

SHARING BEST PRACTICES AND EDUCATIONAL TOOLS AMONG COUNTRIES OF SAHEL

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Abstract

Management of natural resources is a major challenge in Sahelian countries. Didactic panels are a very useful educational tool to help teachers soliciting student's attention and general public curiosity. Panels used in Italian schools were adapted and tested in Cape Verde educational environment and will be permanently exposed in an exhibition building. Topics like ecosystems protection and preservation, establishment of protected areas, enhancement of water resources, groundwater defence from salinization, pollution associated with inadequate waste management, are suitable to diffusion in schools of Niger, Chad, Burkina Faso, as dissemination action of Project RUSSADE, Master "Sécurité alimentaire et durabilité environnementale".

1. Introduction

Someone assumes that anthropogenic actions may govern the modifications that the actions themselves determine on the territory and may control their effects on ecosystems, but this is often not true.

Human concerns may ignore or even despise the limits of the territory, that are well defined by physical laws, limits that become tight and binding when connected with the effects of climate change. Management of natural resources is a major challenge in the Sahelian countries.

Considering that education is highly effective aiming to contrast the environmental degradation, especially when conflicts between natural processes and human needs develop, many efforts were done to improve educational strategies in cooperation projects.

All the geosphere is involved, defined as the components of the Earth system constituted by the land surface, the solid Earth, the hydrosphere, the cryosphere and the atmosphere. This implies ethical obligations, ethical responsibility by all researchers, geoscientists, educators and decision makers and requires a more active role while interacting with society (see Peppoloni and Di Capua, 2016).

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The adoption of ethical principles in research, practice and education is essential if scientists want to best serve the public good. Geoethics which investigate the ethical, social, and cultural implications of the sciences related to GAIA, the mother Earth, represents a new way of thinking about and practicing Earth sciences, focusing on issues related to the relationship of the scientist with the self, colleagues, and society in the broadest sense.

1.1 Goals

In this paragraph the most relevant goals of projects, actions and related research are defined, focusing on education and communication, goals recommended during the Pan-European days of environmental education towards sustainability, held in Barcelona (Manifeste, 2015):

- (1) Promote the exchange of experiences and knowledge.
- (2) Strengthen the relationships between institutions and associations in order to identify shared interests and encourage future partnerships.
- (3) Create a common space regarding the role of the environmental education and the future challenges.
- (4) Encourage the construction of joint projects among different regions, through the development of environmental education policies both at national and international level.

According to the Manifest of the Education for the Environment and Sustainable Development (EESD), this kind of education aims to stimulate critical thinking and to develop values for a better living together. Specifically:

- it aims to strengthen the capacity of every citizen, including the less wealthy, to better perceive environmental issues and to participate in the life of the city by acting individually and collectively;
- it aims to train for a participatory debate in order to prepare young and adults to lead a full role in the future of their territories, either locally or globally;
- it promotes a holistic and systemic approach and aims to develop complex thinking, in order to create responsible citizens who believe in the value of men's action with the capacity to take up their responsibilities in order to act at all levels;
- it aims, in a fundamental way, to (re)-establish strong connections between humans and nature and the environment;
- it makes this link to nature and to the environment a key element of learning.

2. Examples of activities

We introduce some examples of projects whose target were school students or general population, where education played a major role.

The actions were proposed in different countries (Italy, Cape Verde, Brazil) with various duration (from 1 to 6 school years) and developed in original and independent ways, but they were at the same time strongly interconnected (see Ferrero *et al.*, 2014a).

2.1. Twinning between Italian and Sahelian primary and secondary schools

A twinning between Italian schools and schools in Cape Verde was organized as a cooperative learning experience with a common educative path, addressing topics related to the vulnerability of the territory attacked by a tourist development often aggressive and disrespectful of local peculiarities and traditional values, as discussed in Camino and Ferrero (2015). The dialogue started with the initial goal of collecting data about the physical nature of the islands, in order to set up a museum of Nature Sciences with

educational purposes both for residents and tourists. But the project soon developed as a path sharing themes and educational goals and looking for common cultural roots, in particular exploring how students of different ages (6-15 years), perceived the physical environment of their country (see Ferrero et al., 2006a; 2006b). The work was articulated on the exchange of knowledge, ideas, proposals, documents and reports, in order to compare and broaden reflective moments in their respective classes (twinning) (Fig. 1).



Figure 1: Twinning between Cape Verde (left) and Italian (right) primary school classes.

Major themes of Earth Sciences, as volcanoes, earthquakes, floods, were the subjects of the exchange and of further deepening, but also the natural transformations of the landscape, the interference of human activities with natural resources, the collective and individual responsibilities involved in risk management.

The interaction and dialogue between Italian and Cape Verdean teachers were wide continuous, they had meetings for data analysis and interpretation, evaluation of the experience suggestions and proposal for the new steps. An analysis of the first papers (drawings and worksheets) of the involved students showed little interest and probably a lack of awareness of the problems concerned, while from the analysis of final papers a full awareness turns out of the human responsibilities and the possibility of changing the reality, the desire to address environmental issues and to adopt a more responsible lifestyle; finally, students recognize the usefulness of what was learned in the educational process performed, (see Ferrero *et al.*, 2010; 2011; Gimigliano and Ferrero, 2007). From the point of view of education-communication strategies, this experience demonstrates the crucial importance of performing practical and expressive activities followed by reflections and guided rework, to explicitly highlight the links of theoretic topics with everyday life, to use different forms of communication (verbal, written, graphic and artistic).



Figure 2: Exploring and discovering during field activity: classes of primary school on a geological outcrop in Piedmont, Italy (left), on recent lava flows of the Pico do Fogo volcano in Cape Verde (right).

The team explored and compared the spontaneous conceptions of Italian and Cape Verdean students on topics related to the physical natural environment and its changes over time, in connection with the presence of living organisms and in particular changes related with the human interference, to the discontinuous development of the natural processes, diluted in geological time, or concentrated in events considered "catastrophic". The job required a high ability of teachers to lead students without giving them the path, following them with respect and patience in their digressions and their fantasies (Magagna *et al.*, 2012).

2.2. Interviews

A parallel research was conducted investigating farmers, fishermen, small associations of agri-food processing, through interviews in the islands of Fogo, Santiago, S. Antão and S. Vicente (Cape Verde). The purpose of the research was to collect opinions about the availability of natural resources (water, land, energy), quantitative data related to the production for subsistence or for the marketing, the presence and efficiency of working tools, the waste management processing (Calvo *et al.*, 2011). The choice of interviewees was decided with the aim of investigating the work habits, access to resources (natural, energy) and waste disposal of persons related to their native land not only for birth, but also for business choice: respondents are all resident in the workplace, and managers of small to medium production activities. They were subjected semi-open questionnaires, so as to collect some answers in a structured manner and also allow the recording of comments to open questions.



Figure 3: Interviews to farmers and agri-food producers and transformers in the island of Fogo, Cape Verde.

At first the material collected has allowed to have a first idea about the difficulty of managing the waste materials (so-called non-recoverable waste), but at the same time the interviews have revealed other problems: the increasingly urgent water shortages, the criticality of energy availability, environmental degradation caused by a more aggressive human impact. Not only problems, needs, hardships emerged, but also the awareness that 'something' changed over time, to the point that additional material was collected mainly investigating elderly people and highlighted what may be called the 'environmental memory' of the respondents.

The intrinsic value of this witness is not directly correlated with objective and measurable data, but it is very significant the way of thinking of each subjective and depends largely on age registry, the character and the past of their own lives.

Interviews with older people in some areas of Cape Verde allowed to trace ancient ways of working the land, to use the water, to select crop plants and were characterized by a deep understanding of territory. All this was introduced to the twinned classes, discussing the assumption that too fast transformations of social and environmental tissues are not always synonymous with progress.

2.3. Training seminars and refresher courses

While the twinning was progressing the objectives and expectations evolved over the years, due to a growing consciousness of the research group, which processed and analysed the products and used the results and the teachers' reflections to achieve a virtuous cycle of positive feedback. Also the class groups improved their performances, especially when the experience lasted several years.



Figure 4: Seminars and exchange of experiences between Italian and Sahelian teachers. Field work planning and experiencing (top) and teachers training activities (bottom) held in Italy and in Cape Verde.

Even if started with a very structured basic grid, the project was always flexible and modulated on the age of the students, the location (country school or city school), but above all on the type of educational relationship established by the teacher.

Teachers who took part in the experience, very well trained and motivated, developed unique and special relations with their specific class (Fig. 4).

As a result they produced a great variety of valuable outputs, not easily comparable in a strictly cognitive evaluation; their educational value could only partially be described by the qualitative analysis in the more concrete aspects of their content.

Starting from a relatively static perception of the characteristics of the physical environment, in the following years the activities aimed to recognize slow processes and highly dynamic events, to find out the reciprocal interactions between environment and human activities and to reflect on the effects of these interactions in time, as reported in Ferrero *et al.* (2006b) and Mortara and Ferrero (2006).

At the beginning students were mainly stimulated to develop the ability to observe, identify and describe, lately they improved the ability to recognize and interpret cause-effect relationships, complex interactions with many variables. At this point, as an effect of the proposed activities, other values and parameters came to the attention of the students. The ability to recognize connections between the environmental effects observed and the behaviours of individuals and communities increased, as well as the sense of individual responsibility.

Meanwhile, the socio-economic conditions in Cape Verde are going to meet a rapid change (Instituto Nacional de Estatística de Cabo Verde, 2007) which, together with a certain increase in well-being, have produced a large increase in imports and mass tourism products, not respectful and attentive to the risks of environmental degradation. In 2010, a secondary school Cape Verdean teacher proposed to develop in the partner classes comparative reflections on the themes presented by the Earth Charter. It is a statement of fundamental ethical principles, a document that mainly aims to recognize and protect the primary resources, suggesting strategies to achieve the transition to sustainable ways of living and human development. The goals mentioned by the Earth Charter Commission (2007) are: recognize the environmental protection objectives, poverty eradication, development of equitable economic, respect for human rights, democracy and peace as interdependent and indivisible. This perspective has provided an opportunity to open up to a global vision of issues already addressed at the local level, the proposal was received by Italian partners and the twinning of the last year has therefore addressed on this path.

2.4. Educational materials

Several panels on environmental issues were prepared for didactic use in schools and for widespread dissemination in rural areas. They were exposed in several Natural History Museums of Piedmont Region during the International Year of Planet Earth (2007-2009) as a complete educational path "To understand how the Earth work: from local situation to global processes" introduced by Ranzenigo and Ferrero (2006). The panels are grouped as two series: "To know for living with the volcano" (Fig. 5) and "Treasures and secrets of the coast environment in Cape Verde", documents that are posted in the Naturalist page of the website www.caboverde.com/nature. Translated in Portuguese these panels were delivered to the school districts of the islands of Fogo, S. Vicente and Santiago and used in primary and secondary schools.



Figure 5: An example of didactic panel. Protection and preservation of ecosystems through the establishment of protected areas: the case of the Caldera and the volcanic cone, Pico do Fogo, Cape Verde.

2.5. Establishment of a permanent cultural centre



Figure 6: The Auditorium of S. Filipe in the Fogo Island, Cape Verde.

The panels, updated and integrated after the eruption of the Pico do Fogo volcano (nov. 2014 - feb. 2015), will be exposed in the Auditorium of Fogo Island, a centre of cultural and educational opportunities for local population and tourists in Cape Verde, where thematic exhibitions on environmental resources and their protection will be located (Fig. 6).

3. College courses and training courses for adults

The experiences described are well identifiable as action-research projects that were introduced and discussed in several college courses of the University of Torino dedicated to teachers training of all levels and in Seminars and Workshops organised by Museums, Natural Parks and teachers Associations (Ferrero *et al.*, 2010).

3.1. The Project RUSSADE

A recent experience of interaction and cooperation with Higher Education Institutions (HEIs) of Sahel developed within the Project RUSSADE (Réseau des Universités Sahéliennes pour la Sécurité Alimentaire et la Durabilité Environnementale), active since 2013 thanks to a partnership between CISAO (www.cisao.unito.it) and three Universities of Sahelian countries, Niger, Chad and Burkina Faso, (www.russade.eu).

The guidelines of European Union for EDULINK II call for proposals indicate “energy facilities, agriculture and food security” as instruments to eradicate poverty and includes financial support in the educational field for strengthening the systems of higher education in African countries.

For these reasons, CISAO and its African HEIs partners are developing a project whose general objective is to use knowledge to fight hunger and poverty and to promote environmental protection in a sustainable development perspective. The quality of higher education in the field of agriculture and management of natural resources will improve food security and living conditions of Sahelian people. Another goal is to strengthen synergy between the partners through the creation of a permanent network, to enhance capacity, excellence and regional integration (Semita *et al.*, 2014a, 2014b).

In this context is included the first edition of the II level Master “Sécurité alimentaire et durabilité environnementale”.

To improve the impact of education on the quality of life of local population the outputs of the Master will be widely diffused in a larger part of the population, even if not highly alphabetized, to disseminate scientific and methodological instruments to manage natural resources in daily practices with an eye on environmental sustainability and equity (Ferrero and Semita, 2016).

Therefore the third period of the Project RUSSADE is mainly devoted to the diffusion of the results and their impact on the region, to the production of educational materials like panels designed also for primary and secondary school students, with the intervention of teachers, public officials and other staff of local associations, NGOs and other no profit associations (Semita *et al.*, 2015).

Panels illustrate topics like “Enhancement of water resources to develop fisheries and crops”, “Strategies to preserve vegetation and contrast desertification” (Fig. 7), “Pollution associated with inadequate waste management”, “Protection and preservation of ecosystems through the establishment of protected areas” (Fig. 8). Panels are introduced in school and other public contexts and may be integrated with practical activities (laboratory and field trips activities), to better involve students’ attention and communicate an integrated vision of complex problems connected to development and environmental protection.



Projet RUSSADE
(Réseau des Universités Sahéliennes pour la Sécurité Alimentaire et la Durabilité Environnementale)
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résidus agricoles pour contrer le déboisement



plus de 90% des ménages Nigériens utilisent le bois pour la cuisson.
La seule ville de Niamey en consomme 1.000 tonnes par jour.
Pour fournir du bois de chauffage beaucoup plus d'arbres que ceux que la forêt et la savane puissent produire, sont coupés.
Le résultat est une progressive désertification, avec perte de la biodiversité.
La forte consommation de bois est également due à la faible efficacité des foyers traditionnels, comme les « trois pierres », qui est autour de 15%, qui brûlent en moyenne 5,8 kg de bois par jour pour famille



pour contrer le problème on pense de remplacer le bois avec un autre combustible, comme les résidus agricoles. Un procédé de production de pellets à partir de déchets agricoles, a été développé, et en même temps, une poêle à gazéification qui les utilise.
Les foyers à gazéification avec des pellets sont appréciés par les utilisateurs parce que la cuisson se produit sans émissions de fumée, et, en plus, les dépenses pour l'achat du combustible, sont réduites par rapport à celles pour l'achat du bois



le foyer Aaron a un rendement thermique de plus de 50%. Avec seulement 1,4 kg de pellets par jours, faits avec des résidus agricoles, il produit la même chaleur des 5,8 kg de bois utilisés dans les foyers traditionnels



utilisation des résidus agricoles = ZERO consommation de bois





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Figure 7: Strategies to preserve vegetation and contrast desertification (courtesy by S. Bechis)

4. Conclusions

At the end the twinning was perceived as a pleasant and enriching experience, giving teachers and students several opportunities: to plan common activities and include them in the curriculum, put the experience in educational paths, to make it an involving and functional component the students' knowledge increase; an enhancement of the affective and emotional components of learning, living them consciously as an added value; an exercise in patience and confidence waiting for the arrival of news and work items from the partners; an opportunity for feeling equally proud to be the protagonists of a special adventure, in which is a sort of peer education at distance is achieved and, from time to time, students take on the role of experts or recognize such a role in their partners.



Figure 8: Students of the Master RUSSADE during a study tour in the Transnational W Park (Niger, Burkina Faso and Benin)

The relationship established between students and teachers (and indirectly between families) of different cultures offers the possibility to take awareness of different ways of living and value systems, more directly of what happens through the media. twinning experience offered the opportunity to look out beyond the stereotypes and establish a real relationship, through the commitment to express the emotions and surprises derived from of incoming correspondence, exchange of documents, drawings and photos.

4.1. From Biophilia to Geophilia

Attention and empathy are the conditions upon which the Biophilia is based, and, at the same time, are two mental faculties that characterize the human instinct to love and care of living Nature, as introduced and discussed by Barbiero (2011). Can similar links develop between humans and the non-living elements of the Geosphere?

Extensive research conducted with teachers, students and the general public indicate strong similarities in attitude towards non-living components of nature, and this we call Geophilia (see Matteucci *et al.*, 2012; Lucchesi and Giardino, 2012; Ferrero *et al.*, 2014b). Therefore, attention and empathy, properly cultivated in the educational process, lead to a successful approach with the Earth Sciences and to a careful attitude for natural resources.

The experiences of twinning, with the corresponding educational programs, can be considered as a contribution to developing sustainable societies, in particular:

- sustaining the development of Geophilia through careful environmental education participation and awareness of the context - in order to become aware of the finite resources, defend them from destructive uses coming from the outside and / or inside;
- development of a relationship of mutual respect and mutual listening between different culture;
- on a personal level it is easier to take note of the differences, open minds and hearts in dialogue, develop empathy, cultivate a desire to learn in the relation.

4.2. Integrating different educational approaches

A rational approach to environmental problems, which takes into account only the knowledge of the facts, has proved insufficient and inadequate to motivate people to perform preventive or remedial actions.

It is more effective to develop also the emotional and affective aspects of knowledge to deal with environmental education issues and education for sustainability.

Considering the emotional links and relationships between human beings and the planet Earth, our HOME, a new way opens to learn, to understand and therefore to act in harmony with the laws of nature.

As a conclusion we recognise in the role and objectives of intercultural education the four pillars of education according to UNESCO Guidelines (2007).

- Learning to know, improved by the contact with other languages and areas of knowledge.
- Learning to do, meaning to acquire competence to deal with many situations and work in teams.
- Learning to live together, strengthen the understanding of other people, appreciation of interdependence, stimulates carrying out joint projects, learning to manage conflicts.
- Learning to be, invites to act with greater autonomy, judgment and personal responsibility.

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6. References

Barbiero G. (2011). Biophilia and Gaia: Two Hypotheses for an Affective Ecology. JBU I 1.11.

Calvo A., Ferrero E., Capuano S., Mortara G. and Pires P. (2011). *Cultivo, pesco, produzo e vivo em Cabo Verde. Testemunhas de habitantes nas ilhas de Fogo, Santiago, São Vicente e Santo Antão*, Ed. Comunecazione, Bra, 17 pp. <http://www.caboverde.com/book/vivo.htm>.

Camino E, and Ferrero E. (2015). Bambini, popoli e culture in dialogo. In Falchetti E. and Utzeri B. (Eds.). *I linguaggi della sostenibilità. Nuove forme di dialogo nel museo scientifico*: 85-98. ISBN 978 88 908819 0 9. http://www.anms.it/riviste/dettaglio_rivista/16.

Ferrero E., Calvo A., Mortara G., Mundula M. and Vio E. (2014a). Interactive and participative paths for the knowledge of the physical environment. School partnership for education to sustainability and citizenship training. *Proceedings of the 7th World Environmental Education Congress (WEEC 2013)*, June 9-14, 2013, Marrakech, Morocco. Niche 9, Pedagogy and learning: 364-382.

Ferrero E., Cappa A., Lovesio P., and Prando R. (2006a). Pesquisa sobre a percepção do ambiente físico e das suas mudanças nos alunos das escolas do Piemonte (Italia) e de Caboverde, *XIV Simposio Iberico do Ensino da Geologia, Livro de Actas*: 527-532.

Ferrero E., Giardino M., Magagna A. and Mortara G. (2014b). Geophilia, an ethical approach for environmental care and education A virtuous link between university, administrators, associations and communities. *Proceedings of the 7th World Environmental Education Congress (WEEC 2013)*, June 9-14, 2013, Marrakech, Morocco. Niche 6, Ethics, ecophilosophy, human-nature relationships.

Ferrero E., Magagna A., Morando M., Ranzenigo A.C., Ruggiero A. and Mortara G. (2010). Developing intercultural Consciousness in school children: interaction between schools and Museums. *Proceedings 4th International Congress Science and Technology for the safeguard of Cultural Heritage in the Mediterranean Basin*, Cairo 2009, Vol. I: 447-452. ISBN 978-88-96680-31-5.

Ferrero E., Magagna A. and Ranzenigo A.C., avec la collaboration de Bicchi E., Morando M. et Ruggiero A. (2011). Coopération internationale: la réalisation d'Expositions Thématiques comme moyen d'éducation au développement durable environnemental. *Actes du 5^e Colloque International du Réseau Turin – Sahel*: 122-140, Bobo-Dioulasso 10-12 Avril 2009.

Ferrero E., Molinaro E. and Mortara G. (2006b). Développer la conscience de l'environnement en communiquant avec les enfants. Une expérience d'échanges/de jumelage entre le Piémont et le Cap Vert. *3^e Colloque Interuniversitaire Turin-Sahel: Décentralisation, organisations endogènes, ressources environnementales, technologies appropriées*. Atti: 238-247. Bamako (Mali), 10-11 février 2005.

Ferrero E. and Semita C. (2016). The Project RUSSADE: Geoethic Education to face environmental problems in the Sahel. *EGU General assembly 2016 - Session EOS5 Geoethics: theoretical and practical aspects from research integrity to relationships between geosciences and society*. Wien, EGU2016-17181, EGU General Assembly 2016.

Gimigliano D. and Ferrero E. (2007). Quelle éducation scientifique pour favoriser la protection de l'environnement? *Actes 4^e Colloque Interuniversitaire Turin-Sahel: Gestion de l'environnement, production et commercialisation des ressources alimentaires, renforcement des capacités humaines dans la lutte contre la pauvreté au Sahel*. Université Abdou Moumouni de Niamey (Niger), 10-12 janvier 2007: 260-268.

Lucchesi S. and Giardino M. (2012). The role of geoscientists in human progress. *Annals of Geophysics*, 55, 3; doi: 10.4401/ag-5535.

Magagna A., Giannatempo C. and Ferrero E. (2012). Interactive activities to stimulate debate and critical thinking about issues related to earth sciences and sustainable development. *Annals of Geophysics*: 55, 3: 453-460.

Matteucci R., Gosso G., Peppoloni S., Piacente S. and Wasowski J. (2012). A Hippocratic Oath for geologists? *Annals of Geophysics*, 55, 3; doi: 10.4401/ag-5650.

Mortara G. and Ferrero, E. (2006). A análise da paisagem e sua relação com o desenvolvimento turístico das ilhas de Cabo Verde. *XIV Simpósio Ibérico do Ensino da Geologia* (Universidade de Aveiro, 24-29 Luglio 2006). Livro de Actas: 433-438.

Peppoloni S. and Di Capua G. (2016). Geoethics: Ethical, social, and cultural values in geosciences research, practice, and education. doi: 10.1130/2016.2520 (03). In: Wessel G. & Greenberg, J. (Eds.). *Geoscience for the Public Good and Global Development: Toward a Sustainable Future*, Geological Society of America, Special Paper 520: 17-21. <http://specialpapers.gsapubs.org/content/520/17.abstract>.

Ranzenigo A.C. and Ferrero E. (2006). Um itinerário natural como proposta expositiva para uma sala de museu dedicada à ilha de Fogo. *XIV Simposio Iberico do Ensino da Geologia*, (Universidade de Aveiro, 24-29 Luglio 2006). Livro de Actas: 545-551.

Semita C., Ferrero E., Calvo A. and Trucchi G. (2014a). A geoethical approach in higher education: the project RUSSADE in cooperation with Sahelian Universities. *Geophysical Research Abstracts*, Vol. 16, EGU2014-16678-1.

Semita C., Mortara G., Ferrero E. and Trucchi G. (2014b). Réseau des Universités Sahéliennes pour la Sécurité Alimentaire et la Durabilité Environnementale. Une proposition pour un programme d'éducation interculturelle et environnementale. *Proceedings of the 7th World Environmental Education Congress* (WEEC 2013), June 9-14, 2013, Marrakech, Morocco, Niche 7, Greening education: 396-415.

Semita C., Ferrero E., Calvo A., Trucchi G., Balla A., Kabore Zoungana C.Y. and Youssouf I. (2015). Preliminary results of a master on "Food security and environmental sustainability. *Proceedings of the IV CUCS Congress*, Brescia (Italy) 10-12 September 2015. ISBN: 9788835043508. http://cucsbsrescia2015.it/wp-content/uploads/2015/09/ATTI-CUCS_2015_.pdf.

Sitography

CISAO (Centro Interdipartimentale di Ricerca e Cooperazione Tecnico Scientifica con i Paesi del Sahel e dell'Africa Occidentale): www.cisao.unito.it; <http://www.cisao.unito.it/it/progetto-russade>.

Instituto Nacional de Estatística de Cabo Verde, Principais Indicadores de Contas Nacionais (Série Nova - ano de referencia 2007: <http://www.ine.cv/dadostats/dados.aspx?d=2>.

Manifeste, Pan-European days of environmental education towards sustainability, Barcelona, 1-2 Ott. 2015, <http://catalonia.environmental-education.org/wp-content/uploads/2015/12/manifeste-EEDD-anglais1.pdf>.

Projet Russade - FED/2013/320-115 - <http://www.russade.eu/web/>.

The Earth Charter: http://www.unesco.org/education/tlsf/mods/theme_a/img/02_earthcharter; <http://www.cartadellaterra.it/index.php>.

The Naturalist, Capeverdean pages: <http://www.caboverde.com/nature/vulcani.htm>; <http://www.caboverde.com/nature/coste.htm>; <http://www.caboverde.com/pdf/am1.pdf>; <http://www.caboverde.com/pdf/am2.pdf>.

UNESCO Guidelines, (2007): Education Position Paper: <http://unesdoc.unesco.org/images/0010/001095/109590eo.pdf>.