmatic innovation support level (energy sector)

When it comes to the programmatic innovation support level (Figure 12) the findings are more promising than those of the previously mentioned levels. With regard to programmatic innovation support the determinants *STI Funding Schemes*, *Fundamental R&D Programmes* and *Internationalisation Support* are in a quite advanced status (value 2.0 or above). This is due to a successfully implemented innovation policy.

In practice, there are many relevant programmes, such as PIRD, PNRI, ITP, RICTIC, FOPRODI, IN'TECH, that aim at supporting (fundamental) R&D in academia and industry. However, other relevant determinants at programmatic level still have an embryonic status, such as *Applied R&D Programmes*, *Joint Funding Schemes*, *Accompanying Measures to Support STI*, *Entrepreneurial Support*, and *Cluster Development Programmes*. Such programmes and funding schemes are much less developed or do not exist at all, e.g. a national cluster support programme is missing.

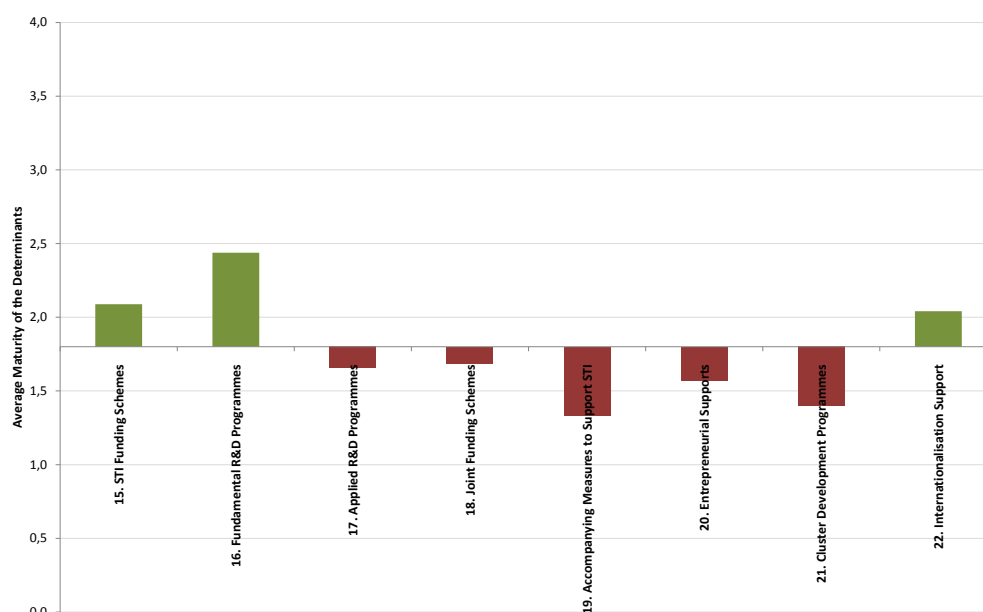


Figure 13 Determinants of the programmatic innovation support level compared to this level's average (energy sector)

The average value shown in Figure 13, based on the eight key determinants (see Figure 1) was assessed with 1.8 on a scale from 0 to 4 (cf. chapter 2.2). Figure 13 further reveals that there is a tremendous gap between the maturity of *Fundamental R&D Programmes* (value 2.4) and *Applied R&D Programmes* (value 1.7). It shows that with regard to fundamental research in the energy sector Tunisia is quite advanced compared to the maturity of other programmatic support activities. However, when it comes to applied research where science is turned into innovation for industry Tunisia is lagging behind.

In some cases policy makers are already aware of this gap and first actions are on-going mostly focussing on how to link fundamental research programmes with applied ones in a better way.

Joint Funding Schemes, *Accompanying Measures to Support STI*, *Entrepreneurial Support* and *Cluster Development Programmes* are not well developed, but need to turn knowledge and invention from fundamental research to applied research. These programmes are missing in the energy sector, or, if existent, are not well coordinated with regard to application procedures and grants.

Findings: STI Funding Schemes

STI Funding Schemes for Energy exists and set clear thematic priorities. They are of high relevance, and significant efforts are spent to make the results available for the public. Further improvements can be gained when the application procedures would become easier and the administrative hurdles would be reduced. Currently, Tunisian companies are quite reluctant to apply for respective grants.



Findings: Fundamental R&D Programmes

When it comes to innovation support programmes within the energy sector Tunisia offers quite well developed measures with regard to *Fundamental R&D Programmes*, e.g. PNRI (Programme National de Promotion de l'Innovation Technologique) by the Ministry of Industry and Technology.¹² The aim of this programme is to encourage the cooperation between industry and research in the field of applied research and technological innovation in industrial enterprises. Projects that apply for funding must include three partners including a laboratory, a technology centre, and a private company. The programme currently funds four projects per year with up to 200.000 Dinar. The figure shows that this determinant was assessed clearly above average. This is the best assessed determinant of the Tunisian innovation system.

Findings: Applied R&D Programmes

Another programme by the Ministry of Industry and Technology is PIRD (Prime d'Investissements dans les Activités de Recherche-Développement).¹³ It is the aim of the programme to encourage businesses, public and private institutions and scientific associations to implement projects of research and development. The grant funding is given either to companies or to research institutes. Currently there are 20 project applications per year.

However, it can be seen in Figure 13 that this determinant was assessed as quite underdeveloped. As reason for that it was mentioned that the topics of the *Applied R&D Programmes* do not conform to the demand of the researchers and to the standard of the international research community. The number of *Applied R&D Programmes* is not satisfactory but it ensures a minimum number of funded projects.

Findings: Joint Funding Schemes

Joint Funding Schemes in the energy sector have not yet been initiated by Tunisian innovation support programmes. Tunisian researchers often benefit from *Joint Funding Schemes* that are initiated by other countries, such as Japan.

Findings: Accompanying Measures to Support STI

Even though Tunisia is engaged in tackling the potential of science, technology and innovation *Accompanying Measures to Support STI* in the energy sector have not been realised yet in Tunisia. The few measures that exist are not visible.

¹² More information is to be found at: <http://www.industrie.gov.tn/fr/directdoc.asp?docid=319>

¹³ More information is to be found at: <http://www.industrie.gov.tn/fr/directdoc.asp?docid=318>



Findings: Entrepreneurial Support

Entrepreneurial Support in the energy sector has been recognised as important for Tunisia's competitiveness, but relevant initiatives have not yet started.

Findings: Cluster Development Programmes

Cluster Development Programmes do not play a role yet in the Tunisia's innovation landscape. The concept of knowledge spill-over through networking activities has not yet been perceived as relevant for the innovation performance of Tunisia. As indicated earlier, appropriate actions have just started to strengthen the maturity of clusters, also in the energy sector.

Findings: Internationalisation Support

The programmatic innovation support also includes *Internationalisation Support*, mostly through participation in EU-funded projects. Stakeholders in the energy sector consider internationalisation support important to increase Tunisia's competitiveness at international level. The funding of international cooperation has a positive impact on the international competitiveness of especially the research institutes in the energy sector in Tunisia.

5.1.4 Micro Level: Innovation Capacity Level – Energy Sector

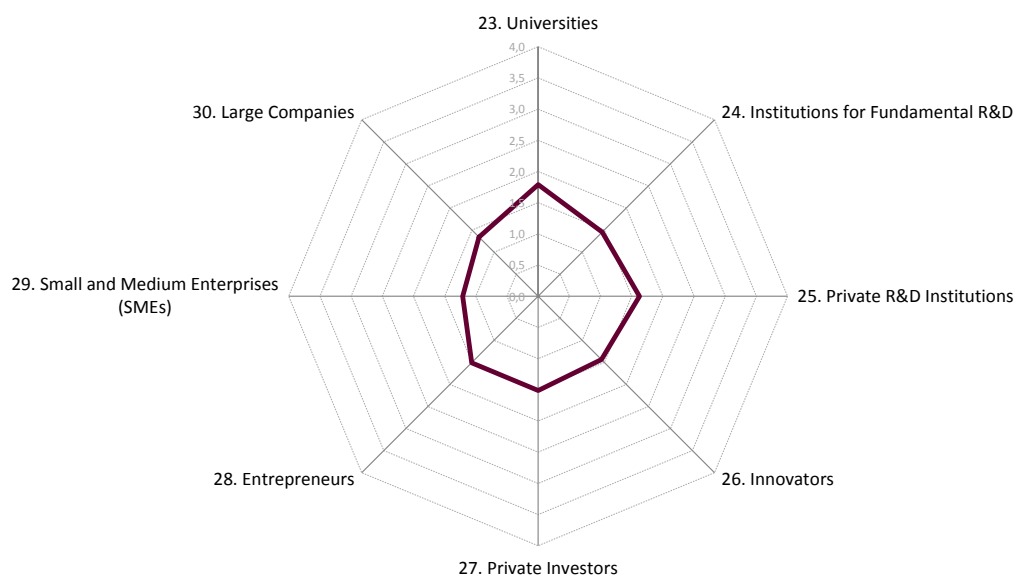


Figure 14 Determinants of the innovation capacity level (energy sector)

Figure 14 displays the status of the determinants where innovation actually happens. With regard to Tunisia's energy sector it can be said that *Universities* are relatively



advanced (value of 1.8) whereas all other determinants at innovation capacity level (values of 1.6 or below). This figure actually mirrors the result of the too little innovation support activities that take place in Tunisia in the energy sector (see Figure 10 - Figure 13). As a consequence the maturity of this level is very low (average 1.5, see Figure 15).

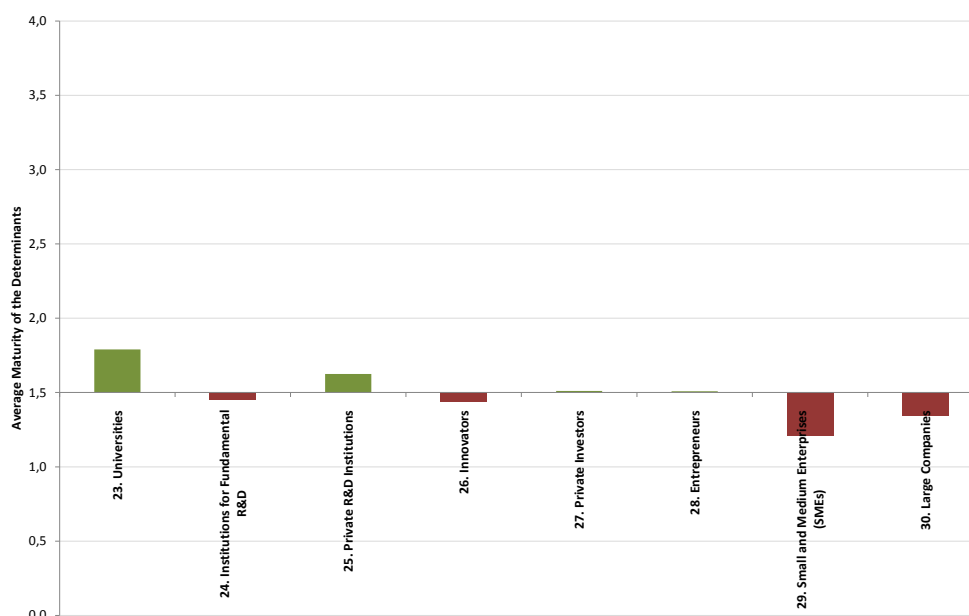


Figure 15 Determinants of the innovation capacity level compared to this level's average (energy sector)

The average value shown in Figure 15, based on the eight key determinants (Figure 1), was assessed with 1.5 on a scale from 0 to 4 (cf. chapter 2.2). This figure affirms that except for *Universities* (value 1.8) none of the determinants has reached a status that allows innovation oriented performance. These findings are backed by the day-to-day practice in Tunisia where there are only a few companies and other actors that can be considered as drivers for innovation.

One of the most significant weaknesses that were pointed out during the discussions in the workshop is the little to non-existent entrepreneurial education, which yields in a very unstable industry in the energy sector (see very low values for *SMEs* and *Large Companies*) and disorientation in institutions for fundamental R&D and private R&D institutions. The lack of entrepreneurial support schemes hampers any development that could increase the industrial structure in the energy sector.

Thus, the conditions for *Institutions for Fundamental R&D*, for *Innovators*, for *Private Investors*, *Entrepreneurs*, *SMEs* and *Large Enterprises* are not satisfactory. The impact that innovation support measures should leave on this level has not yet been reached.

Findings: Universities

The main deficits of *Universities* focussing on energy related technologies arise from too little or non-existent connections to industry, little competitiveness at international level, inability to attract world class researchers or high potentials, low level of training and education of students, and insufficient equipment.



Findings: Institutions for Fundamental R&D

With regard to *Fundamental R&D Institutions* the situation is similar. They are even less recognised as relevant for innovation than universities. Most of these institutions operate according to their own priorities instead of orienting towards national priorities, which is actually not a surprise, since the national priorities often do not conform to the current need. *Fundamental R&D Institutions* are only of little interest to researchers from abroad specialised in the energy field.

Findings: Private R&D Institutions

The maturity of *Private R&D Institutions* is at a lower to medium level. Even though they are often poorly equipped and understaffed, they are recognised as important innovation providers for SMEs in the energy sector.

Findings: Innovators, Private Investors, Entrepreneurs, SMEs and Large Companies

The importance of *Innovators, Entrepreneurs, SMEs and Large Companies* for the Tunisian innovation system has not yet been recognised in the energy sector. So far these determinants receive only little support from policy level and are isolated instead of participating in innovation oriented networking activities. *Private Investors*, private equity firms and risk capital are often not available. They do not receive sufficient support even though it has become clear from other examples of other countries that particularly private investors are better able to decide between good and bad investments than some charity organisation especially in the renewable energy business.

5.2 Results of the Analysis of the Water Sector

One of Tunisia's main challenges is to manage its scarce water resources. According to Louati & Bucknall Tunisia has undergone a change from traditional practices to modern water management: "Tunisia is an example of good planning and management." (Louati & Bucknall 2008, p. 158). Managing water resources mainly means to equally allocate the water resources to the different regions of the country.

This task is difficult as the water supplies are limited, the costs of the generation and storage of water are increasing, and the demand for water is ever growing (Louati & Bucknall 2008). At policy level strategies have been set up that give proposals for the handling of agricultural water, drinking water, waste water and re-use of water. New technologies are installed to manage these tasks, such as the application of geographic information systems in order to control water usage and water supply. The stakeholders that work on these challenges are the Tunisian Ministry of Agriculture and Water Resources (MARH), the National Water Information System (SINEAU) and the National Company for Exploitation and Distribution of Water (SONEDE).

Despite these regulatory, institutional and technical measures that aim at improving the maturity of the water sector in Tunisia the assessment of the determinants of the



innovation system in this sector remains low as the following chapters will show (chapter 5.2.1 – chapter 5.2.4).

According to the answers of experts from the innovation support level and from the innovation capacity level during the workshop the sector water in the Tunisian innovation system is weakly developed. With an average of 1.3 it can be said that many determinants have not yet reached a status that help to become an innovation oriented sector.

The following subchapters (chapter 5.2.1 – chapter 5.2.4) show the results of the expert opinion surveys. They are based on the interviews by the experts of the Tunisian water sector. Thus, the values reflect the opinion of the interviewed experts who know the policy agendas and innovation support activities relevant for the water sector in Tunisia.

In order to easily depict that maturity of the determinants within the water sector at each level of the Tunisian innovation system the interview results are presented by radar charts and bar charts.

The radar chart figures give an overall impression of the maturity of the individual determinants for each level of the water sector. Well matured and weakly developed determinants can thus be depicted easily.

The bar chart figures show the particular average of each level in the water sector, which has been taken as orientation to point out which of the determinants are at a very low state and which of them are at least above the country specific and level specific average.

5.2.1 Macro Level: Innovation Policy Level – Water Sector

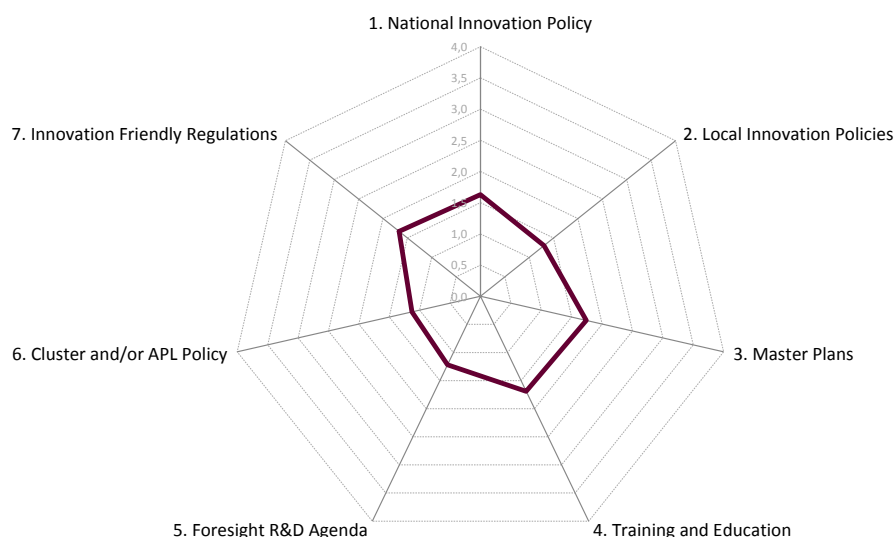


Figure 16 Determinants of the innovation policy level (water sector)

Figure 16 depicts the low level of maturity of the determinants of the innovation policy level within Tunisia's water sector. The determinants *Master Plans* and *Training and Education* and *Innovation Friendly Regulations* rank at 1.7. All other policy activities in



this sector *National Innovation Policy*, *Local Innovation Policies*, *Foresight R&D Agenda* and *Cluster Policy* have been ranked even lower (value 1.6 or below). One reason for this result may be that on the one hand policy papers and strategy agendas exist, but on the other hand the papers and agendas failed to be turned into policy actions. This picture is similar to the results of the energy sector.

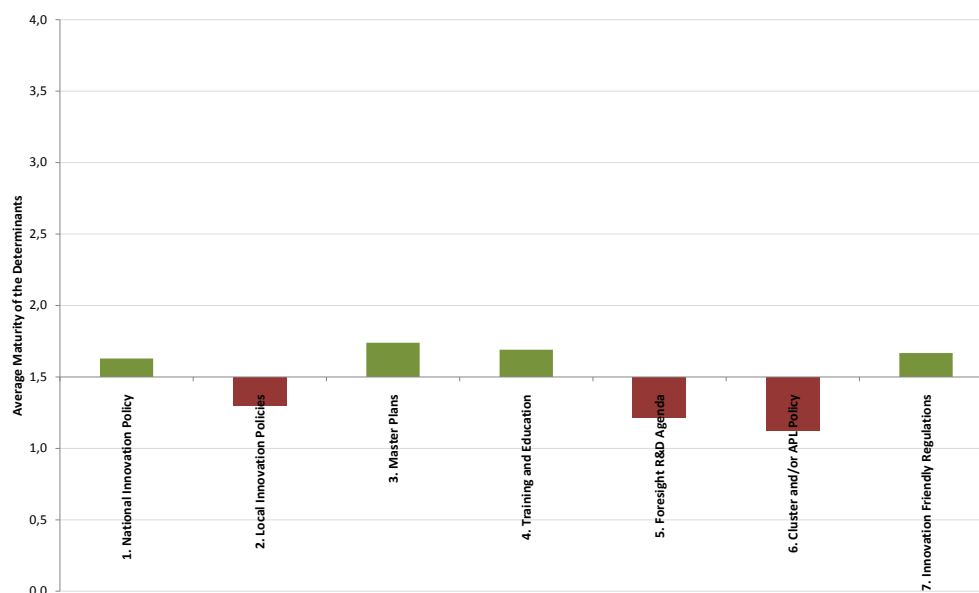


Figure 17 Determinants of the innovation policy level compared to this level's average (water sector)

The average value shown in Figure 17, based on the seven key determinants (Figure 1) was assessed with 1.5 on a scale from 0 to 4 (cf. chapter 2.2).

The determinants *Master Plans* and *Innovation Friendly Regulations* are the only determinants that have reached a level of advancement which allows the set-up of an innovation enhancing landscape with regard to the water sector in Tunisia. All other determinants do not provide the necessary maturation to start any innovation related activities. The determinants *Foresight R&D Agenda* and *Cluster Policy* show only rudimentary signs of being started and can therefore not yet serve as real innovation policy in Tunisia.

The Tunisian Ministry of Agriculture and Water Resources (responsible for the overall supply and use of water) and the Tunisian Ministry of Environment and Sustainable Development (responsible for impact studies and monitoring of environment systems) made the topic water rank high on Tunisia's national strategy agendas (OECD 2010a) and installed national water policies. Despite these high ambitions Figure 17 shows that the policy level has been rated quite low according to the answers of the experts of the workshop.

The expert opinion surveys emphasised that the policy level has to invest much more in establishing and developing interfaces to the other levels of the innovation system. Often, the knowledge of the representatives of the policy level is not appropriate to understand the need of academia and industry.



Findings: National Innovation Policy & Master Plans

Tunisia has set up a *National Innovation Policy* that focuses on the issues of water technologies – the *Water Master Plan* set up in 2003 by the Ministry of Agriculture and Water Resources (Ministère du Développement et de la Coopération Internationale 2004). It sets clear thematic priorities according to the national demand and is turned into practice through significant efforts of public engagement in innovation, science and technology.

However, only a small group of experts has been involved during the design of the innovation policy and therefore many aspects, such as clear responsibilities defined among the stakeholders in the water sector related to the implementation process, have not been considered.

Findings: Local Innovation Policy

Local Innovation Policies have so far neither been put into practice nor are they linked to or harmonised with the national innovation policy.

Findings: Training and Education

Training and Education Schemes as well as curricula in science and technology are only sporadically available. They do not reflect the national demand.

Findings: Foresight R&D Agenda, Cluster Policy and Innovation Friendly Regulations

A *Foresight R&D Agenda* including issues on water does not yield high on Tunisia's policy agenda. Similar to that also *Cluster Policy* does not yet play a major role in the Tunisian innovation policy. *Innovation Friendly Regulations* including issues on water technologies are in force and they stimulate innovation, but these regulations are not harmonised with other innovation policies or measures.

So far the water sector in Tunisia has been managed by public authorities only. The inclusion of private companies and the decentralisation of the water management have not yet been considered as a driver for innovation in this sector.



5.2.2 Meso Level: Institutional Innovation Support – Water Sector

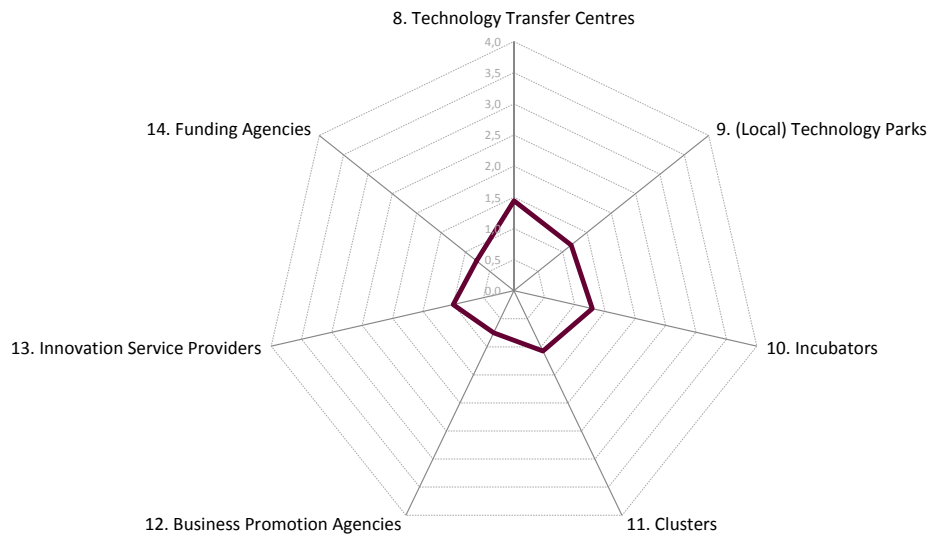


Figure 18 Determinants of the institutional innovation support level (water sector)

Due to the weakly developed determinants on policy level (as shown in Figure 16 and Figure 17) also the innovation support level shows also room for improvements as depicted in Figure 18. Institutions that help industry and academia to turn innovative projects into products and technologies are not well supported and most often the staff at these institutions lack the proper education, e.g. in management skills and business administration. As a consequence, people that are in need of institutional innovation support are not well advised.

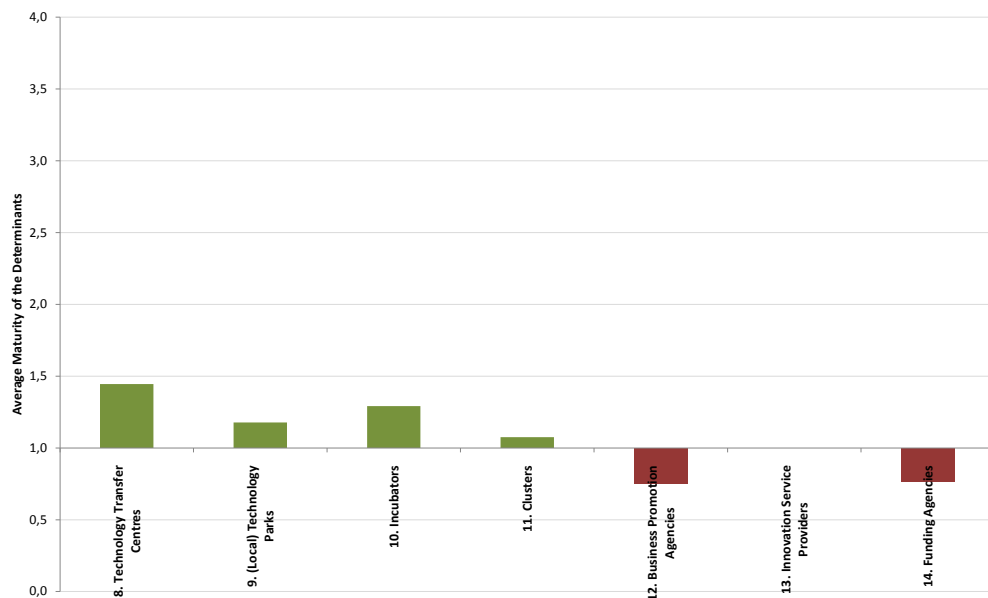


Figure 19 Determinants of the institutional innovation support level compared to this level's average (water sector)

The average value shown in Figure 17, based on the seven key determinants (see Figure 1) was assessed with 1.0 on a scale from 0 to 4 (cf. chapter 2.2). The



advancement of the determinants of the programmatic innovation support level is thus very low. This result is the direct consequence of the insufficient activities at policy level (cf. Figure 14 and Figure 15).

At least the determinants *Technology Transfer Centres*, *Technology Parks*, *Incubators*, and *Clusters* have been rated above the level specific average, but are all still under the value of 1.5. This indicates the efforts that currently take place to start the improvement of these institutions, e.g. workshops organised by EU-funded projects aiming at the increase of innovation capacity in Tunisia.

Findings: Technology Transfer Centres

The national *Technology Transfer Centres* scheme in the water sector is rather weakly developed. *Technology Transfer Centres* in this sector have not yet been recognised as important instrument for the innovation culture in the water sector in Tunisia. As a consequence, not one *Technology Transfer Centre* has been established that focusses especially on water technologies. Especially the policy level is not aware of the value of *Technology Transfer Centres*.

Findings: Technology Parks

Technology Parks support the innovation policies but they strongly depend on public authorities, lack staff and equipment, are not recognised as important innovation partners for local SMEs and are often not integrated in the public discourse on innovation. SONEDE is Tunisia's main industrial partner in water technologies, especially because of its responsibility for the efficient use of drinking water in Tunisia.

Findings: Incubators

Incubators mostly act isolated and are not connected to the latest innovation topics. They also depend on public authorities, are poorly equipped and understaffed, are not part of a network, and are not recognised as source of innovation.

Findings: Clusters

Clusters only exist in a few industrial or technological areas (e.g. Tunisian Waste Cluster). The concept of clusters is new to Tunisia. Measures to introduce this topic and to overcoming this knowledge gap are missing.

Findings: Business Promotion Agencies, Innovation Service Providers and Funding Agencies

Business Promotion Agencies and other *Innovation Service Providers* that focus on the sector water rarely exist in Tunisia. They are understaffed and lack a strategy. With regard to water related issues *Funding Agencies* are not yet considered as an important tool to turn innovation policy measures into practice.



5.2.3 Meso Level: Programmatic Innovation Support – Water Sector

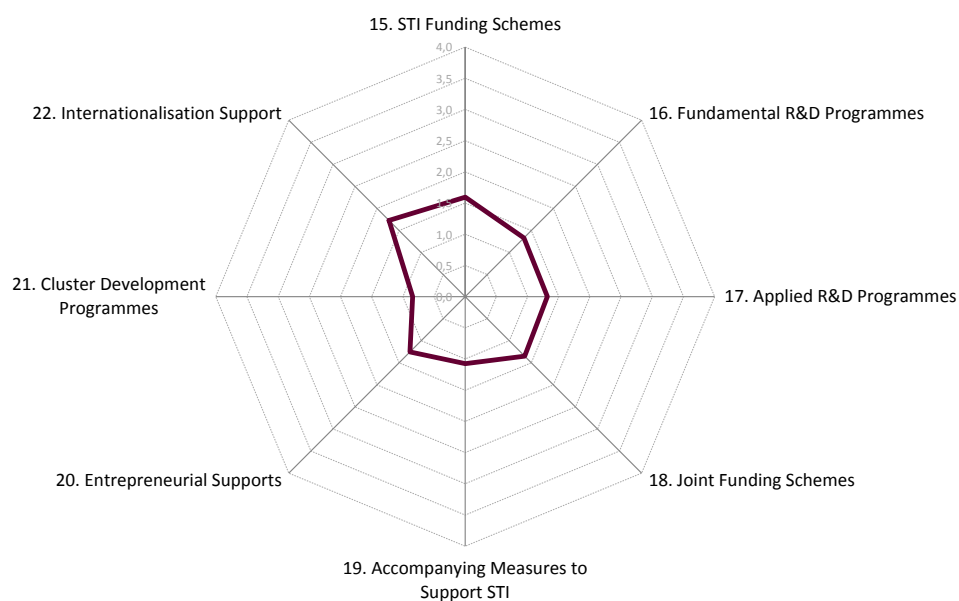


Figure 20 Determinants of the programmatic innovation support level (water sector)

Since the respective policies in the field of water technologies are still at a comparatively low level, not that much progress has been made on the programmatic innovation support level as well.

Basically, the status of maturity of the programmatic innovation support level is the result of actions undertaken or not undertaken of the policy level (Figure 20). Most of the determinants (*Fundamental R&D Programmes*, *applied R&D Programmes*, *Joint Funding Schemes*, *Accompanying Measures to Support STI*, *Entrepreneurial Support*, *Cluster Development Programmes*) have a very low maturity (values 1.3 or below).

These programmes lack a professional setting up and a successful implementation where the grant budget is well-coordinated with the actual research demand. Only *Internationalisation Support* and *STI Funding Schemes* reveal some effort towards innovation oriented support measures (values at 1.7). Here, mostly the input from foreign countries, e.g. through EU-funded projects, leads to some effects at the programmatic innovation support level.

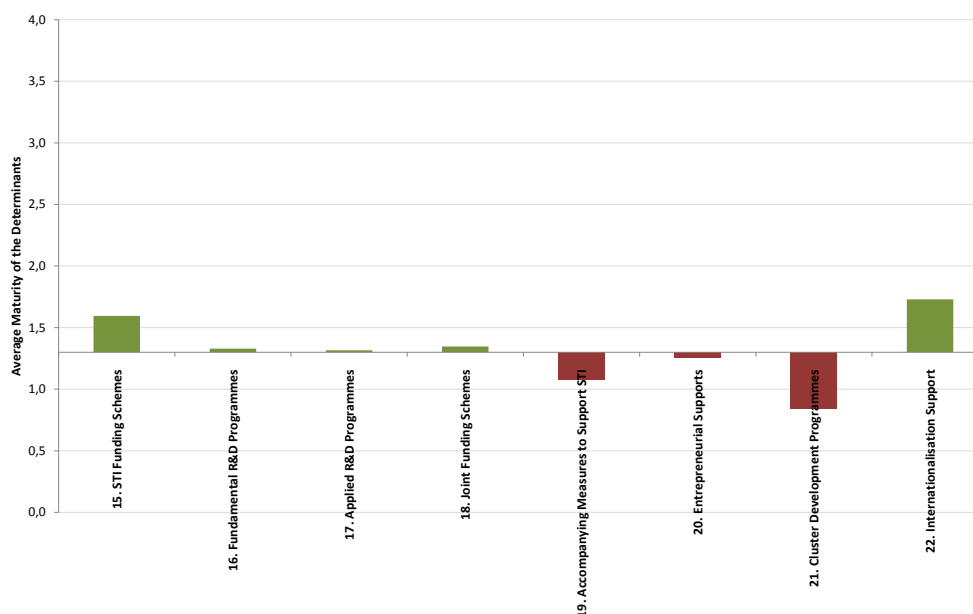


Figure 21 Determinants of the programmatic innovation support level compared to this level's average (water sector)

Looking at the specific average of this level (1.3) in Figure 21 it becomes even clearer how poorly developed the programmes are. This is a strong indicator of Tunisia's difficulties in designing funding programmes in the water sector and implementing them. Especially, *Cluster Development Programmes* fail since cluster policy does not play a major role in Tunisia yet (cf. Figure 16 and Figure 17).

Findings: Funding Schemes

Public funding of Science, Technology and Innovation (STI) through programmes in the water sector is well established compared to the other determinants. However, the amount of public funds as well as the diversity of R&D funding programmes are not sufficient and do not accord to the national demand. Public funding is mainly coming from national sources. Third party funding from foreign sources only play a minor role. The access to public funding is limited by thematic priorities. However, little efforts are spent to make the project outcomes visible for the public. The impact of programmatic innovation support has not been assessed yet.

Findings: Fundamental R&D Programmes

With regard to *Fundamental R&D* the programmes are not demand-oriented and do not meet national priorities. However, transnational cooperation between researchers is actively encouraged within existing fundamental STI funding schemes.

Findings: Applied R&D Programmes

With regard to *Applied R&D* the number and variety of funding programmes is at a good level and accords to the national demand and national priorities.



Findings: Joint Funding Schemes

In contrast to that, *Joint Funding Schemes* are rather not demand-oriented and do not meet national priorities as they do not include collaborative STI funding. However, some of the collaborative STI programmes of the past contributed to close the gaps between industry and academia. Still, most of them have been terminated by the end of 2009.

Findings: Accompanying Measure to support STI

Accompanying Measures to Support STI are weakly established and therefore not acknowledged. The availability of funds is insufficient and does not consider the national demand.

Findings: Entrepreneurial Support

With regard to *Entrepreneurial Support* the framework conditions for technology-oriented entrepreneurship are poorly developed. Only a few measures for supporting the pre-incubation or starting phase, such as business-plan training or financial planning, exist.

Findings: Cluster Development Programmes

Cluster Development Programmes are not yet existent. Thus, networking activities have not been standardised yet in Tunisia.

Findings: Internationalisation Support

The *Support of Internationalisation* through funding schemes is also not existent in the water sector, except for international cooperation projects mostly funded by the European Commission.

Tunisian researchers mostly benefit from EU-funded projects; e.g. PASRI (“Supporting the research and innovation system of Tunisia”) provides solutions to research and innovation problems in Tunisia and spurs employment by strengthening ties between research and production systems.



5.2.4 Micro Level: Innovation Capacity Level – Water Sector

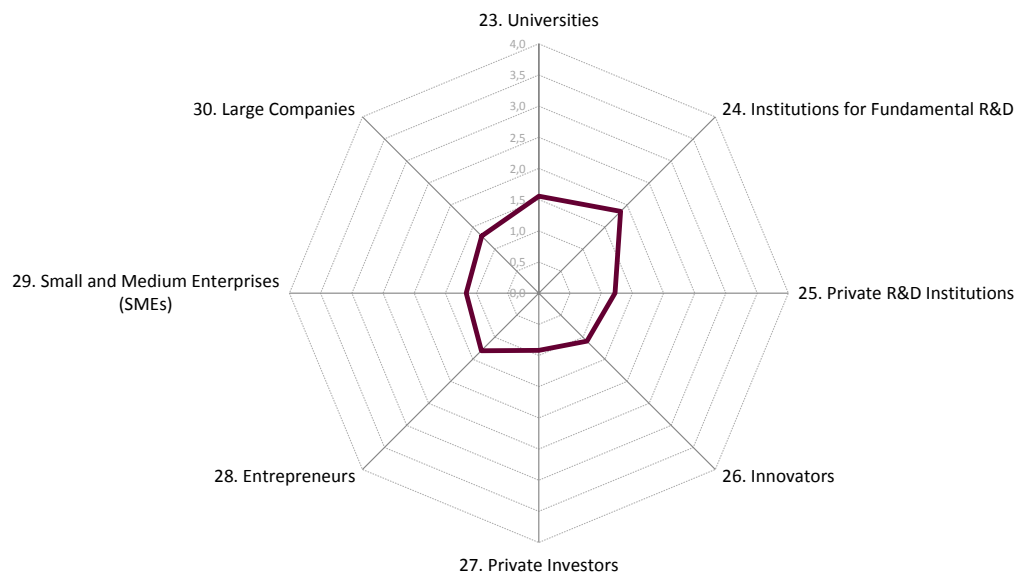


Figure 22 Determinants of the innovation capacity level (water sector)

Not surprisingly, Figure 22 shows, that the innovation capacity level has many deficits. The values for the determinants *Private R&D Institutions*, *Innovators*, *Private Investors*, *Entrepreneurs*, *SMEs* and *Large Companies* are below 1.5. This means that they are in a status that lacks an innovation oriented strategy. Under these conditions the production and diffusion of innovative products and services in Tunisia's water sector cannot increase. Only the determinants *Universities* (value at 1.6) and *Institutions for Fundamental R&D* (value at 1.9) seem to benefit from some effect of Tunisia's innovation support activities in the water sector.

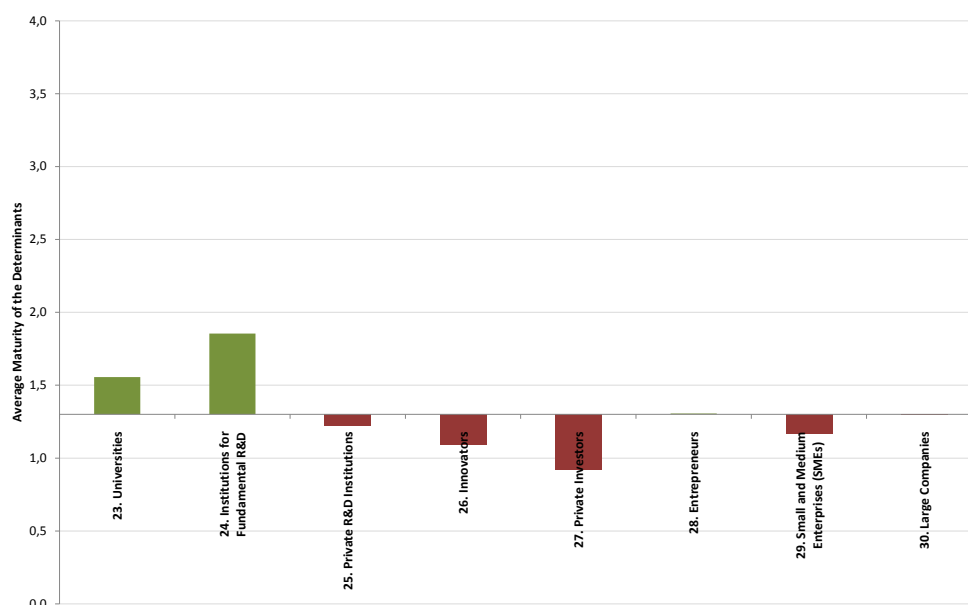


Figure 23 Determinants of the innovation capacity level compared to this level's average (water sector)

Looking at the maturity average of this level which is at 1.3 (Figure 23) it becomes even more visible that the innovation capacity level has satisfactory results in two aspects (*Universities* and *Institutions for Fundamental R&D*) and weak results in all other determinants.

Obviously, only *Universities* and *Institutions for Fundamental R&D* benefit from the however poor programme implementation and other innovation support measures. *Entrepreneurs*, *SMEs* and *Large Companies* have not been recognised as innovation drivers and are therefore not sufficiently considered by the government. Thus, the maturity level of water related industry is very low in the Tunisian innovation system.

Findings: Universities

Tunisia has several *Universities* and they have a medium-scale spectrum of research and education opportunities. The *Universities* are considered to play an important role in the national innovation system when it comes to issues on water treatment, water purification and waste water. However, the staffs at the universities are not sufficient and often the equipment lacks important parts and materials.

The linkages of the universities to industry are only weakly developed. *Universities* are mainly institutionally funded, but also receive funding from public programmes. At international level only some universities are acknowledged. However, world class researchers are only partly attracted by the international research programmes for Tunisia. The level of training and education of students is quite good; the curricula are developed according to the current needs. Hence, scientific excellence with regard to water technologies is provided by many universities in Tunisia.

Findings: Institutions for Fundamental R&D

The *Institutions for Fundamental R&D* are existent but they do not cover the full spectrum of R&D. However, they play an important role in the national innovation



system. *Institutions for Fundamental R&D* in Tunisia are fairly equipped and fairly staffed. They operate to a great extent according to national priorities and generate ample usable input for applied R&D. Many are visible at international level. They are mainly institutionally funded. The *Institutions for Fundamental R&D* in Tunisia are well known for providing scientific excellence with regard to water technologies. However, they are rather of medium interest to world class researchers or high potentials.

Findings: Private R&D Institutions

Private R&D Institutions with special focus on water technologies have not yet been established.

Findings: Innovators

With regard to *Innovators* the number of researchers with individual interest is at medium level. Innovation culture in general has not yet been recognised as important in Tunisia. The support schemes for innovators to develop ideas into products or services are only weakly developed. A rewarding system for new ideas does not exist. Innovators work rather individually than within a network. The public understanding of science and innovation is at a good medium level.

Findings: Private Investors

With regard to *Private Investors* in the water sector Tunisia has a big lack. Not many private investors exist since the conditions are not good. That is why venture capital rarely exists.

Findings: Entrepreneurs

Entrepreneurship in the water sector is little supported. Although there are researchers and inventors with individual interest in starting their own science, technology or modernisation business and their acceptance in public is good, the level of entrepreneurial education, such as management skills, is low. Instruments to reduce the personal risk of entrepreneurs or to secure sufficient financing are not known.

Findings: SMEs and Large Companies

The number of *SMEs* in the water sector but also in general in Tunisia is very low. They do not play such an important role as drivers for innovation. They are not involved in developing new technologies or innovative products, have a weak position within the innovation system and cannot be considered as competitive. Also *Large Companies* are not seen as innovation drivers. However, they were considered as more important than *SMEs* by the participants of the workshop.

6 Comparing the Sectors Energy and Water

The radar charts of following chapters (6.1 - 6.2) depict a comparison of the Expert Opinion Survey results for the sectors energy and water. Basically, the sector energy has been assessed as slightly more matured than the sector water. As such, the water sector could benefit from already existing successes in the energy sector through mutual learning among both sectors.

However, both sectors show rather low levels of innovation support activities. Therefore, many projects at innovation capacity level do not reach their full potential or are being cancelled before their innovative momentum. The following subchapters give a short description of the statuses for both sectors and introduce first proposals for improvement of some of the determinants.

6.1 Macro Level: Innovation Policy Level

At policy level the results of the water and the energy sector show almost the same pattern (Figure 24). With regard to *national innovation policy* and *master plans* Tunisia is assessed with a moderate maturity by the EOS. A better coordination between both sectors, e.g. through exchange of experience concerning innovation related measures could be one of the aims by which both sectors benefit from each other.

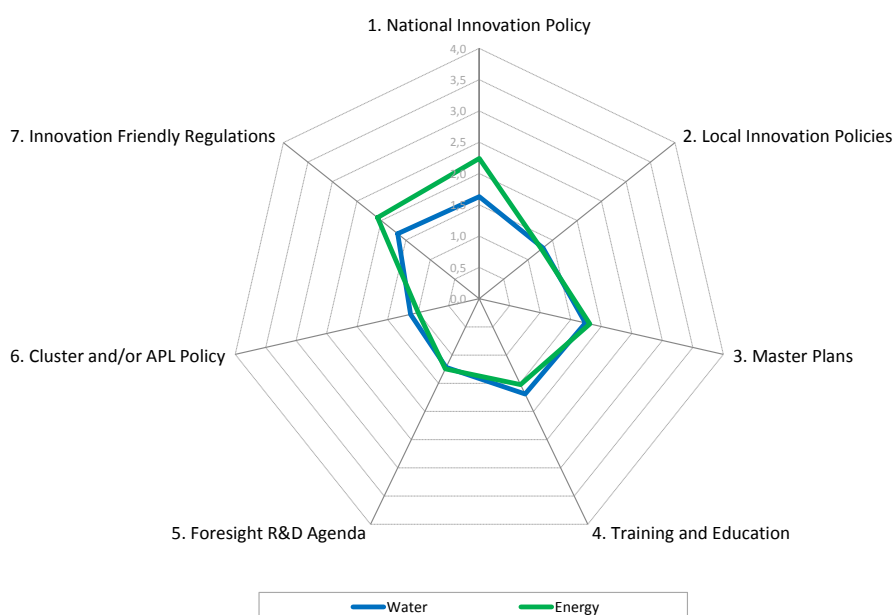


Figure 24 Comparing the sectors water and energy in Tunisia at policy level

6.2 Meso Level: Institutional Innovation Support

The maturity of the institutional innovation support level in the energy sector has been assessed significantly better than of the water sector (Figure 25), whereas all the relevant determinants are on a quite low level. The reason for this difference seems to be the slightly better implementation of the policy measures in the energy sector.



Technology Transfer Centres were ranked on the same low level. This is due to the fact that the centre approach has not yet been consequently implemented. Reasons have been mentioned in the previous part of this study. Significant differences can be seen for *Business Promotion Agencies* and *Funding Agencies*.

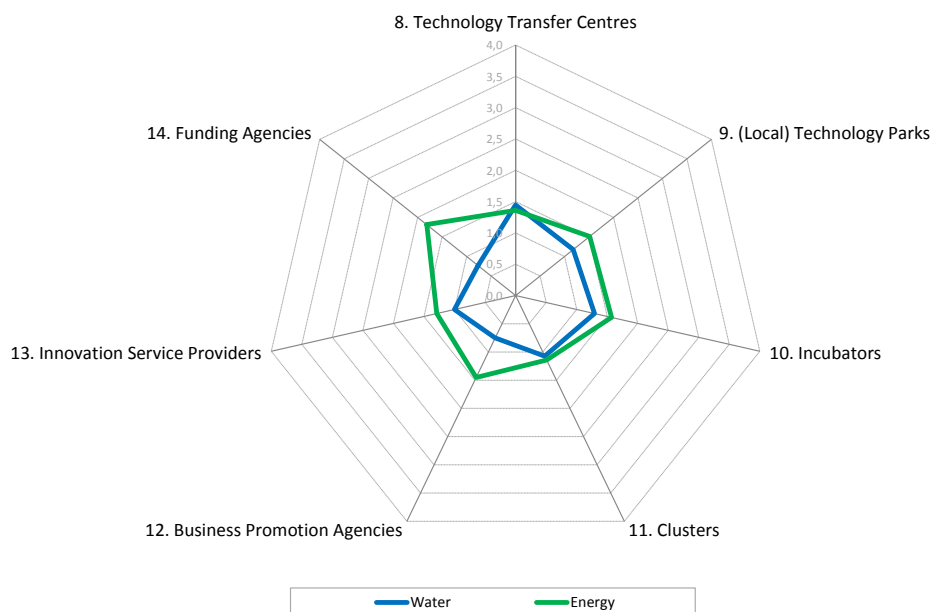


Figure 25 Comparing the sectors water and energy in Tunisia at institutional innovation support level

6.3 Meso Level: Programmatic Innovation Support

The comparison at programmatic innovation support level clearly shows that the respective determinants are much better developed for the energy sector (Figure 26). Various programmes and funding schemes of the energy sector are established and implemented in a better manner than in the water sector. Especially, when it comes to *Fundamental R&D-Programmes* there is a significant difference between the energy and the water sector.

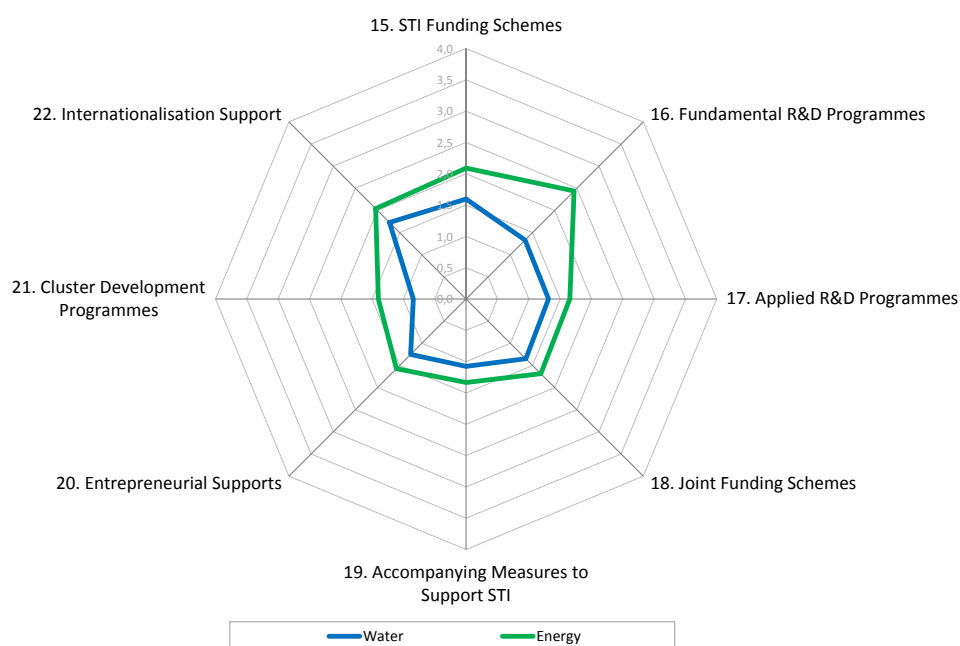


Figure 26 Comparing the sectors water and energy in Tunisia at programmatic innovation support level

6.4 Micro Level: Innovation Capacity Level

At the innovation capacity level all relevant determinants are weakly developed (Figure 27). Especially, the *SME* structure, which can be considered as one of the main drivers for innovation, seems to be underdeveloped, since there are no funding schemes in place which focus on this target group.

Taking the significantly higher values of the determinants of the institutional innovation support as well as of the programmatic support level for energy into account (Figure 25 and Figure 26), it is surprising that the differences shown in Figure 27 are so small.

Of course, some determinants, such as *Private R&D Institutions*, *Innovators* or *Private Investors*, are ranked higher, but not that significantly. There is no difference for *SMEs* in the energy and water technology sector. One explanation might be that active STI support in the energy and water technology field is quite new and it takes time to realise visible benefit at innovation capacity level.

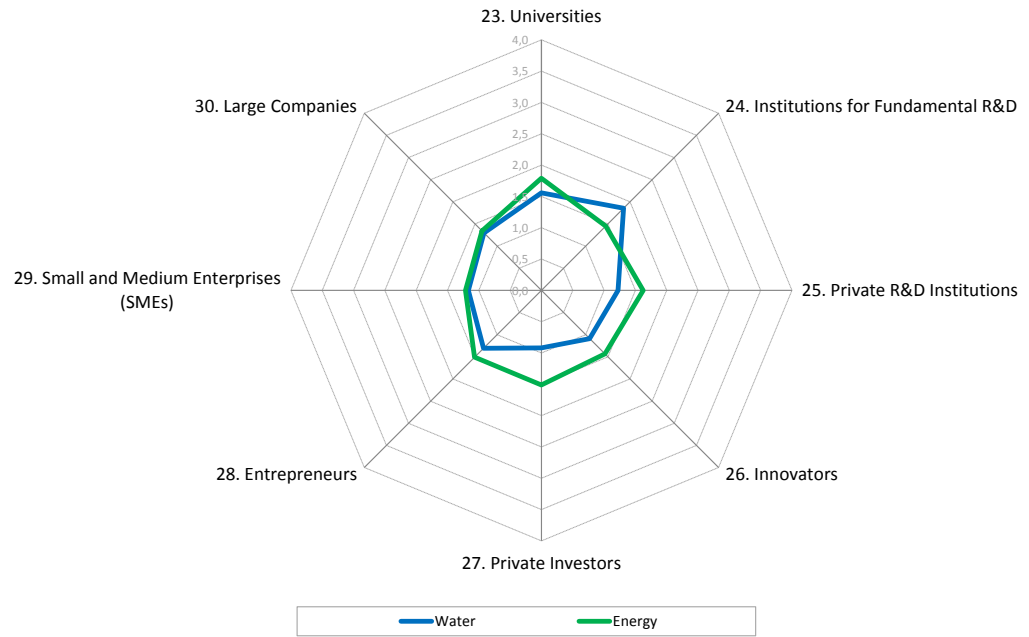


Figure 27 Comparing the sectors water and energy in Tunisia at innovation capacity level



7 Comparing Tunisia with Similar Economies

In order to further classify Tunisia's current status of its innovation system, it is compared to other countries, already been analysed with the ANIS approach, and classified as efficiency-driven economies. As mentioned in chapter 2.4 the countries used for the comparison are **Jordan**, **Namibia** and **Indonesia**. Furthermore, we have included **Egypt** in the comparative portfolio. Even though Egypt is defined by the GCR as transition country we decided to include it in the comparative portfolio because Tunisia - due to the revolution and political uncertainties during the last years - can also be considered as a "moving" country between different stages similar to Egypt.

Jordan, Namibia, Indonesia and Egypt were also analysed with the ANIS tool and are therefore used as comparative portfolio in the following subchapters (7.1 - 7.4).¹⁴

Furthermore, VDI/VDE-IT (iit) has carried out a short term consulting project targeting the Industrial Council for Technology and Innovation of Egypt and its Centres (TICs). The project ran for three months between October and December 2012. It was supported by the GiZ and financed by the German Federal Ministry for Economic Cooperation and Development. The work included a comparison of the current status of the technology and innovation centres with 2008, the identification of success factors for technology and innovation centres, and an assessment of the work of the technology and innovation centres. One of the main results was that the status of the Egyptian innovation system has not changed significantly since 2008.

The selected countries are especially relevant for comparison with regard to the water sector as they all also suffer from scarce (drinking) water resources (Haddadin 2006; Pérard 2008; WIRA Study Team 2012). Egypt's water policy can be taken as good example as it achieved 100% drinking water coverage and is currently striving for achieving this result in the waste water sector (OECD 2010a).

Furthermore, in all of the above mentioned countries the institutional conditions for renewable energies are at similarly low levels. Tunisia and Jordan have nevertheless started to establish a strategy for renewable energies and energy efficiency which include environmental protection and constant availability of energy (OECD 2013b).

Back in 2010 Tunisia was described as leading country in North Africa with efficient government structures and good educational conditions (Schwab 2010). The following figures in this chapter will show quite a contrast to this statement by the GCR by comparing it to the other countries. This can be mainly reasoned by the fact that the situation in Tunisia has changed dramatically during the last two years. This statement is confirmed by the Global Competitiveness Report of 2011-2012 which says that due to the unrest the competitiveness index ranking of Tunisia dropped by eight positions (Schwab 2011). The GCR of 2011 recommends a further improvement of the business environment towards becoming more competitive.

This dramatic drop is reasoned by the GCR with the uncertainty about the future of Tunisia and its innovation system and "higher public awareness of the countries' structural weaknesses, resulting mainly in poorer assessments of different aspects of

¹⁴ The ANIS reports for these countries were published as follows: Egypt 2008, Jordan 2009, Namibia 2010, Indonesia 2011.



public and private institutions” (Schwab 2011, p. 37). These statements are confirmed by the results of the ANIS questionnaire (see chapter 5).

The following comparisons assess and benchmark further Tunisia's national innovation system as well as identify options for enhancing its overall performance.

7.1 Macro Level: Innovation Policy Level

The pattern for the innovation policy level exhibits similar results for all countries (Figure 28). Generally, the level of maturity is relatively low. Except the determinant *National Innovation Policy* shows slightly better results for Tunisia than for the other countries. The launch of several R&D policy programmes in Tunisia since 2003 might be one of main outcomes of this relatively stable *National Innovation Policy*. Among others the “National Research and Innovation Programme” has been launched (Chaabouni, 2008).

The radar chart (Figure 28) shows good results for Egypt’s *Innovation Friendly Regulations*. One reason for this might be that in Egypt, the industrial and innovation policies target on the selective development of sectors, subsectors and sometimes also highlight specific aspects of high potential. Their purpose is to coordinate and to align actors in the innovation system to implement support and fiscal measures.

However, the figure shows that the countries have similar problems developing policy programmes. Comparative workshops for specific determinants, for example foresight R&D agenda could help to complete each other’s strategies.

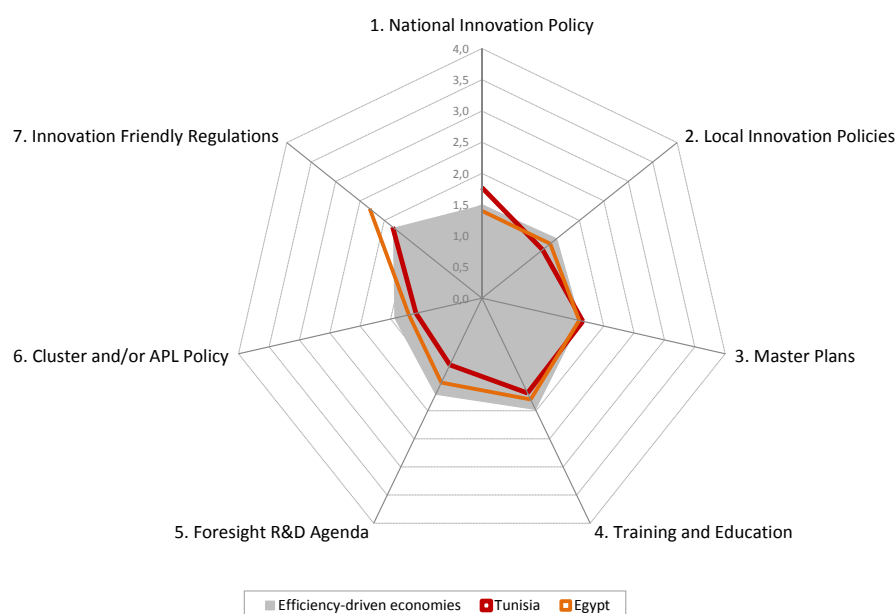


Figure 28 Maturity of the determinants of Tunisia’s policy level in the sectors water and energy, compared to the average of selected efficiency-driven economies and Egypt¹⁵

¹⁵ The countries that are used for the comparative portfolio are Jordan, Namibia, Indonesia and Egypt. The grey area depicts their average. The red line shows the average values of Tunisia (sectors energy and water combined). The orange line shows the average values of Egypt.



7.2 Meso Level: Institutional Innovation Support

Figure 29 shows that the institutional innovation support level is very little developed in Tunisia. Whereas the average of the comparative portfolio exhibits values at medium level especially concerning *Incubators*, *Business Promotion Agencies*, *Innovation Service Providers* and *Funding Agencies*, Tunisia struggles with too little recognition of these determinants. The main weakness as described by the experts during the workshop is that these determinants are not yet considered as being important support tools for innovation. Simply setting up an innovation policy, such as the “The National Programme for Technology Parks” is not sufficient.

There is an urgent need in Tunisia to improve the existent innovation support institutions by implementing concrete activity plans, by training the staff of these institutions, and by raising awareness at policy level.

It is very interesting to see in Figure 29 that although at policy level all countries have a relatively similar status, the countries of the comparative portfolio are definitely more successful in “using” their innovation support institutions than Tunisia.

This is especially true for Egypt and its Technology and Innovation Centres. For most of the Egyptian Technology and Innovation Centres the emphasis is laid on supporting the modernisation, transferring modern businesses and technological knowledge and practices to the clients at innovation capacity level, and supporting the coordination and cooperation of the clients. The Egyptian Technology and Innovation Centres have been consequently implemented and sufficiently staffed; their performance is consequently monitored by the respective ministry.

Although the Egyptian Technology and Innovation Centres are also struggling, they operate on a much higher level. There are many success stories, e.g. on how they contributed to turn inventions into dedicated products and technologies (Hahn & Meier zu Köcker, 2012). Hence, they act as innovation service providers, and as a consequence this determinant received quite high values for Egypt. Furthermore, the other determinants have received high values as they all supply satisfying innovation support.

All in all, it can be concluded that the implementation and governance of innovation support institutions, which do play an important role, is weak in Tunisia, especially when comparing it to Tunisia’s neighbours or peers.

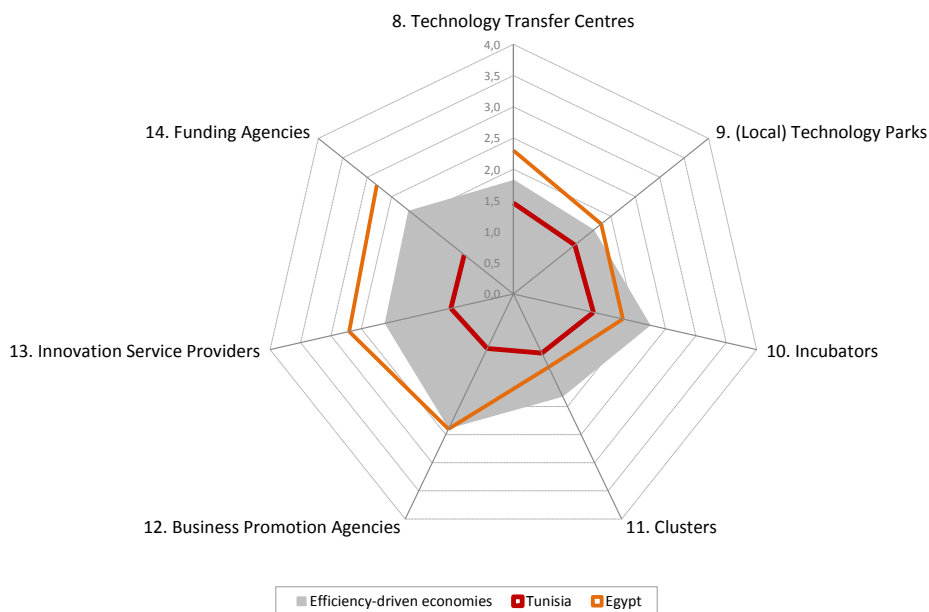


Figure 29 Maturity of the determinants of Tunisia's institutional innovation support level in the sectors water and energy, compared to the average of selected efficiency-driven economies and Egypt

7.3 Meso Level: Programmatic Innovation Support

At the programmatic innovation support level Tunisia is also below the average of efficiency driven countries. Figure 30 however shows that the tendency of the individual determinants is similar to the average tendency. *STI Funding Schemes*, *Fundamental R&D* and *Internationalisation Support* seem to receive good programmatic uphold.

However, the overall effort at this level seems to be too low to make Tunisia catch up with the other countries. Especially, with regard to *Cluster Development Programmes* and *Entrepreneurial Support* more knowledge and know-how at macro- meso- and micro-level is needed in Tunisia. Particularly when comparing the values of Egypt to the values of Tunisia, it becomes even clearer that Egypt has successfully applied its know-how in implementing support programmes. Values above 2.0 for *STI Funding Schemes* or *Applied R&D Programmes*, or a value of 3.0 for *Entrepreneurial Support* reveal a focussed innovation support strategy.

A major issue in Egypt is the strengthening of national and local manufacturing. This implies the focussing on national services necessary for the achievement of these objectives, e.g. the support of sustainable growth of existing and new companies along competitive national value chains. The innovation support services comprise all knowledge and technology support, including management knowledge, access to finance and legal support.

To sum it up, Figure 30 shows that similar to the results of the institutional innovation support level, also at programmatic innovation support level, it becomes obvious that the comparative countries perform much better in implementing their innovation



support programmes even though the basic conditions at policy level are similar for all countries.

A considerable difference can be seen for *Entrepreneurial Support Programmes*, which are high on the policy agenda in Egypt and other countries of the comparative portfolio. When it comes to *Cluster Development Programmes*, Tunisia and Egypt are ranked lower than those countries of the comparative portfolio. Indeed, cluster support measures in both countries are provided by third donors with rather low success.

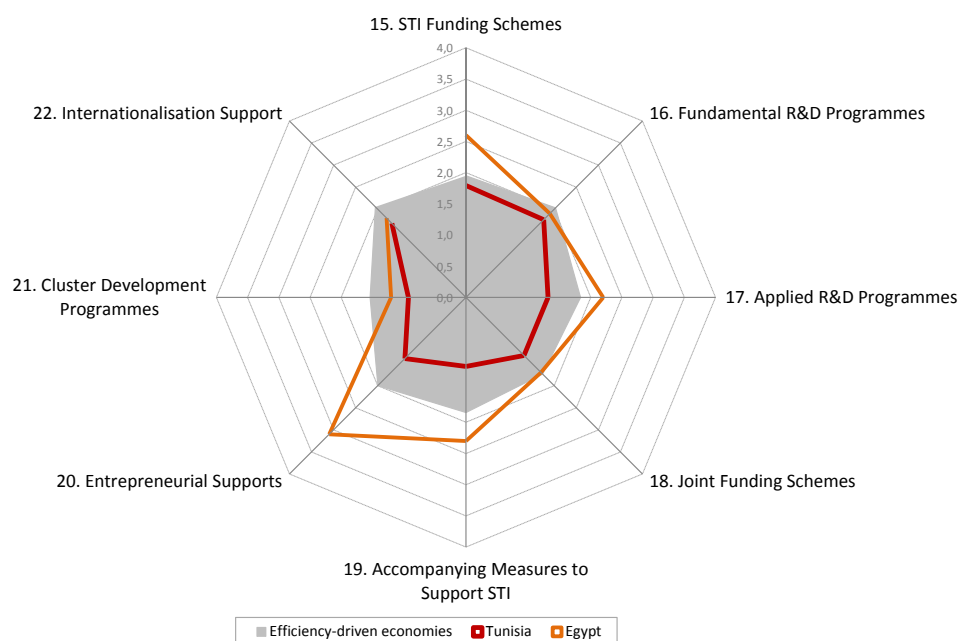


Figure 30 Maturity of the determinants of Tunisia's programmatic innovation support level in the sectors water and energy, compared to the average of selected efficiency-driven economies and Egypt

7.4 Micro Level: Innovation Capacity Level

The innovation capacity level of the energy and the water sector is clearly below the average of the comparative countries (Figure 31). Since the Tunisian questionnaires were answered mainly by experts from the innovation policy level and from the innovation capacity level, it shows that Tunisian scientists and researchers have a very critical view towards their innovation support system.

The main reason behind this major difference is probably the political unrest during the last years in Tunisia. People at the innovation capacity level are dissatisfied with their current situation and therefore see the main innovation factors as quite critical. A rebuilding of trust among the players should be one of the next actions in order to regain self-consciousness at this level.

Not surprisingly, since the innovation support level of the comparative countries registers more success than Tunisia's innovation support level, also the innovation capacity level of the comparative portfolio provides more innovation oriented projects and services. This proves that the establishment, roll-out and implementation of innovation support measures lead to more innovation capacity not only in

industrialised countries but also in efficiency-driven countries. Tunisia should therefore urgently take the countries of the comparative portfolio as examples for its own innovation policy in the water sector and energy sector.

This role model applies especially to Egypt. The values shown in Figure 31 confirm that a successful innovation support (cf. Figure 29 and Figure 30) lead to good results at innovation capacity level. Furthermore, almost all determinants at innovation capacity level of Egypt show an advanced development. Particularly, the so important small and medium sized enterprises seem to benefit from the innovation support activities in Egypt. In Tunisia, this determinant has been almost neglected so far.

Hence, with regard to companies the management capabilities of Tunisian entrepreneurs have to be trained. *Technology Transfer Centres* at innovation support level could take over these tasks. The development of entrepreneurial skills could lead to better managed industry. Especially in the water sector the inclusion of private companies could help to expedite the decentralisation of the water management in Tunisia. This could advance the coverage of the drinking water supply and the technology for the desalination of the water (Pérard 2008).

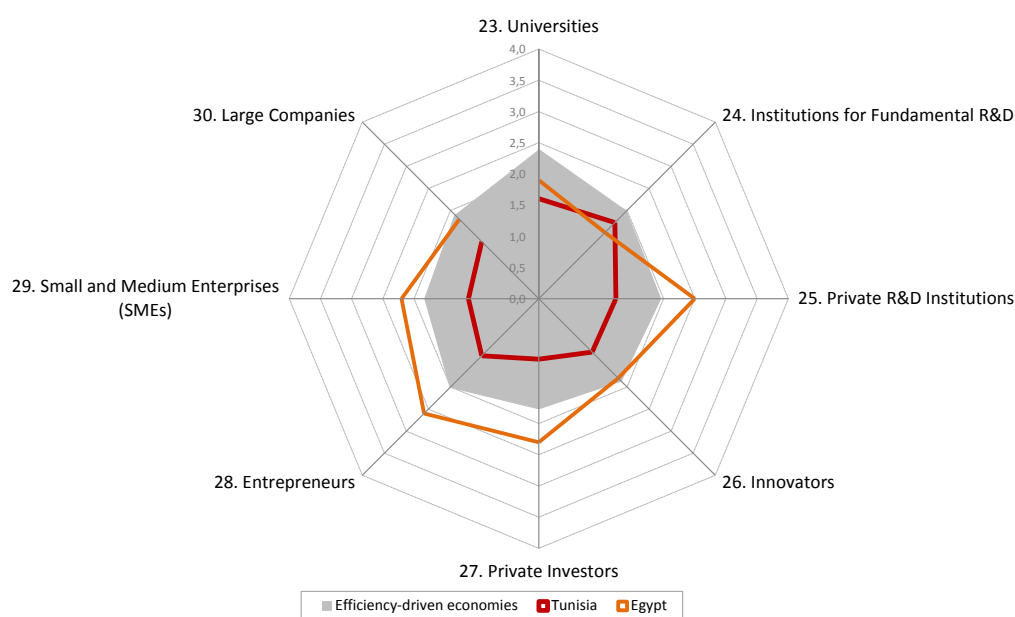


Figure 31 Maturity of the determinants of Tunisia's innovation capacity level in the sectors water and energy, compared to the average of selected efficiency-driven economies and Egypt



8 Main Challenges and Scope of Intervention in Tunisia

The status of maturity of the sectors within the Tunisian innovation system and the performance of its actors can be improved by policy measures addressing the improvements of single determinants or even several of them. The prospective impact can be expected on all three levels if the policy is adequately formulated, implemented and the potentials adequately targeted.

In the third part of the workshop the experts were asked to rate the determinants of the Tunisian innovation system within their specific sector according to their effort and impact.

In order to prioritise the measures that improve given determinants, especially those that were rated below average with respect to scarce resources, a portfolio analysis was conducted with ANIS in order to distinguish effective measures from those that involve extensive effort and high risks with regard to implementation.

In the next step it is now very crucial to know and to make use of effective policy tools in order to enhance the performance of single determinants as well as the overall performance.

When improving a given determinant, two indicators can be calculated. Firstly, the **Impact Index** (Quality & Quantity of Impact) is calculated, which accounts for innovation support quality multiplied with diffusion enhancement of the measure. This indicator describes the effectiveness of an expected impact on the innovation system.

Secondly, the **Effort Index** is calculated, which accounts for the costs of a certain measure and its implementation risk. Implementation risks include e.g. difficulties in the coordination between ministries, the insufficient authority for the implementation of measures, or the complexity of an implementation measure.

Impact and Effort indices have been calculated for all determinants of the Tunisian innovation system and for each sector separately. If an innovation system should be improved, certain determinants must be addressed. It is quite clear that some determinants are easy to improve, others are much more complex. For this reason, we grouped the determinants according to their complexity for improvement. As it is shown in Figure 32 and Figure 34, we used a portfolio with two different scales. One scale represents the “efforts needed” (How extensive is the needed amount of investment to enhance the performance of the determinant?), the other represents the “expected impact” (What range of improvement can be expected?).

To answer the question “What is the scope for intervention?” with highest perspectives for improvement of the capability of the innovation system, the results of the interviews and the background information are visualised in the following portfolio. The determinants in the figures have been marked with the same numbers that are to be found at the beginning of the present study (Figure 1).

Generally, it can be said that even though the portfolio of intervention has been developed separately for each of the two sectors the following actions including their recommendations can be applied to both the water and the energy sector.

8.1 Improving the determinants of the energy sector

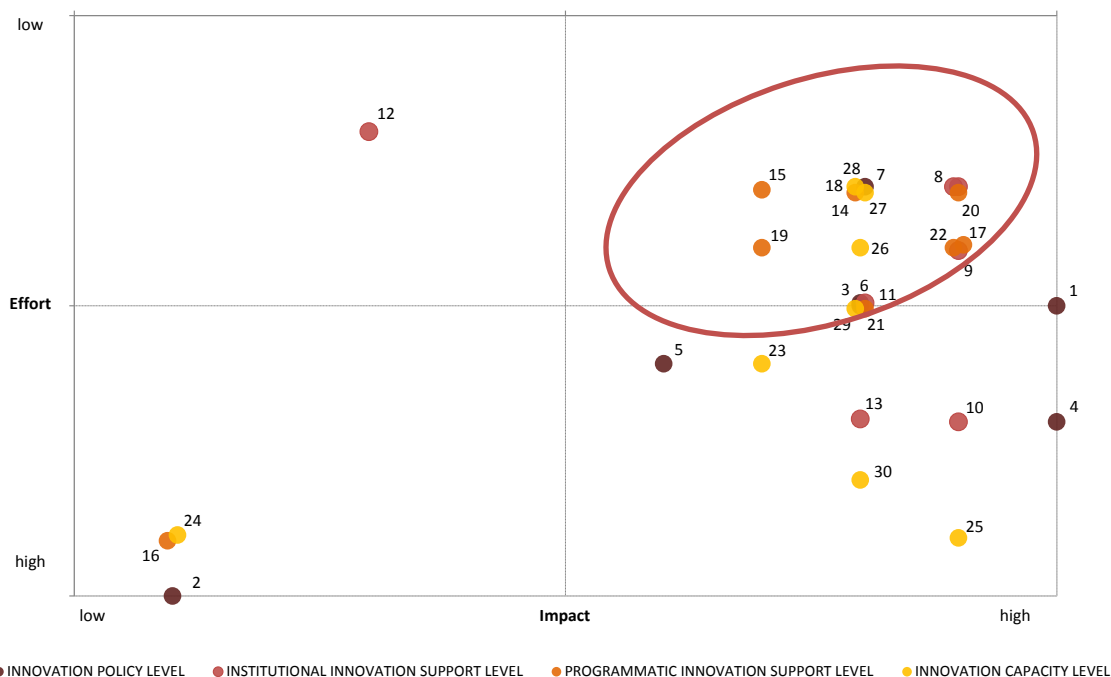


Figure 32 Portfolio – Scope of intervention of innovation support schemes in Tunisia – Energy

Recommendation 1: Improving the implementation and management of current STI support programmes

According to the Expert Opinion Surveys, there are many determinants that can be improved with relatively small effort and high impact (Figure 32, upper right corner). Some of them belong to the programmatic support level:

- *STI Funding Schemes (15),*
- *Applied R&D Programmes (17),*
- *Joint Funding Schemes (18),*
- *Entrepreneurial Support (20) or*
- *Internationalisation Support (22).*

Most of them have been ranked comparatively low (area between 1.5 and 2.0). When having a closer look at these programmes, it becomes clear that the main reason for their low ranking is the fact that the implementation and management of these programmes is not as efficient and demand-oriented as it could be. The corresponding programme calls are considered to be quite complicated from the beneficiary's point of view. The proposal evaluation procedures are considered as hardly transparent and time consuming. Even the eventual confirmation that a proposal will be funded does not necessarily mean that the beneficiary will actually receive funding in the end. In addition, the programme objectives have not changed over the last years and thus, do not correspond to the industrial demand.



Summarising all these observations, the improvement of the above mentioned determinants is not a matter of political willingness or money. Instead, the determinants at programmatic innovation support level can be improved by enhancing the implementation and administration of these programmes.

The reason behind this fact is that there is a lack of capacities of programme implementation and administration in the corresponding ministries. An international benchmarking of STI programme implementation and management (including programme design, implementation, administration, monitoring etc.), which means a voluntary comparison with other, similar STI programmes from other nations, could be a good way to stimulate mutual learning among Tunisian policy makers and those who are in charge of the programme implementation and management.

The result of such a benchmarking is not a “good” or “bad” evaluation or any other kind of ranking, but rather a new insight on how other programme owners deal with similar challenges and how they address certain issues best. During such benchmarking exercises all core elements of an STI programme “life cycle” will be compared with similar STI programmes, starting with analytical actions before an STI programme is launched and ending with an impact and success measurement.

The following core elements / actions of an STI programme are benchmarked:

- Phase I: Analytical phase: all actions that usually have to be conducted before the implementation of an STI programme will be compared;
- Phase II: Development process of core programme design features;
- Phase III: Call design and call implementation;
- Phase IV: Communication and awareness raising;
- Phase V: Programme management and administration of the programme;
- Phase VI: Monitoring;
- Phase VII: Adaptation and continuous improvements.

Benchmarking (and coaching on how to implement improving actions) shall be done according to these phases. In the end, Tunisian policy makers and administrative staff will identify areas for improvement and can learn from their peers.

Recommendation 2: Using evaluation and impact measuring for a better STI programme governance

Evaluation and impact measuring of STI support programmes are important tools to justify public investments in STI and adopting programme designs and objectives. Such activities help to identify success stories as well as areas for sectorial improvement.

There are different evaluation approaches (e. g. ex-ante, ex-post or formative evaluations), which are commonly used worldwide. Figure 33 reveals a rough evaluation design, which can be adapted to different STI support programmes. It can serve as a guide during a particular evaluation, as it depicts all levels (policy, programmes and beneficiaries) that are typically involved in such evaluation activities. However, according to the individual needs, certain groups can be ignored; e. g. in the framework of an impact analysis, the policy level is usually not regarded.

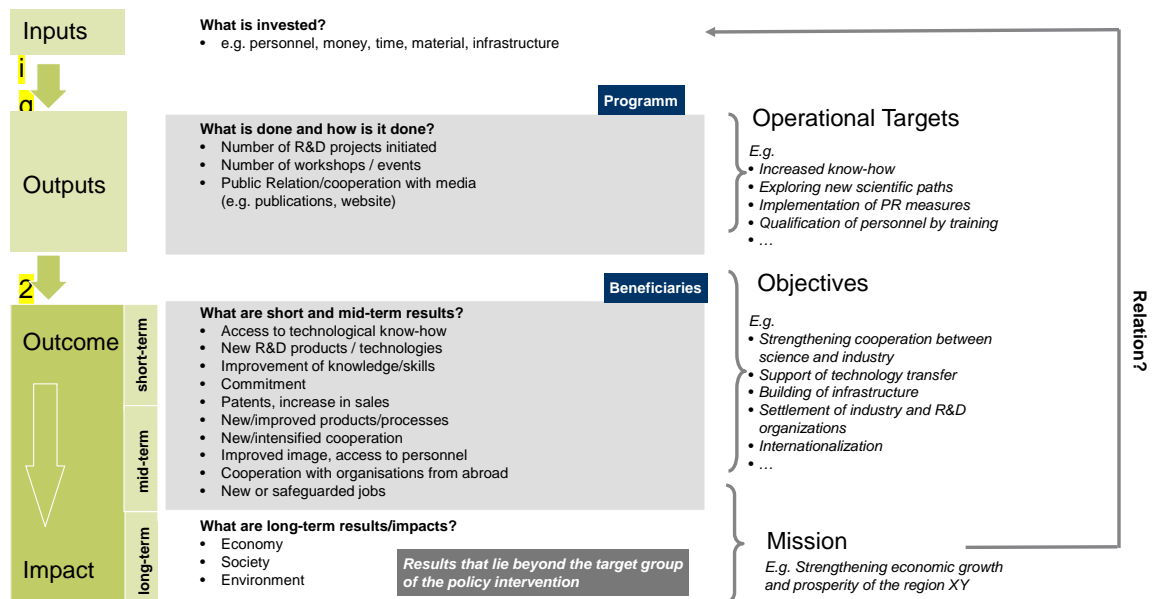


Figure 33 Evaluation Design (Kind, 2013)

It is strongly recommended to run evaluations of on-going STI programmes for the above mentioned reason. Due to the current lack of evaluation capacities within the corresponding ministries, external evaluation coaches would be helpful. They could coach the whole process, starting with a proper evaluation design until defining proper indications and involving the right stakeholders. In the end, Tunisian policy makers will have a realistic picture of the impact of their programmes and will know where to undertake corrective actions.

Recommendation 3: Improving the impact of Tunisian Technology Transfer Centres

Figure 32 further reveals that the impact of *Tunisian Technology Transfer Centres* could also be improved with realistic efforts. Technology Transfer Centres today are a very popular tool to bring together industry and academia, and enable more sustainable innovations.

The reason for this is that *Technology Transfer Centres*, provided they are adequately staffed with researchers and fully technologically equipped, can offer innovation-related services according to their clients' needs. The Slovenian Centre Polimat or the Austrian Centre PCCL can be considered as best practises.¹⁶

The clients are mostly enterprises that need support in creating innovations. The current weakness of the *Tunisian Technology Transfer Centres* is the poor implementation and the lack of sufficient staffing, equipment and management

¹⁶ For further information see www.polimat.si and www.pccl.at.



capabilities. Consequently, this recommendation focuses on a better implementation of the centre approach.

It is not necessarily a question of money but rather a question of political commitment and centre management. There are several options how to improve the management competence of such centres. One option could be benchmarking exercises according to the European management excellence approach.¹⁷ Another option could be study visits to neighbour countries, such as Egypt or Turkey. Both countries have made good progress in implementing and using *Technology Transfer Centres*. The policy level should also be involved in such coaching and training, since the political governance of these centres has to be improved as well.

Recommendation 4: Strengthening regional networks and clusters

A special role should be assigned to the determinants *Cluster Policy (6) (at policy level)*, *Clusters in general (11) (at institutional innovation support level)* and *Cluster Development Programmes (21) (at programmatic innovation support level)*. These determinants were assessed with having a relatively high impact when improving them with medium to high effort. The experts in the workshop were of the opinion that the support of clusters and the implementation of a sound cluster policy could lead to major positive impact for the energy sector in Tunisia. Since the concept of clusters is relatively new in Tunisia the effort to implement cluster related measures was assessed with medium to high values.

By establishing cluster structures the lack of cooperation between industry and academia could be abolished. Therefore the development of a nationwide cluster policy focussing on the sectors water and energy would support this process. This should include the development of an implementation plan to foster regional sector based networks of innovation and the building up of already existing cluster activities towards better performance.

Currently a cluster policy is not installed in Tunisia. There are some activities on-going supported by third donors, such as the GiZ, but with limited success. It is recommended to better involve local stakeholders and policy makers in the cluster development process. A common process to develop a national cluster policy would be an option. In addition, coaching and advice should focus on cluster management excellence rather than setting up more clusters. Consequently, further support actions should focus on the cluster organisations as such. The European Cluster Excellence Initiative ECEI developed clear criteria and guidelines how to improve cluster management in practice.

¹⁷ The European Cluster Excellence Initiative ECEI has developed benchmarking and excellence indicators for Technology Transfer Centres as well (www.cluster-analysis.org).

8.2 Improving the determinants of the water sector

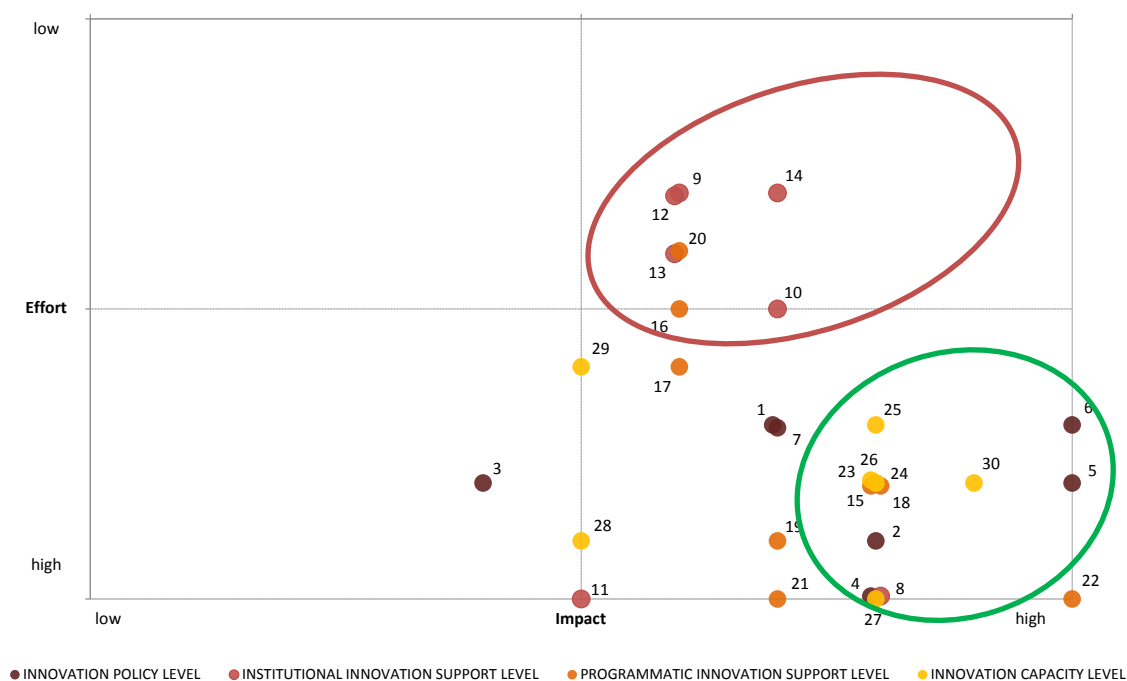


Figure 34 Portfolio – Scope of intervention of innovation support schemes in Tunisia - Water

Recommendation 5: Strengthening the existing institutional innovation support providers

The water sector needs considerably more effort to improve than the energy sector. Many determinants are very weakly developed. That is why it is no surprise that only a few determinants are to be found in the quadrant with little effort and high impact (Figure 34). In any case the water sector in Tunisia needs strong efforts to improve those determinants that promise the most impact.

Yet, the determinants in the water sector that can have a high impact using only little effort are *Technology Parks (9)*, *Incubators (10)*, *Business Promotion Agencies (12)*, *Innovation Service Providers (13)*, *Funding Agencies (14)*, and *Fundamental R&D Programmes (16)* (Figure 34, upper right corner).

Similar to the energy sector, many institutional innovation support entities are poorly implemented or exist only on paper. Thus, it is strongly recommended to have a more detailed look at these institutions and to support the Tunisian government in better implementing such entities. There are two dimensions:

- **The policy dimension:** The respective entities must be able to operate as flexible as possible. They should not be too much controlled by the government, e. g. it is not appropriate that such entities are part of the ministries or similar institutions. There is no doubt that the government shall be able to monitor the development, but a minimum of flexibility is needed. Here, policy learning and benchmarking on how this is done in other countries would be a first step. Policy makers also have to acknowledge that a minimum of investment in staff and equipment is mandatory.



- The management dimension: The management of such entities is the key for success. Future support measures should clearly focus on upgrading the management capabilities of these entities. It is recommended to run some benchmarking exercises or conducting the training need analysis first and then set up a proper training agenda.

Recommendation 6: Developing a national research agenda

The Tunisian STI funding scheme in the water technology sector is still very weak. Although significant improvements will require extensive efforts, it is recommended to start appropriate actions. Similar to the energy sector, the STI programme landscape shall be evaluated in order to have less but more powerful STI programmes in place.

Based on a commonly developed Tunisian research agenda, STI programmes shall focus on some areas in the water technology field, where highest impact is expected. So far, there are too many programmes with far too little impact. It would be better to merge programmes in order to gain a critical mass. In addition, actions mentioned for the energy sector (recommendation 1 and 2) should also be applied for the water technology sector. Following this recommendation, significant progress can be expected at innovation programme level.



9 Recommendations for the Cooperation of the Tunisian and the German Ministries

The **continuous improvement** of the conditions of the Tunisian innovation system will more likely take place, if the Tunisian government receives tailor-made support and advice from third parties. Yet, compared to previous approaches, conducting additional training measures will not sufficiently contribute to any improvement. Instead, the overall challenge in Tunisia will be the implementation of cohesive policies and innovation support approaches. Thus, the support of the German government has to be more practical than it has been so far.

The findings clearly reveal that it seems to be much too early to implement common bilateral calls for joint research. Instead, the contribution of the German government should focus on the previously mentioned recommendations.

- **Recommendation 1: Improving the implementation and management of current STI support programmes**

German ministries and funding agencies have long-term experience in implementing manifold innovation support measures. A good approach therefore would be the comparison of good practices and the benchmarking of implementation and administrative procedures, provided that this is done in a very practical manner. This means that the steps of implementation and administration have to be compared and benchmarked in a very detailed manner. As long as the implementation and administration of Tunisian STI is still at such an embryonic level, the implementation of joint calls is too early and would therefore not be successful.

- **Recommendation 2: Using evaluation and impact measuring for a better STI programme governance**

A further German contribution could be to jointly run an evaluation of one or more Tunisian STI programmes. This would include the core activities: 1) joint definition of the evaluation design, 2) demarcation of success criteria and 3) description of improving actions. In the end, appropriate knowledge and know-how can be transferred from Germany to Tunisia aiming, again, at better implementing STI policies and programmes. German ministries and funding agencies have extensive experience in this field.

- **Recommendation 3: Improving the impact of Tunisian Technology Transfer Centres**

German government actively supported the setting up of *Technology Transfer Centres* in Germany in the 1990s. Nowadays, *Technology Transfer Centres* play an important role within the German innovation system.

Hence, for Tunisia the German contribution could focus on the policy implementation level (policy actions and programmes for setting up *Technology Transfer Centres*) as well as on the management level. Benchmarking *Centres of Excellence* and peer reviews would be efficient tools to improve the capability of *Tunisian Technology Transfer Centres*.



- **Recommendation 4: Strengthening regional networks and clusters**

Germany's cluster policy is considered to be one of the most advanced ones in Europe. There are many different programmes in place focussing on different cluster excellence levels, e.g. setting up new regional networks (*ZIM NEMO*) or the *Cutting Edge Competition* for world class clusters. Here, the German contribution could be to advice the Tunisian government how to set up an appropriate and tailor-made funding scheme. Based on an analysis of the maturity of already existing Tunisian clusters, appropriate support measures should be defined. So far, Tunisia does not have any policy or support measure for clusters in place.

- **Recommendation 5: Strengthening the existing institutional innovation support providers**

Here, similar actions are proposed as for recommendation 3, yet with a broader scope. Not only *Technology Transfer Centres* should be focussed on but any kind of institutional innovation support providers.



Appendices

Further Key Questions Discussed During the Workshop

One of the most effective means to enhance the local innovation environment in Tunisia for both the energy and the water sector is the implementation of business incubators and knowledge hubs respectively. They possess the absorptive capacity to gather relevant knowledge and also to transfer this knowledge to the relevant actors. As such it is possible to provide SMEs with information that helps them to initiate new projects and processes.

Business incubators and knowledge hubs are in the very beginning in Tunisia. These entities enhance the transfer from the generation of new knowledge in research institutes to the implementation of new products or services through (start-up) companies.

In order to support innovation at innovation capacity level it could be helpful to invite people from all levels of the innovation system and make them discuss the conditions in which SMEs, universities, large companies, R&D institutes can possibly grow. Having analysed these conditions a network of knowledge can be developed.

Table 2 summarises main points of the discussion of the expert workshop. It can be considered as an addendum to the results of the expert opinion surveys and as a “further steps”- agenda for the Tunisian ministries.

The left column of Table 2 displays the stakeholders of the innovation capacity level. The right column of Table 2 shows the measures that should be initiated by the innovation support level in order to set up favourable conditions for the innovation capacity level. The entire table represents a list of questions with which the policy level should discuss Tunisia’s innovation policy agenda.

Participant of the innovation system	Questions	Measures
Training & Education (Institutions)	<ul style="list-style-type: none"> – Are the students well prepared for practical (R&D) work? (at the companies?) – Do they know what makes a business idea a good one? (or where to find out) – Is entrepreneurial activity encouraged? – Is research and development activity enhanced? 	<ul style="list-style-type: none"> – Consider alignment of curricula (partly) with local industry demands – Offer support and / or qualification in checking feasibility of business ideas – Offer qualification in entrepreneurship – Promote entrepreneurial spirit – Offer infrastructure for start-up
Research Institutions	<ul style="list-style-type: none"> – Are inventions enhanced? – Is the invention unique? (patents, publications) – Does it contain potential for a superior technical function in research or commercial products? – Does the application of the technical function add enough value to the solution / product that makes the invention commercially exploitable? 	<ul style="list-style-type: none"> – Enhance motivation of inventors (image of inventor / entrepreneur) – Enhance qualification of inventors and / or support for evaluation of inventions (e.g. co-operation economic / engineering faculties) – Support spin-offs (entrepreneurial coaching)



Cooperation between Industry and Research Institutions and Education Institutions	<ul style="list-style-type: none"> - What R&D requirements do local companies have? - What additional future R&D requirements could local companies have? - What relevant R&D projects do the local research institutions offer? - What additional or varied R&D projects could the local research institutions offer? 	<ul style="list-style-type: none"> - Round table "industry and research" - Explore the value chain of specific industry - Find out what specific invention is valuable to local development - Disseminate knowledge about financing possibilities - Start co-operative research for sustainable regional development (spin-offs, incubators, entrepreneurial coaching, patenting agency)
Industry	<ul style="list-style-type: none"> - What technology innovations do companies and suppliers need? - What R&D offers can local research institutions provide? - What education requirements do I have? - Is there financing for R&D? 	<ul style="list-style-type: none"> - Round table „industry and research“ - Explore the innovation need of the specific value chain - Find out what invention is valuable to commercial success - Find out about financing possibilities - Start (co-operative) research for sustainable regional development (spin-offs, incubators)
Innovation Support Agencies / Incubators	<ul style="list-style-type: none"> - What R&D requirements do local companies have? - What additional future R&D requirements could local companies have? - What relevant R&D projects do the local research institutions offer? - What additional or varied R&D projects could the local research institutions offer? 	<ul style="list-style-type: none"> - Enhance entrepreneur image - Evaluate business ideas, offer coaching and consulting for IPR and entrepreneurial activities - Supply / disseminate knowledge about financing (industry) - Support co-operation between industry and research - Offer space for well-defined businesses

Table 2 Levels and actors within a national innovation system



Agenda of the Workshop



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Under the Auspices of the Tunisian Ministry of Higher Education and Scientific Research

ANIS-Workshop on the sectors of *Water Technologies & Renewable Energy*
22 – 23 April 2013

Venue: Hotel Novotel, Mohamed V

Day 1: April 22, 2013

08:00 – 09:00	Registration
09:00 – 09:30	Opening of the Workshop by Mr. Dr. Moncef BEN SALEM, The Minister of Higher Education and Scientific Research
09:30 – 10:00	Presenting the aims of the Workshop by Lysann Müller & Nadine May (VDI/VDE Innovation + Technik GmbH, Germany)
10:00 – 10:15	Speaker 1: Mr. Zied KBAIER (CRTEn, Borj-Cedria) Borj-Cedria Ecopark presentation
10:15 – 10:30	Speaker 2: Pr. Mohamed BEN AMOR (CERTE, Borj-Cedria) Exemple d'un cas d'Innovation dans le secteur de l'eau
10:30 – 11:00	Coffee break
11:00 – 12:30	Introducing ANIS as a tool and guide to install effective innovation policy measures
	Framing the topic "Water Technologies" and "Energy"
	Milestone 1: Mapping the Tunisian innovation system focusing on the sector "Water Technologies" and "Energy"
12:30 – 14:00	Lunch break
14:00 – 15:30	Starting the ANIS Questionnaire
15:30 – 15:50	Coffee break
15:50 – 17:00	Continuing the ANIS Questionnaire

Moderators : Lysann Müller & Nadine May (VDI/VDE Innovation + Technik GmbH, Germany)



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Day 2: April 23, 2013

08:30 – 09:00	Registration
09:00 – 10:00	Milestone 2: Continuing and finishing the ANIS Questionnaire + discussion
10:00 – 10:30	Coffee break
10:30 – 12:30	Milestone 3: Extraction of the most relevant determinants for influencing the current status of the innovation system within the sector “Water Technologies” and “Energy”
	Discussion on how these determinants can be improved
12:30 – 14:00	Lunch break
14:00 – 15:30	Discussion on how these determinants can be improved
15:30 – 15:50	Coffee break
15:50 – 17:00	Milestone 4: Setting up of portfolio of intervention with recommendations for the sector “Water Technologies” and “Energy”

Moderators : Lysann Müller & Nadine May (VDI/VDE Innovation + Technik GmbH, Germany)



Participants List Energy Sector

Policy Level (Macro Level)

N°	Organisation	Abbreviation	Participant	Position
1	Ministère de l'Enseignement Supérieur de la Recherche Scientifique (MESRS)	MESRS-DGVR	Pr. Khemaies ZAYANI	Director
2	Ministère de l'Enseignement Supérieur de la Recherche Scientifique (MESRS)	MESRS-DGCI	Pr. Slim CHOURA	General Director
3	Ministère de l'Industrie (MIT)	MI-DGE	Mr. Rachid BEN DALY	General Director
4	Ministère de l'Enseignement Supérieur de la Recherche Scientifique (MESRS)	MESRS-Cabinet	Pr. Radhouane CHTOUROU	Minister's Counselor
5	Ministère de l'Enseignement Supérieur de la Recherche Scientifique (MESRS)	MESRS-DGRS	Pr. Rachid GHRIR	General Director
6	Ministère de l'Industrie (MIT)	MI-DGIIT	Mr. Ridha KLAI	General Director

Institutional Innovation Support Level (Meso Level)

N°	Organisation	Abbreviation	Participant	Position
1	Agence Nationale de Promotion de la Recherche Scientifique (ANPR)	ANPR	Pr. Bahri REZIG	General Director
2	Agence Nationale pour la Maîtrise de l'Energie (ANME)	ANME-DER	Mme Hélène BEN KHEMIS	In charge of RI Projects
3	Agence de Promotion de l'Industrie et de l'Innovation (APII)	APII-CIDT	Mr. Mohamed BELHAJ	Deputy Director
4	Institut National de la Normalisation et de la Propriété Industrielle (INNORPI)	INNORPI	Mr. Nafâa BOUTITI	Deputy Director

Programmatic Innovation Support Level (Meso Level)

N°	Organisation	Abbreviation	Participant	Position
1	GIZ Tunisie (Deutsche Gesellschaft für Internationale Zusammenarbeit)	GIZ-PAEI	Mlle Fatma M'SELMI	Expert
2	Unité d'Appui au Projet d'Appui au Système de Recherche et de l'Innovation (UAPASRI)	UAPASRI	Mlle Hasna HAMZAOUI	Team Leader
3	Unité d'Appui au Projet d'Appui au Système de Recherche et de l'Innovation (UAPASRI)	UAPASRI	Mr. Patrick CREHAN	Expert
4	Mediterranean Innovation and Research coordination Action (MIRA)	MIRA	Pr. Moez JEBARA	National Coordinator
5	Réseau des Experts Innovation et Développement Durable (IDNET)	IDNET	Mr. Nizar BEN SALEM	President
6	The German Academic Exchange Service - Tunisia (DAAD - Deutscher Akademischer Austausch Dienst)	DAAD Tunis	Mme Beate Schindler-KOVATS	Director



Innovation Capacity Level (Micro Level)

N°	Organisation	Abbreviation	Participant	Position
1	Société de Gestion de la Technopole de Borj-Cedria (SGTBC)	SGTBC	Mr. Talel SAHMIM	Director
2	Centre de Recherches et des Technologies de l'Energie (CRTEen)	CRTEen	Pr. Brahim BESSAIS	General Director
3	Centre de Recherches et des Technologies de l'Energie (CRTEen)	CRTEen-LPT	Mme Kamilia BEN YOUSSEF	Principal Engineer
4	Industrial Innovation Centre (IIC)	IIC	Dr. Fahem FANTAR	Scientific Researcher
5	Centre de Recherches et des Technologies de l'Energie (CRTEen)	CRTEen-LPV	Pr. Abdellatif BEL HADJ MOHAMED	Director
6	Ecole Nationale d'Ingénieurs de Tunis (ENIT)	ENIT	Pr. Chiheb BOUDEN	Director



Participants List Water Sector

Policy Level (Macro Level)

N°	Organisation	Abbreviation	Participant	Position
1	Ministère de l'Agriculture, Cabinet du Ministre	MA-Cabinet	Pr. Lokman ZAIBET	Senior Legal Secretary
2	Ministère de l'Agriculture, Cabinet du Ministre	MA-Cabinet	Pr. Mohamed Salah BACHTA	Senior Legal Secretary
3	Ministère de l'Agriculture, Cabinet du Ministre	MA-Cabinet	Dr. Slah NASRI	Senior Legal Secretary

Institutional Innovation Support Level (Meso Level)

N°	Organisation	Abbreviation	Participant	Position
1	Société Nationale d'Exploitation et de Distribution des Eaux	SONEDE	Mr Youssef SELMI	Director of Exploitation
2	Institution de la Recherche et de l'Enseignement Supérieur Agricoles	IRESA	Dr. Thameur CHAIBI	Director of Laboratory

Innovation Capacity Level (Micro Level)

N°	Organisation	Abbreviation	Participant	Position
1	Centre de Recherches et des Technologies des Eaux, Technopole Borj-Cedria	CERTE	Pr. Mohamed Ben Youssef	General Director
2	Centre de Recherches et des Technologies des Eaux, Technopole Borj-Cedria, Laboratoire des Georessources	CERTE-LabGeoR	Pr. Mourad BEDIR	Director of Laboratory
3	Centre de Recherches et des Technologies des Eaux, Technopole Borj-Cedria, Laboratoire des des traitements des eaux Naturelles	CERTE-LabTEN	Pr. Mohamed BEN AMOR	Director of Laboratory
4	Centre de Recherches et des Technologies des Eaux, Technopole Borj-Cedria, Laboratoire des des traitements des eaux Naturelles	CERTE-LabTEN	Dr. Mohamed TLILI	Scientific Researcher
5	Centre de Recherches et des Technologies des Eaux, Technopole Borj-Cedria, Laboratoire des Traitements des Eaux Usées.	CERTE-LabTEU	Dr. Ismail TRABELSI	Scientific Researcher
6	Centre de Recherches et des Technologies des Eaux, Technopole Borj-Cedria, Laboratoire des Traitements des Eaux Usées.	CERTE-LabTEU	Dr. Imen KHOUNI	Scientific Researcher



Organisation Committee

N°	Organisation	Abbreviation	Participant	Position
1	Centre de Recherches et des Technologies de l'Energie (CRTEen)	CRTEen-BuTT	Mr. Zied KBAIER	Principal Engineer
2	Centre de Recherches et des Technologies de l'Eau (CERTE)	CERTE	Mr. Mohamed KEFI	Scientific Researcher
3	Centre de Recherches et des Technologies de l'Energie (CRTEen)	CRTEen-BuTT	Mr. Mohamed Haythem RAOUADI	Principal Engineer
4	Centre de Recherches et des Technologies de l'Energie (CRTEen)	CRTEen-BuTT	Mme Olfa OUKHAI	Technician
5	Centre de Recherches et des Technologies de l'Energie (CRTEen)	CRTEen-BuTT	Mme Aida Darghouth ASLI	Principal Engineer
6	Centre de Recherches et des Technologies de l'Energie (CRTEen)	CRTEen-BuTT	Mr. Slim NAOUI	Principal Engineer
7	Centre de Recherches et des Technologies de l'Energie (CRTEen)	CRTEen-BuTT	Mr. Houcemeddine JAIBI	Principal Engineer
8	Centre de Recherches et des Technologies de l'Energie (CRTEen)	CRTEen-BuTT	Mr. Ahmed BELKHECHINE	Principal Engineer



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