

New Paradigm for Renewable Energy Education in Morocco

Mohammed Daoudi

Laboratory of Engineering Didactic and Dynamic Systems, Faculty of Sciences and Technologies, University Hassan 1st, km 3, B.P 577, Settat, Morocco.

Email address: mohammed.daoudi87 @ gmail.com; mo.daoudi @ uhp.ac.ma

Abstract— The national energy strategy 2030-2009 is part of the overall development strategies to adopt a Moroccan energy model based on several objectives, which is to diversify the sources of energy supply, by increasing the part of renewable energies and by generalizing access to energy at competitive prices, then by controlling energy, in addition to preserving the environment. These objectives will enable it to meet the growing demand for electricity by securing energy supply and reducing energy dependence abroad. As part of the implementation of this strategy, Morocco has implemented a large number of programs and projects for the production of electricity from clean energy sources, in particular solar and wind. The national energy strategy has proven effective because it has made Morocco a model at the regional and continental level, but this production dynamic has not been coordinated by the school education system, highlighting the great disparity and imbalance between productive dynamics and the educational system in educational programs at the school level.

Keywords— Energy; Renewable energy; Education; Paradigm; Morocco.

I. INTRODUCTION

The subject of renewable energies is no longer limited to academics, specialists, and economic and political decision-makers, but it transcends it to become a problem that interests everyone, whatever their functional and social positions. It is not surprising that interest in renewable energies is evolving in this way, as we, as individuals, are particularly concerned about the future energy resources of our regions and in the world in general.

Energy not only affects our level of daily well-being, but it also takes on more global importance linked to the critical problems of different societies.

Interest in the question of renewable energies has appeared in recent decades, but its global character only appeared in the 1970s, in particular the development of the world energy situation at the end of 1973.

It has been confirmed to everyone after these events that the problem is not related to the evolution of oil and gas prices, but it is more important than that and is related to the storage capacity of these sources which are running out to meet the growing energy demand of different countries.

As a result, the world has sought alternative solutions, hoping that it will undergo a transitional period during which it can move from reliance on fossil fuels to reliance on more permanent and less polluted sources.

Studies over the past two decades have predicted that renewable energy education will be a new system in both developed and developing countries.

From this point of view, we consider the necessity and the importance of approaching education in renewable energies in the context of more global concern for the environment.

II. OVERVIEW OF RENEWABLE ENERGY EDUCATION

Since the beginning of the last century, the education system has adapted in Western societies, in response to the growing needs expressed by the market economy and the rapid changes in the division of social labor.

It has become clear that learners must prepare for an institutional education which includes training the experience and skills of the individual, and at the same time allows him to acquire modern values, where harmony exists between the individual and the world, so that he is able to develop, given that modern society constantly demands creativity and innovation in the scientific, technical and economic fields.

This cannot be achieved without activating educational strategies at school and in the family based on the concept of environmental justice and on the relationship between the individual and the group. There is no doubt that the transformations produced by the industrial community have led to the emergence of a secondary perspective on the environment, in an unbalanced environmental model, due to the increasing exploitation of nature and the use excessive damage to its products [1-4].

In this context, contemporary societies have devoted themselves to inventing a number of mechanisms to support nature and the environment, through the educational system, which is the most important entry point for framing societal awareness, and establishing it on the basis of a new perspective on environmental justice.

Because environmental problems are caused by energy-related factors, energy and the environment are closely related concepts.

III. RENEWABLE ENERGIES IN MOROCCO

A. Renewable Energy Projects in Morocco

The Moroccan strategy in the field of renewable energies, which is part of the new dynamic of global development that the country is experiencing, has proven its effectiveness and its will to bring Morocco out of a country which is based almost entirely on the satisfaction of its oil and gas needs by

importing a renewable energy product and transforming the existing challenges in the energy field. With investment opportunities, by engaging in large-scale projects to develop this sector [5].

The Moroccan strategy aims to bring the share of renewable energies to 52% by 2030, in addition to the objective of reducing energy consumption by 15% by 2030, through energy efficiency [6]. These ambitious objectives began to be achieved through the implementation of a large number of projects, starting with the opening of the largest wind complex in Africa near the city of Tarfaya in 2014, until the inauguration of the first phase of the world's largest solar complex, "Noor 1" Ouarzazate in early 2016 [7-9], which should generate energy for a million households and places Morocco among the great powers in this area, as well as other projects in the wind industry.

Morocco is keen to make this strategy based on rational use of energy, environmental protection, limiting climate change and sustainable development through agricultural and industrial policies.

B. Qualified Training

Direct and indirect job opportunities in Morocco are estimated at 300,000 jobs [5]. The jobs related to the manufacturing of components, the construction and operation of power plants as well as maintenance. It is therefore necessary to train qualified managers capable of supporting the Moroccan renewable energy project.

For mid-career formation for experts and engineers interested in working on renewable energy technologies or for new graduates who wish to specialize further in certain specific areas, undergraduate supervisory courses may be required.

Short courses and the media can help achieve this. Certificate and diploma level courses must be available to train employees in the manufacturing, installation, and maintenance of renewable energy systems. Regular university courses in energy engineering in general with a specialization in the field of renewable energies and energy conservation will be necessary to provide the workforce necessary for the design, development, and evaluation of technologies emerging.

It is now widely accepted that renewable energy education needs to be included at different levels in colleges, universities, and other academic institutions. To raise public awareness of energy and give direct exposure to basic concepts and their applications, appropriate efforts need to be made at the school level, which is still very weak in school-level curricula.

C. A New Paradigm in Renewable Energy Education

In most developing countries, we do not find environmental approaches, moreover, in these countries, the environment is not a priority for development.

The majority of school activities remain locked in the school and are not linked to the external community. This is from the perspective of environmental education in schools is

not considered as an experimental and technical perspective and is not linked to a socio-environmental perspective.

In Morocco, as in the case of North African countries, modern education systems were built after independence, based on a quote from the external education model, either at the level of the curriculum or the level of educational pathways and structures, except for adjustments which are part of the original model, which makes these borrowed systems unprofitable compared to the results produced by these programs.

In the current circumstances, there is a growing need to build an environmental education program in educational programs, based on a holistic perspective which leads to the integration of nature with the individual and society, which leads directly to the need for a new paradigm in renewable energy education.

In our opinion, the most important foundations of this new educational paradigm are:

- Establish a separate energy education system: separate curricula should be developed for different levels (school, vocational training, higher schools, and universities).

- Those renewable energy considerations are presented as part of the energy package, and those energy considerations are generally placed in the context of development.

- It should include all energy resources (renewable and non-renewable) with particular emphasis on certain specific resources according to local needs and characteristics. It should cover all aspects of energy technologies such as resource assessment, technology, and economy.

- Although energy education programs may somewhat meet the needs of the local site, they must at the same time be consistent with national, regional, and international priorities and requirements.

- It must be flexible and dynamic and thus allow future improvements. It should provide a balance between theory and practical aspects and should encompass all aspects of education/training, including lectures, laboratories, demonstrations, training in practical skills, design, and manufacturing, etc.

- It must be able to provide energy education for all in a minimum of time and must be economically feasible so that the maximum number of people can be educated within the limits of current financial resources.

- Renewable energy education should also provide self-employment for students and should, therefore, be directly linked to the job requirements and labor responsibilities required in the field of renewable energy.

Finally, they must be compatible with global efforts in this direction, and they must allow for the sharing of experiences and effective interaction.

IV. CONCLUSION

The objectives should aim to improve young people's awareness of the environment and renewable energies for sustainable development, but also to develop innovative analytical approaches and solutions to problems.

There is a need to develop and implement a well-designed renewable energy education program, including environmental

education issues in cooperation with all institutions dealing with renewable energy.

A good balance between theoretical and practical contributions is crucial for any renewable energy education program.

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