

# Environmental education at the service of wetlands conservation in Northeast of Algeria

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## ABSTRACT

Algeria by its geographical position, geological configuration and the diversity of its climate presents an important richness of national and international wetlands. However, due to lack of information and sensitization, these wetlands are being degraded both by anthropogenic activities and by their under-exploitation or overexploitation in the context of the valorization of their natural products. Thus, the Algerian Ministry of Environment has created the Environment Houses, whose main missions are education, information and sensitization on the protection and conservation of the environment in general. In this context, a survey was conducted in a few schools at all levels in four cities in northeastern of Algeria (Annaba, El Tarf, Skikda, Souk-Ahras) to assess the importance of environmental education and sensitization in the preservation of wetlands. The results showed that schools sensitized through environmental education campaigns led by Houses of Environment, have more knowledge about wetlands and their preservation, compared to those not sensitized. Indeed, this study has highlighted the primary role of environment houses in environmental education and sensitization of the need to protect and enhance these wetlands.

*Key words* : Wetlands, Environmental education, Sensitization, Conservation, Environment house.

## Introduction

Wetlands are among the most fertile ecosystems in the world; for their wealth of fauna and flora. Although they cover only 6% of the land surface, they are found everywhere, in every climate, in all countries, from arctic tundra to tropical mangrove (Skinner and Zalewski, 1995).

According to a definition of AWO (2005) "Wetlands are characterized by the permanent or temporary presence of fresh, brackish or saline available

water at surface or shallow depths. Often in the position of a transition interface between terrestrial and aquatic environments, they are distinguished by hydromorphic or undeveloped soils, and/or dominant vegetation consisting of hygrophilous plants at least for part of the year. Finally, they feed and/or shelter continuously or discontinuous animal species subservient in these spaces». This global ecological definition is completed by a list of more or less common ecosystems belonging to wetlands, they are the: "marshes, swamps, fens, breakdowns,

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reed beds, peat bogs, moist meadows, agricultural marshes, moors and wetlands, alluvial forests and marshy riverine, ponds including temporary ponds, dead arms, seasonal strikes, flats, lagoons, salt meadows, salt marshes, rice fields, mangroves, etc. ». They are located on the edge of springs, streams, rivers, lakes, seashore, bays and estuaries, in deltas, in valley depressions or in areas of seepage on hillside (AWO, 2005).

The Mediterranean region sheltered a wide variety of ancient cultures, which share a number of influences and values. Wetlands of this basin share similar characteristics, due to their climates, topographies and geologies, as well as features related to the Mediterranean Sea (Britton and Crivelli, 1993). Indeed, in these countries, wetlands face similar problems. These Mediterranean wetlands are mainly coastal and are at low altitude. The estimation of their areas is controversial (Allaoua, 1997). Algeria being the largest country in the Mediterranean region by its surface area, but also by its geographical position and physical configuration and the diversity of its climate, conferred on it an important wealth of wetlands. There are in the north-eastern part, numerous freshwater lakes, marshes and flood plains, while the northwest fringe and the high steppine plains are defined by salt plains such as the chotts, sebkhas, and the dayates, and finally the Sahara contains the oasis, and the daya, and in the fossil hydrographic network of the mountains of the Hoggar and Tassili permanent wetlands called the gueltas.

Algeria has acceded to the Convention of Wetlands called Ramsar Convention, on December 11, 1982 (Decree No. 82-439), and its accession was effective in 1984, through the classification of two sites of international importance, the lake Tonga and Lake Oubeira (City of El Tarf). Since this ratification, it has made many advances, notably through the establishment and professionalization of a "wetland" team within the Forests head office, as well as the development of national and international partnerships, and also the ranking of 50 Ramsar sites. Unfortunately, these wetlands still face many threats including wastewater discharges and pollution of all kinds, and overexploitation of resources, endangering the ecosystems. To remedy these threats, Algeria implemented in March 2012, a National Committee of Multi-Sector Wetlands incorporating associations, to implement a wetland strategy, which was validated in March 2016, the strat-

egy is based on a sustainable ecosystem approach (DGF, 2015). This strategy defined 18 specific objectives with activities to be implemented by 2030, including among the priorities, community involvement through training, environmental education and sensitization; hence the creation of the National Conservatory for Environment Training (CNFE), a public industrial and commercial nature under the supervision of the Ministry of Environment and Renewable Energies in Algeria. The Conservatory is created by Executive Decree No.02-263 of 17 August 2002. Supplemented by Executive Decree No. 12-174 of April 11, 2012, to strengthen the institutional framework for the implementation of national environmental policy and sustainable development through the creation of appendices called "Environmental Houses" at city. These houses are educational, social and environmental areas that involve all people of the country in preserving and protecting our environment through responsible daily practices. These are places of discovery, meetings and consultation, they allow to reunite social and cultural ties goshawks of common concern through seminars, conferences, exhibitions and other events, where academics, professionals and young people are invited throughout the year (MET, 2010). The conservatory with its houses have three main missions: environmental education, sensitization and training on different topics related to the environment.

Environmental education informs and motivates people and gives them the means to support the conservation of wetlands. It remains a teaching and learning process that lasts throughout life and can enhance the ability of individuals to address issues concerning the environment and development, have better awareness of their complexity and better understanding. To acquire knowledge, values and attitudes, everyday expertise usable and ethical behavior that is consistent with sustainable development and promote effective participation in decision-making (WI, 2003).

The study objective is to highlight the essential role of environmental education and sensitization to preserve wetlands. The study is based on Eco-sociopedagogical survey in four cities located in the Northeast of Algeria. This survey was conducted in schools of different levels (primary, middle and secondary school) based on an essential criterion which is the prior sensitization or not of these institutions students.

## Materials and Methods

### Presentation of the study area

Our study area is the extreme northeast of Algeria, four (04) cities in this area have been chosen:

#### The city of Annaba

The city of Annaba (36° 54' 15" North, 7° 45' 07" East) is located in the extreme northeast of Algeria. It is the third largest coastal city of Algeria with a Mediterranean climate. It is a touristic city and has an important industrial activities.

#### The city of Skikda

Located at the east of Annaba, the city of Skikda (36° 52' North, 6° 54' East) is also a Mediterranean city, with a very humid climate. It is agricultural, touristic, and industrial city.

#### The city of El Tarf

The city of El Tarf (36° 46' 00" North, 8° 19' 00" East) is located in the west of Annaba city very close to the Tunisian border. It is a coastal city with a Mediterranean climate and mainly agricultural activities.

#### The city of Souk Ahras

It is located in southeast of Annaba city (36° 17' 15" North, 7° 57' 15" East). It has a semi-humid climate and is a mining and agricultural city.

### 2.2. Criteria for selecting cities

#### Presence of wetland

In this study, the first criterion for choosing cities is the presence of wetlands and their national and international importance. The city of Annaba lists forty-two (42) wetlands, only Fetzara lake is classified Ramsar. The city of Skikda known for its resort ranked Guerbes-Sanhadja classified Ramsar has thirty (30) Wetlands. Very famous for its rich wetlands, the city of El Tarf, nine (09) wetlands are classified Ramsar, an exceptional flora and fauna wealth. However, the town of Souk Ahras does not account any wetland of international importance (DGF, 2018).

#### Presence of Environment House

Second criterion of choice of cities is the presence or absence of a Environment House. Indeed, it is the first state organism dedicated to environmental education and sensitization and can easily access to

schools, and coordinate actions for environmental education. The Environment House of Annaba city is one of the first house of environment built in Algeria, which is operational since February 2011, followed by that of El Tarf in April 2012, and finally the latest one is that of Skikda functional since June 2014. However, there's none Environment House in Souk Ahras.

#### Criteria selection for the socio-pedagogical survey

Our socio-pedagogical survey was conducted at all schools level on the basis of two main criteria:

##### School level

The survey was conducted in the four selected cities on the three grade levels (primary, middle and secondary school).

##### Sensitization

Prospecting for schools is based on the sensitization test. Indeed, for each primary school and middle one, in each city we chose one that had a prior sensitization on wetlands, and another school that has not been sensitized. However for secondary schools we worked with non-sensitized and this is common for all stated cities, except for one secondary school sensitized in Annaba city.

##### Survey model

To conduct this investigation, we developed the same survey model for the three grades. The survey contains ten (10) questions in Arabic (official language of study in Algeria), where the level of the questions increases as and as we rise in questions (from easy to difficult). The survey is based on three possible response: R1 (Right); R2 (False) and R3 (No response: the student fails to respond)

##### Statistical analysis

At the end of our investigation a total of 480 survey for all levels were gathered in the four cities. The results are shown as a percentage (%) and treated by statistical analysis using the R software. The applied statistical tests are chi-square test and Fisher exact test. The significant level was defined at  $p < 0.05$ .

## Results

Once the exploration is completed, we made a first analysis of the results for each city, we made comparisons between sensitized establishments and

those not sensitized for each level (primary, middle and secondary school), and also a comparison of non-sensitized establishments and those sensitized all levels combined. And we completed a comparison of overall schools between all cities.

**Results of Annaba City**

**Comparison between primary sensitized school and non-sensitized one**

The results show 59% of right response in the sensitized primary, against 19% of wrong answers and 22% abstention; however the non-sensitized primary school reveals only 10% of right answer, 24% of wrong answers and 66% of no answered questions. Indeed, statistical analysis reveal a very significant difference ( $p < 0.01$ ) in favor of sensitized primary knowledge (Fig. 1).

**Comparison between middle sensitized school and non-sensitized one**

The results at the middle sensitized school reveal 71% of right answers, and only 23% of wrong answers and 6% of abstention; while for the non-sensitized one, rates show 65% of correct responses, 19% of wrong answers and 16% of students did not respond. In addition, a highly significant difference ( $p < 0.001$ ) was observed during the statistical analysis for the sensitized middle school (Fig.2).

**Comparison between secondary sensitized school and non-sensitized one**

The data collected at the secondary sensitized school detect 83% of correct answers, against only 8% of incorrect answers and 9% no answered. However, the results in secondary non-sensitized school show 72% of correct answers, 10% wrong ones and 18% no answered questions. The statistical analysis applied to the results showed a highly significant difference ( $p < 0.001$ ) in favor of the sensitized high school (Fig. 3).

**General comparison between sensitized schools and non-sensitized ones at all levels**

The results of sensitized schools at all levels together reveal 70% of right answers, 17% of wrong answers, and only 13% of abstained. While, for non-sensitized schools at all levels have gotten only 48% of right answers, 18% of wrong answers and 34% no answers. These results were confirmed by the applied statistical analysis who showed a highly significant difference ( $p < 0.001$ ) in favor to sensitized schools (Table1).

**Results of El Tarf City**

**Comparison between sensitized and non-sensitized primary school**

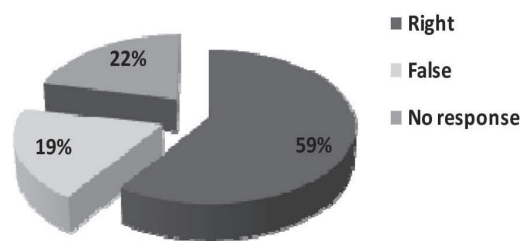
The data collected at the primary sensitized school present a rate of 76% of accurate responses, for only 12% of false responses, and 12% of abstention. On the other hand in the primary non-sensitized school, we got 15% of correct, 34% of incorrect, and 51% did not respond. Thus, the statistical analysis of these results revealed a highly significant sensitization effect ( $p < 0.001$ ) (Fig. 4).

**Comparison between sensitized and non-sensitized middle school**

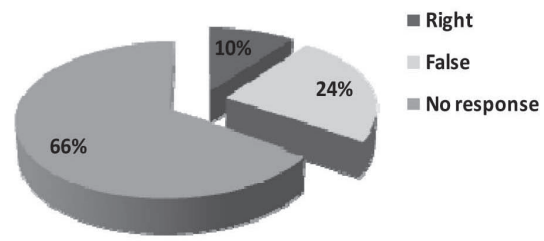
At the sensitized middle school, a rate of 82% of students responded correctly, 10% responded incorrectly, and 8% abstained. At the same time, at the non-sensitized middle, a 68% of correct response, 14% of incorrect response and 18% of non-response were reported. The statistical analysis shows a highly significant difference ( $p < 0.001$ ) in favor of the sensitized middle school (Fig.5).

**Result of non-sensitized secondary school**

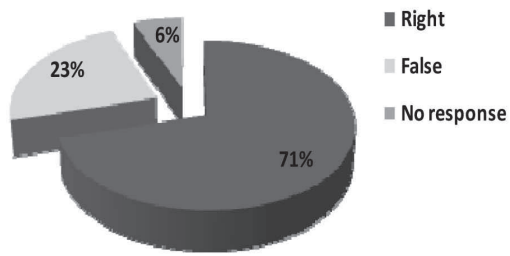
The results obtained at the non-sensitized secondary school show 80% of the correct answers, against just



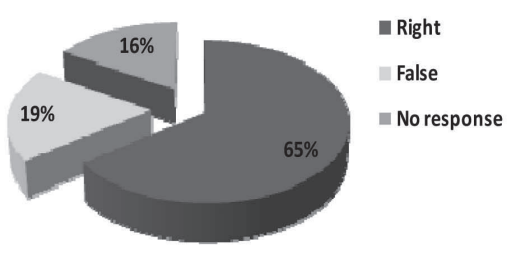
Sensitized Annaba Primary school



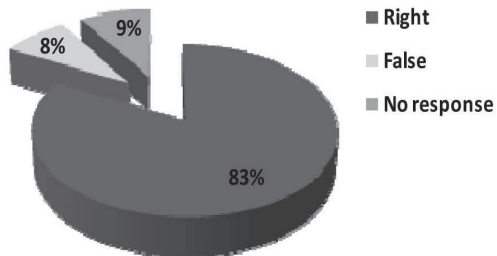
Non-sensitized Annaba Primary school



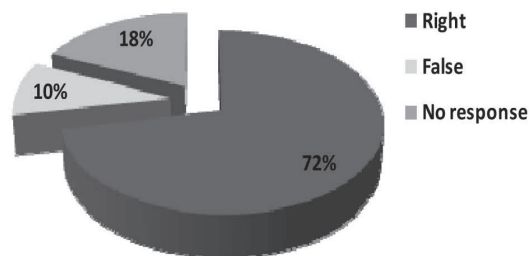
Sensitized Annaba Middle school



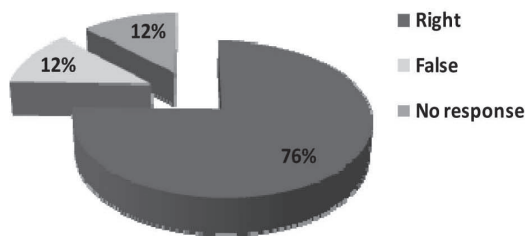
Non-sensitized Annaba Middle school



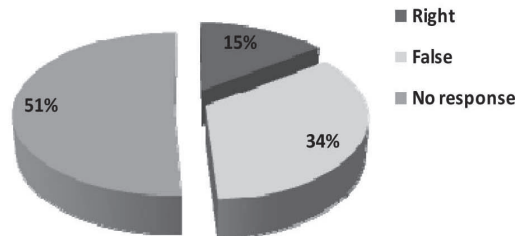
Sensitized Annaba Secondary school



Non-sensitized Annaba Secondary school



Sensitized El Tarf Primary school



Non-sensitized El Tarf Primary school

**Table 1.** General comparison between sensitized and non-sensitized schools at all levels in Annaba city (n= 192).

Responses	Schools		Significant level <i>p</i>
	Sensitized (%)	Non-sensitized (%)	
R 1	70	48	0.000
R 2	17	18	
R 3	13	34	

R1 (Right); R2 (False), R3 (No response)

**Table 2.** General comparison between sensitized and non-sensitized schools at all levels in El Tarf city (n= 178).

Responses	Schools		Significant level <i>p</i>
	Sensitized (%)	Non-sensitized (%)	
R 1	79	59	0.001
R 2	11	16	
R 3	10	25	

R1 (Right); R2 (False), R3 (No response)

6% of the incorrect answers, and 14% abstained. We remind that none secondary school have been previously sensitized at this city (Fig.6).

**General comparison between sensitized and non-sensitized schools at all levels**

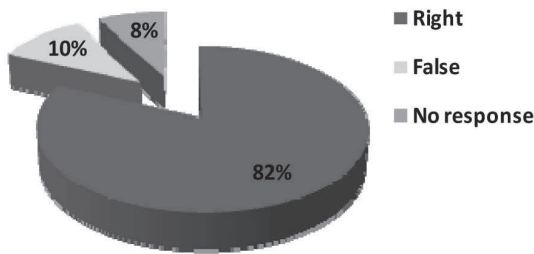
Exploration of results shows that 79% of students gave correct answers and 11% incorrect answers; while 10% of pupils abstained from answering. However, for non-sensitized schools, 59% were correct, 16% were incorrect, and 25% of students gave no response. Indeed, the statistical analysis applied to these results identified a highly significant sensi-

tization effect ( $p < 0.001$ ) (Table 2).

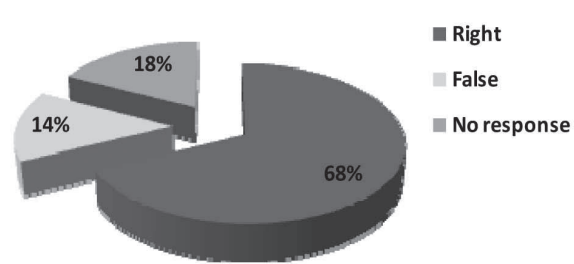
**Results of Skikda City**

**Comparison between primary sensitized and primary non-sensitized**

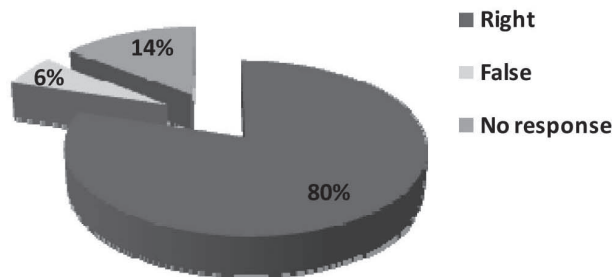
Data collected at the primary sensitized show 77% of correct, 13% of false and 10% of non-response. Nevertheless, for the non-sensitized primary, we got 66% of correct answers, 17% of wrong answers, and the same rate of abstention. Statistical comparison revealed no significant difference ( $p > 0.05$ ) between sensitized and non-sensitized primary (Fig. 7).



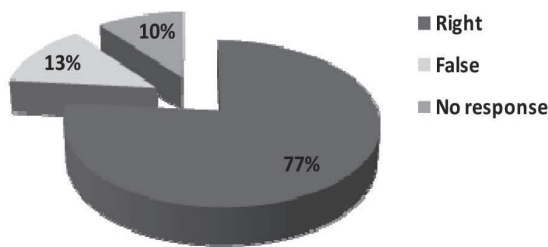
Sensitized El Tarf Middle school



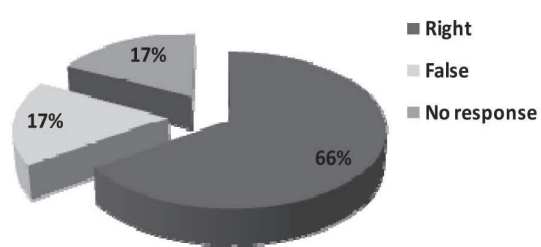
Non-sensitized El Tarf Middle school



Non-sensitized El Tarf Secondary school



Sensitized Skikda Primary school



Non-sensitized Skikda Primary school

**Comparison between middle sensitized and middle non-sensitized**

Harvested results illustrate 72% of correct responses, 14% of incorrect responses and 14% of abstaining at the sensitized middle. Parallel to the non-sensitized college we recorded 70% of correct answers, 16% of incorrect answers and 14% of non-response. A significant difference ( $p < 0.01$ ) was observed between the sensitized middle and the non-sensitized one (Fig. 8).

**Result of the secondary non-sensitized school**

The results obtained at the non-sensitized secondary school reveal 65% of accurate answers, 10% of false answers, and 25% abstained from answering. We do not have a secondary school previously sensitized at this city (Fig. 9).

**General comparison between sensitized non-sensitized schools all levels combined**

Examination of the results of schools sensitized all levels combined shows 76% of correct responses, 13% of incorrect responses and 11% of abstention. However, for schools not sensitized all levels combined 66% of correct responses, 14% of false responses, and 20% of non-response were noted. In

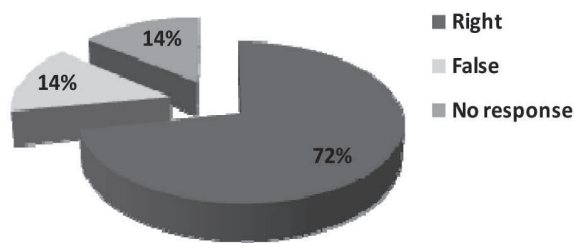
addition, the statistical analysis applied on these results revealed a highly significant difference ( $p < 0.001$ ) in favor of sensitized schools (Table 3).

**Results of Souk-Ahras city**

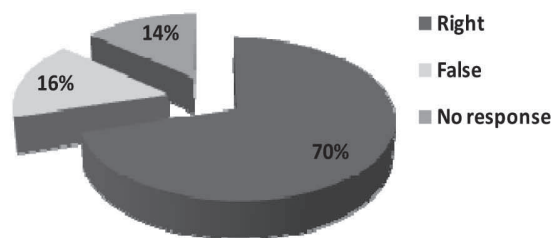
After having prepared everything for our survey at the schools in the city of Souk-Ahras, we were unable to obtain any results because of the absence of Environment House at this city, which should facilitate our access to schools. Despite the lack of results we wanted to maintain the city of Souk-Ahras to highlight the importance of the presence of these Environmental Houses in the sensitization and environmental education.

**General comparison between cities all schools combined**

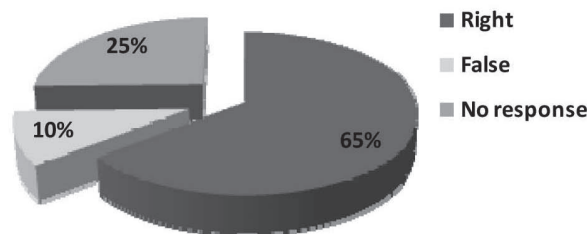
The survey carried out at schools in the study cities illustrates for the Annaba city 59% of good answers, 17% of bad answers and 24% of abstention. However, for the El Tarf city 69% of correct answers, 14% erroneous responses and 17% of non-responses were shown. While the city of Skikda revealed 73% of correct answers, 13% of false answers and 14% no answered. The applied statistical analysis showed a very significant difference ( $p < 0.01$ ) between cities (Table 4).



**Sensitized Skikda Middle school**



**Non-sensitized Skikda Middle school**



**Non-sensitized Skikda Secondary school**

**Table 3.** General comparison between sensitized and non-sensitized schools at all levels in Skikda city (n= 110).

Responses	Schools		Significant level p
	Sensitized (%)	Non-sensitized (%)	
R 1	76	66	0.000
R 2	13	14	
R 3	11	20	

R1 (Right); R2 (False), R3 (No response)

**Table 4.** Overall comparison between study cities across all schools(n= 480).

Responses	Cities			Significant level p
	Annaba (%)	El Tarf (%)	Skikda (%)	
R 1	59	69	73	0.001
R 2	17	14	13	
R 3	24	17	14	

R1 (Right); R2 (False), R3 (No response)

## Discussion

Wetlands remain unknown areas, especially by the Algerian society, their knowledge remains weak in relation to the objectives of Algerian government politic for the preservation of these environments. The main objectives of the Algerian policy for the preservation of wetlands are sensitization, environmental education and training. Indeed, environmental education remains the key element for extension and for everyone's involvement in preserving our environment. In this context, we have carried out an Eco-socio-pedagogical survey of schools (primary, middle and secondary school) in four cities located in the extreme Northeast of Algeria.

Results of Annaba city show a high rate of correct responses among the students at school sensitized all levels combined, compared to non-sensitized schools, showing the importance of sensitization and environmental education in improving knowledge about the importance of wetlands and their conservation. The statistical analysis and comparative study of the results of sensitized establishments combined with those not sensitized confirms these results. Indeed, the students of the sensitized schools have received sensitizing campaigns insured by Environment House of Annaba, as well as educational outings given especially for secondary school students, this proves that environmental education has a crucial role, and therefore we need to put more material and human resources for environmental sensitization and education.

A study carried out by the Mediterranean Wet-

lands Observatory on a number of Maghreb sites, including Algeria, on the educational services of these areas showed that, after acquiring knowledge 67% of people think that these gains influence their environmental comportment and among this change of behavior is the sensitization of those around them of the importance of these areas (Chazée *et al.*, 2017). In addition, at the city of El Tarf, we found a good percentage of correct responses about the knowledge of these wetlands at the sensitized and non-sensitized primary and middle schools. However, secondary school students who have not had any prior awareness campaigns show good knowledge of wetlands. This is because the innate knowledge of these wetlands acquired since childhood has positively influenced the knowledge of students from the region. In fact, this city is very rich in wetlands known in the eastern region for their faunistic and floristic richness. The same profile is reported by our results concerning the city of Skikda, in addition to the high rate of correct responses among students in schools that are sensitized, we found that students in schools that are not sensitized have a satisfactory level of knowledge about wetlands in their housing area.

Knowledge among pupils in non-sensitized schools in the cities of El Tarf and Skikda can be explained by the transfer of heritage knowledge by residents to the new generations, given the closeness of these areas; this heritage is well preserved and very well passed down from generation to generation. Furthermore, our results revealed the importance and role of Environmental Houses in these

three cities (Annaba, El Tarf, Skikda) as a state agency for environmental education through sensitization and training campaigns carried out at these schools. These sensitization campaigns have contributed significantly to the increase in the percentage of correct responses and thus to the improvement of knowledge of pupils concerning these wetlands, their richness, their importance and essentially the need for their preservation.

The essential role of these Environment Houses and their contribution in improving knowledge of these wetlands has been highlighted by our attempt to carry out this work at the city of Souk-Ahras, where we have previously reported the non-existence of Environment House. Indeed, the absence of an Environment House in this city made this mission unachievable, although it was programmed and we prepared the completely related arrangements.

The work of Environmental Houses at schools was facilitated by an agreement signed between the Ministry of National Education and the Ministry of the Environment on 02 April 2002, to ensure and promote environmental education in schools. The project to create the Environmental Houses in each city, made it possible to complete the institutional system of management, issues related to the local environment. This participatory proximity management, constitutes the fundamental mission of the Environmental Houses as a privileged place of encounter and expression of all the actors of the economic, social and cultural life of each city. We are currently at 38 Houses in the Algerian territory (end 2018), with about ten that are not yet operational. The objective is to reach 48 Houses in the 48 cities of Algeria.

Algeria has invested 5.3 milliard Algerian dinars until this day in the construction and commissioning of these Environment Houses, giving great importance to the sensitization and environmental education (Bentaher, 2018). These Environment Houses have a crucial role in the dissemination of environmental knowledge and information, their multiplication and exploitation are paramount. The specificities of each city bring a wealth through the exchanges that these Houses maintain between them. We also noted that the more experience the Houses gain, the more they can carry out their sensitization and environmental education roles. Which explains why Annaba Environment House, the first Houses installed in Algeria, was the only

House that has been able to ensure sensitization at the level of secondary schools. Its team is more qualified and better trained compared to the Houses of El Tarf and Skikda hence the need to strengthen the human capacities of these houses for more palpable results.

## Conclusion

Wetlands are extremely productive ecosystems that provide all kinds of benefits, as our knowledge of the values of these natural wetland ecosystems improves, our attitude changes. It is clear that these areas must be preserved, optimizing their uses for sustainable development, allowing future generations to enjoy their benefits as well. Indeed, this Eco-socio-pedagogical survey has highlighted the very important role of Environment House in environmental education and sensitization-raising for an awareness of the need to protect and enhance these wetlands.

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