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Cooperation with Mediterranean Partners to build Opportunities around ICT and Societal And Industrial Challenges of Horizon 2020

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| Abstract | This document is the analysis of the ICT sector for Syria. |
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Section 1 - Introduction

1.1 Purpose

This document compiles the analysis of the ICT sector in Syria.

The objective is to identify in Syria the critical mass per specific Information and Communication Technology where it is suitable to create Working Groups within the future Technology Platform of Mashriq.

1.2 Scope of the document

This document is produced as part of WP2 - Information and data intelligence analysis and identification of MED key stakeholders.

This document is produced as an outcome of:

- Task 2.1 Definition of methodology for the study and interviews
- Task 2.2 Collection of country information and analysis of collected data
- Task 2.3 Consolidation and harmonisation of the analysis

1.3 Structure of the document

The document is structured as follows:

- Overview of the ICT Sector in the country.
- Analysis per Technologies following the ETP model.
- List of contributors / stakeholders.

Section 2 - Syria

2.1 Situation for ICT

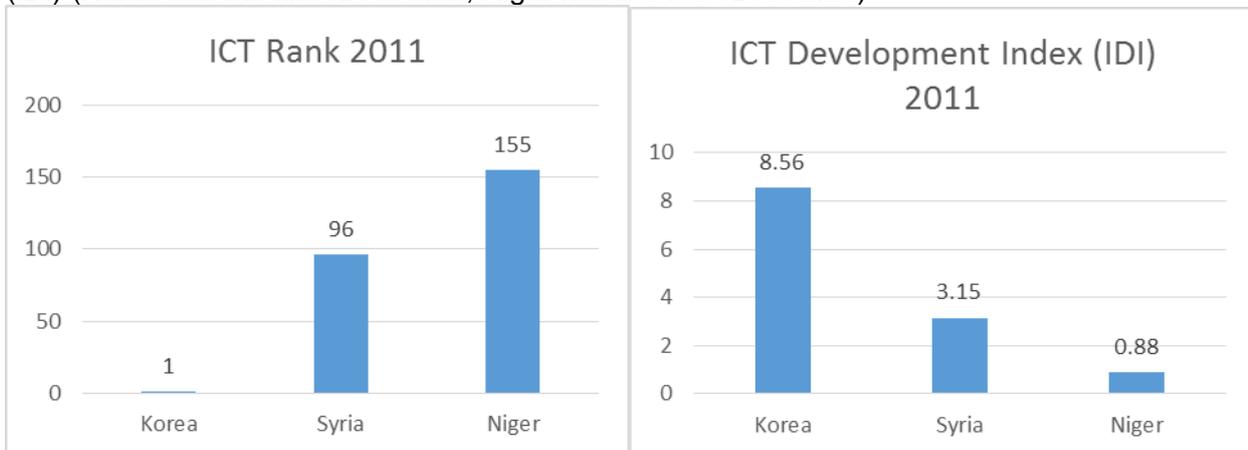
2.1.1 General overview

Situation of the country in terms in ICT

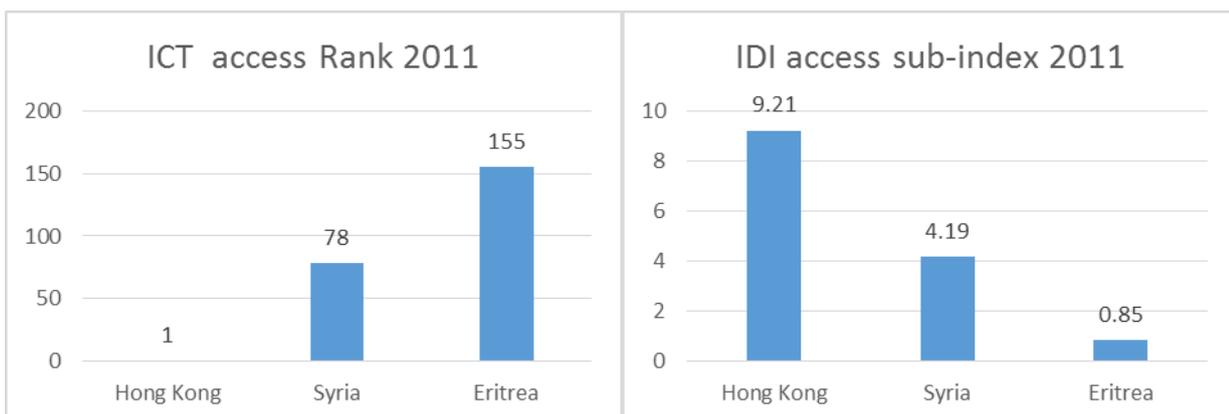
During the last decade, interest in Information and Communications Technologies in Syria increased tremendously, with needed infrastructures for modern telecommunications being built and expanded, and enabling environment developed. Plans carried by Ministry of Communications and Technology (**MoCT**) were being implemented in accordance with the **national ICT strategy**, the **e-government initiative** and the **eleventh five-year plan** for the years 2011-2015; Internet availability, improved substantially; particularly affordable broadband; concrete steps were taken towards liberalization/regulation of the telecom sector; and issuance of essential cyber legislations and their enforcement were underway.

Position in the world ranking:

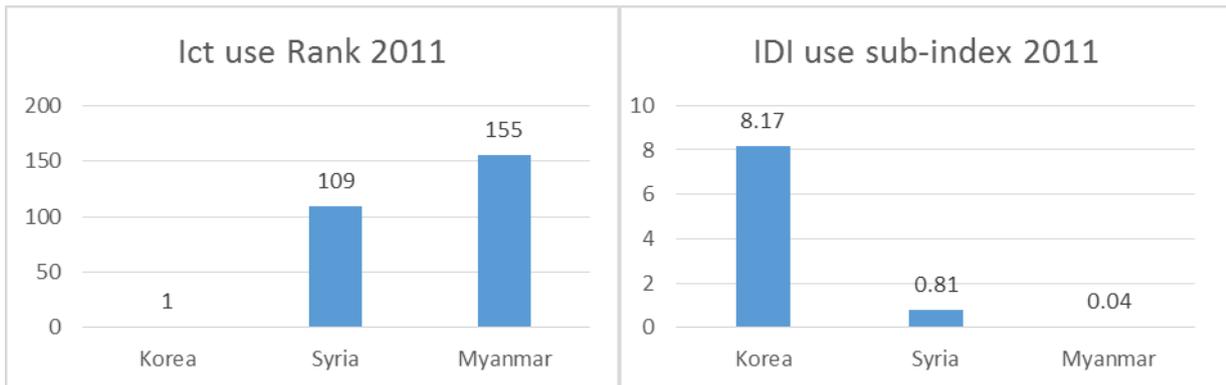
Syria in 2011 ranked 96 out of 155 countries in the ICT and had 3.15 in the Development Index (IDI) (Korea had the first IDI of 8.56, Niger had the last IDI of 0.88)



Syria in 2011 ranked 78 out of 155 countries in the ICT access and had 4.19 in the IDI **access sub-index** (Korea had the first IDI of **9.21**, **Eritrea** had the last IDI of **0.85**)



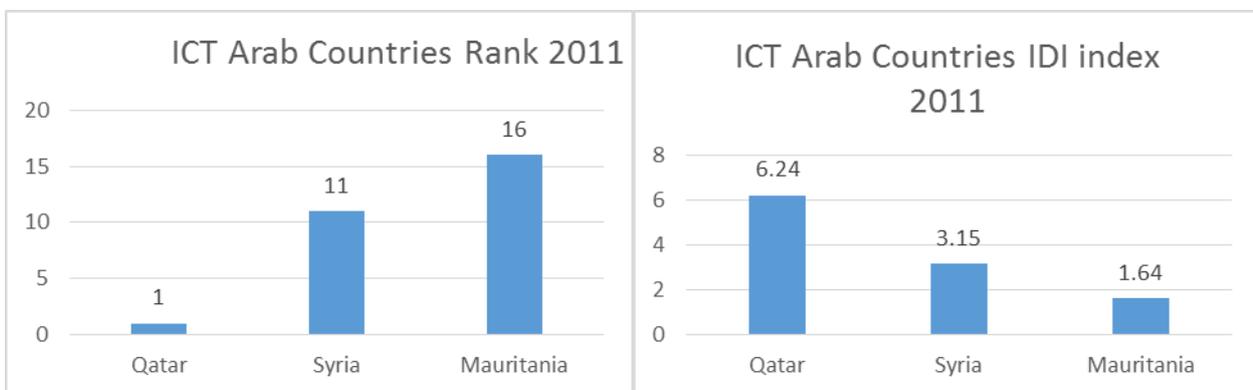
Syria in 2011 ranked **109** out of **155** countries in the **ICT use** and had **0.81** in the **IDI use sub-index** (Korea had the first IDI of **8.17**, **Myanmar** had the last IDI of **0.04**)



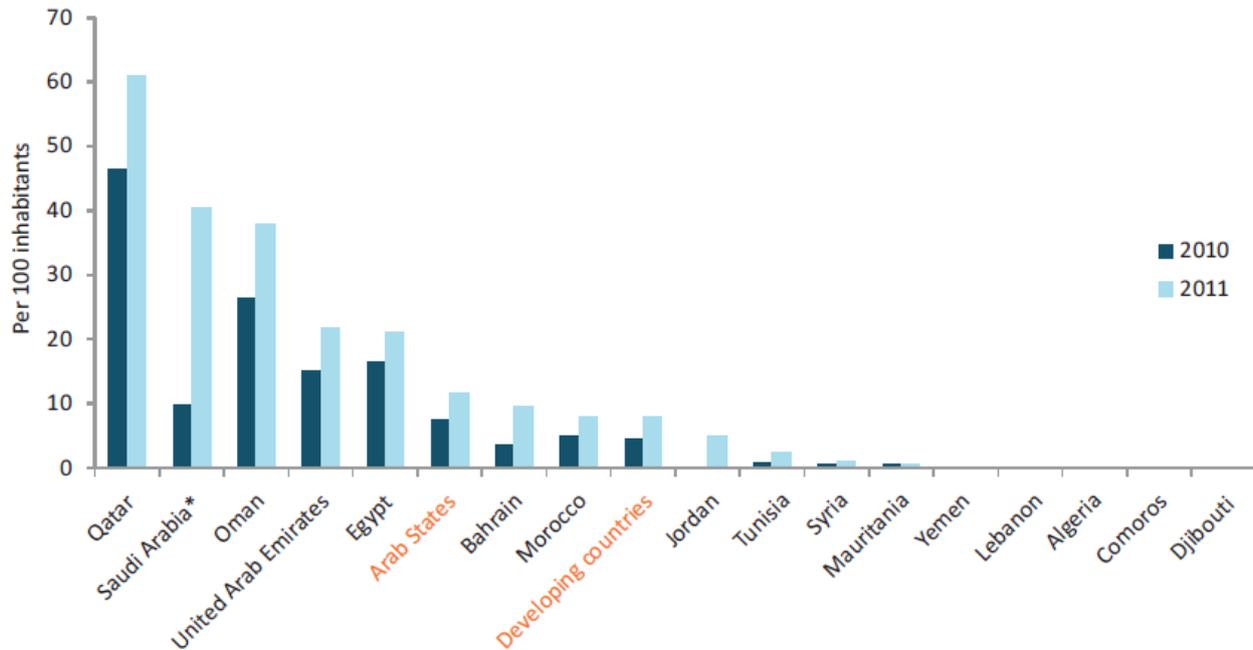
Syria in 2011 ranked **107** out of **155** countries in the **ICT skill** and had **5.74** in the **IDI skill sub-index** (Korea had the first IDI of **9.86**, **Niger** had the last IDI of **1.45**)



Syria in 2011 ranked **11** out of **16 Arab** countries in the **ICT** and had **3.15** IDI (Qatar had the first IDI of **6.24**, **Mauritania** had the last IDI of **1.64**)



Active mobile-broadband penetration, Arab States, 2010 and 2011



Potential for growth / forecasts

The potential for growth:

- Developing and repairing ICT infrastructure;
- Providing broadband access to all citizens;
- Capacity building in ICT;
- Use ICT as a basic tool for the dissemination of culture, learning and training (available to all citizens, regardless of age or place of residence) with a view to eliminate illiteracy and promote intellectual standard
- Developing e-government services using Internet, mobile, ATM and Citizen Service Centers;
- Building an ICT economic sector;
- Use of ICT to promote performance of business transactions, services, education with a view to achieve sustainable economic and social development
- Promoting digital Arabic content;
- Creation of software industry with focus on open source model
- Building confidence and security in the use of ICT;
- Regulating the telecom sector to ensure fair competition;
- Increasing the level of regional and international cooperation;
- Encouraging investments in ICT.
- Establish modern regulatory and legislative framework for ICT application (including the protection of intellectual property).

2.1.2 Situation of research and innovation

Main funding organizations for research and innovation programs

The Higher Commission for Scientific Research (**HCSR**) started in 2010 to draw the **national policy for science, technology and innovation**. This policy has 8 top priorities: agriculture, energy, health, information and communications technology, industry, environment, Education and research Development, and transport.

Several types of funds exist. In August 2009 a national fund was created to finance R&D projects with the participation of public and private companies of 5% of their budget. The eleventh five-year plan encourages the creation venture capital companies to fund ICT projects. The total R&D budget was 0.18% of GDP in 2006, this budget is expected to be 2% in 2020. In 2010 the Higher

Commission for Scientific Research starts funding research projects based on open calls in different sector.

The investments made by **MoCT** and public institutions for the development of ICT during the past three years are mostly directed towards building and developing the needed infrastructure for increasing the number of phone lines, particularly in rural areas, maintenance of existing telephone network, increasing ADSL ports on telephone exchanges and providing value-added services, particularly for accessing the Internet. The private sector investments are mainly in mobile communications, from the only two mobile operators **Syriatel & MTN**.

Main current initiatives / programs / policies / tools for research and innovation

In 2008, **UNDP** signed an agreement with **MoCT** and the Planning and International Cooperation Commission (**PICC**) for the “Strategic ICT Program for Socio-Economic Development” in Syria, splitting the financing of the projects between UNDP (55%), **MoCT** (27%) and **PICC** (14%). This program establishes many portals, tele-centers in rural and disadvantaged areas, consultancy and technical training.

The State of **India** financed the India-Syria Excellence Centre for IT between 2010 and end 2012 in the form of equipment and expertise. The center provides advanced training information security, information systems, networking, operating systems and infrastructure.

The league of Arab States (**LAS**) agreed to co-finance, with Syrian Government, the establishment of the Arab Academy for e-Business and a Master’s Program in e-Business in Aleppo starting in October 2009. LAS formally stopped its financing in 2012 due to the crisis.

Several bilateral joint research programs of cooperation with Arab countries such as the **Syrian-Lebanese** research program and the **Syrian-Egyptian** research program

ITU partially financed the project Translating ICT Terms from 2009 until the end of 2012. **SCS** is continuing the financing and implementation of the project, which is expected to be completed in 2014, with its own resources.

In 2008, the Republic of **Korea** and the Syrian Government agreed on financing and establishing the IT Plaza.

In 2007 the European Investment Bank (**EIB**) agreed to finance telecom projects. Between 2007 and 2012 the third rural project aimed at adding 33,400 telephone lines in 4,300 villages was implemented. The financing of two other projects (“The Last Mile” a fiber optic network extension and a GIS project) was declined by the Bank as a result of European sanctions due to the crisis.

In the past five years, a number of cooperation agreements, including financing, were signed between **MoCT** and each of Russia, Azerbaijan, Armenia, Cyprus and Turkey, but their execution stopped due to the crisis.

Syria is a partner in several **FP7-EU** funded projects, mostly in agriculture, ICT and health. More than 13 projects were signed during the period 2008-2014 such as EUMEDGRID-SUPPORT, JOINMED, BIONEXGEN, RESCAP-MED, MEDCHAMPS, OSCAR, SUWARESA, SOLIBAM, SUSTAINMED, CA2AFRICA.

2.1.3 Situation of industry and academia

The main geographic locations where ICT is developed:

ICT is mainly developed in Damascus, Aleppo and Latakia

Situation of industry

In spite of the fact that there isn't a general framework for Public and private partnership in Syria, a number of ICT ventures between Syrian Telecom (**ST**) and renowned telecom companies exist and date back to the past decade. Three such joint ventures are presented below:

- **ST-Samsung** (Syrian Korean Company for Manufacturing & Marketing Communications Equipment)
 The capital of the ST-Samsung is 4.5 million USD with a sharing ratio of 51% for ST and 49% for Samsung. The company manufactures rural exchange systems, private branch exchanges and optical network access (ONA) ports with voice and data (broadband). 215,000 ONA ports were installed in 2011 and 2012 to expand the existing rural telephone network.
- Syrian German Telecommunication Company (**SGTC**)
 The capital of SGTC is 4 million USD with a sharing ratio of 25% for ST and 75% for GTC. The company manufactures mainly wireless communications equipment (WLL) with Wideband Code Division Multiple Access (WCDMA) technology. These equipments were used to install 94,044 lines in 2011 and 2012.
- Syrian Company for Electronic Payment (**Tasdid**)
 Tasdid is a joint venture between Syrian Telecom, the Global Company of Emirates (GET), Syriatel and other Syrian and Arab companies. Its capital is 100 million USD with a sharing ratio of 25% for ST and 75% for GET and the other private companies. Tasdid provides electronic payment services of water, electricity, telephone and government services bills via different payment methods (Internet, voice response, automated teller machine ATM).
- Syrian Computer Society (**SCS**)
 SCS promotes ICT and related sectors in Syria, particularly scientific, technical, cultural and professional aspects, leading to the building of the knowledge economy. **SCS** has an Internet Service Provider, and is active in a number of projects such as the ICT Incubators (in Damascus, Homs and Latakia), Arabisation of ICT terms (in collaboration with MoCT and ITU), Promotion of software industry (**CMMI** – in partnership with MoCT and SEI-Egypt), Training on ICT Standards (in cooperation with **MoCT** and EU), Expansion of tele-centers in rural and remote areas (in collaboration with MoCT and Syria Trust for Development); Small and micro financing (in partnership with Syria Trust for Development); and eSyria a multifaceted national e-content blog.
- **The Syria Trust for Development**
 The Syria Trust for Development supports and incubates local initiatives, encouraging entrepreneurship and volunteerism. It has incubated since 2001 several development projects such as **Firdos**, **Shabab**, **Massar**, **Rawafed** and Syrian Development Research Centre.
- **Syrian Enterprise and Business Centre (SEBC)**
 SEBC is a non-profit making institution that benefited from 10 years of cooperation with the European Union (EU) in developing the business sector in Syria. It focuses on developing the private sector and evolution into a market economy. In the past years a number of initiatives were launched, including **ISRAR** (Initiative for Syrian Regulatory and Administrative Reform) to improve and simplify the Syrian business environment, through use of ICT. The MED Digital project, aimed at the promotion of digital marketing by SMEs in the Mediterranean Countries. The Citizen Service Centers, which facilitate obtaining various administrative documents.

Situation of academia

Higher education programs in Information Technology studies are offered at the Higher Institute of Applied Sciences and Technology (**HIAST**), the public universities, Syrian Virtual University (**SVU**),

and most private universities. Master's and PhD programs in ICT have been launched in Damascus University, HIAST during the past couple of years. A joint Executive Master's degree between Damascus University and Telecom Bretagne-France was stopped due to the crisis.

The Ministry of Communications and Technology (**MoCT**), the Ministry of Higher Education (**MoHE**) and the Higher Institute for Business Administration (**HIBA**) established a specialized Master's program in Communications and Information Technology Regulation.

Multiple key players and sponsors exist for the promotion of R&D in the field of ICT, including the Ministry of Communications and Technology and the Higher Consultative Committee that is responsible for coordinating ICT policies, strategies and action plans. Moreover, the Higher Commission for Scientific Research is responsible for coordinating and funding R&D activities.

There are several numbers of research institutes in Syria, focus on applications related to the solution of specific national, economic, industrial, human and environmental challenges; many are sponsored by government ministries, a small number is privately established or forms part of international institutions. The research institutions are:

- Higher Institute of Applied Sciences and Technology (**HIAST**): Research focuses on ICT, renewable energy and environment,
- General Commission for Scientific Agricultural Research (**GCSAR**): A semi-autonomous body focusing on field crops, vegetables, natural resources (soil and water), horticulture, pesticides, plant protection, livestock, food industry, and socioeconomic
- General Commission for Biotechnology (**GCBT**): It conducts research on genetic engineering, genetic manipulation of plants and micro-biology techniques
- The General Organization for Seed Multiplication (**GOSM**): It conducts national projects for seed-development and seed quality standards (wheat, barley, corn, cotton, sugar bit, legumes)
- The Atomic Energy Commission of Syria (**AECS**): It conducts research related to agricultural biotechnology, crop breeding, agronomy, entomology, animal production, and food preservation.
- The National Energy Research Center (**NERC**): The main task is to draw a national policy for renewable energy
- General Organization of Remote Sensing (**GORS**): Under the Ministry of Communications and Technology conducts research related to remote sensing in areas of geology, geophysics, hydrology, agriculture, and the environment
- Environmental and Scientific Research Center (**ESRC**)
- International Center for Agricultural Research in the Dry Areas (**ICARDA**): it focuses on the management of soil, water, nutrients, plants and animals.

2.2 Sectorial analysis and indicators

2.2.1 Software & Services

Current situation for industry:

Software and services are clearly mentioned in the **National ICT policy**, **e-government initiative** and in the **national policy for science, technology and innovation**. A study on software development industry, which was commissioned by MoCT and SCS estimates the number of software companies in Syria at 150 companies in 2010. Most probably this number has decreased in 2013 due to economic crunch caused by the current situation. The implementation of the e-Government project provides an incentive for the software industry to grow and increase the quality of its products. It also turns the high potential demand for software into an active driving force for the IT industry.

Main relevant entities:

The Higher Institute of Applied Sciences and Technology (**HIAST**), the public universities, Syrian Virtual University (**SVU**), private universities, General Organization of Remote Sensing (**GORS**), and several SMEs.

Research community:

It focuses on Arabic language processing, Arabic language search engines, digital libraries, Intelligent Business Software, Mobile content and gaming, Building portals and websites.

Natural Language Processing (**NLP**) for the Arabic language is an important axis of research and development in Syria. The Higher Institute of Applied Sciences and Technology (**HIAST**) research projects focus on knowledge base of the Arabic language, syntactical Arabic corpora and text to speech system, the Interactive Arabic Dictionary, morphological analysis, grammatical and semantic analysis tools and applications and question answering systems, Semantic search engine, text diacritization and speech synthesis, Arabic ontology construction, semantic Web and Arabic translation assistance tools. Some of the research is carried out in collaboration with other universities and research centers in the Arab region, such as the Interactive Arabic Dictionary with King Abdulaziz City for Science and Technology (**KACST**) in Riyadh, KSA.

Several SMEs activities, products are tools for Arabic language processing. "**Arabi**" provides a tool for the automatic vocalization of Arabic texts in addition to transforming text to speech. "**Votek**" provides a library for Arabic speech recognition and interactive services. "**Abjad Hawaz**" provides a search engine for Arabic text that determines semantically and contextually similar words. Other content and Arabic language processing applications in different environments like Android and iOS.

Several SMEs such as **EI-ixir**, **Nova**, **TmsArabia**, **ZgroupMobile**, **Innovation System's Software developers** are developing intelligent business software, expandable ERP systems, mobile content and gaming, Mobile Network Solutions, Portal development and content services.

Partnerships between academia and industry is initiated by **HIAST** with several SMEs (**Agora**, **GWA**, **ZgroupMobile**, **AdinSopt**) and large industries (**Syrian Commercial Bank**, **Damascus Securities Exchange**, **Syriatel** and **MTN**). Several projects are developed and funded, for example:

- **Damascus Securities Exchange (DSE)**: Developing the mobile application of the online trading information of Damascus Securities Exchange to run on multiple mobile platforms
- **Syrian Commercial Bank (SCB)**: m-banking for Commercial bank of Syria
- **Syriatel**: an extraction system of economic news on financial markets and investment environment Mobile Coverage Management System, Optimizing Sales, Visits, a Tool for Drive Test Data Collection using Smart Phone App and Web Service Analysis, 3G network Analyzer Analysis and Development of mobile application for on-site employees in a company connected to web-based application, 2G-3G Frequency planning, Urban Propagation Model Remote Control of Antenna Tilt System, Tool for modulation specifications in 3G network
- **MTN**: Tool for GSM network parameters.
- **ADinSPOT**: Portal to manage advertisement for several wireless networks.
- **AGORA**: Web agent information extraction system.
- **ZgroupMobile**: eCommerce site built entirely in HTML5 technology. Walkie-Talkie client/server solution for PC/Mobile

- **GWA:** Analysis and Development of mobile application for on-site employees in a company connected to web-based application. Mobile Application for academic services, Mobile application for Learning English

Projects funded by the Higher Commission for Scientific Research (HCSR):

The funded research project is conducted by **HIAS**T, it focuses on designing an Open Source Educational Portal for Arabic content.

EU Projects:

One EU FP7 projects with HIAS

- 910,000 Euro fund, during the period 01/02/2009 - 31/07/2011 for the project **JOIN-MED:** Establishing the EU-Mediterranean ICT research network

Plan for the future / relevance and importance of the topic for the country

Software industry and its related technologies in Syria occupy a prominent position in ICT due to the constant demand of the domestic and pan-Arab markets. If well managed, this industry can have a remarkable impact on economic development in Syria, and can create many job opportunities for youth. The software industry is not restricted to the development of programs and systems; it also includes the building, disseminating and preserving of content in all possible fields, including educational, academic, cultural, entertainment and services fields. Questions related to the Arabic language play an important role in the software industry, as far as both programs and content are concerned. Priority, therefore, should be given to the promotion of a digital Arabic content, because developing a local content adapted to local needs will undoubtedly encourage socio-economic development, and motivate the participation of all stakeholders and parties concerned, even those living in rural and remote areas. Designers, disseminates and producers of Arabic content should play a leading role in enhancing the information society.

Other important topics are: Open Source, cryptography, data Mining, e-services, 3D simulation, Human machine interface (face and speech recognition), management systems and decision-making, Intelligent applications in medicine, industrial networks and embedded automated systems, Mobile applications, Web development, Arabic language processing, Multimedia, e-learning, e-commerce, e-business, GIS, GPS, Image Processing.

| N° | Indicator - Political Support | Indicator | Results |
|----|---|-------------|--|
| 1 | National or State Policies | PO-01 | Yes, in the National ICT policy, e-government initiative and in the national policy for science, technology and innovation |
| 2 | Funding mechanisms to support ICT research | PO-02 | Yes, by HCSR and Europe and some SMEs |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, for example, Natural Arabic Language Processing, Mobile Applications |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry is doing Research and Innovation | IN-01 (1-5) | 2 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 2 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 2 |
| 8 | Independence of local industry | IN-04 (1-5) | 2 |
| 9 | Foreign Direct Investment (FDI) and presence of development centers | IN-05 (1-5) | 3 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 2 |

| | | | |
|-----------|--|------------------|----------------|
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 2 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 2 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 2 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 2 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 2 |
| 21 | Innovation policy and/or initiative | GE-02 | Yes |

2.2.2 Networked Electronic Media (Contents)

Current situation for industry:

During the past decade and with the ascent of the information society, the rise in Internet penetration in the Syrian society and loosening of restrictions on the media, its landscape and role changed drastically. The private sector entered with strength in financing media ventures and a large number of newspapers and magazines appeared on the market in Arabic and in English, covering political, social and economic domains among others. Radio stations also emerged with focus on youth, social development and musical entertainment. Hence, the role of the media in Syria has been changing quickly in the past few years, particularly with the **new Media Law and the regulation of media work** through the National Media Council (**NMC**)

At the end of March 2013, the number of Syrian websites was 5517 sites in the different categories, and these include 345 media websites and 114 newspaper and magazine websites. The cultural websites cover cultural activities such as art, poetry, literature and theatre, in addition to activities of cultural centers. Furthermore, libraries and publishing houses have been using websites to publicize their publications to visitors.

The use of social media, mainly in Arabic, has increased exponentially in the past few years, particularly with the advent of the crisis in Syria. Information exchange, news, discussions, photos and video clips increased dramatically and groups mushroomed at a high rate on social networks, particularly on Facebook. However, no statistics are published by Facebook by number of users in Syria or volume of content. But other social networks, such as Twitter and YouTube provide some statistics that show the explosive increase in users and content related to Syria.

Main relevant entities:

The faculty of Information technology, Engineering and the faculty of Fine Art at Damascus university and several SMEs

Plan for the future / relevance and importance of the topic for the country:

- Semantic approach to control the Arabic news content on the Web
- Simulation of traditional Syrian art in cartoon
- A study of Hyperlink and multimedia on websites' news

- Multimedia development in website design

| N° | Indicator - Political Support | Indicator | Results |
|----|--|-------------|--|
| 1 | National or State Policies | PO-01 | Yes, in the Media Law and the regulation of media work |
| 2 | Funding mechanisms to support ICT research | PO-02 | Funding programs are very limited, |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, for example, Semantic approach for Arabic news content in the Web |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry is doing Research and Innovation | IN-01 (1-5) | 2 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 2 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 2 |
| 8 | Independence of local industry | IN-04 (1-5) | 3 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 4 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 2 |
| 12 | Support to MED-TPs | IN-08 | Is foreseen |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 3 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 3 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 3 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 2 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 2 |
| 21 | Innovation policy and/or initiative | GE-02 | No |

2.2.3 Telecommunications

Current situation for industry:

Telecommunications/Mobile & Wireless Communications are clearly mentioned in the National ICT policy, e-government initiative and in the national policy for science, technology and innovation. Syrian Telecom (**ST**) is the owner and sole operator of the fixed telephony network, and in charge of developing the ICT infrastructure. BOT contracts awarded to the two private operators of mobile telephony (**Syriatel and MTN**) with coverage of 99% of the population.

By the end of 2012, the penetration rate is estimated at 10 PCs, 20 fixed lines, 59 mobile lines for every 100 citizens. There are currently 15 Internet service providers (**ISPs**) offering Internet connection services.

There are no **WiFi** or **WiMAX** points to provide services for subscribers, although some pilot

projects have been carried out to install WiFi points in Damascus International Airport, Damascus Fairgrounds and National Library. Fiber optic connections are used to link all telecom sites for voice telephony and Internet connection as well as for leased lines.

Although most Government institutions use ICT in their daily work, particularly administrative and management applications, connectivity between various branches and with the Internet is limited. Schools have very few PCs to carry out their core activities of teaching and learning (2 PCs for 100 students), and Internet connectivity for that purpose is very low (less than 5% of schools). Public universities are in a better position, with a ratio of PCs to students varying between 1% at the Faculty of Arts and Humanities, and 55% of the Faculty of Informatics Engineering of the University of Damascus. They also have an academic network, the Syrian Higher Education and Research Network (**SHERN**), and better access to the Internet for professors and students, noting that professors get free ADSL subscriptions at home. Private universities have even better means and connectivity, but they deal with a much lower number of students. Hospitals, libraries, post offices and museums have limited access to ICT, particularly the Internet, to carry out their professional activities. The access centers are still few, cover a small portion of rural and remote areas and have limited means (e.g. Most of them have dial-up or no connection to the Internet).

The current crisis, destruction of large parts of the telecom infrastructure and lower investment in ICT in the public and private sectors lead certainly lower connectivity in 2014.

Main relevant entities:

Syrian Telecom (ST), Mobile Operators (Syriatel and MTN), Universities, HIAST, Syrian Computer Society and SMEs.

Research community:

Peer to peer networks and applications, Adaptation between non homogenous networks, 4G Mobile communications, Mobile Coverage Management System, Tool for Drive Test Data Collection using Smart Phone App and Web Service Analysis, 3G network Analyzer, Tool for GSM network parameters for mobile operators, a Tool for modulation specifications in 3G networks, 2G-3G Frequency planning, Urban Propagation Model, Remote Control of Antenna Tilt System

Plan for the future / relevance and importance of the topic for the country

Wireless sensors, IP Multimedia Subsystems, Secure wired and wireless network protocols. Wearable and enhanced reality computing, Low-power communications, Security radio networks, Software Defined radio, Fiber Optic Communication and Security.

| N° | Indicator - Political Support | Indicator | Results |
|----|---|-------------|--|
| 1 | National or State Policies | PO-01 | Yes, in the National ICT policy, e-government initiative and in the national policy for science, technology and innovation |
| 2 | Funding mechanisms to support ICT research | PO-02 | No, Funding programs are very limited |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, for example, 4G network, Software Defined radio |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry is doing Research and Innovation | IN-01 (1-5) | 1 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 2 |

| | | | |
|-----------|--|------------------|----------------|
| 7 | Involvement in European funded projects | IN-03 (1-5) | 1 |
| 8 | Independence of local industry | IN-04 (1-5) | 2 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 3 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 1 |
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 1 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 2 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 1 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 1 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 1 |
| 21 | Innovation policy and/or initiative | GE-02 | Is foreseen |

2.2.4 High Performance Computing

High Performance Computing is briefly mentioned in the national policy for science, technology and innovation. The Ministry of Higher Education, Syrian universities and various institutes carry out research in High Performance Computing. HIAST and HIBA participated in the **EUMedConnect** project, allowing them to benefit from this Euro-Mediterranean network for research with available throughput of 34 Mbps, bypassing local ISPs and avoiding traffic problems. This network facilitates collaboration in R&D with other Arab countries as well as European countries. This is highly desirable and even essential in projects such as Arabic Language Processing (ALP), High Performance Computing (HPC), Grid Technologies and Nano Technology. An HPC center was established at HIAST in order to increase knowledge of various high-performance computing technologies, provide a multi-technology platform to assist in the implementation of engineering and research applications requiring high computational power, and provide training for high-performance computing technologies. A Syrian HPC Initiative is led by HIAST aiming at establishing a National Grid Network linking all universities and research centers, establishing HPC graduate studies, building a HIAST cloud to make good use of the internal resources in various computing tasks, for example: Calculate the thermal stresses in a solid body using the finite element

| N° | Indicator - Political Support | Indicator | Results |
|-----------|--|------------------|---|
| 1 | National or State Policies | PO-01 | No, but briefly mentioned in the national policy for science, technology and innovation. |
| 2 | Funding mechanisms to support ICT research | PO-02 | No, funding programs are very limited |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, for example, Calculate the thermal stresses in a solid body using the finite element |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |

| | | | |
|-----------|--|------------------|----------------|
| 5 | Presence of Large ICT Industry doing Research and Innovation | IN-01 (1-5) | 2 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 2 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 2 |
| 8 | Independence of local industry | IN-04 (1-5) | 2 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 4 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 2 |
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 2 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 2 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 2 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 2 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 2 |
| 21 | Innovation policy and/or initiative | GE-02 | No |

2.2.5 Photonics

Photonics is not mentioned in the national ICT policy nor in the national policy for science, technology and innovation. Rare are the research in this field, but it seems that this situation is changing and it is foreseen to have a photonics new market demand.

| | | | |
|-----------|---|------------------|-----------------------------------|
| N° | Indicator - Political Support | Indicator | Results |
| 1 | National or State Policies | PO-01 | No, Research policy doesn't exist |
| 2 | Funding mechanisms to support ICT research | PO-02 | Is foreseen |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | No |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry doing Research and Innovation | IN-01 (1-5) | 2 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 1 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 1 |
| 8 | Independence of local industry | IN-04 (1-5) | 2 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 4 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 1 |
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |

| N° | Indicator - Academic support | Indicator | Results |
|----|--|-------------|---------|
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 2 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 2 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 1 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 1 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 1 |
| 21 | Innovation policy and/or initiative | GE-02 | No |

2.2.6 Nanoelectronics

Nanoelectronics are not mentioned in the **national policy for science, technology and innovation**. However, Nanotechnology seems to be a new trend and several institutes start developing basic research in nanotechnology.

Projects funded by the Higher Commission for Scientific Research (HCSR):

Three projects are funded by the Higher Commission for Scientific Research. The projects are conducted by the Higher Institute of Laser Research and Applications and HIAST:

- Study and design and implementation of nano-fiber manufacturing using the technique of spinning electric
- Calculate the electronic structure and properties of some materials
- Study the colored metal Alloy using Nanotechnology

EU Projects:

BIONEXGEN is a FP7 EU funded project (3,419,571 Euro) with the AL Baath University in Nanotechnology and water resources management for the period 01/09/2010-28/02/2014

| N° | Indicator - Political Support | Indicator | Results |
|----|---|-------------|-----------------------------------|
| 1 | National or State Policies | PO-01 | No, Research policy doesn't exist |
| 2 | Funding mechanisms to support ICT research | PO-02 | Is foreseen by HCSR and Europe |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, for example, Nanotechnology. |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry doing Research and Innovation | IN-01 (1-5) | 2 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 1 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 1 |
| 8 | Independence of local industry | IN-04 (1-5) | 2 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 3 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 1 |
| 12 | Support to MED-TPs | IN-08 | Yes |

| | | | |
|-----------|--|------------------|----------------|
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 2 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 2 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 1 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 1 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 1 |
| 21 | Innovation policy and/or initiative | GE-02 | Is foreseen |

2.2.7 Smart Systems Integration

Smart System Integration is mentioned in the national policy for science technology and innovation, under intelligent applications and Business application. Several projects are conducted by HIAST Damascus University and some SMEs, for example: intelligent business solutions and expandable ERP systems, intelligent video management system and intelligent business software.

| | | | |
|-----------|--|------------------|--|
| N° | Indicator - Political Support | Indicator | Results |
| 1 | National or State Policies | PO-01 | No, Research policy doesn't exist, but it could be considered under intelligent applications and business application. |
| 2 | Funding mechanisms to support ICT research | PO-02 | No, Funding programs are very limited, due to the current crisis. |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, intelligent business solutions and ERP systems |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry is doing Research and Innovation | IN-01 (1-5) | 2 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 1 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 2 |
| 8 | Independence of local industry | IN-04 (1-5) | 2 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 3 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 1 |
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 2 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 2 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 2 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 2 |

| | | | |
|-----------|---|------------------|----------------|
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 2 |
| 21 | Innovation policy and/or initiative | GE-02 | No |

2.2.8 Embedded Intelligence and Systems

Embedded Intelligence and Systems are not clearly mentioned in the national ICT policy nor in the national policy for science technology and innovation. However, several projects in embedded systems are conducted by HIAST and Damascus University, for example: MEMS technology, MPEG and MP3 player Video and audio Compression on FPGA.

| N° | Indicator - Political Support | Indicator | Results |
|----|--|-------------|-----------------------------------|
| 1 | National or State Policies | PO-01 | No, Research policy doesn't exist |
| 2 | Funding mechanisms to support ICT research | PO-02 | Is foreseen |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | No |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry doing Research and Innovation | IN-01 (1-5) | 2 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 2 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 2 |
| 8 | Independence of local industry | IN-04 (1-5) | 2 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 4 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 2 |
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 2 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 2 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 2 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 2 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 2 |
| 21 | Innovation policy and/or initiative | GE-02 | No |

2.2.9 Robotics

Robotic is not clearly mentioned in the national policy for science technology and innovation, but it

could be part of human-machine interaction and industrial automation mentioned in the policy. Several projects are conducted by HIAST and Damascus University, for example: the design of a robot arm for flexible manufacturing processes, design and modeling robot in Cartesian coordinates to carry a cylindrical elements, and the design of mechanical transmission systems in robots.

| N° | Indicator - Political Support | Indicator | Results |
|----|--|-------------|---|
| 1 | National or State Policies | PO-01 | No, research policy doesn't exist but it could be part of the policy of the human-machine interaction and industrial automation |
| 2 | Funding mechanisms to support ICT research | PO-02 | No, funding programs are very limited, due to the current crisis. |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, for example, usage of robot arm in manufacturing processes. |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry doing Research and Innovation | IN-01 (1-5) | 2 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 1 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 2 |
| 8 | Independence of local industry | IN-04 (1-5) | 2 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 3 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 1 |
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 1 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 2 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 2 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 2 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 1 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 2 |
| 21 | Innovation policy and/or initiative | GE-02 | Is foreseen |

2.2.10 ICT for Energy

Current situation for industry:

The energy sector is a strategic sector and occupies a high priority in the national policy for science, technology and innovation. Demand for energy is constantly increasing while the sources of traditional energy are decreasing, and despite the existence of reserves of oil and gas with good infrastructure, the loss is very high in electric power production and network distribution. Investment in renewable energies is very crucial.

Main relevant entities:

The National Energy Research Center (NERC), public universities (faculty of chemical and petroleum, faculty of sciences, technical engineering, mechanical and Electrical Engineering), HIAST, Research Centre for Renewable Energies, the Center of tests and industrial research, General commission for biotechnology.

Research community:**The main research topics:**

- Use of Hybrid methods in the calculation of wind turbine capacity
- The design of wind turbine and sun's energy to pump water from rivers and wells
- Development of hybrid systems (wind-PV) for electricity generation with storage for use in isolated areas.
- Use of solar energy in water desalination, lighting streets and squares.
- Storage of solar energy using compressed air.
- A Study of a hybrid plant to generate energy from biomass and solar energy
- Effect of mechanical pretreatment on biogas production from cotton stalks.
- Producing the energy needs of the residential complex using solar energy and bio-energy.
- The use of biomass energy technology as an effective tool in the development of rural Area.

Projects funded by the Higher Commission for Scientific Research (HCSR):

- HIAST: Design and implementation of plant for the production of biofuels from household wastes, fats and used oils.
- Higher Institute of Marine Research: Study of Syrian algae to produce biofuel.

International cooperation projects:

- A pilot project to generate electricity using wind energy with 5 MW capacity, in cooperation with the Syrian- European complex of Heavy Industries.
- A pilot project to illuminate part of the international road (Damascus-Jordanian border) with a capacity of 101.45 (KW) using Photo-Voltaic (PV) systems, in cooperation with the Japanese government
- Atlas of the wind in Syria, a cooperation project with Denmark and a fund from the UNDP.
- A pilot project to generate electricity from solar energy in kalamoon Private University, in cooperation with the chamber of youth in of Aleppo and Freiburg (Syria-Germany).

Plan for the future / relevance and importance of the topic for the country:

- Development of Solar wind, sea waves, and Biomass energies
- Development of oil and gas exploration
- Development of the electric grid
- Reduce the loss of electricity distribution

| N° | Indicator - Political Support | Indicator | Results |
|----|--|-------------|--|
| 1 | National or State Policies | PO-01 | Is foreseen, in the national policy for science, technology and innovation. |
| 2 | Funding mechanisms to support ICT research | PO-02 | Is foreseen by HCSR and international cooperation |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, for example, renewable energies such as solar, wind and biomass energy. |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry is doing Research and Innovation | IN-01 (1-5) | 1 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 1 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 1 |
| 8 | Independence of local industry | IN-04 (1-5) | 2 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 3 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 1 |
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 1 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 2 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 3 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 1 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 1 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 1 |
| 21 | Innovation policy and/or initiative | GE-02 | Yes |

2.2.11 ICT for Health

Current situation for industry:

Health sector occupies a high priority in the national policy for science, technology and innovation. The goal of the strategy is to enhance the public health and provide preventive services of high quality. A hospital information management system exists in several national hospitals. This system includes information and financial management, and digital storage of the patient's medical records. There are also software packages that facilitate the entry and management of the daily and periodic patient's records of all hospitals. Moreover, the Ministry of Health (**MoH**) has a central management system for drugstores used to distribute medicines and laboratory materials throughout the country. All Health Directorates in the Governors are connected to the Head Office and various branches through a network, making it possible to exchange data related to health services and epidemiological surveillance systems between this network and all hospitals of the country when necessary.

Main relevant entities:

Ministry of Health, MoCT, universities (Medical engineering faculty, the Medical School, Faculty of Pharmacy) and pharmaceutical industry.

Research community:

Projects funded by the Higher Commission for Scientific Research (HCSR):

Several funded research is conducted by the Faculty of Science, General Commission for Biotechnology, Faculty of Pharmacy, and HIBA. The research focus on:

- Study of cellular response against the disease of leishmaniasis
- Molecular and immunological and environmental study of cutaneous leishmaniasis disease in Syria and develop strategies for new vaccines
- To study the response of breast cancer stem cells on some drugs
- The use of cancer stem cells to evaluate the therapy of some cancers
- A model of the relationship between job satisfaction and organizational citizenship behaviors and intentions of leaving work- Study in the field of hospitals

International cooperation:

Two EU FP7 projects with the Syrian Society Against Cancer:

- 1,986,255 Euro fund, during the period 01/01/2012-31/12/2014 for the project RESCAP-MED: NCDs and their social determinants in Mediterranean partner countries: building sustainable research capacity for effective policy intervention.
- 2,703,358 Euro Fund, during the period 01/03/2009-28/02/2013 for the project MEDCHAMPS: Mediterranean studies of cardiovascular disease and hyperglycaemia: analytical modelling of population socio-economic transitions

UNDP and the Ministry of Health, with support from MoCT, implemented a project for the provision of two Internet-based services, namely: Registration of the graduates of medical and health colleges and institutes; and application for a contemporary license for medical and health practitioners.

Plan for the future / relevance and importance of the topic for the country

- Tools for medical image retrieval based on medical database contents
- MRI and CT image enhancement
- Detection of calcification in mammogram images using mathematical classifiers
- Expert system to detect cancer in mammogram images
- Use of Histogram for edge detection from breast CT images.
- Detection of liver cancer from MRI images
- Neural network to Diagnosis of aortic valve disease
- Simulation and Automatic control of heart beats of heart beats
- 3D simulation of lower jaw
- 3D sounds for to help the visually impaired persons
- Retina Electrical Signal Analysis
- Design of a wireless Glucose sensor
- Hospital Management System, Hospital Quality Assurance, and medical information protection

- UV rays to sterilize air in the ventilation ducts
- A study of the pollution of oxygen and compressed air in hospitals

| N° | Indicator - Political Support | Indicator | Results |
|----|--|-------------|--|
| 1 | National or State Policies | PO-01 | No, but health sector is mentioned in the national policy for science, technology and innovation |
| 2 | Funding mechanisms to support ICT research | PO-02 | No, but several projects are funded by HCSR and Europe. |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, for example, image processing for cancer detection, hospital management system. |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry doing Research and Innovation | IN-01 (1-5) | 2 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 3 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 1 |
| 8 | Independence of local industry | IN-04 (1-5) | 3 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 3 |
| 10 | Market Demand | IN-06 | Is foreseen |
| 11 | Number of Patents | IN-07 (1-5) | 1 |
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 3 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 3 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 2 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 2 |
| 18 | Existing cooperation with EU countries | AC-05 | Is foreseen |
| 19 | Support to MED-TPs | AC-06 | Is foreseen |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 2 |
| 21 | Innovation policy and/or initiative | GE-02 | Yes |

2.2.12 ICT for Transport

Current situation for industry:

Transport is clearly mentioned in the national policy for science, technology and innovation. Syria has a strategic geographical place and acceptable transport infrastructure with a large contribution of the private sector.

Main relevant entities:

Ministry of transport, universities (Faculty of civil engineering) and several SMEs

Research community:

Development of public transport in cities and the development of railway.

Plan for the future / relevance and importance of the topic for the country:

- The expansion and development of the road network and railways between the countryside and cities.
- Usage of GIS and GPS for transport management.
- Creation of research center for transport and connect all ports with networks and creation of database in transport to help in decision.
- Environment protection from transport emissions.
- Usage of green transport.
- Statistical analysis of accident causes.
- Management and planning of road maintenance.
- Enhancement of vehicle test systems and comparison with other countries.
- Matrix calculation of standard costs for railways.
- Road material recycling.
- Usage of green energy (sun-wind) in the railways.

| N° | Indicator - Political Support | Indicator | Results |
|----|--|-------------|--|
| 1 | National or State Policies | PO-01 | Research policy exists in the national policy for science, technology and innovation, but the current crisis disrupted, delayed and canceled several projects. |
| 2 | Funding mechanisms to support ICT research | PO-02 | Yes, but very limited |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, for example, usage of GIS and GPS for transport management, usage of green transport |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry doing Research and Innovation | IN-01 (1-5) | 3 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 2 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 1 |
| 8 | Independence of local industry | IN-04 (1-5) | 3 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 3 |
| 10 | Market Demand | IN-06 | No |
| 11 | Number of Patents | IN-07 (1-5) | 1 |
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 2 |

| | | | |
|-----------|---|------------------|----------------|
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 1 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 1 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 1 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 1 |
| 21 | Innovation policy and/or initiative | GE-02 | Yes |

2.2.13 ICT for Environment

Current situation for industry:

Environment is clearly mentioned in the national policy for science, technology and innovation. Syria faces serious natural and man-made environmental problems that need to be urgently addressed. The most pressing ones are related to water scarcity and contamination, soil degradation, air pollution, inappropriate solid waste treatment and disposal, biodiversity loss and coastal and maritime pollution. Environmental degradation is now affecting the health and economic productivity of the population. Undesirable environmental changes are driven by many factors including economic growth, population growth, urbanization, intensification of agriculture, rising energy use and transportation, but importantly with a better understanding and management there is scope to improve the current situation. Syria is now in the phase of catching up with regional and international environmental standards.

Main relevant entities:

The Ministry of Local Administration and Environment (**MoLAE**), The General Commission for Environmental Affairs (**GCEA**), the Environmental Studies Centre (**ESC**), General Commission for Scientific Agriculture Research, HIAST, public universities (faculties of Agriculture, Sciences, Civil engineering, electrical and mechanical Engineering, and the technical Faculty), and limited number of NGOs.

Research community:

The main research topics:

- Production organic fertilizer (Compost) by fermenting various agricultural wastes
- A device to convert organic waste into compost
- Wood fabrication from cotton oil industry waste
- The production of biogas from solid waste of olive oil manufacturing
- Hybrid plant to generate energy from biomass and solar energy
- Effect of mechanical pre-treatment on biogas production from cotton stalks
- Producing the energy needs of the residential complex using solar energy and bio-energy
- The use of biomass energy technology as an effective tool in the development of rural area
- Treatment of Polymeric waste into useful materials.
- Treatment of medical waste.

- Recycling of plastic waste

Projects funded by the Higher Commission for Scientific Research:

- Development of electrochemical methods in the treatment of water laundries
- Manufacturing of membranes for desalination purposes
- Modeling of public wastewater treatment plants using activated sludge
- The relationship between rising cancers in the coastal region with pollution of food and environment
- The impact of modern agricultural technologies on sustainability

International cooperation:

Syria receives relatively little donor support in the field of environment. The main donors are the European Union, followed by Germany and Japan as bilateral donors, and UNDP-GEF, IFAD, AFESD, and FAO as multilateral donors. Although donors cover a wide range of activities, most interventions are focused on the water sector (water supply, waste water treatment). Nevertheless, the financial volume of donors' contributions is small compared to the investments of the Syrian government in the water sector. Other major fields of donor support are solid waste (JICA, GTZ), rangeland management (IFAD), forestry (FAO), biodiversity and protected area management (UNDP-GEF).

Plan for the future / relevance and importance of the topic for the country

- Developments of seawater desalination and cloud seeding techniques for water purification
- Creation of technological park with new techniques of waste management
- Developing programs for environment awareness
- Data centre for environment studies and monitoring
- Influence of climate changes on water resources
- Air and water safety
- Protection of biodiversity
- Management of solid and liquid waste

| N° | Indicator - Political Support | Indicator | Results |
|----|--|-------------|--|
| 1 | National or State Policies | PO-01 | Is foreseen, in the national policy for science, technology and innovation. |
| 2 | Funding mechanisms to support ICT research | PO-02 | Is foreseen, by HCSR and international cooperation |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | No, but policies show some priorities, for example, Treatment of medical waste, Recycling of plastic waste |
| 4 | Support to MED-TPs | PO-04 | No |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry doing Research and Innovation | IN-01 (1-5) | 1 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 2 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 2 |
| 8 | Independence of local industry | IN-04 (1-5) | 2 |

| | | | |
|-----------|--|------------------|----------------|
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 4 |
| 10 | Market Demand | IN-06 | No |
| 11 | Number of Patents | IN-07 (1-5) | 2 |
| 12 | Support to MED-TPs | IN-08 | No |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 2 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 5 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 3 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 3 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 2 |
| 18 | Existing cooperation with EU countries | AC-05 | No |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 3 |
| 21 | Innovation policy and/or initiative | GE-02 | Yes |

2.2.14 ICT for Food and Plants

Current situation for industry:

The agriculture sector is one of the most important sectors of the national economy, thus the national policy for science, technology and innovation puts the agriculture and water sector in its top priority. The agricultural sector suffers from poor agricultural research, in addition to the degradation of land, pastures, low productivity and climate change.

Main relevant entities:

Ministry of Agriculture and Agrarian Reform (**MAAR**), General Commission for Scientific Agriculture Research (**GCSAR**), General Commission for Biotechnology (**GCBT**), the General Organization for Seed Multiplication (**GOSM**), General Organization of Remote Sensing (**GORS**), the Atomic Energy Commission of Syria (**AECS**), International Center for Agricultural Research in the Dry Areas (**ICARDA**), and several faculties in the public universities (faculties of agriculture, Sciences and Pharmacy) and several SMEs such as Aleppo Yeast Factory.

Research community:

The main research topics:

- Use of image processing to monitor some substances in meat and oil
- The role of food industry in the Syrian industry
- The effect of gamma rays on the chemical characteristics of the Syrian olive oils
- The use of some plants in food preservation
- Study of commercial Essential oils
- **Projects funded by the Higher Commission for Scientific Research (HCSR):**
- Genetic diversity of Damascus roses
- Variations of some local varieties of peanuts
- The effect of gamma rays and pesticides in tomato nematodes
- Study of the biological activity of algae on some human pathogens

- Development of Damascene almond tree planting
- Genetic improvement of some varieties of tomato strain
- Develop drought-tolerant hybrids sorghum
- Remote sensing techniques to monitor the production of wheat in Syria
- Improve the efficiency of yeast

EU Projects:

Five EU FP7 projects coordinated by ICARDA, **MAAR**:

- 2,998,654 Euro fund, during the period 01/04/2012 31/03/2016 for the project OSCAR: Optimizing Subsidiary Crop Applications in Rotations
- 499,904 Euro Fund, during the period 01/01/2011 31/12/2013 for the project SUWARESA: Capacity and knowledge building on the Sustainable Use of Water Resources in Syrian Agriculture
- 5,999,000 Euro Fund, during the period 01/03/2010 31/08/2014 for the project SOLIBAM: Strategies for Organic and Low-input Integrated Breeding And Management
- 1,996,771 Euro Fund, during the period 01/03/2010 30/06/2013 for the project SUSTAINMED: Sustainable agro-food systems and rural development in the Mediterranean Partner Countries
- 999,808 Euro Fund, during the period 01/01/2010 - 31/12/2012 for the project CA2AFRICA: Conservation Agriculture in AFRICA: Analyzing and Foreseeing its Impact - Comprehending its Adoption

Plan for the future / relevance and importance of the topic for the country

- Development of improved seeds and genetic engineering
- Development of crops that require a small amount of water
- Food production from seawater.
- Development of fish farms, agriculture products that can be manufactured in accordance with the requirements of the market
- Rural development, procurement of agricultural equipments
- Development of new materials in agriculture and industry
- Developments of Modern methods of irrigation
- Developments of Seawater desalination and cloud seeding techniques for water purification
- Development of irrigation canals, drainage and bridge building
- Radar survey for monitoring the leaks water supply networks
- Development of new techniques of flood management
- Determination of water balance in basin of surface water and groundwater

Prior to the current events, Syria was a significant exporter of agricultural products, including cotton, sugar, tomatoes, potatoes, oranges, apples, olive oil, sheep, cattle, poultry meat and hens' eggs. Unfortunately after three years of crisis, some farmers have abandoned their land because of the threat of violence, and others because of the damage to irrigation canals and pumps, high cost of inputs and fuel and the low returns for their products. MAAR expects that the area planted to cotton, sugar beet will be down by 50 percent this year. Of the country's eleven cotton ginneries only four are still functioning. Most of the national wheat flour milling capacity and bakeries producing standard bread products are either no longer operating or are operating at low capacity. Although food commodities are available in most governorates, the quantities for sale in local markets of all basic food commodities have reduced compared to last year. Prices of the main food commodities have more than doubled since 2011.

| N° | Indicator - Political Support | Indicator | Results |
|----|-------------------------------|-----------|--|
| 1 | National or State Policies | PO-01 | Yes, in the national policy for science, technology and innovation |

| | | | |
|-----------|--|------------------|--|
| 2 | Funding mechanisms to support ICT research | PO-02 | Yes, by HCSR and Europe |
| 3 | Future Plans, Priorities and Strategies in ICT R&D | PO-03 | Yes, for example: genetic engineering, Modern methods of irrigation, Seawater desalination |
| 4 | Support to MED-TPs | PO-04 | Yes |
| N° | Indicator - Industrial support | Indicator | Results |
| 5 | Presence of Large ICT Industry doing Research and Innovation | IN-01 (1-5) | 3 |
| 6 | Presence of Research and Innovation Intensive SMEs | IN-02 (1-5) | 3 |
| 7 | Involvement in European funded projects | IN-03 (1-5) | 3 |
| 8 | Independence of local industry | IN-04 (1-5) | 3 |
| 9 | Foreign Direct Investment (FDI) and presence of development centres | IN-05 (1-5) | 4 |
| 10 | Market Demand | IN-06 | Yes |
| 11 | Number of Patents | IN-07 (1-5) | 2 |
| 12 | Support to MED-TPs | IN-08 | Yes |
| 13 | Already existing commercial cooperation with European industries | IN-09 (1-5) | 3 |
| N° | Indicator - Academic support | Indicator | Results |
| 14 | Number of Universities, Research Centres and Higher Education Institutions | AC-01 (1-5) | 3 |
| 15 | Researchers operating in the targeted field | AC-02 (1-5) | 3 |
| 16 | Number of yearly scientific publications | AC-03 (1-5) | 3 |
| 17 | Previous participations in FP6-FP7 R&D projects in the ICT priority | AC-04 (1-5) | 3 |
| 18 | Existing cooperation with EU countries | AC-05 | Yes |
| 19 | Support to MED-TPs | AC-06 | Yes |
| N° | Indicator - General | Indicator | Results |
| 20 | Previous participations in FP6-FP7 R&D projects in the ICT priority | GE-01 (1-5) | 3 |
| 21 | Innovation policy and/or initiative | GE-02 | Yes |

2.2.15 Other ICT domains

No data available.

2.3 List of contributors

The following table compiles the list of contributors to the analysis (data collected by interviews or by email campaign).

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(*) Industry (large), Industry (SME), Academic, Government

Section 3 - Conclusions

The critical mass in Syria to create a Working Group in the future Technology Platform:

1. **Software:** Digital Arabic content including Arabic language processing, Mobile applications and e-services.
2. **Renewable Energy:** Solar and Biomass energy
3. **Food:** Improved seeds and genetic engineering, Water Management
4. **Health:** Hospital Management System
5. **Transport:** Green Transport
6. **Environment:** Management of solid and liquid waste

Annex I - Acronyms

| Term / expression | Description |
|--------------------------|--|
| ETP | European Technology Platform |
| ICT | Information and Communication Technology |
| LatAm | Latin America |
| LATP | Latin America Technology Platform |
| SRIA | Strategic Research and Innovation Agenda |
| TP | Technology Platform |