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UNESCO REGIONAL OFFICE
FOR SCIENCES FOR THE ARAB STATES
THE SCIENCE & TECHNOLOGY UNIT



UNESCO NETWORK FOR THE EXPANSION OF CONVERGING TECHNOLOGIES IN THE ARAB REGION (UNESCO-NECTAR)



A Regional Initiative for Promoting Quality Science Generation (Nano Bio Ci, Cognitive Sciences)
and its Conversion into Knowledge-based Economy

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NATURAL SCIENCES

PREFACE

For centuries, Arab States were the hub of ground-breaking science. Now, even those dependent on oil revenue will have to start to foster science and technology (S&T) capabilities in the face of increasing insecurity over water and energy – and to start investing on the proliferation of innovation to attain a knowledge-based economy in the region. Today the regional expenditure on R&D is the lowest worldwide, while the critical mass of the Arab scientists, which the Arab countries have produced, resides in the western hemisphere.

And with over 30% of the Arab population are young people (≤ 15 years), who can stimulate growth and create dynamic societies, the current "inability of Arab governments to provide the young with relevant employment after schooling or university education has initiated a regional wave of social upheaval" as was rightfully pointed out in the **UNESCO World Science Report 2010**.

For Arab countries, key targets will need to be met for all five-priority areas known collectively by the UN acronym **WEHAB** (water, energy, health, agriculture and biodiversity), and national S&T capacity is definitely in order to address these priorities.

UNESCO presents UNESCO-NECTAR, a regional initiative to assist in strengthening the **National Innovation System (NIS)** in each of the Arab States, through fostering strategic partnerships between academia, research and industry at the national and regional levels to stimulate the economy. The development of South-South and North-South networks of universities and technological innovation centres will lead to converting brain drain into brain gain and knowledge into wealth towards a superior knowledge-based society.

IRINA BOKOVA,
DIRECTOR-GENERAL OF UNISCO

UNESCO-NECTAR VISION



- It is a non-governmental regional network created by UNESCO to assist member states in the Arab region to promote quality science and knowledge generation towards a strong knowledge based economy.
- It is a UNESCO initiative for the Arab region to develop and/or institutionally strengthen the **National Innovation System (NIS)** of each member state through the creation of the required strategic partnerships between academic institutions, research institutions, and the productive sector (industry) both at the national and regional levels;
- It is a UNESCO mechanism to intensify technology utilization in all economic sectors by strengthening Education, R&D, Innovation, and commercialization (ERDIC) in the field of converging technologies (**nanotechnology, biotechnology, CI technologies, and cognitive sciences**) and all the basic sciences associated with these technologies (**chemistry, physics, biology and mathematics**).

MISSION



- Like any regional network, UNESCO-NECTAR identifies regional priorities and associated capacity building requirements, works on raising awareness on promising areas of activities & promotes ownership of regional programs focusing on ERDIC in the field of Science, Technology and Innovation (STI).
- It creates the required partnerships & coordinates the implementation of regional projects in the framework of the Arab Strategy for Science & Technology led by the League of Arab States (LAS);
- It adds value to the science, technology & innovation (STI) programs developed at national and regional and complements their efforts for regional integration;
- It stimulates the flow of knowledge amongst universities, scientific institutes, Innovation centers, private sector, and promotes and fosters an entrepreneurial culture;
- It induces effective and practical modalities to support and further the conversion of generated knowledge into wealth, building on prior progress in the region.

SPECIFIC OBJECTIVES

- To create an **“independent knowledge sphere”** by providing and sustaining an environment conducive to creativity, R&D, innovation, and entrepreneurship, away from political intrusion, in order to stimulate knowledge generation and technological development in the region.
- To **educate a new generation of qualified researchers** in a cross-disciplinary fashion to better prepare college graduates for the diversity and quality of skills needed to enhance the industry, the economy and society at large, both at the national and regional levels. This is ominously augmented through rigorous **industrial training** and **the use of an assemblage of demo/pilot projects**;
- To **build the necessary bridge between Science, R&D and the productive sector** (industry) to enhance the quality and quantity of national products through robust utilization of innovative technologies; **AND** to optimize the levels of synergy and knowledge transfer between the sub-disciplines of physics, chemistry, mathematics and biology through inducing an integrated science teaching approach at the undergraduate college level
- To **build a bridge between the science community** in each member country and all the internationally well-recognized Arab scientists and their institutes to enhance technology transfer, as well as regional and international collaboration in Science, Technology, and Innovation (STI).

LINKS TO UNESCO PROGRAMME

- **36 C/5 Biennial Sectoral Priorities 1 & 2:** Strengthening STI systems for sustainable development, poverty eradication, and a culture of peace and non-violence; Mobilizing science for the sustainable use of natural resources, and for natural disaster reduction and mitigation;
- **185 EX/11:** Development of South-South and North-South networks of universities and science teaching centres of excellence; Institutional capacity-building and fostering of research infrastructures through the development of the activity of science networks;
- **185 EX/12:** Fostering Engineering education, capacity-building and applications to address poverty, sustainable development and climate change.
- **185 EX/45 Rev.2:** Promotion of South-South Cooperation: Strategic partnership for the operationalization of the consortium on science, technology and innovation for the South (COSTIS).

STI PRIORITY AREAS OF ACTION



Today the Arab region is typified by absence of S&T strategies, poor coordination between private and the public R&D sectors, and little innovation due to weak linkages between the academic and research institutes and the productive sector. Unemployment within the R&D community is particularly high among women researchers, who constitute around 35% of the total researchers in the region.

These nations can still attain higher levels of social welfare and productivity due to the new discoveries in life sciences & innovative technologies. These countries can now leapfrog over the expensive investment in infrastructure only by ensuring their possession of sufficient absorptive capacity to build on the backlog of unexploited technologies and benefit from the associated lower risks. Value creation nowadays depends increasingly on a better use of knowledge, whatever its form and whatever its origin, and whether the process technologies used are developed domestically or not;

UNESCO-NECTAR is hence designed to strengthen the institutional capacity and the required absorptive aptitude and effectiveness of the national innovation system in each member state. This will result in generating the required knowledge and technological progress towards a knowledge-based society.

In the context of the above, UNESCO-NECTAR has identified the following priority areas:

- **Quality Graduate Education:** High diplomas and Masters Programs, extended to PhD, will be offered in all areas of converging technologies. This will also be complemented by a strong program in cognitive sciences.
- **A Rigorous Industrial Training Program:** To connect NECTAR graduates with all relevant industries, hence re-defining the academia-industry R&D relationship to the required cooperation & regional integration levels.
- **An Industrial Pull-System:** To implement innovative projects in the different economic sectors to create the necessary demand for technological progress & entrepreneurship.
- **Integrated Science Teaching Approach:** Converging technologies has transformed basic sciences into fundamental sciences. Students will need to become much more knowledgeable in all these sciences to successfully contribute to the economy of their countries;
- **Leading Science into Innovation:** Use the knowledge generated in these disciplines to develop technological applications in areas such as biomedicine, innovative solutions to critical problems in renewable energy production and storage, water desalination and purification, among many other areas.

MODALITY OF IMPLEMENTATION

- UNESCO-NECTAR is designed to build on the regional existing infrastructure of **private establishments in higher education & industrial institutes and their associated research capabilities**, especially in the four main tracks of converging technologies. The proposed network will lobby for synergy & optimal use of the available resources to promote the intensive use of **these technologies & their applications** to contribute in the development of the sought knowledge-based society;
- Using its neutrality advantage, UNESCO will select one or more well established **Engineering (or S&T)** establishment in each member state to act as the national focal point(s) for UNESCO-NECTAR and carry out its mandates. Each focal-point institute will create an **ERDIC Innovation Center in Converging Technologies** to implement a strategically-designed work program intended to strengthen the National Innovation System (NIS) within its member country through three tasks:
 - Act as the required platform to form a unified national network for developing a quality program for education, R&D, innovation and commercialization of new products (ERDIC) in the four fields of converging technologies and the basic sciences associated with these technologies;
 - Each focal-point institute will be capacitated to act as an Innovation center in these technologies and to include an assemblage and exhibition for clean technologies pilot systems for raising public awareness;
 - Create and exemplify a partnership model between the three pillars of every NIS (academic institutes, research institutes, and industry). This will also include a robust program for regional human and institutional capacity building, as well as the support of a series of UNESCO programs and activities leading to the popularization of sciences in the Arab Region;
- Through their established **ERDIC Innovation Centers**, each institute will start by offering a **one-year post-graduate** diploma in the four tracks of converging technologies **namely nanotechnology; biotechnology; CI technologies; and cognitive sciences**. This will prepare all graduates for their **Masters degree** through another year of research. The program accreditation will be based on joint-programs with reputable regional and/or international academic institutions;
- As a special niche of these institutes, these post-graduate diploma programs offered will include an **8-10 weeks robust industrial training program** in one of the relevant industries in the region. Grants and **scholarships within and outside the region** will also be made available for diploma graduates towards their Masters degrees through UNESCO partnerships with regional and international organizations to promote N-S and S-S cooperation;

- A series of **regional innovation** sessions will be organized to exchange research experiences and brainstorm for new marketable ideas, in the different areas of these technologies. This **will promote and induce innovation**, where each of the selected institutes could develop great ideas into successful products through relevant business models towards entrepreneurial spin off companies;
- Due to the cosmic Egyptian qualified human resources available in the Science Community, The hub (main node) for the regional network will be based in Cairo, Egypt;
- Each institute will substantively contribute to the biannual work program of UNESCO-NECTAR, and will consist of the following events:
 - ✓ A **refereed scientific publication** of the R&D work produced by all UNESCO-NECTAR institutes;
 - ✓ An **annual International Conference** to promote N-S and S-S cooperation for knowledge sharing between the different international and the national science communities in the different science fields covered by the network program, with possible **Best Arab Science Research Prize (BASRP)** established from within UNESCO-NECTAR;
 - ✓ A **scientists exchange program** between the different UNESCO institutes to attract Arab expatriate scientists to turn brain drain into brain gain;
 - ✓ A robust **capacity building program** with pre-identified seminars and training workshops to bridge-gap the needs of the different ERDIC Centers in the different member countries;
 - ✓ An **Arab Student Innovation Conference (ASIC)** covering all fields of STI, with a possible **Best Arab Student Innovation Prize (BASIP)** also established from within UNESCO-NECTAR;
 - ✓ An **annual program for offering scholarships** to top college graduates from the different member countries in the region;



TARGETED ACTIVITIES FOR THE OUTSET PHASE: 2011-2013

During the outset phase, UNESCO-NECTAR seeks to build the sought national ERDIC Innovation centers and their regional programs, and mobilize the necessary resources from national, regional and international bodies for its development phase to ensure its sustainability. The following resembles the main activities required to make UNESCO-NECTAR fully operational within the next 24 months:

- Creation of the necessary seed fund that is a critical catalyst to successfully establish the network during its starting phase; Immediate creation of the "Egyptian Network for Technological Advancement (**ENTA**), as recommended by national experts;
- Development of the network governance structure that is able to cope with its mandates and meet its expectations for the next phase. The network secretariat will be equipped and enabled to follow up its activities with the regional and international concerned institutes after the launching ceremony and the official opening of the **HUB Center planned in Cairo, Egypt**;
- Selection of the first-tier of the network's national focal points to carry out the necessary functions and tasks of the starting phase. A number of member countries have been selected for this starting phase: **Bahrain, Egypt, Libya, Mauritania, Morocco, Palestine, Qatar, Sudan, Syria, and Yemen**;
- Design and development of the required curricula in all the science fields associated with the network's programs and the acquirement of its program(s) accreditation with international standards;
- Establishment of the network's necessary partnerships with **academia** and the **productive sector** both at the national and regional levels, to ensure robust involvement of the **private sector** in supporting R&D, incubation of generated scientific marketable ideas and leading the process of converting the generated science and knowledge into innovation;
- Creation of the necessary databases for the different sectors of the national science communities and industry; **AND** networking institutional and human critical mass and engaging with regional and international partners under UNESCO leadership;



STRUCTURE OF UNESCO-NECTAR

The governance of UNESCO-NECTAR will consist of:

- UNESCO-NECTAR will have an **honorary network president** selected from amongst the famous scientists of the region;
- The **General Secretariat** of UNESCO-NECTAR (**GS**) will encompass a number of selected hi-level regional scientists that will accept the responsibility of monitoring and coordinating the activities of the network's affiliated institutes and ensure that its mandates are fully met;
- The members of the **Coordination Committee (CC)** will include the executive Officers and/or SGs of the different **ERDIC centers** forming the network. This group will be responsible for supervising the network activities and will work together with the GS to find solutions to the issues facing the different national related programs;
- The **Scientific Advisory Board** of UNESCO-NECTAR (**SAB**) will comprise representatives of sister regional and international institutes to evaluate the implementation process and advise both the GS and CC.
- UNESCO-NECTAR **General Assembly (GA)** will eventually include all academic and research institutions in the region, which are substantively contributing to the network's program and where their memberships bring an added value to the network.

VISIBILITY & COLLABORATIONS

- All ministries of affiliated institutes will be informed of UNESCO-NECTAR activities, where as consultations will be held between stakeholders to identify new directions and improve UNESCO-NECTAR program.
- Diplomatic missions of countries involved will be informed on the launch of UNESCO-NECTAR;
- UNESCO-NECTAR implementing regional and intra-regional programs with other networks and institutes such as: Arab Fund for Economic and Social Development (AFESD), Arab Academy of Sciences (AAS), ICTP, ICGEB, ISTIC, KACST, KAUST, Qatar Foundation, Qatar Scientific Research Fund (QSRF), SISSA, Islamic World Academy of Sciences (IWAS), TWAS. Many of these institutes and organization are strategic and associate partners of the network;

MAIN DIRECTIONS FOR THE DEVELOPMENT PHASE: 2013-2016

- The programs of UNESCO-NECTAR will be adjusted to substantially contribute to the operationalization of the Arab STI Strategy to be adopted by the League of Arab States, and implemented under its regional specificities;
- These programs will be conceived, planned, coordinated and implemented in consultation with the various concerned authorities and stakeholders to fit into the regional development goals by involving the various economic sectors. Using the existing UNESCO resources, UNESCO-NECTAR will assist each ERDIC center to develop the system and associated bodies necessary for the creation of the expected spin-off companies.
- The wide range of programs will target devising innovative applications in the thematic priority sectors of energy, water, food security, health care and environment protection. To strengthen and optimize the impact of these thematic activities, a regional capacity building program for human resources will be developed and implemented;

RESOURCE MOBILIZATION

- The selected ERDIC centers, affiliated to UNESCO-NECTAR, are contributing to the expenditure of the different programs and to the various activities of the network. They are also dedicating scientists, technical and administrative staff;
- Strategic and associate partners of UNESCO-NECTAR offer their support to the network in the form grants, fellowships, prizes and/or direct support to specific activities of the network on sustainable basis. These partners include but are not limited to: Arab Fund for Economic and Social Development (AFESD), AAS, ICTP, ICGEB, ISTIC, **MBRF**; **MESF**, QSRF, SISSA, IWAS, and TWAS;
- As participants to the established UNESCO-NECTAR consortium, the ERDIC centers regulate their annual budgets from students conscriptions, topped by targeted financial support from donors, and at a later stage from investments arising from the expected spin-off companies created;
- UNESCO-NECTAR will create a **SEED fund of about \$2.1M USD (an average of \$210,000 USD per each of the ten countries)**, which is a critical catalyst to successfully establish the network during its outset phase. A number of lucrative exemplary projects will also be implemented by partners from the private sector to support the network through its five-year naissance program.