

PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

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Introduction

This report looks at the science, technology and innovation system of Algeria. Section 1 briefly deals with the national political environment; Section 2 looks at the key country characteristics including the economic, demographic and health, education and information and communication technology infrastructure. Finally, Section 3, which forms the main part of the report, gives an overview and analysis of the science and technology system. This section is subdivided into seven thematic subsections covering the governance of the science and technology, science and technology landscape, S&T human resources, funding, research outputs, technological innovation and lastly international co-operation and networks activities.



Section 1: The political environment

After more than a century of rule by France, Algerians fought through much of the 1950s to achieve independence in 1962. Algeria's primary political party, the National Liberation Front (FLN), has dominated politics ever since. Many Algerians in the subsequent generation were not satisfied, however, and moved to counter the FLN's centrality in Algerian politics. The surprising first round success of the Islamic Salvation Front (FIS) in the December 1991 balloting spurred the Algerian army to intervene and postpone the second round of elections to prevent what the secular elite feared would be an extremist-led government from assuming power. The army began a crack down on the FIS that spurred FIS supporters to begin attacking government targets. The government later allowed elections featuring pro-government and moderate religious-based parties, but did not appease the activists who progressively widened their attacks. The fighting escalated into an insurgency, which saw intense fighting between 1992 and 1998 and which resulted in over 100,000 deaths - many attributed to indiscriminate massacres of villagers by extremists.

The government gained the upper hand by the late-1990s and FIS's armed wing, the Islamic Salvation Army, disbanded in January 2000. However, small numbers of armed militants persist in confronting government forces and conducting ambushes and occasional attacks on villages. The army placed Abdelaziz BOUTEFLIKA in the presidency in 1999 in a fraudulent election but claimed neutrality in his 2004 landslide re-election victory. Longstanding problems continue to face BOUTEFLIKA in his second term, including the ethnic minority Berbers' ongoing autonomy campaign, large-scale unemployment, a shortage of housing, unreliable electrical and water

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supplies, government inefficiencies and corruption, and the continuing - although significantly degraded - activities of extremist militants. (CIA World Fact book, 2007)

Section 2: Country characteristics

2.1 Basic economic outlook

The hydrocarbons sector is the backbone of the Algerian economy, accounting for roughly 60% of budget revenues, 30% of GDP, and over 95% of export earnings. Algeria has the seventh-largest reserves of natural gas in the world, is the second largest gas exporter; and ranks 14th in oil reserves. Economic policy reforms supported by the IMF and debt rescheduling from the Paris Club in the past decade have helped improve Algeria's financial and macroeconomic indicators. (<http://www.nationmaster.com/red/country/ag-algeria/eco-economy&all=1>)

From 1999 to 2003, real GDP grew by 3.8 percent a year, on average, essentially led by the oil sector performance, which grew by 4.3 percent during the same period. The non-hydrocarbon- non-agricultural sector grew by 3.3 percent, led by a strong 5 percent real growth in value added from private manufacturing industries. In 2003 alone, GDP growth reached 6.8 percent, the highest rate in the previous five years, on the account of higher oil production and an extraordinarily good agricultural output performance related to good weather. (World Bank, 2004)

Table 1: Economic Indicators

National Accounts	2002	2003	2004	2005
GDP at current market prices	56 951.45	68 014.73	84 817.50	1 04 934.80
Gross domestic savings	23 217.32	30 518.77	39 883.10	57 075.15
GDP at market prices (constant 2000 prices)	58914.21	62920.38	66192.24	69905.62

Source: African Development Bank, 2006

The country's economic health and stability is evident from the growth rates of 6.9% in 2003 and 5.4 percent 2004 and underpins the expectations of further substantial growth of around 4.5 percent in 2005 and 2006. Algeria has reduced its debt ratio to 24.7 percent, rebuilt official reserves to the equivalent of nearly two years of imports, still has a budget surplus (even taking into account its FRR revenue regulation fund) and has inflation under control (OECD, 2005). Adequate rainfall produced exceptional harvests in 2003 and the agricultural sector grew 17 percent (after shrinking 1.3 percent in 2002), mainly because of good sector policies and financial management of state farmland since the national agricultural development plan (PNDA) was launched in 2000. Cereal production more than doubled in 2003 to nearly 42.4 million quintals (from 20.2 million in 2002). Non-cereal vegetable output, which is less erratic because of expanding irrigation, grew much more slowly (4 percent). Livestock production continued to advance, showing a 7 percent increase (5 percent in 2002). (OECD, 2005)

The government continued to develop the country's infrastructures as a means of encouraging private sector initiative in 2004. A 40 billion economic growth support plan (PSCE) was launched in August 2004. Work on roads includes major projects such as the coast road, the east-west motorway, the Hauts Plateaux by-pass, north-south freeways, the Trans-Sahara, the opening of new and repaired roads aimed at ending the isolation of about 700 000 people and improving traffic movement in major towns and cities. (OECD, 2005)

2.2 Demographic profile incorporating health, education and ICT indicators

Table 2: Summary of various demographic statistics for Algeria

Indicator	Statistic	Year	Source
General demographical			
Total Population (millions)	32.854	2005	African Development Bank, 2006 ²
Percentage of urban population	58.8	2003	UNDP Human Development Indicators
Health			
Crude birth rate (per 1000 population)	20.8	2005	African Development Bank, 2006
Life expectancy at birth (years)	71.8	2005	African Development Bank, 2006
Total fertility rate	2.4	2005	African Development Bank, 2006
Infant mortality rate (per 1000)	33.5	2005	African Development Bank, 2006
Physicians	35,368	2002	World Health Organisation ³
Physicians (density per 1 000 population)	1.13	2002	World Health Organisation
Nurses	68,950	2002	World Health Organisation
Nurses (density per 1 000 population)	2.21	2002	World Health Organisation
Dentists (number)	9,553	2002	World Health Organisation
Pharmacists (number)	6,333	2002	World Health Organisation
Education			
Primary completion rate, total (% of relevant age group)	94.3	2004	World Development Indicators Database, April 2006
School enrolment, primary (% gross)	111.7	2004	World Development Indicators Database, April 2006
School enrolment, secondary (% gross)	80.7	2004	World Development Indicators Database, April 2006
School enrolment, tertiary (% gross)	19.6	2004	World Development Indicators Database, April 2006
Ratio of girls to boys in primary and secondary education (%)	98.9	2004	World Development Indicators Database, April 2006
Literacy rate, adult total (% of people ages 15 and above)	69.9	2004	World Development Indicators Database, April 2006
Information & Communication Technology (ICT)			
Telephone main lines (per 1,000 people)	99	2004	World Bank , ICT at a Glance
Mobile subscribers (per 1,000 people)	151	2004	World Bank , ICT at a Glance
Population covered by mobile telephony (%)	84	2004	World Bank , ICT at a Glance
Internet users (per 1,000 people)	46	2004	World Bank , ICT at a Glance
Personal computers (per 1,000 people)	9	2004	World Bank , ICT at a Glance
Households with television (%)	98	2004	World Bank , ICT at a Glance

² www.afdb.org

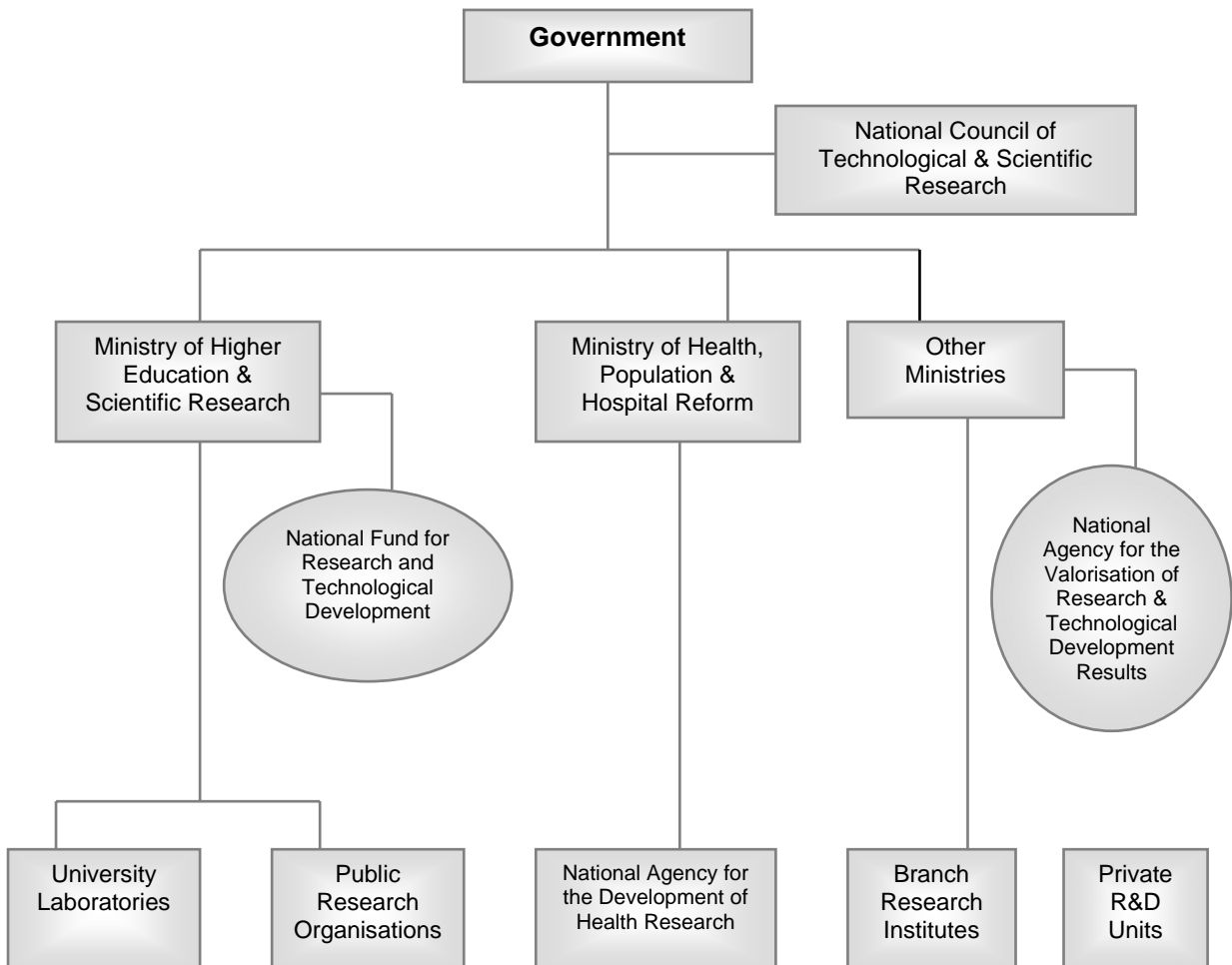
³ www.who.org

Section 3: Science and technology system

During the 70s, Algeria began to develop its research system through the Ministry of Higher Education and Scientific Research (the MESRS). A new national authority of Research was created in 1973: l'Organisme National de Recherché Scientifique (National Organisation for Research, or ONRS). Thanks to this initiative, scientific research progressed considerably: the first national research program was implemented and a hundred research projects initiated. The management was efficient: research units and centres had been created while others had been boosted and many researchers had been trained or recruited, but research was not a national priority yet. Furthermore, ONRS had difficulties extending its activities to Research Institutes under administrative supervision of some technical Ministries, such as Agriculture, Industry, or to R&D Units inside powerful companies in the iron and steel industry, or in the oil sector. (UNESCO Profile, 2006)

3.1 Governance of Science and Technology

Figure 1: Organizational chart of the Algerian S&T governance System



Source: Observatoire Sciences Techniques, 2005

The following table depicts the evolution of the authorities governing scientific research in Algeria.

Table 3: Evolution of authorities governing scientific research in Algeria

Institutions	Year founded	Administrative supervision	Year of dissolution
Conseil de la Recherche Scientifique	1963	Franco Algerian	1968
Organisme de Coopération Scientifique	1968	Franco Algerian	1971
Conseil Provisoire de la Recherche Scientifique	1971	Franco Algerian	1973
Organisme National de la Recherche Scientifique	1973	Ministry of Higher Education	1983
Commissariat aux Energies Nouvelles	1982	Presidential Office	1986
Conseil National de la Recherche Scientifique et Technique	1984	Prime Minister's Office	1986
Haut Commissariat à la Recherche	1986	Presidential Office	1990
Ministère Délégué à la Recherche et à la Technologie	1990	Prime Minister's Office	1991
Ministère Délégué à la Recherche, la Technologie et l'Environnement	1991	Prime Minister's Office	1991
Secrétariat d'Etat à la Recherche	1991	Ministère aux Universités	1992
Secrétariat d'Etat	1992	Ministère de l'Education	1993
Commission intersectorielle de promotion, de programmation et d'évaluation de la recherche	1992	Prime Minister's Office	Still exists but is not very active
Conseil National de la recherche scientifique	1992	Prime Minister's Office	still exists but is not very active
Ministère Délégué aux Universités et à la Recherche	1993	Ministère de l'Education	1994
Direction de la Coordination de la Recherche	1995	Ministry of Higher Education and Scientific Research	still exists
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique	1994	Ministry of Higher Education and Scientific Research	still exists
Ministère adjoint chargé de la recherche scientifique	1999_	Ministry of Higher Education and Scientific Research	still exists

Research became more of a public concern in the eighties. The creation of the Haut Commissariat à la Recherche (HCR) in 1986 was followed by a long period of instability in the governance of science due to constant change in governing institutions and policies. (UNESCO Profile, 2006)

Later on (from 1993 to 2001) the civil war seriously weakened the system, and government interest for science. Armed groups often threatened and even murdered intellectuals and prominent scholars, making individual interest in science even less. Many researchers and executives targeted by Islamic guerrillas were forced to flee Algeria. Nevertheless, researchers who stayed in Algeria remained very active; they developed collaborations, so that the period resulted in an increased cooperation between the education sector and all other research performers such as the government sector and industrial sector. (UNESCO Profile, 2006)

3.1.1 *Ministry of National Education*

The Ministry of National Education is responsible for the supervision of basic and secondary education.

3.1.2 *Ministry of Higher Education and Scientific Research*

The Ministry of Higher Education and Scientific Research, and the Ministry of Professional Education in collaboration with various other relevant ministries regulate the tertiary sector. (Clark, N. 2006)

The Ministry of Higher Education and Scientific Research lists a total of 57 public institutions of higher education: 27 universities, 13 university centres, 6 national schools (*écoles nationales*), 6 national institutes (*instituts nationaux*), and 4 teacher-training institutes (*écoles normales supérieures*). The structure of university studies is currently being reformed from a 3-4-5-7 system to a 3-5-8 system based on a three-year *licence*, two-year *master* and a three-year *doctorat* (Clark, N. 2006)

3.1.3 *Ministry of Agriculture*

Algeria's agricultural sector, which constitutes about 10 percent of gross domestic product (GDP), employs 27 percent of the workforce, is unable to meet the food needs of the country's population. As a result, some 45 percent of food is imported. The primary crops are wheat, barley, and potatoes. In addition, farmers were successful growing dates for export. Cultivation is concentrated in the fertile coastal plain of the Tell region, which represents just a slice of Algeria's total territory. Altogether, only about 3 percent of Algerian territory is arable. Even in the Tell, rainfall variability has a significant impact on production. Government efforts to stimulate farming in the less arable steppe and desert regions have met with limited success. However, herdsman maintain livestock, specifically goats, cattle, and sheep, in the High Plateaus. In 2002, livestock farmers produced 551,500 tons of meat. (Library of Congress, 2006)

3.1.4 *Science and technology priorities*

ICT

In May 2000, the government issued a policy statement outlining the telecommunications liberalization program to be implemented over five years (2000-2005). The first step involved the preparation and enactment of a new set of legislations conducive to private sector participation and abolishing the public monopoly over the provision of telecommunications networks and services. The law was enacted in August 2000. A new regulatory body (ARPT) was created to take over regulatory functions previously handled by the ministry of post and telecommunications. The latter was subsequently reorganized to cope with its new mandate. (Noumba, P.; 2004)

Two important infrastructure projects were launched in parallel to the reform the implementation. The first project related to the construction of the Algiers-Palma submarine cable connecting Algeria to Spain and offering a total bandwidth of 160 Gbps. The second project related to the rollout of an Internet platform offering national and international backbone connectivity to Algerian ISPs. Both projects were completed respectively in 2001 and 2002. In launching these projects, the government's objective was to expand and upgrade the main transmission facilities and accommodate new entrants' bandwidth needs. (Noumba, P.; 2004)

The Algerian government has given emphasis to the development of ICT human resources. In light of the globally emerging knowledge and information society, Algeria has put in place a committee in charge of defining the elements of an Algerian national information society strategy. The work of the committee will help set up the links among the different sectors, in the area of infrastructure, training and research as well as information systems and ICT's.

One hundred and thirty million dollars have been allocated to create a technopole at Sidi Abdallah, 30kms from Algiers. This site covers a surface of 1,870 hectares through the municipalities of Mahelma and Rahmania. It comprises three technology parks, which will be able to accommodate firms specialized in advanced technologies, and an industrial park:

- Technopark El Boustène
Focus Areas: Biotechnology (pharmaceuticals), ICT's & Electronics
- Technopark Ibnou-Sina
Focus Areas: Biotechnology (pharmaceutics), Health Care & Medicine, ICT, Tourism and Engineering
- Cyber Park: Focus Areas: ICT, Media and Communications
- Park of Sidi Bennour
Focus Areas: Agro-food

3.2 *Science and Technology landscape*

The infrastructure for Algeria's R&D system was in existence well before independence. There were R&D initiatives in the fields of energy and health, such as the Centre Nucleaire and l'Institut Pasteur. After independence, the choice of a socialist road for socio-economic development led to the establishment of a large public sector including R&D. All pre-independence scientific research institutions were nationalized after 1967. A major post-independence objective in Algeria was to create the ability to emulate research efforts in the successfully industrialized countries with the view to quickly catch up with them and rapidly close the 'technological gap'. (Mohammed Said Oukil, 1996)

Table 4: Highlights of Institutions Development

Year founded	Name	Field
1930	Centre National de Recherché et d'Application en Géosciences	Geosciences
1956	Centre de Recherchés Anthropologiques, Préhistoriques et Ethnographiques	Anthropology and prehistory
1958	Institut d'Etudes Nucléaires	Nuclear technology
1974	Centre de Recherché sur les Ressources Biologiques Terrestres	Biology
1974	Centre National de Recherché sur les Zones Arides	Arid zones
1974	Centre Universitaire de Recherché, d'Etudes et de Réalisation	Social sciences (basic and applied)
1974	Centre d'Information Scientifique et Technique et de Transfert Technologique	Technology
1975	Centre de Recherché en Economie Appliquée	Applied economy
1975	Centre de Recherché en Architecture et Urbanisme	Architecture
1976	Centre National d'Etudes et de Recherchés en Aménagement du Territoire	Development
1976	Centre d'Etudes et de Recherchés Agronomiques	Agronomics
1976	Centre des Sciences et de la Technologie Nucléaire	Nuclear technology
1986	Centre de Recherché en Economie Appliquée au Développement	Economy
	Centre de Recherché Océanographique et des Pêches	Oceanography
	Centre de Recherché sur l'Information Scientifique et Technique	Information

3.2.1 S&T Agencies

3.2.1.1 Agence Nationale pour le Développement de la Recherché Universitaire-ANDRU

The principal objective of the agency is to drive and support the development and the valorisation of the activities of research lying within the scope of the National Research Programmes (P.N.R) within the university institutions.

Within this framework, the Agency will have the following tasks:

- To work out the annual and multi- annual research programs and to take care of their execution.
- To carry out the invitation and tendering process within programs and follow-up on the projects
- Provide finance for certain research projects
- Be involved in the monitoring and evaluation of research projects

- To promote and instigate the mechanisms and the circuits of support and administrative and financial management of university research.
- To ensure the diffusion and the utilization of the research results
- To assist where needs arise on the technical and financial level for acquisition for equipment and scientific documentation, necessary to the realization of its programs.

Furthermore, within the framework of the regulation, the agency will have to support the development and the maintenance of relations and exchanges of scientific and technical assistance.

3.2.1.2 *Agence Nationale pour le Développement de la Recherche en Santé (ANDRS)*

The National Agency for the Development of Research in Health is a publicly owned establishment related to administration, charged to contribute to the implementation and the realization of research in accordance with the national programmes in health. The agency will have the following tasks:

- Work out its annual and multi-annual programs, in accordance with the adopted priorities, and to take care of their execution;
- Proceed with the launching and the follow-up tenders within the framework of its programs;
- Finance, through programme budgeting, with means of conventions and/or of contracts, the adopted research projects;
- Promote and bring about the mechanisms and systems of support along with administrative and financial management of research
- Proceed with the setting up of devices to follow-up and evaluate activities of research
- Contribute to the material and financial responsibilities of scientific demonstrations organized in the fields related to its activities;
- Take part, in relation to the structures concerned, with the financing of the actions of improvement and recycling necessary to the realization of its programs;
- Carry out the acquisition of complement equipment, of materials, products and documentation related to the realization of its programs;
- Ensure the diffusion and utilisation of the research results

3.2.2 *R& D Performing Institutes*

The R&D performing institutions in Algeria may be categorized into the higher education sector institutions, public sector research and technology institutes as well as private sector research institutes

3.2.2.1 *Higher Education Sector*

The French established the first Algerian university –Algiers University – in 1909, and most of the students at the time were French. In 1962, there was only one university in Algeria with offices in Oran (for the West of the country) and Constantine (East). Today, there are more than 50 universities with more than 700, 00 students. (Saad, M; Zawdie, G; Derbal, A & Lee, R. 2006)

After the Algerian independence in 1962, significant changes were introduced in order to facilitate access to higher education for a greater number of Algerians. One of the most important reforms, introduced in 1971, sought to mobilize the full potential of the Algerian universities so that they would be in a position to support the ambitious economic, social and cultural transformation and development of the newly independent country. The 1971 Reform proposed a change of teaching and learning methods, including assessment methods, teaching contents, structure, organization and management of the university and creation of new specialties, options and modules in order to better

respond to the development needs of the country. A modular scheme was introduced. The academic year was prolonged and divided into 2 semesters. (Saad, M; Zawdie, G; Derbal, A & Lee, R. 2006)

The next major reform was in 1999. This Reform was aimed at preparing Algerian universities to support the transition from a centralized to free market economy and to address the threats and opportunities of globalization to the Algerian economy. The new economic, social and political challenges brought forth by globalization trends prompted revision of the role the universities in provision of science and technology through teaching and research activities. This Reform also aimed to ensure that the Algerian university system was driven not by the objective merely to increase quantity of output, but rather by the objective to improve quality that would enhance credibility. (Saad, M; Zawdie, G; Derbal, A & Lee, R. 2006)

The 1999 Reform provided for universities to forge links with industry and to be integrated with 'actors' in the local environment in order to play a more active role in regional development. The number of researchers increased from 5000 in 1996 to 15000 in 2002. With the 1999 Reform, S&T policy shifted from a centralized to a decentralized approach and institutional networks emerged through a greater community involvement of universities in liaison with local actors. This process involved relationships and joint actions within and between government, industry and university and research institutions both at national and regional levels. Such networks and relationships helped promote innovation through knowledge creation and dissemination. However, the Reform did not provide for sufficient power to be devolved to local actors, so that the potential gains expected to derive from the articulation of institutional networks is still far from fully realized. The dominant role of the state and its centralized approach coupled with the lack of a knowledge sharing culture has had the effect of rendering this coordination complex and unattainable in spite of the creation of a large number of committees at the national and regional levels. There was also a lack of adequate and consistent follow-up scheme for cooperative projects. This means that the integrated or holistic approach has not yet taken root as the way of doing things in Algeria. The fragmentation of decision-making networks has the effect of preventing the surfacing of consensus, which is identified by Etzkowitz et al (2004) as the main preconditions for technological development through the application of the "triple helix" model of innovation. (Saad, M; Zawdie, G; Derbal, A & Lee, R. 2006)

Most of Algeria's universities are located in the northern coastal regions and serve as umbrellas for a wide range of faculties, much like the French university system, which in turn are divided into academic departments. University centres tend to operate in more remote regions and have historically been limited in the number of programs they offer. Typically, programs at university centres focus on the particular manpower needs of the regions they serve by training professionals and technicians in specific professional fields. In recent years, many university centres have expanded the number of disciplines in which they offer programs to the extent that some have been upgraded to university status. (Clark, N. 2006)

In 2003, almost 6000 foreign students were enrolled in an Algerian institution of higher education, of which 4000 were from French-speaking Africa. (Clark, N. 2006)

Table 5: Public Universities

Name	Faculties	Website
Université d'Alger	Medicine Law (check) Languages Economics Human and Social Sciences Political Sciences and Information Islamic sciences Institute of sports and physical sciences	www.univ-alger.dz
Université Scientifique et Technique Houari Boumédiène (USTHB), Alger	Mathematics Physics Chemistry Biological sciences Earth sciences, geography and land management Civil engineering Mechanical and process engineering Electronics and information	www.usthb.dz
Université d'Oran Es Sénia	Sciences Medicine Earth sciences, geography and land management Law Economics & Commerce Social Sciences Human sciences and Islamic civilisation Languages & Art	www.univ-oran.dz
Université des Sciences et de la Technologie d'Oran (USTO)	Sciences Electrical engineering Architecture & civil engineering Mechanical engineering	www.univ-usto.dz
Université Scientifique et Technique de Constantine (USTC)	Sharia & Islamic Civilisation Human sciences and literature	
Université de Sétif	Sciences Engineering sciences Medicine Law Economic and management sciences Social sciences and literature	www.setif-fac.com

Table 5 Continued

Name	Faculties	Website
Université de Tizi Ouzou	Sciences Electronics and information Construction engineering Biological and Agricultural sciences Medicine Economic and management sciences Law Social sciences and literature	
Université de Tlemcen	Sciences Engineering sciences Medicine Law Economic and management sciences Human sciences, Social sciences and literature	www.univ-tlemcen.dz
Université de Batna	Sciences Engineering sciences Medicine Law Economic and management sciences Human sciences and literature Social sciences and Islamic sciences	www.univ-batna.dz
Université de Blida,	Sciences Engineering sciences Medicine Law Economic and management sciences Social sciences and literature Agricultural and veterinary sciences	www.univ-blida.dz
Université de Bumerdès	Sciences Engineering sciences Chemistry and Hydrocarbons Law and Commerce	www.umbb.dz

Table 5 Continued

Name	Faculties	Website
Université Djillali Liabès, Sidi Bel Abbès	Sciences Engineering sciences Medicine Law Economic and management sciences Human sciences and literature	www.univ-sba.dz
Université de Béjaia	Sciences Natural & Life sciences Law and Commerce Human sciences and literature	
Université Hassiba Ben Bouali de Chlef	Sciences & Engineering sciences Agricultural & Biological sciences Language & Literature Economic & Management sciences Administrative sciences Institute of sports & physical activities	
Université Amar Telidji de Laghouat	Sciences & Engineering Economic & Management sciences Law & Social sciences	
Université Mentouri de Constantine	Sciences Natural & Life sciences Engineering sciences Earth sciences, geography and land management Medicine Law Economic & Management sciences Human sciences and literature Language & Literature	
Université Mohamed Khider de Biskra	Sciences & Engineering Law and Political Sciences Economic & Management sciences Human and Social sciences & Literature	

Table 5 Continued

Name	Faculties	Website
Université de Ouargla	Sciences & Engineering Law & Economic Sciences Human sciences & Literature	
Université de Skikda	Sciences & Engineering Management & Economic Sciences Law & Social Sciences	www.univ-skikda.dz
Université de M'Sila	Sciences & Engineering Commercial, Management & Economic Sciences Law Social sciences & Literature	
Université 08 Mai 1945 de Guelma	Sciences & Engineering Management & Economic Sciences Law & Social Sciences	
Université Abdelhak Benhamouda de Jijel	Sciences Engineering sciences Law Management Sciences	www.univ-jijel.dz
Université de Mostaganem	Sciences & Engineering sciences Law & Commercial Sciences Social sciences Literature & Arts	www.univ-mosta.dz
Université Ibn Khaldoun de Tيارت	Sciences & Engineering sciences Agricultural & Veterinary sciences Human & Social Sciences	www.univ-tiaret.dz
Université D'Adrar	Sciences & Engineering sciences Social & Islamic Sciences	

Table 6: University Centres

Name	Institute	Website
Centre Universitaire de Tebessa	Civil engineering Mining Earth sciences	www.umkbiskra.net
Centre Universitaire de Bouira	Law Languages & Arabic literature Economic sciences	
Centre Universitaire de Oum El Bouaghi	Physical Sciences Mechanical engineering Electronics Natural sciences Language and literature Administrative sciences Economic and management sciences	
Centre Universitaire de Tamanrasset	Law Human Sciences	
Centre Universitaire de Ghardaia	Social Sciences & Humanities Commercial science	
Centre Universitaire de Khemis Miliana	Earth & Natural science Economic sciences	
Centre Universitaire de Bordj Bou Arreridj	Information Electronics	
Centre Universitaire D'El Oued	Juridical sciences Language & Literature Commercial sciences	
Centre Universitaire de Souk Ahras	Juridical sciences Sciences & Engineering sciences	
Centre Universitaire D'El Tarf	Agronomy Veterinary sciences	

Table 6 Continued

Name	Institute	Website
Centre Universitaire de Médéa	Engineering Management sciences Languages Administrative sciences	
Centre Universitaire de Khenchela	Juridical sciences Language & Literature	
Centre Universitaire de Béchar	Sciences Mechanical engineering	www.univ-bechar.dz
Centre Universitaire de Mascara	Hydraulics Agronomy	www.cuniv-mascara.edu.dz/
Centre Universitaire de Saida	Sciences Electronics Hydraulics	

3.2.2.2 Public Research Institutes

Table 7: The Algerian Public Research Institutes

Name	Field	Website
Centre de Recherché en Astronomie Astrophysique et Géophysique, CRAAG	Astronomy, Astrophysics & Geophysics	www.craag.edu.dz
Centre de Développement des Technologies Avancées, CDTA, Alger	Advanced Technologies	www.cdta.dz
Centre de Développement des Techniques Nucléaires, CDTN	Nuclear Technique development	
Centre de Recherché et d'Exploitation des Matériaux, CREM	Materials	
Centre de Recherché Scientifique et Technique en Soudage et Contrôle (CSC), Alger		
Centre de Radio protection et Sûreté, CRS		
Centre de Développement des Energies Renouvelables, CDER	Renewable energies	www.cder.edu.dz

Table 7 Continued

Name	Field	Website
Centre National des Techniques Spatiales, CNTS	Spatial technologies	www.cnts.dz/
Centre de Recherché sur l'Information Scientifique et Technique, CERIST	Science & Technology information	www.cerist.dz
Centre de Recherché Scientifique et Technique en Analyses Physico-Chimiques, CRAPC, Alger	Chemistry	
Centre National de Recherché Appliquée en Parasismique, CGS		www.cgs-dz.org
Centre de Recherché des Industries Agro-Alimentaires	Agro-research	
Institut Technique de Developpement de l'Agronomie Saharienne		
Commissariat au Developpement de l'Agriculture des Regions Sahariennes		
Centre d'Etudes et de Recherché Appliquees et de Documentation pour la Peche et l'Aquaculture		

3.2.2.3 Private Research Institutes

Table 8: The Algerian Private Research Institutes

Main corporate research centres	Fields	Websites
Centre de Recherche-Développement de SONATRACH	Hydrocarbons	www.sonatrach-dz.com
Centre de Recherche-Développement ANABIB		www.anabib.com
Centre de Recherche-Développement SAIDAL	Pharmaceuticals	
Institut Algérien du Pétrole, rattaché en 1998 à SONATRACH,	Hydrocarbons	www.sonatrach-dz.com/
Centre d'Etudes et de Recherché Minière, EREM	Mining	
Centre de Recherché pour la Valorisation des Hydrocarbures et de leurs dérivés (CERHYD), intégré en 1998 au CRD SONATRACH,	Hydrocarbons	www.sonatrach-dz.com

Semi-public research is principally the sort that some of the large Algerian public sector companies are trying to develop. These companies work in a variety of fields such as hydrocarbons, iron, steel, electronics, chemistry, food and agriculture. Some have centres for research and development (CRDs) as can be seen in the table above, while others simply have research units. These units are nearly always approved by the MESRS and/or linked with projects that have their base in a university or research centre. (Khelifaoui, H. 2004)

The oldest and biggest of these CRDs is that of SONATRACH, which was founded in 1960 under the name Department of the Central Hydrocarbon laboratory. It became a registered CRD in 1988. The title change was deliberate due to changes that occurred in the centre's structure, and with part of its activities changing from straightforward investigation and analytical service to true research. (Khelifaoui, H. 2004)

The fate of semi-public research is naturally closely linked to that of the parent company. Some sectors sustain themselves and try to develop (like SONATRACH); others (like the CRD of the pharmaceuticals company SAIDAL) emerge and increase in importance. Yet other sectors are in a state of collapse, like the Department of Applied Research of the steel maker SIDER, despite having been pioneer in the field. (Khelifaoui, H. 2004)

3.3 Human capital for S&T

The world of full-time vocational research consists of national research centres dependent on the MESRS. There are 60 research centres and units. The table below indicates Algerian science's quantitative weaknesses. There is 908 permanent researchers, plus 3500 teacher-researchers who can devote no more than 40% of their time on research. The number researchers per discipline are very different from the critical mass needed for perpetuating research. (Khelifaoui, H. 2004)

Table 9: Research Projects and Staff Falling under the MESRS

Establishment type	Research entities	Research projects	Total number of staff	Number of whom are researchers
MESRS research centres				
Renewable Energy	12	379	1338	550
Advanced technologies	3	153	473	238
Physical, chemical and human sciences	7	20	215	120
Subtotal	22	552	2026	908
University –based research	38	988	3500*	3500
Grand total	60	1540	5526*	4408

Source: (Khelifaoui, H. 2004)

Note*: these figures do not include administrative and support personnel assigned to university research

The MESRS constitutes 76% of national research force; the majority of the personnel actually consist of teacher-researchers at university and so are only part-time researchers. Owing to the sheer student numbers, the time they can devote to research activities is very much strained (less than 40% of their time). The proportion staff-students ratio decreased from

1 teacher for 10 students in 1985 to 1 teacher for 23 students in 1999 and even one for 236 students if one only takes into account people with master 's degrees.

The halt in recruitment that occurred ten years ago induced a lack of researchers in the whole public sector. In research centres, the first generation, trained at the time of the ONRS, is coming up for retirement but there is no substantial intellectual force ready to take over. (Khelifaoui, H. 2004)

3.3.1 Master and Doctoral qualifications

The number of Algerian students who have enrolled for postgraduate studies has increased in the past two decades as can be seen in the table below.

Table 10: Changes in postgraduate student numbers

Category	1982-83	1986-87	1992-93	2000-2001
Postgraduate students enrolled	5722	11407	13982	19225

Source: (Khelifaoui, H. 2004)

3.3.2 Human and institutional capacity development strategies

The reform of 1999 was developed around the themes of *democratisation, Arabisation, Algerianisation*, albeit without losing sight of the scientific and technological orientation of university education. The democratisation of the university was aimed at ensuring a greater and free to Algerian students. This resulted in the rapid expansion of enrolment over the years shown in the table below:

Table 11: Number of undergraduate students in Algerian universities

Year	1960	1970	1980	1990	2000	2001	2004
Number of students	1137	12243	57445	181350	466084	552804	700000

Source: Saad, M; Zawdie, G; Derbal, A & Lee, R. 2006

The *Algerianisation* and *Arabisation* of the university system involved the progressive replacement of French by Arabic as the medium of instruction; curricula revision and adaptation of teaching methods to suit the needs of newly independent country. This led to the recruitment of an increasing proportion of university staff from Algerian and other Arabic countries. This is apparent from Table 2 below, which shows growth in the proportion of Algerian staff from 54% in 1970 to 99% in 2000. (Saad, M; Zawdie, G; Derbal, A & Lee, R. 2006)

Table 12: Proportion of Algerian staff in Algerian universities

	1963	1970	1990	2000
Total number of academic staff	298	697	14536	17460
Number of Algerian staff	128	376	13311	17401
Proportion of Algerian staff	46.61%	53.95%	91.57%	99.66%

Source: Saad, M; Zawdie, G; Derbal, A & Lee, R. 2006

The pursuit of a third objective, namely emphasis on the scientific and technological orientation of university education, was motivated by the importance given by the state to the achievement of rapid socio-economic development through industrialization and the exploitation of the natural resources, mainly hydrocarbons. Thus, for example, by 1986- 87, about 70% of university students were registered in scientific and technological areas of study, with about 30% studying technology. However, these figures dropped quickly in subsequent years because of a lack of employment opportunities for graduates in those areas. (Saad, M; Zawdie, G; Derbal, A & Lee, R. 2006)

The Algerian framework of university degrees is currently under reform with the traditional system, modelled on the French structure, to be gradually replaced with a three-tier system deemed more internationally compatible. The reform, known as the "L.M.D.," is set to introduce a degree structure based on the new French model of bachelor's, masters and doctoral degrees (*Licence, Master, Doctorat*). Introduced by executive decree in 2004, the reforms are being undertaken as a pilot project at 10 Algerian universities, which are working in consultation with a number of European universities. The new degree framework is similar in structure to the reforms being undertaken in Europe through the Bologna Process:

- The *licence*, corresponding to three years of study beyond the *baccalauréat* (bac+3);
- The *master*, corresponding to two years further study beyond the *licence* (bac+5);
- The *doctorat*, corresponding to three years of research beyond the *master* (bac+8).

It is hoped that the new system will make program offerings from Algerian universities more compatible with those around the world, thereby increasing the international mobility of Algerian faculty and students. In addition, the reforms are aimed at increasing student flexibility in choosing and transferring courses and credits; making the system more efficient as relates to the time it takes for students to graduate; increasing lifelong learning opportunities; and increasing institutional autonomy while producing learning outcomes more attuned to the needs of the labour market. (Clark, N. 2006)

Educational reform has focused on teacher training, reforming curricula and general reorganization of the sector. It has strengthened initial training for new teachers and set up a national training and refresher programme for working teachers and a range of measures to improve their status. Curricula have been revised, notably for language teaching, textbook content and the criteria used for choosing between the different disciplines. Science has been emphasized and new information and communication technology is being introduced as a teaching tool and a means of access to knowledge. (OECD, 2005)

A national education and training council (CNEF) and national education monitoring centre (ONE) have been set up to monitor and assess the reforms. The basic education reform introducing new subjects (science and technology, music and drawing) in primary schools, English from the age of nine and the fourth year in the intermediate cycle came into effect in the 2003/04 school year. In 2004/05, French was introduced in the second year of primary school and the first stage of the higher education

reform (new version of ordinary degree and doctorate) was implemented. The master's degree will not be introduced until the first new ordinary degrees are awarded in 2008. (OECD, 2005)

The fresh resources brought in with the reform have resulted in reductions in the number of children per teacher and per class, which fell respectively from 38 to 28 and from 36 to 27 in the first two phases of basic education between 2001 and 2003. During this time, 71 new secondary schools were built that will bring classroom size down to about 19 pupils, one of the lowest in the region. (OECD, 2005)

Illiteracy in the aged 15 and above population fell to 31 percent in 2003 (from 47 percent in 1990), while school enrolment increased to 95 percent in primary education and 62 percent in secondary in 2003. (OECD, 2005)

3.3.3 *Scientific mobility*

Table 11: Number of foreign Algerian students enrolled in higher education for some countries (1998-2002)

Host country	Foreign Algerian Students enrolled		Evolution 2002/1998 (%)
	1998	2002	
France	16074	14056	-13
Germany	208	335	-18
United Kingdom	222	314	+41
Belgium	448	407	-9
Italy	66	58	-12
Spain	99	133	+34
United States	188	196	+4
Japan	12	16	+33

Source: Observatoire Sciences Techniques, 2005

The largest proportion of Algerian students enrolled in higher education does so in the host country of France, both in 1998 and 2002. In 1998 Belgium, the United Kingdom and Germany, in that respective order, were other host countries that mostly enrolled Algerian students in higher education.

3.4 *Financial resources (funding)*

It is clear that Algerian universities are facing acute budgetary constraints in spite of the growing demand for their services. This problem is further aggravated by inefficiency in organization and management, which has the effect of compromising the quality of services delivered. In addition, Algerian universities are still strongly dependent on the Ministry of Higher Education for their programmes, resources and even determination of learning outcomes. Moreover, the dominance of the state is all too apparent, although it can be argued that by the standards of many developing countries like those in sub-Saharan region, for instance, Algeria has come a long way in appreciating

the significance of the “triple helix” system as the way forward for establishing the university as an active agent in the creation and dissemination of knowledge and the promotion of innovation and technological progress through engagement in industry-orientated research and skill development. (Saad, M; Zawdie, G; Derbal, A & Lee, R. 2006)

3.4.1 *International donor funding*

The United Nations Development Programme in Algeria

The United Nations Development Programme (UNDP) has played an important role in supporting development projects in Algeria, and in particular, it has assisted Algeria in all its structural adjustment programmes. The UNDP's goal is to strengthen international co-operation in the field of sustainable human development through a greater operational contribution. (Centre for Administrative Innovation in the Euro-Mediterranean Region)

The first UNDP office in Algeria was opened in 1963 and provided the Algerian government with specialized technical assistance and training activities. These activities were sanctioned by the agreement stipulated in 1977 with the Algerian government, which established the modalities for granting aid, such as direct or indirect assistance, and the possibility of intermediation on the part of organisations entrusted with implementing specific projects. With this same agreement, the Algerian government introduced the principle of equal cost sharing, which implied that for every dollar spent on a project the government would contribute an equivalent amount. Until 1997, co-operation took place within a specific programme, agreed upon with the government, and based on five-year plans. After this date, the nature of co-operation with UNDP changed and its duration was shortened. In June 2002 in Geneva, the UNDP Board of Directors and the United Nations Populations Fund presented the Second Framework of Co-operation with Algeria (2002-2006) whose goals include:

- Poverty reduction;
- Environmental protection and the improvement of living conditions;
- Economic reforms and governance;
- Equal opportunities.

The document describes management modalities and the goals of resource mobilization. (Centre for Administrative Innovation in the Euro-Mediterranean Region)

World Bank

The World Bank started an ICT Development Support Project in 2002 in cooperation with the Ministry of Post and Telecommunications with the aim of creating an enabling environment and improve access to efficient and affordable ICT services, facilitate private sector development growth in ICT sector; improve the competitiveness of local ICT companies; and foster the efficiency of government in delivery of services. Among these aims, the project intends to support also the development of new ICT companies through the so-called "Net-enterprise" development program. The programme envisages support to the set-up of the CyberPark and an incubation facility, "Technobridge Incubator" with the technology park to support ICT R&D initiatives and/or start-up companies with innovative projects; to set a seed capital R&D grants mechanism to support IT start-ups and innovative SMEs and providing institutional development support to the Institut National des Telecommunications (INT) and to the Ecole Centrale des Postes et Telecommunications to renew its curricula and courses on ICT management and cyber-entrepreneurship. (<http://www.epa-ansa.com>)

Canadian International Development Agency (CIDA)

With respect to development cooperation, the Canadian International Development Agency (CIDA) has distributed more than \$165million in grants and contributions since 1964. CIDA's bilateral program in Algeria focuses on two sectors: development of the private sector through vocational training, and support for civil society. It subscribes to the priorities defined by Algeria and directly targets the development of local capabilities. Canadian official development assistance to Algeria, including that from CIDA and other departments and institutions, totalled \$4.3million in 2004–2005. (<http://www.acdi-cida.gc.ca/CIDAWEB/acdicida.nsf/En/JUD-124143425-QY3#3>)

Cooperation between Algeria and Canada in vocational training reflects a decade of working together in partnership to support the development of the private sector. It was based on this relationship that the Algerian authorities sought Canadian expertise to assist them in their reform of vocational training. This reform has profound economic and social implications, and is a key factor in Algeria's transition to an open-market economy. Algeria has opted for a skills-based approach, and Canada's leadership in this area is recognized worldwide. (<http://www.acdi-cida.gc.ca/CIDAWEB/acdicida.nsf/En/JUD-124143425-QY3#3>)

Through the Civil Society Support Fund, CIDA is one of the few funding agencies active in promoting human rights, more particularly, the rights of women and children. The fund seeks to develop the capabilities of the association movement as an engine of social change at a crucial point in Algeria's democratic transition. This project is also supported by the Canada Fund for Local Initiatives, which supports small projects submitted by Algerian civil society, mainly in education and health care. (<http://www.acdi-cida.gc.ca/CIDAWEB/acdicida.nsf/En/JUD-124143425-QY3#3>)

3.5 Research outputs

Table 12: World share (fractional counting)⁴ of scientific publications of Algeria for eight disciplines (1993, 1997, and 2001)

Discipline	1993	1997	2001
Fundamental Biology	0.07	0.10	0.06
Medical Research	0.11	0.06	0.08
Applied Biology-ecology	0.22	0.22	0.22
Chemistry	0.37	0.49	0.62
Physics	0.51	0.62	0.73
Astro & Geo sciences	0.25	0.30	0.41
Engineering	0.33	0.39	0.73
Mathematics	0.45	0.43	0.63
Total	148	186	244

Source: OST, 2005- ISI-Thomson Scientific data

The world share of Algerian scientific publications in the ISI database, from 1993 to 2001 has increased. The disciplines in which there has been an increase in publications are Chemistry, Physics, Astro & Geo sciences, Engineering and Mathematics. A decrease in publications has occurred in the fundamental Biology and Medical Research disciplines.

⁴ Fractional counting: contribution to world science for each author in co-published contributions is fractioned in order to have a count of one for each article (or 100% on the whole group of authors of the contribution). This type of counting, called "fractional counting", where each article weights as a unit, permits to make counts of publications for a country or a discipline, since all totals add-up. It is thus well adapted to macro-analysis. Extended to impact measures (see further), this type of counting is preferable for international visibility comparison.

The choice of language of publication is a sign of important scientific strategy; two languages all over the world dominate the expression of scientific fields: English and French. However, the language choice for the Algerian community has a lot to do first with the ability to master the French language and second with the traditional establishment of scientific relationships and the different bilateral agreements France had with the Algerian government since independence. For this reason, the French language is more dominant in subject fields dealing with Nature, Environmental Sciences and the Medical sciences, as these research programs were developed during the French-Algerian bilateral agreements before and after the 1970's. One should also not neglect the fact that the official national language is Arabic (in education, administration and university studies except for medical sciences research); for this reason it would be on interest to determine why this language is absent from research practice. (Rostaing, H; Leveille, V. & Yacine, B. 2001)

3.6 Technological innovation

3.6.1 Technology balance of payments

The technology balance of payments measures international transfer of technology including- licensing contracts, purchases of patents, expertise and research, and technical assistance. Unlike R&D expenditure, these are payments for production-ready technologies. Although the technology balance of payments reflects a country's ability to sell its technology abroad and its uses of foreign technologies, a deficit does not necessarily indicate low competitiveness.

Table 13: Foreign Direct Investment Overview

FDI Inflows:	2001	2002	2003
Inward	1196	1065	634
Outward	9	100	14
FDI Stocks:	2000	2002	2003
Inward	3441	5702	6336
Outward	343	452	466

Source: UNCTAD, World Investment Report, 2004

Algeria has attracted more than 1 billion Euros in Foreign Direct investment (FDI) in the period 2001-2004. Private equity first started in Algeria in 1990. There are many investment funds but only one Venture Capital (VC) fund, FINALEP, with a total value of 9 million Euros. For now venture capital funds are subject to the same prudential laws as banks but new legislation is currently under preparation to address this situation. (EU, 2005)

Table 14: Patent applications filed in Algeria (1997-2004)*

Citizens	No of patent applications
Residents	42
Non-residents	88.839

Source: The Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRTCIC)

* Data for the most recent year available between 1997 and 2004.

During the period 1997- 2004 the number of non-resident patent applications (88.839) doubled those of the residents (42) of Algeria. It is therefore necessary for more Algerian residents to apply for patent applications, and the government should aid their citizens in this process where needed.

Manufacturing has slumped by 50 percent over the past 15 years, causing a significant loss of industrial activity despite strenuous financial efforts on the part of the government. All state-owned manufacturing did less business in 2003 – 20.6 percent in agro-food, 10.4 percent in chemicals, rubber and plastics, 7.6 percent in construction materials and 5.3 percent in the wood, cork and paper industries. However, some sectors grew, notably steel, metal, mechanical and electrical industries (ISMME) (9.1 percent), energy (6.6 percent) and to a lesser extent mines and quarries (0.7 percent). (OECD, 2005)

The government wants to tackle the situation by boosting and speeding up the modernization of production to adapt it to the demands of growing economic liberalization and by upgrading management skills and capacity. This should make manufacturing more competitive and, above all, make the rather unadventurous private sector more dynamic. Privately controlled industry grew 2.9 percent in 2003. This was down certainly from 6.6 percent in 2002 but still showed a potential that could be better used. Private sector activity in 2003 grew in construction materials and ceramics (2.4 percent), chemicals (2.2) and agrofood (1.7). (OECD, 2005)

The small and medium-term enterprises/industries (SME/SMI) sector has grown from scratch, as there was no networking in Algeria and no industrial policy for SMEs, even though a ministry of SME/SMIs has existed since 1992. The growth of the sector meets a genuine economic need, especially for jobs to reduce the high 23.7 percent unemployment rate. Many incentives are now being put in place. The country's informal economy is very vigorous, including in the financial sector. (OECD, 2005)

The government has revived privatization in a bid to speed up infrastructure upgrading and the economy in general. Although 111 state-owned firms were privatized in 2004, 1 283 firms still remain to be divested. About 300 should be disposed of in 2005. The privatizations have created some 2 400 new jobs and raised about 18 billion dinars (187 million). They have also involved planned investment totalling 24.72 billion dinars (257 million), not including 8.2 billion dinars (85 million) of public debt taken on by buyers. The government has said it does not want to privatize "strategic" or "sovereign" firms in areas such as oil/gas, electricity, gas and railways. (OECD, 2005)

3.6.4 *Innovation*

Algeria has neither an RTD policy nor an Innovation policy. An RTD strategy is being developed and the 'Agence de la Valorisation de la Recherche' tries to link research with business development. Some elements of an innovation infrastructure are now being developed

3.7 *International co-operation and networks*

The European Union and the development of Mediterranean countries:

The Mediterranean area is a strategically important area for the European Union. The Euro- Mediterranean Partnership agreement signed in Barcelona in 1995 is the most important document linking the EU with its 12 partner countries in the Mediterranean (Morocco, Algeria, Tunisia, Egypt, Israel, Jordan, the Palestinian National Authority, Lebanon, Syria, Turkey, Cyprus and Malta; Libya has observer status).

The main goals of the Barcelona Partnership and of the common strategy adopted by the European Council include:

- The creation of an area of peace and stability based on the fundamental principles of human rights and democracy;
- The creation of Euro-Mediterranean free trade areas;
- Improving understanding between Mediterranean peoples and developing an active civil society.

In order to meet these goals, the EU launched the MEDA intervention programme, which is the main financing instrument for the Euro-Mediterranean partnership and which offers technical and financial support for structural reforms in the countries that signed the partnership. (Centre for Administrative Innovation in the Euro-Mediterranean Region). MEDA resources in 1995-99 were used to finance structural adjustment programmes, economic transitions, private sector development, and intervention in classic development sectors such as education, health, environment, and rural development. These types of interventions often overlap with the reforms launched by the Algerian government, and thus often re-enforce each other in the support for the reform process. (Centre for Administrative Innovation in the Euro-Mediterranean Region)

The most recent MEDA programme covers the period between 2000 and 2006 and reaffirms the intervention priorities of the first MEDA programme, in accordance with the Barcelona Agreement. In accordance with MEDA regulations, the Country Strategy document identifies the EU's cooperation goals, based on a complete evaluation of the partner country's political agenda and its political and socio-economic situation. The National Indicative Programme, an annex to the Country Strategy, presents the EU's response in detail, and highlights its goals, expected results, and the conditions that must be respected in terms of priority co-operation for the period 2002-2004. (Centre for Administrative Innovation in the Euro-Mediterranean Region)

3.8 *Conclusion*

The Algerian Science and Technology system is one that is slowly recovering from past political and economic disturbances. The government has renewed initiatives to restore and incorporate S&T as part of its development strategy, and this will bear positive outcomes for the country in the end.

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