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**Trend in environmental education images of textbooks from Western and Eastern European countries and non-European countries**

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## Environmental Education and Sustainable Development in images of textbooks from

European and non-European countries:

Analysis of spatial, ecological, economical, social and cultural dimensions

### Abstract

Environmental education intends to provide knowledge and develop competencies for the sustainable development and can be classified in five dimensions (Sachs, 1993): *spatial, ecological, economical, social and cultural* dimensions. In the present work we investigated how Human-Nature relationships are presented in images of textbooks addressed to 14-16 years old pupils of 14 European, African and Middle-East countries, by looking at the above five dimensions. For this purpose, we carried out quantitative and qualitative analysis on *i) local and foreign/global images; ii) urban, rural and nature images; iii) negative and positive impact, human management, beauty of nature and neutral images; and iv) the presence of humans in images, particularly the gender distribution in positive and in negative impact images*. For the analysis a specific part of the grid constructed by the European project BIOHEAD-CITIZEN was used. Results showed that: *i) Western European countries, in contrast to the Eastern European countries and non-European countries, exhibited more images of urban-rural landscape than nature (spatial dimension); ii) the negative impact images were more frequent than the positive impact ones in all countries, and in textbooks of four countries human management images were absent (ecological and economical dimensions); iii) men were more frequently presented in negative impact images whereas women in positive impact ones, showing a clear association with the social representation of men and women in society (social and cultural dimensions). Differences between textbook images of Western and Eastern European countries and between these and African countries were found and are discussed.*

**Keywords:** environmental education, textbooks analysis, comparative analysis.

## 1. INTRODUCTION

Since Tbilisi Conference in 1977 (UNESCO, 1980), several documents emphasize the need for including environmental education into formal education system at primary and secondary school, paying attention to the different cultural, social and economic contexts. Under Agenda 21, one of the four priorities identified was Education, Public Awareness and Training for Sustainability (UNESCO, 1992). Therefore, reorientation of teacher education and changing of syllabuses and textbooks have emerged as an important and a long process in different countries (Lakatos *et al.*, 2003; Salite & Klepere, 2003).

In this context, we have implemented a large European project BIOHEAD-CITIZEN (FP6, STREP CIT2-CT-2004-506015; Carvalho, 2004) involving nineteen countries: thirteen European countries (Cyprus, Estonia, England, Finland, France, Germany, Hungary, Italy, Lithuania, Malta, Poland, Portugal and Romania), five African countries (Algeria, Morocco, Mozambique, Tunisia and Senegal) and one from the Middle East (Lebanon). The aim of this project is to deepen the understanding of how different aspects of citizenship can be promoted through biology, health and environmental education. It is intended to improve the understanding across different disciplines and across different countries, specifically aiming at identifying key issues for improving the transmission of science knowledge in the perspective of reinforcing the link between science and education and contributing to a better citizenship in a knowledge based society (Carvalho, 2004).

Two main approaches have been carried out in this project: one, seeking teachers' and future teachers' conceptions about biology, health and environmental issues and, the other, looking at the same issues in current school textbooks in the same countries. In the present work we ~~intended to~~ investigated how Human-Nature relationships are

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3 presented in the textbooks of these from 14 European, African and Middle East countries  
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6 by looking at the spatial, economical, ecological, social and cultural dimensions that are  
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8 relevant to reach environmental sustainability (Sachs, 1993; Oliveira & Bizzo, 2005). For  
9  
10 this purpose images of current textbooks were analysed, as they validate what the text  
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12 states and have a powerful role as representations of the real world through the reader's  
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14 work of interpretation, perception of the narrative, and perceptual order of the  
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16 document (Pozzer & Roth, 2003).  
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## 25 **2. THEORETICAL BACKGROUND**

### 26 *2.1. Concepts of the 'Sustainable Development' in Environment Education*

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30 Nowadays, a global increase of environmental problems have been observed, such as air,  
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32 water and soil pollution, destruction of ozone layer, biodiversity reduction, exhaustion of  
33  
34 natural resources and global warming (UNESCO, 2004). Therefore the need for  
35  
36 environmental education oriented towards the aim of sustainable development is a  
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38 matter of great concern nowadays.  
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44 In 1987 the concept 'sustainable development' was described as a systematic, long-term  
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46 utilization of natural resources ensuring the accessibility of these resources for future  
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48 generations (WCED, 1987). Later, the Conference in Rio de Janeiro emphasized the  
49  
50 significance of Sustainable Development in Agenda 21 (UNESCO, 1992). This document  
51  
52 introduced the principle of sustainability and the need to apply it to economic, social and  
53  
54 environment aspects. Since then the interpretation of the concept 'sustainable  
55  
56 development' has diverged into two different interpretations (Salite, 2002) in  
57  
58 environmental education: the anthropocentrism and the ecocentrism. The former  
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3 stresses the significance of human beings and capability of humans to understand and  
4 control natural processes in a desirable direction. In this view, the focus is on the  
5 development of normative criteria for energy connections between humans and the  
6 environment, such as the monitoring of human actions, the calculation of human impact  
7 on nature. The latter, the ecocentrism, is looking for ways of creating cohesion with  
8 human life and life-supporting systems, as complementary components within the  
9 ecosphere. Here the focus is on the psychological-ethical relationship between humans  
10 and nature, *i.e.* it undertakes studies on the aims, values, attitudes and humans' actions.  
11 Both levels of seeking solutions for problems of sustainable development have been  
12 gradually adopted as typical approaches to education and in the consciousness of society  
13 but, gradually, the ecocentrism recognition has been increasing (Filho, 2000; Salite, 2002).

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31 Environmental eEducation nowadays intends to provide people with an understanding of  
32 their natural and cultural environment and to enable the development of new rules,  
33 practices and values, encouraging the sustainable use and development of natural  
34 resources and the improvement of quality of life for all living beings (Obara *et al.*, 2009).  
35 The concept of Environmental Education embraces four important issues: the  
36 understanding of the concept of *Ecosystems* as defined by modern ecology, particularly  
37 related with the dynamics of systems and the notion of *Biodiversity*, being the latter a  
38 central concept in the comprehension of evolution, and of the policies of control and  
39 ecological management; *Pollution* and the *Use of Resources*, which are important topics  
40 involving values and beliefs, and that are central in the education for a sustainable future  
41 (Caravita *et al.*, 2008).  
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## 2.2. The role of the Images in School Science Textbooks for Environmental Education

Textbooks are cultural artefacts which participate in the cognitive and social organization of knowledge (Lebrun, 2007). They translate national programmes guidelines which are the expression of national education policies. Textbooks are used by teachers with a double function: as a national programme (or syllabuses) guideline and as a didactical resource (Carvalho *et al.*, 2009). Thus, the textbook analysis turns out to be a relevant tool for studying socio-cultural determinants of environmental problems, in particular the school-related ones.

Images that appear in the textbooks have a major importance in the construction of pupils' conceptions, and they serve to wake emotions and actions. It has been claimed that some images are better memorized than the corresponding text (Meyers, 1990; Korfiatis *et al.*, 2004; Pozzer & Roth, 2003) and that they have had an important role in the environmental wakeup since the 60s (Seppanen & Valiverronen, 2003). For example, images of human-nature relationship might be given in two oppositions (Schroeder, 2007): 'people apart from nature' and 'people as a part of nature'. The former represents a belief that human beings are somehow different or separate from the natural world. This view implies that the presence of people in images, their artefacts and activities give a negative impact by diminishing the naturalness of the environment. Therefore, nature is seen as having an intrinsic order, harmony, or beauty, in a world where humans are absent. The latter statement represents the belief that human beings belong to the natural world and they live and coop with nature, not necessarily destroying it. Schultz (2000) has shown that people who see themselves as more connected to nature score higher on measures of ecocentric concern and lower on measures of egoistic concern, *i.e.* utilitarian perspective, with respect to environmental problems. The same author (Schults

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*et al.*, 2004) has found that believing in oneself as being included in nature vary in different cultures and may be influenced by situational and environmental factors, for example, people who live in large cities and are distanced from the natural world might see themselves as less connected to nature. Similarly, Hernández *et al.* (2007) have found that place attachment and place identity in natives and non-natives is an affective factor for sensibility and deeper look into environmental problems.

The gender issue must be viewed within a sustainable community where the self-determination of women, as well as men, is important for the well-being of human societies within the well-being of the entire Earth community, as noted in *Gender and education for all: The leap to equality* (UNESCO 2003), where gender parity and gender equality in education mean different things: reaching parity should be considered as a 'first stage' measure of progress towards gender equality in education. Studies (Sørensen, 2007:266) have further shown that "girls more than boys value content with connection to the surrounding world and with emphasis on the environment and ethical issues".

Having in mind this framework, in the present work we analysed (i) local and foreign/global images; (ii) urban, rural and nature images; (iii) negative and positive impact, human management, beauty of nature and neutral images; and (iv) the presence of humans in images, particularly the gender distribution in positive and in negative impact images. Textbooks for 14-16 years old students were selected as this age group children are especially sensitive to environmental problems (Keller, 1985; Sivek, 2002; Prokop *et al.*, 2010).



## 3.

## METHODOLOGY

This work was performed by using the specific parts of the grid on “Ecology and Environmental Education” constructed by the European FP6 STREP project BIOHEAD-CITIZEN (CIT2-CT-2004-506015) (Carvalho, 2004; Caravita *et al.*, 2008). For the design of the grids to be applied in textbooks analysis, precise subtopics of Environmental Education being exemplar of interactions between Science and Society and challenges in Citizenship were chosen. They were: *Pollution, Use of Resources, Ecosystem and Cycles* and *Biodiversity*.

These grids of analysis were the result of a collective and international work carried out by researchers from all the countries involved in the project. For the grids construction, a sample of textbooks from all countries was analysed in a project meeting, and an initial version of the grids was built. Then, in each country, these grids were pre-tested on at least one textbook. The final version of the grids took into account the results of this pre-test (Carvalho *et al.*, 2009; Tracana, 2009). This final grid was applied by each team in its country textbooks. The problem of subjective interpretation in this kind of qualitative analyse, was controlled by having two analysts applying separately the grids and cross-checking the findings afterwards.

The corpus of the present study was composed of 25 textbooks from 14 different European, African and Middle East countries: Cyprus (1), Estonia (1), Finland (2), France (2), Germany (2), Hungary (2), Italy (4), Lebanon (3), Lithuania (1), Malta (1), Morocco (2), Portugal (1), Romania (1), Senegal (2) (see Annex 1). These current textbooks were selected, when possible, out of the most used ones in schools, but in some countries only

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3 one official textbook was available. The other two criteria for the textbooks selection  
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6 were the presence of the four subtopics and targeting the 14-16 years old pupils.  
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9 In countries like Estonia, France, Italy, Lithuania, Malta, Portugal and Romania the four  
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11 subtopics (*Pollution, Use of Resources, Ecosystem and Cycles and Biodiversity*) could be  
12  
13 found in the same textbook whereas in other countries (Finland, Germany, Hungary,  
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15 Lebanon, Morocco and Senegal) the four subtopics were found in separate textbooks. In  
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17 this case, when more than one textbook covered complementary the four subtopics, the  
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19 books were put together for the subsequent analysis, as shown in the Results (see table  
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25 2).

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27 In the present study we used a part of the long grid related to the qualitative and  
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29 quantitative images analysis (Table 1). For further analysis, all images were examined and  
30  
31 grouped into categories: 1) images with local or global environment; 2) images with or  
32  
33 without human activities; 3) images which represent a negative or positive human impact  
34  
35 on nature or management of nature; 4) images of men, women, or children. To assess the  
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37 occurrences of each indicator, the grid was applied by noting the page numbers and the  
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39 quantity of images found in each textbook.  
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47 [Insert table 1 about here]  
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## 50 51 4. RESULTS AND DISCUSSION

### 52 53 4.1. General information about images in textbooks

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55 The four subtopics (*Pollution, Use of Resources, Ecosystem and Cycles and Biodiversity*),  
56  
57 targeting around 14-16 years-old pupils, were found in textbooks of all countries, except  
58  
59 those from Cyprus and Morocco which missed one subtopic, *Biodiversity* and *Pollution*,  
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3 respectively (Table 2). The absence of the today important *Biodiversity* subtopic in the  
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5  
6 Cypriot **current** textbook can be due to the fact that this book was firstly published long  
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8 time ago (in 1999), when this subtopic was not considered as important as it is nowadays.  
9  
10 In fact, the concept *Biological Diversity* or *Biodiversity* was formally introduced in the  
11  
12 American Forum of Biodiversity in 1986 (Thompson & Starzomski, 2007). The absence of  
13  
14 *Pollution* in Moroccan textbooks may be due to the low concern given in this country to  
15  
16 this issue, as developing countries are mostly “concerned about hunger, misery,  
17  
18 *unemployment*” (Vargas, 2005: 75).  
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26 **[Insert table 2 about here]**  
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31 Although missing the subtopic *Biodiversity*, the Cypriot textbook was the longest one (190  
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33 pages) having the highest number of pages on *Pollution* (112), and also a high number of  
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35 pages on *Ecosystems and Cycles* (55) and the *Use of Resources* (23). **Generally, the text**  
36  
37 **surface text is higher than the images surface, indicating that the main information is**  
38  
39 **within the text.** The longer textbooks devoted to the four subtopics were from Senegal,  
40  
41 Italy-B and Romania with 159, 134 and 128 pages, respectively (Table 2). The lowest  
42  
43 number of images was in the Lithuanian and Estonian textbooks (31 in each), **but the**  
44  
45 **proportion between images and pages in these textbooks (0.9 and 0.6, respectively) was**  
46  
47 **similar to the one found in Cypriot textbook: 0.5 (Table 2, last column). In contrast, the**  
48  
49 **Romanian textbook was the one having the highest images surface in relation to the text**  
50  
51 **surface, showing a proportion of 2.7 images per page and the highest total of images in**  
52  
53 **the book: 348 (Table 2).**  
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3 Textbooks differed largely as far as the proportion of images and pages were concerned  
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5 (Table 2). Figure 1 shows that the majority of the textbooks (18) had more images than  
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7 pages (being the Lebanon-05 textbook the one with higher proportion of images: 3.5),  
8  
9 whereas only seven (Lithuania, France-99, Italy-P, Senegal-86, Estonia, Cyprus and  
10  
11 Morocco-S) have fewer images than pages.  
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18 **[Insert figure 1 about here]**  
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23 We agree with Pozzer & Roth (2003) when they refer that, on one side, the use of few  
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25 images (for example in Morocco-S textbook) often does not allow the reader to disclose  
26  
27 what really matters and it may not make sense for students; on the other side, too many  
28  
29 illustrations (for example as in Lebanon-05 textbook) distract attention and students can  
30  
31 miss important textual information. A specific tendency regarding European *versus* non-  
32  
33 European countries or Western *versus* Eastern European countries for presenting more  
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35 images/pages was not found.  
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#### 43 44 *4.2. Qualitative analysis of textbooks images*

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47 Images are powerful tools for learning, giving important opportunities for discussion,  
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49 analysis and group activities (Mowat, 2002). Images in textbooks illustrate what is written  
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51 in the text and, usually, they are better memorised than the text itself (Korfiatis *et. al.*,  
52  
53 2004). In the present study we analysed how the images in current textbooks of 14  
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55 countries refer to the human-nature relationship, within the four subtopics of  
56  
57 environmental education: *Pollution, Use of Resources, Ecosystems and Cycles*, and  
58  
59 *Biodiversity*.  
60

#### 4.2.1. Local and foreign/global images

It was considered to be a foreign image if it exhibited clearly fauna, flora, geologic or geographic pictures from other countries or other world regions. For example, Lithuania textbooks showed images from Brazil, Burkina Faso, Denmark, Great Britain and India. In general, a greater emphasis on local images was given rather than to foreign or global images (Figure 2). The majority of countries emphasise the local images: Italy-G, Senegal, Romania, Estonia, Finland, France-03, Italy-P, Malta, Morocco, Portugal and France-99. In contrast, the Lithuanian textbook is the only one giving much higher emphasis to foreign images. Other five textbooks have equal proportion of local and foreign/global images: Hungary, Germany, Italy-B, Italy-M and Lebanon (Figure 2).

[Insert figure 2 about here]

Following the remark by Girdwidz *et al.* (2006) that learning in “virtual” environments should be always complemented with “real” experiments in order to promote pupils’ abilities and skills in planning, realizing, and verifying the results from virtual situations, similarly, learning from “visual” material of textbooks should be also complemented with “real” experience of pupils in order to promote their ecological viewpoint and skills in tackling local or global ecological problems. In other words, balanced images representing local and foreign environments may attract students’ interest and challenge their curiosity and attention for the environment in general, instead of focusing only on their local, regional or national environment. The coexistence of local and foreign environments in textbook images can be considered as an attempt to point towards

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3 sustainability and cultivate a consequent ethic impression. However, when Lithuanian  
4 pupils read their textbook and find images information about pollution only in Gujarat,  
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6 Brasilia, Burkina Faso, Denmark, Britain, and India, and never in Lithuania, they  
7  
8 automatically get the message that these problems are not so serious in their own  
9  
10 environment. Consequently, they may feel that the responsibility for the solution of these  
11  
12 problems relates mainly to the citizens of those countries. On the contrary, when pupils  
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14 realize that the same problems facing their country are evident all over the world, then  
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16 they conceptually understand the need for coordinated efforts to provide sustainable  
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18 solutions.  
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#### 28 **4.2.2. Urban, rural and nature images**

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31 **We found** that urban and rural landscapes in textbooks often conveyed the negative  
32  
33 effects of human actions on natural ecosystems, showing an anthropocentric conception  
34  
35 about the environment. In contrast, nature was usually presented in the absence of  
36  
37 humans, not only in wilderness but also in town green spots and villages, such as, public  
38  
39 gardens and farms (Figure 3).  
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43 **[Insert figure 3 about here]**  
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51 Results showed a strict difference between textbooks from all Western European  
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53 countries and those from Eastern European countries and non-European countries as far  
54  
55 as the presence of urban/rural versus nature images are concerned. The former countries  
56  
57 exhibit more images of urban/rural landscape rather than nature: Italy-G, France-03,  
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59 France-99, Malta, Italy-M, Portugal, Italy-B, Finland, Italy-P, Germany (Figure 4).  
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**Anthropocentric view, which interprets that “natural world” exists entirely for human**

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3 benefits (Salite, 2002), is visible when nature is represented majority in rural and urban  
4  
5  
6 landscapes. In contrast, Eastern European countries and non-European countries present  
7  
8 more images showing nature than urban/rural landscapes: Romania, Morocco, Senegal,  
9  
10 Lebanon, Cyprus, Estonia, Lithuania and Hungary (Figure 4).  
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16 [Insert figure 4 about here]  
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21 As Rehmann-Sutter (2000) has pointed out, when one speaks about “nature” as  
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23 appearing in the wilderness, he/she has the notion that nature exists and develops by  
24  
25 itself without intervention from human beings. The above disproportions of images in  
26  
27 textbooks can shape public opinion that nature is the opposite of culture, society,  
28  
29 technology, and can promote the idea that persons play a role outside nature.  
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#### 36 4.2.3. Negative impact, human management, beauty of nature and neutral images

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39 A large proportion of images illustrated the *negative impact* (Figure 5, NI) by humans,  
40  
41 indicating authors’ attempts to fix students’ attention to some human indifference  
42  
43 towards nature and unwillingness in environment related actions. In general, textbook  
44  
45 pictures on *human management* conveyed positive impact on the environment,  
46  
47 indicating a real understanding of the importance to protect the different ecosystems  
48  
49 (Figure 5, HM). Images that showed the *beauty of nature* conveyed a positive human  
50  
51 impact too, as expressing the message that nature should be protected (Figure 5, BN).  
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53 Some of the pictures transmitted none of the above three kind of messages therefore  
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55 they were considered as *neutral images* (Figure 5, N). *Neutral images* and those on the  
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3 *beauty of nature* dominated in textbooks of Senegal and some Eastern European  
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5 countries (Cyprus, Romania, Lithuania, Hungary and Estonia).  
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11 **[Insert figure 5 about here]**  
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13 *Negative impact* was present in all countries textbooks. Western European countries  
14 textbooks (Italy-G, France-99, Portugal, Malta, Italy-M, France-03 and Germany)  
15 presented a large proportion of both *negative impact* and *human management* pictures,  
16 expressing the message about human power to change environment in both negative and  
17 positive trends. *Human management* was absent in textbooks from four countries:  
18 Lithuania, Cyprus, Morocco and Italy-P. **Strong, powerful negative impact images can be**  
19 **inadequate for environmental education as pupils can interpret them as alarming**  
20 **message suggesting that the environmental disturbance is so deep that this trend cannot**  
21 **be reversed and that humans can do very little or nothing for improving the situation.**  
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#### 38 **4.2.4. Presence of humans in images: images having men/ women in negative and** 39 **positive impact** 40 41

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43 In general, persons do not appear frequently in images. **From a total of 2136 images, men**  
44 **could be found in 157 images (7.4%) and women in 134 (6.3%), being the difference**  
45 **between groups not statistically significant ( $P>0.05$ ). Similarly, there were no significant**  
46 **differences ( $P>0.05$ ) between the presence of men (125 occurrences, 5.8%) and women**  
47 **(129 occurrences, 6.0%) in *positive impact* images, although women were more frequent**  
48 **than men. In contrast, considerably less persons could be found in *negative impact***  
49 **images and significant differences could be found between gender groups ( $P<0.05$ ), being**  
50 **more men (32, 1.5%) than women (5 occurrences, 0.4%), transmitting the idea that**  
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3 males, rather than females, are associated to the negative actions towards the  
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5 environment.  
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8 Interesting is the case of the Finish textbook that for the *negative impact* images showed  
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10 only men (10 occurrences, Figure 6A) whereas for the *positive impact* showed more  
11  
12 women (70 occurrences) than men (23 occurrences) (Figure 6B). Women in higher  
13  
14 presence than men could be found in European countries only: Finland, Lithuania,  
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16 Hungary, Italy-G, Italy-M, Malta and Portugal (Figure 6B).  
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28 Most images expressing the human *negative impact* on the environment did not include  
29  
30 persons, but only machines and the polluted areas, as in the textbooks from Senegal,  
31  
32 Lithuania, Hungary, Italy-P, Italy-M and Estonia (Figure 6A).  
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35 There were also few images where persons appeared as victims of the degradation of the  
36  
37 environment, as the example of the Hungarian textbook, where the images presented  
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39 children playing in a nearby polluted river or next to the dirty and polluted area of a  
40  
41 chemical factory (Figure 7).  
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53 [Insert figure 7 about here]  
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54 The fact that men are strictly more frequently presented in *negative impact* images and  
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56 women in *positive impact* ones, shows a clear association with the social representation  
57  
58 of men and women in society: men with the male active role in society and women with a  
59  
60 contemplative view in the beauty of nature.

#### 4. CONCLUDING REMARKS AND IMPLICATIONS

Sustainable development is a major issue nowadays and textbooks are good tools to contribute to children's and young people's learning and acquiring competences and willingness for environmental protection and management. According to Sachs (1993), to reach environmental sustainability it is necessary to consider simultaneously five dimensions: *spatial*, *economical*, *ecological*, *social* and *cultural* dimensions. The *spatial dimension* incorporates a balanced configuration of the local-global and rural-urban issues; the *economical dimension* looks at the possibility of efficient allocation and management of resources; the *ecological dimension* involves research and measures not only to reduce resources consumption but also to intensify resource saving technologies, in order to define rules allowing an appropriate environmental protection; the *social dimension* aims at reducing distance between life pattern of social groups; the *cultural dimensions* cover the acknowledgement of the peculiarity of each ecosystem, culture and local history. In the present study, we found images associated to all these five aspects and we looked at the specificities found among groups of countries.

Having in mind the *spatial aspects*, the textbooks of most countries showed a higher number of local images. We think that young people at the age of 14-16 years old should be introduced to peculiarities of foreign ecosystems (including cultural aspects) in order to get aware of a wide-reaching view of the geo-socio-cultural diversity of the world. According to O'Connor (1992) the slogan "act locally thinking globally" has limitations, since it is also necessary to act globally, advocating and adopting policies at planetary level, enabling to avoid the impositions of private interests and prejudicial values to other persons, to other populations or continents and also to future generations. Therefore 14-

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3 16 years old textbooks should give balanced importance to either local or foreign/global  
4 images as we observed in textbooks from Hungary, Germany, Italy and Lebanon.  
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8 The emphasis in urban-rural and nature is also a matter of the *spatial* dimension. The  
9 results showed that the Western European countries – in contrast to the Eastern  
10 European countries and non-European countries – exhibited more images of urban-rural  
11 landscape rather than nature. We suggest that textbooks from these Western European  
12 countries should give more emphasis to images of nature since it has been argued that  
13 these images influence individual behaviour and the willingness to valorise and to protect  
14 the environment (Bogner, 1998; Gobster, 2001, referred in Korfiatis *et al.*, 2004).  
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17  
18 As mentioned above, both *economical* and *ecological* dimensions focus on the  
19 consumption and management of natural resources. Results from the textbook analysis  
20 showed that the *negative impact* images were more frequent than the *positive impact*  
21 ones in all countries and the main value represented in these images regarded raw  
22 material and food for human consumption. Similar results have been found by Korfiatis  
23 and collaborators (2004). In textbooks from four countries (Lithuania, Cyprus, Morocco  
24 and Italy-P) *human management* images are absent. The presence of negative impact  
25 images together with the absence of human management images in these textbooks  
26 indicates that authors aimed at showing ecological problems but paid no attention how to  
27 solve them, which may compromise the education for the environmental sustainability  
28 (Woollcombe, 2002; Jacobi, 2003).  
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31  
32 Finally, both *social* and *cultural* dimensions could also be analysed in the 14 countries  
33 textbooks. *Only in negative impact images the men presence dominated comparing to*  
34 *women, transmitting the message that women have a lower role in disturbing the*  
35 *environment which is in agreement with data showing that girls are more sensitive to the*  
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3 environmental issues than boys (Sørensen, 2007). Excepting textbooks from Eastern  
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5 European countries (Romania, Lithuania, Hungary and Estonia) and Senegal, the other  
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7 textbooks give more emphasis to *negative impact* and *human management* rather than  
8  
9 the *beauty of nature*, which is in contrast to what is argued by Dunlap and colleagues  
10  
11 (2000) defending that persons should live in harmony with the nature instead of using it  
12  
13 as a resource for their needs. This is in accordance to the UNESCO (2004:13) message  
14  
15 which defends that sustainable development has the purpose of “*life with several*  
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17 *individual, institutional and society challenges, to have the vision of tomorrow as a day*  
18  
19 *that belong to all or it will not belong to anyone*”.

20  
21 In brief, this study on textbooks addressed to 14-15 years old young people suggests that  
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23 most countries should introduce to wider foreign images on human-nature relationship.  
24  
25 The textbooks from Eastern European countries should give more emphasis to both  
26  
27 *human management* and urban and rural images whereas those from Western European  
28  
29 countries should pay attention to the *beauty of nature*. Furthermore, the subtopics of  
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31 biodiversity and pollution should be introduced in textbooks from Cyprus and Morocco,  
32  
33 respectively. Finally, a balance in the presence of men and women in images (either with  
34  
35 *negative or positive impact*) should be a matter of greater concern by all textbooks  
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37 authors and publishers.  
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52  
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54  
55 2004-506015 and the Portuguese FCT project (“Analysis of school textbooks”  
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57 PTDC/CED/65224/200).  
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3 The authors particularly thank the colleagues who gathered data or coordinated this  
4 process concerning the topic "Environmental Education" in the textbooks of their  
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3 **Environmental Education and Sustainable Development** in images of textbooks  
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6 **from European and non-European countries: Analysis of spatial, ecological,**  
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8 **economical, social and cultural dimensions**  
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14 Tables  
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24 **Table 1.** The part of the grid constructed by the European project BIOHEAD-CITIZEN  
25 “Content of images: Humans and Nature” used in the present study.  
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	Images of natural environments	Images of nature with human activities	Urban environment	Rural landscapes	Humans in environments		
					M	F	M+F
Images of local environments							
Images of “exotic” environments							
Images illustrating the negative human impact							
Images emphasizing the beauty of nature							
Images illustrating human management of environment							

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**Table 2.** Number of pages and images addressing the four subtopics of Ecology and Environmental Education in 25 textbooks from 14 Countries.

	Country	Number of Pages (P)					Number of Images (I)					I/P
		Pol	UR	EC	Bio	Total	Pol	UR	EC	Bio	Total	
1	Cyprus (1999)	112	23	55	-	<b>190</b>	16	24	55	-	<b>95</b>	<b>0.5</b>
2	Estonia (2002)	17	4	12	23	<b>56</b>	13	2	10	6	<b>31</b>	<b>0.6</b>
3	Finland (2004)	59	25	-	-	<b>84</b>	137	47	-	-	<b>184</b>	<b>2.2</b>
4	Finland (2005)	-	-	18	14	<b>32</b>	-	-	30	30	<b>60</b>	<b>1.9</b>
5	France (2003)	10	5	5	7	<b>27</b>	22	5	5	6	<b>38</b>	<b>1.4</b>
6	France (1999)	10	4	33	12	<b>59</b>	25	3	9	14	<b>51</b>	<b>0.9</b>
7	Germany (1994)	11	7	47	-	<b>65</b>	8	19	60	-	<b>87</b>	<b>1.3</b>
8	Germany (2005)	-	-	-	19	<b>19</b>	-	-	-	54	<b>54</b>	<b>2.8</b>
9	Hungary (2003)	4	-	4	3	<b>11</b>	13	-	13	6	<b>32</b>	<b>2.9</b>
10	Hungary (2004)	-	22	-	-	<b>22</b>	-	37	-	-	<b>37</b>	<b>1.7</b>
11	Italy-G (2004)	7	2	34	6	<b>49</b>	8	2	57	8	<b>75</b>	<b>1.5</b>
12	Italy-M (2000)	7	9	28	9	<b>53</b>	19	18	63	9	<b>109</b>	<b>2.1</b>
13	Italy-B (2004)	20	60	36	18	<b>134</b>	31	95	57	20	<b>203</b>	<b>1.5</b>
14	Italy-P (2001)	18	18	16	3	<b>55</b>	5	9	29	3	<b>46</b>	<b>0.8</b>
15	Lebanon (2001)	-	-	33	15	<b>48</b>	-	-	44	23	<b>67</b>	<b>1.4</b>
16	Lebanon (2004)	56	-	-	-	<b>56</b>	74	-	-	-	<b>74</b>	<b>1.3</b>
17	Lebanon (2005)	-	4	-	-	<b>4</b>	-	14	-	-	<b>14</b>	<b>3.5</b>
18	Lithuania (2000)	7	12	11	3	<b>33</b>	7	8	15	1	<b>31</b>	<b>0.9</b>
19	Malta (1986)	8	4	39	6	<b>57</b>	14	12	67	11	<b>104</b>	<b>1.8</b>
20	Morocco-A (2005)	-	9	78	-	<b>87</b>	-	29	189	-	<b>218</b>	<b>2.5</b>
21	Morocco-S (2005)	-	-	-	57	<b>57</b>	-	-	-	12	<b>12</b>	<b>0.2</b>
22	Portugal (2004)	17	8	10	6	<b>41</b>	23	8	9	5	<b>45</b>	<b>1.1</b>
23	Romania (2000)	12	3	30	83	<b>128</b>	19	9	125	195	<b>348</b>	<b>2.7</b>
24	Senegal (1986)	5	-	139	15	<b>159</b>	4	-	58	35	<b>97</b>	<b>0.6</b>
25	Senegal (1996)	-	13	-	-	<b>13</b>	-	24	-	-	<b>24</b>	<b>1.8</b>
	<b>TOTAL</b>	<b>380</b>	<b>232</b>	<b>628</b>	<b>299</b>	<b>1539</b>	<b>438</b>	<b>365</b>	<b>895</b>	<b>438</b>	<b>2136</b>	<b>---</b>

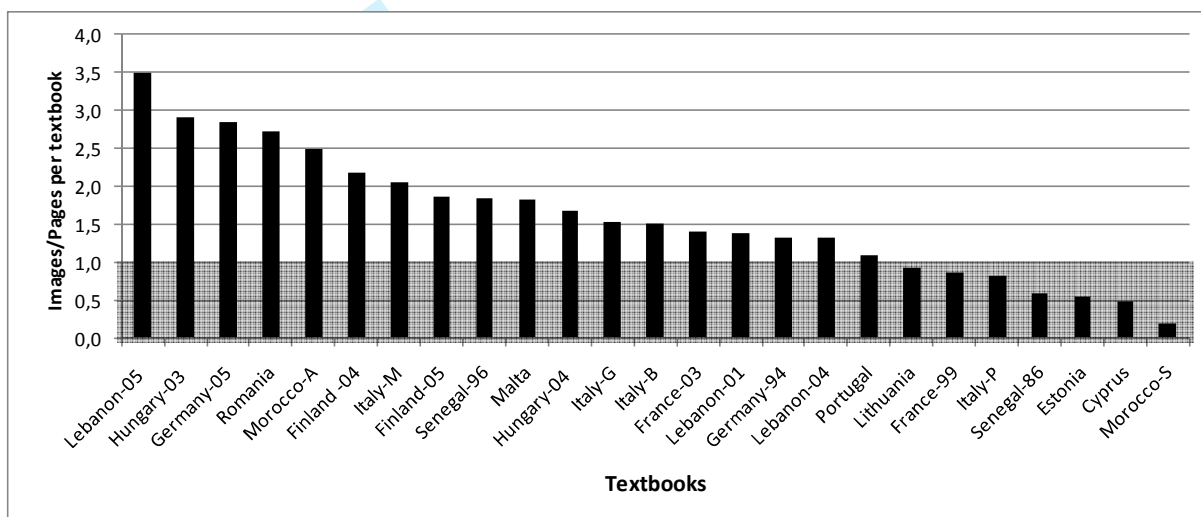
**Annex 1**  
**List of analyzed Textbooks**

N°	Country	Pupils' age	Author(s)	Title	Publisher	Year
1	Cyprus	16-17	Michaelides, A. et al.	Επιστήμη του περιβάλλοντος. (Environmental science).	Ministry of education – Cyprus.	1999
2	Estonia	14	Martin, M.	Bioloogia põhikoolile III. (Biology for primary school III).	AS BIT	2002
3	Finland	15-19	Happonen, P., Holopainen, M., Sotkas, P., Tenhunen, A., Tihtarinen-Ulmanen, M. & Venäläinen, J.	Bios 1: Eliömaailma. (Bios 1: The world of living organisms).	Aalto, V./ WSOY.	2005
4	Finland	15-19	Happonen, P., Holopainen, M., Sotkas, P., Tenhunen, A., Tihtarinen-Ulmanen, M. & Venäläinen, J.	Bios 3: Ympäristöekologia. (BIOS 3: Environmental Ecology).	Aalto, V./ WSOY.	2004
5	France-03	14-15	Chapron, G., Charles, M., Duco, A., Grandouillet, D., Guibert, S. & Schmidt, F	Sciences de la vie et de la Terre 3 <sup>e</sup> . (Life and Earth Sciences 3 <sup>e</sup> ).	Belin.	2003
6	France-99	14-15	Tavernier, R. & Lizeaux, C.	Sciences de la vie et de la Terre 3 <sup>e</sup> . Life and Earth science 3 <sup>e</sup> ).	Paris: Bordas	1999
7	Germany	13-14	Bonora, V., Dieterle, A., Görz, G., Gotzler, H. & Libera, W.	Natura 8 – Biologie für Gymnasien Bayern (Nature 8 – Biology for grammar school, Bavarian edition).	Stuttgart: Ernst Klett Schulbuchverlag GmbH.	1994
8	Germany	14-15	Bonora, V., Dieterle, A., Görz, G., Gotzler, H. & Libera, W.	Natura 9. Jahrgangsstufe, Biologie für Gymnasium Bayern. (Nature 9, biology for grammar school, Bavarian edition).	Stuttgart: Ernst Klett Schulbuchverlag GmbH.	2005
9	Hungary	13-14	Gyuláné, A. & István, F.	A távoli tájak élővilága és az élőlények rendszere. (Fauna and flora of far lands and system of the living beings).	Dr. Paál Tamásné.	2003
10	Hungary	16	Makádi, M. & Taraczközi, A.	A Föld, amelyen élünk. (Earth, where we are living).	Hungary.	2001
11	Italy-G	14-17	Gainotti, A. & Modelli, A.	Biologia – Diversità e unità dei viventi Mod A – D (Biology - Difference and unity of the living Mod A – D)	Zanichelli	2004

12	Italy-M	14-17	Miller, K. R. & Levine J.	Il mondo della natura. Il punto di vista della Biologia V ol A-F (The world of the nature. The point of view of the Biology)	Edizioni scolastiche, Bruno Mondadori	2000
13	Italy-B	14-17	Boschetti, M. & Fedrizzi, E.	Nuovo Ecosistema Terra. Vol. SA (New Earth ecosystem. Vol. SA)	Minerva italica	2004
14	Italy-P	14-17	Piseri, A, Poltronieri, P. & Vitale, P.	Vivere. Percorsi modulari di Biologia. Vol.B. I viventi nell'ambiente (To live. Modular Units of Biology. Vol. B. Living beings in the environment.)	Loescher	2001
15	Lebanon	16	Dagher, J., Hajjar, Z., Safi, S. & Sabehe, M.	Life science (science section).	CNDPR.	1999
16	Lebanon	15	Jammal, N., Dagher, J., Ghorayeb, L., Hajjar, Z., Hossari, A., Sabehe, M. & Shbaro, C.	Life science.	CNDPR.	1998
17	Lebanon	14	Lebdeh, D.A., Dakrauh, R., Seif, N.A. & Jarjou, Z.G.	Life and Earth sciences.	CNRDP.	2000
18	Lithuania	15-16	Price, G. & Taylor, J.	Biologija. (Biology).	Vilnius: Alma Littera.	2000
19	Malta	13-16	Mackean, D. G.	GSCE biology.	GSCE	1986
20	Morocco-A	15-16	Addak, A., Hamid, A., Hamouch, A., Belaamiri, M., Assassi, N.E. & Jabbar, B.	منهل علوم الحياة و الارض (Almanac in the life and earth sciences)	IMARSSI, arts du 21° sciecle.	2005
21	Morocco-S	15-16	Sadki, A., Mokhlis, A., Elhodaigui, M., Elouardi, M., Khwadji, A., Benabboud, J., Ahguig, A., Bry, M.	المفيد في علوم الحياة و الأرض الجدد المشترك العلمي (The interesting in live and earth sciences)	Dar Attakafa Casablanca	2005
22	Portugal	14-15	Dias da Silva, A., Gramaxo, F., Santos, M. E. & Mesquita, A. F.	Terra, Universo de Vida – 2ª Parte. (Earth, Universe of life – 2ª Part).	Porto Editora.	2004
23	Romania	14-15	Mihail, A. & Mohan, Ghe.	Biologie - Manual pentru clasa a VIII- a. (Biology - Textbook for the 8 th class).	Bucuresti: Editura All.	2000
24	Senegal	17-18	Djakou, R. T. & Thanon, S. Y.	Ecologie – Géologie - Afrique intertropicale. (Ecology – Geology – Inter-tropical Africa).	Paris: Bordas.	1986
25	Senegal	14-15	Djakou, R. T. & Thanon, S. Y.	Géologie – Biologie. (Geology – Biology)	Editions Nathan, Paris.	1996

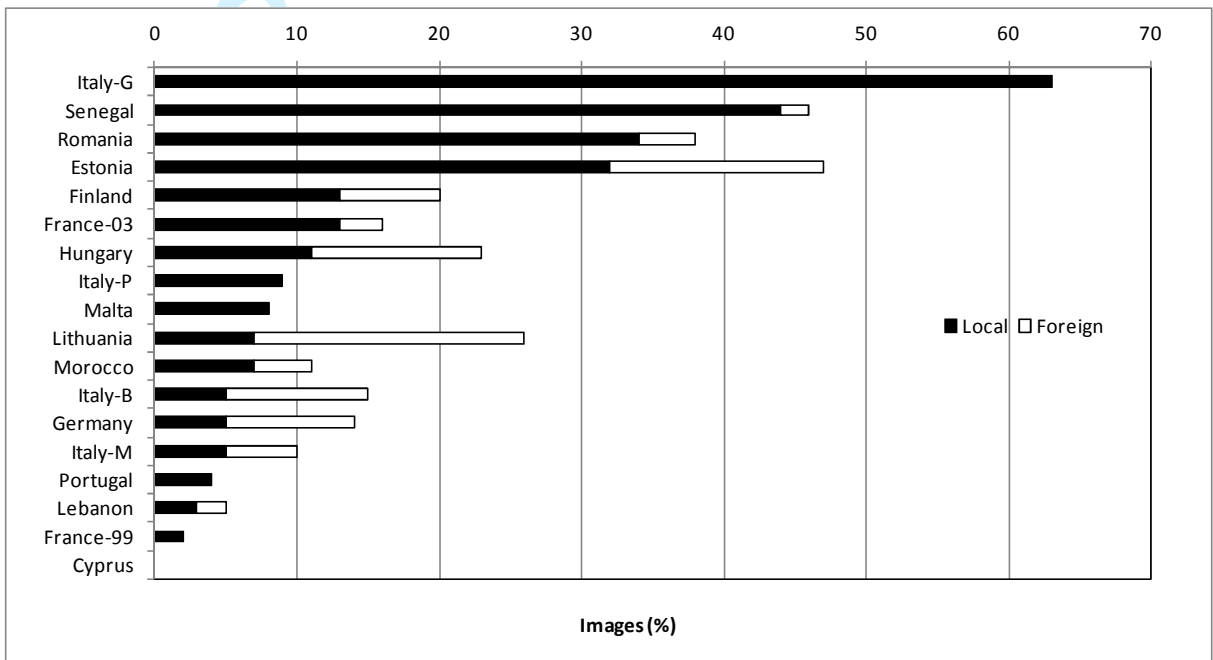
**Environmental Education and Sustainable Development in images of textbooks from European and non-European countries: Analysis of spatial, ecological, economical, social and cultural dimensions**

Figures



**Figure 1.** Proportion of the number of images and pages addressing Environmental Education in 25 textbooks from 14 Countries.

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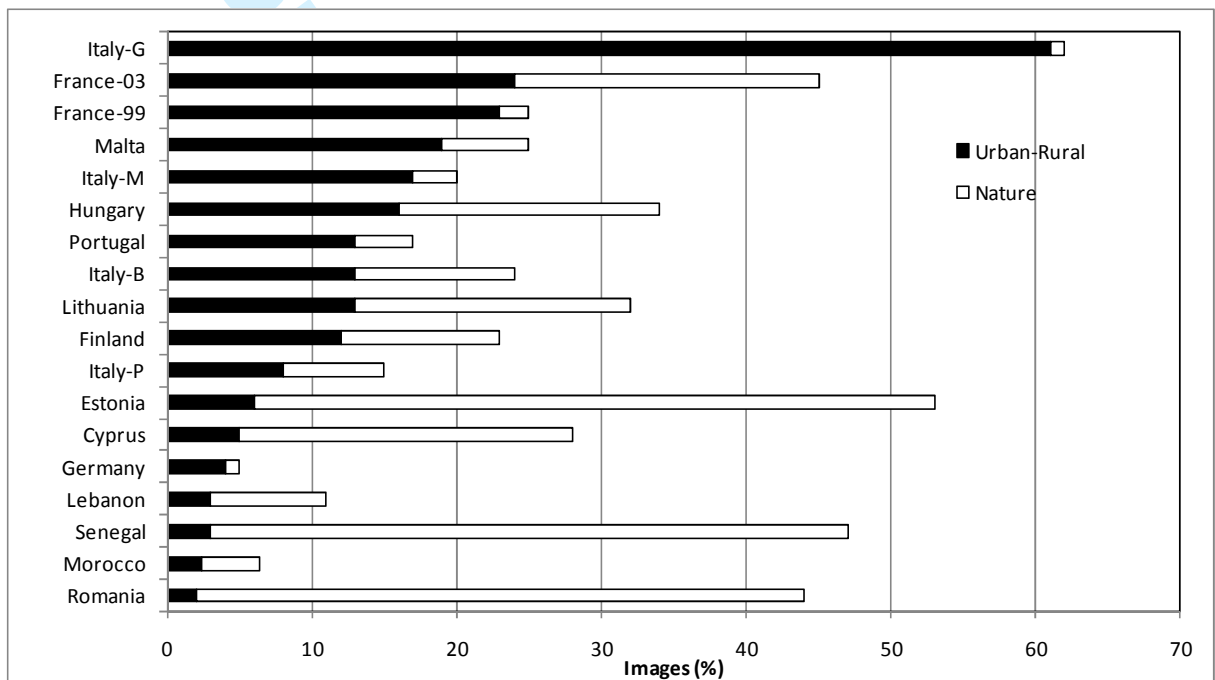
**Figure 2.** Proportion of local and foreign images exhibited in the four subtopics of Environmental Education in textbooks from 14 Countries.



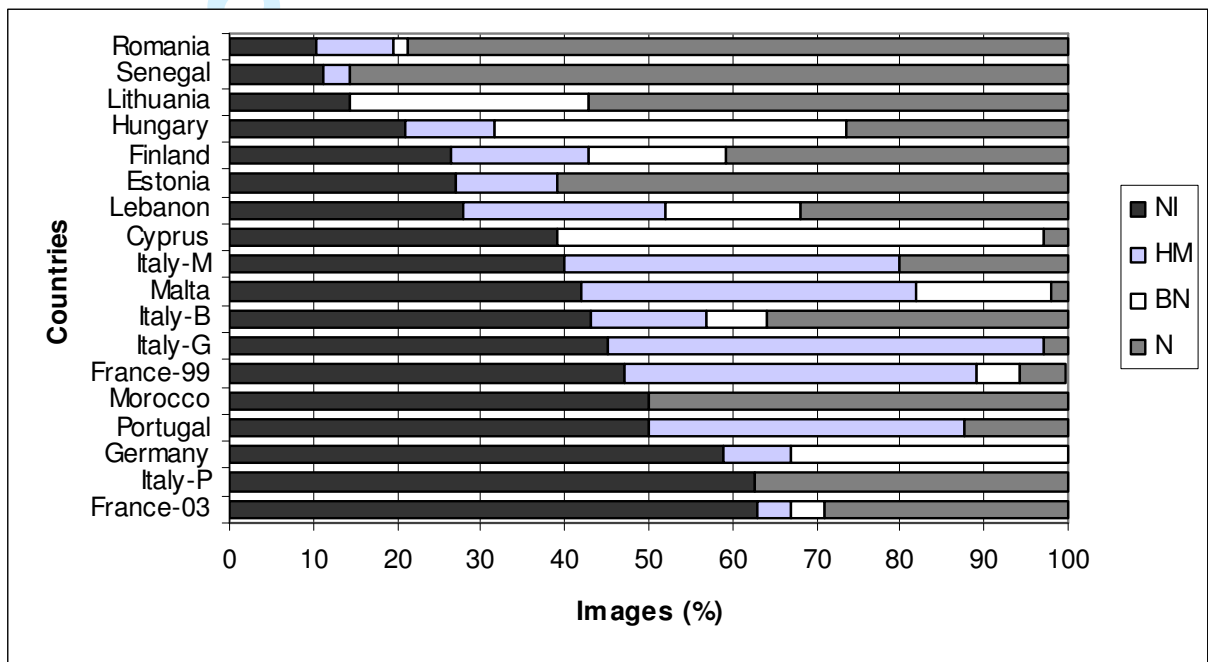
**Figure 3.** Examples of images showing nature in urban and rural landscapes.  
A – Portugal textbook; B – France-99 textbook.



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**Figure 4.** Proportion of Urban/ Rural and Nature images exhibited in textbooks from 14 Countries.



**Figure 5.** Proportion of the Nature and Humans in the images of subtopics.

Abbreviations: NI. Images illustrating the *negative impact* by humans;

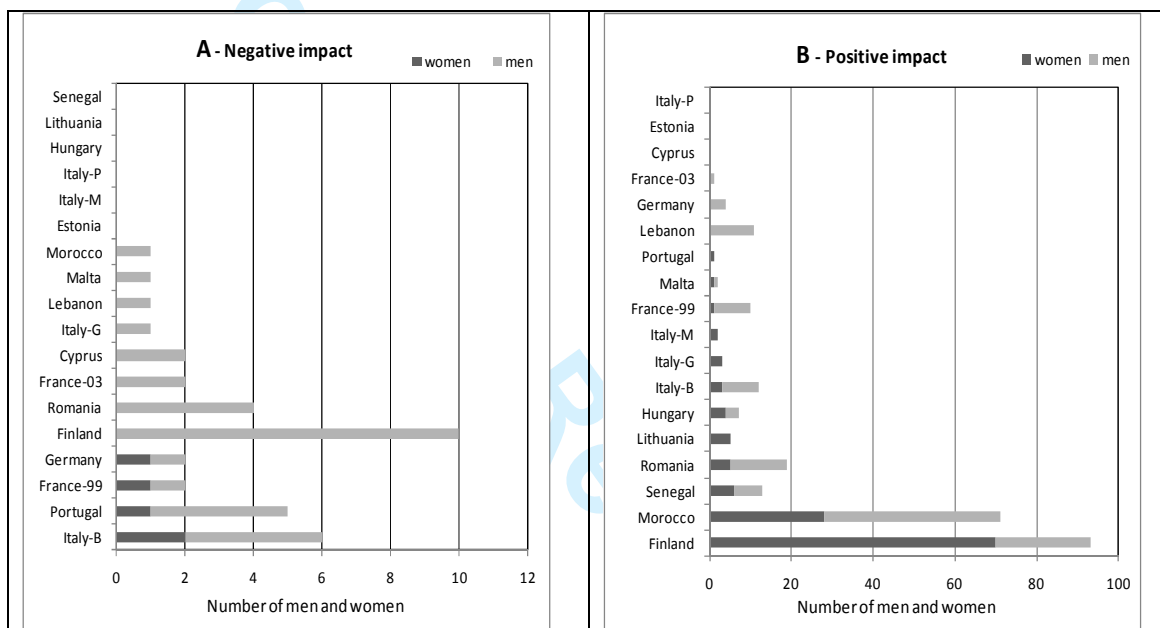
HM. Images illustrating *human management* of the environment;

BN. Images emphasizing the *beauty of nature*;

N. *Neutral* images.

(Other abbreviations as in Figure 1)

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**Figure 6.** Number of men and women exhibited in images with negative impact (A) or positive impact (B) of textbooks from 14 Countries. Note the scales are different.



**Figure 7.** Examples of negative impact images showing humans as victims of the polluted environment.  
Hungary textbook.

## Trend in environmental education images of textbooks from Western and Eastern European countries and non-European countries

### Abstract

Textbook analysis is seen as a major element for studying environmental education addressing pupils, being image analysis rather relevant when studying textbooks written in 11 languages. We analysed 25 textbooks from 14 countries addressed to 14-16 years old pupils, focusing on: (i) local and foreign/global images; (ii) urban/rural and nature images; (iii) negative impact, human management and the beauty of nature; and (iv) men and women in images with negative and positive impact. We distinguished some trends between Western (WEc) and Eastern (EEc) European countries and non-European countries (NEc). In contrast to textbooks from EEc and NEc, which tend to show the beauty of nature with little humans' influence, WEc textbooks tend to exhibit more images of urban/rural landscape, of human negative impact and of human management, expressing an anthropocentric view about the environment. Men are usually more present in textbook images than women. However, some images exhibiting more women than men could be found in textbooks from WEc and EEc, but never in NEc. In negative impact pictures, men are more often present than women but NEc women are never present in such images. Women are more frequent than men in positive impact images. Results suggest that textbooks from EEc and NEc should give more emphasis to human management and urban/rural images whereas those from WEc should give more attention to the beauty of nature. A balance in the presence of men and women in images should be a matter of greater concern by all textbooks authors and publishers.

### Concepts of Environmental Education (EE) and Sustainable Development (SD)

The concept of environmental education (EE) has emerged with dominant reductionism programmes and education oriented primarily to the conservation of basic resources. William B. Stapp and his colleagues (1969) have defined and proposed two major objectives of EE focused on (i) community environment and its associated problems and (ii) the role of the citizens of all ages in working towards the solution of these problems. This earlier concept of EE was adopted by the world community at the Tbilisi Intergovernmental Conference on EE in 1977 (UNESCO, 1980), assuming EE as a process aiming at promoting people aware of and concerned about the global environment and its associated problems, and developing attitudes, motivations, knowledge, commitment and skills to work individually and collectively towards solutions of current problems and the prevention of new ones.

Although the concept of EE varies slightly under different conditions and in response to local situations, in general it focuses on (i) awareness and sensitivity about environmental and environmental challenges; (ii) knowledge and understanding of environmental issues at a variety of levels, ranging from local to global and including understanding of different influences, either natural or human ones; (iii) attitudes towards the concern for the environment and the systems of values underlying such attitudes, helping to maintain the environmental quality; (iv) skills to mitigate and solve the environmental problems; and (v) active participation in existing environmental related programmes (Palmer, 2003).

In 1987, the United Nations World Commission on Environment and Development issued the Brundtland report, "Our Common Future", which proposes some advances towards sustainability, *i.e.* sustainable development (SD), or development that meets 'the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987, p. 12). It includes three dimensions (environmental responsibility, economic return and social development) and five areas for SD: (i) economic growth; (ii) equity, *i.e.* a fair allocation of resources to sustain growth; (iii) more democratic systems; (iv) adoption of

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3 lifestyles within the planet ecological means; (iv) population levels within the productive  
4 potential of ecosystems. Despite its commendable objectives, the Brundtland Report (WCED,  
5 1987) has been subject to some criticism from those who claim that development is too often  
6 associated to economical growth, assuming the economic development cannot be allowed to  
7 go on degrading the environment (Lélé, 1991). A widely used concept of SD has been  
8 defined as 'improving the quality of life while living within the carrying capacity of  
9 supporting ecosystems' (Jacobs, 1996, p. 26).

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20 The Conference in Rio de Janeiro emphasized the significance of Sustainable  
21 Development in Agenda 21 (UNESCO, 1992). This document calls for a reorientation of EE  
22 and introduces the principle of sustainability and the need to apply it to economic, social and  
23 environmental aspects. Sauvè (1996) summarizes in two ways the multiple views regarding  
24 how environmental education should be linked to sustainable development: (i) adding SD  
25 objectives to existing EE goals and (ii) ultimating goals of SD to EE. The latter is close to  
26 Education for Sustainable Development (Sauvè, 1996) and the concept of sustainable  
27 development as systematic, long-term utilization of natural resources ensuring the  
28 accessibility of these resources for future generations has been largely accepted (Salite, 2002;  
29 2003).

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Environmental education nowadays intends to provide people with an understanding of their natural and cultural environment and to enable the development of new rules, practices and values, encouraging the sustainable use and development of natural resources and the improvement of quality of life for all living beings (Obara *et al.*, 2009). Responsible environmental action requires serious reasoning about environmental issues. Drummond and Marsden (1999) discuss two alternative and extreme positions on sustainability, grounded on two philosophical positions, anthropocentrism and ecocentrism, respectively, soft and hard sustainability. The main task of soft sustainability is prevention of catastrophe for human society accepting science and modern technologies and intergeneration distribution treated

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3 separately, aversion lower environmental risk. The main task of hard sustainability is  
4 promotion of society in harmony with supporting ecosystems and questions science for  
5 seeking alternative technologies.  
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10 For Salite (2002) the anthropocentrism stresses the significance of human beings and  
11 capability of humans to understand and control natural processes in a desirable direction. In  
12 this view, the focus is on the development of normative criteria for energy connections  
13 between humans and the environment, such as the monitoring of human actions, the  
14 calculation of human impact on nature. The latter, the ecocentrism, is looking for ways of  
15 creating cohesion with human life and life-supporting systems, as complementary components  
16 within the ecosphere. Here the focus is on the psychological-ethical relationship between  
17 humans and nature, i.e. it undertakes studies on the aims, values, attitudes and humans'  
18 actions. Both levels of seeking solutions for problems of sustainable development have been  
19 gradually adopted as typical approaches to education and in the consciousness of society but,  
20 gradually, the ecocentrism recognition has been increasing (Filho, 2000; Salite, 2002; Postma,  
21 2006). Furthermore, Dawe & Ryan (2003) insist that sustainable development is definitely  
22 anthropocentric and thus unable to dissolve the false barriers between the human sphere of  
23 economic and social activities and the ecological sphere that sustains these activities  
24 (Sneddon *et al.*, 2006). After all, only the needs of (present and future) humans are considered  
25 in its definition (Postma, 2006).  
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### 51 **The role of images in textbooks on environmental education**

52 Textbooks are cultural artefacts which participate in the cognitive and social organization of  
53 knowledge (Lebrun, 2007). They translate national programmes guidelines which are the  
54 expression of national education policies. Textbooks are used by teachers with a double  
55 function: as a national programme (or syllabuses) guideline and as a didactical resource  
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3 (Carvalho *et al.*, 2009). Thus, the textbook analysis turns out to be a relevant tool for studying  
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5 socio-cultural determinants of environmental problems, in particular the school-related ones.  
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8 Most of the studies on textbook analysis have focused on the text analysis but iconic  
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10 information has been considered as authenticating what the text is about (Pinto & Ametller  
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12 2002; Pozzer & Roth, 2003). In contrast to the need for interpreting and understanding the  
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14 complex textual language, pictures are autonomous systems of communication that do not  
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16 simply reproduce reality but produce images of reality which are bound up with the interests  
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18 of the social institutions (as school) within which the pictures are produced, circulated and  
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20 read (Kress & van Leeuwen, 1996). Therefore they are a suitable tool for the assessment of  
21  
22 semantic contents and hence to create specific types of order, relations and identities within  
23  
24 the pedagogic and the more general communicative discourse (Dimopoulos *et al.*, 2003).  
25  
26 Image analysis turns out to be rather relevant when analysing textbooks from 14 countries  
27  
28 with 11 different languages.  
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34 Images that appear in the textbooks have a major importance in the construction of  
35  
36 pupils' conceptions, and they serve to wake emotions and actions. It has been claimed that  
37  
38 some images are better memorized than the corresponding text (Meyers, 1990; Korfiatis *et al.*,  
39  
40 2004; Pozzer & Roth, 2003) and that they have had an important role in the environmental  
41  
42 wakeup since the 60s (Seppanen & Valiverronen, 2003). For example, images of human-  
43  
44 nature relationship might be given in two oppositions (Schroeder, 2007): 'people apart from  
45  
46 nature' and 'people as a part of nature'. The former represents a belief that human beings are  
47  
48 somehow different or separate from the natural world. This view implies that the presence of  
49  
50 people in images, their artefacts and activities give a negative impact by diminishing the  
51  
52 naturalness of the environment. Therefore, nature is seen as having an intrinsic order,  
53  
54 harmony, or beauty, in a world where humans are absent. It represents the belief that human  
55  
56 beings belong to the natural world and they live and coop with nature, not necessarily  
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58 destroying it. Some authors (Schultz, 2000; Korfiatis *et al.*, 2004) have shown that people  
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3 who see themselves as more connected to nature score higher on measures of ecocentric  
4 concern and lower on measures of utilitarian or anthropocentric perspective with respect to  
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8 environmental problems. In addition, Schults and collaborators (2004) have found that  
9  
10 believing in oneself as being included in nature vary in different cultures and may be  
11  
12 influenced by situational and environmental factors, for example, people who live in large  
13  
14 cities and are distanced from the natural world might see themselves as less connected to  
15  
16 nature. Similarly, Hernández and collaborators (2007) have found that place attachment and  
17  
18 place identity in natives and non-natives is an affective factor for sensibility and deeper look  
19  
20 into environmental problems.  
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25 A great deal of theoretical uncertainty exists regarding gender differences in  
26  
27 environmental concern that can be seen in three perspectives: (i) difference in sensitivity of  
28  
29 gender to environmental problems; (ii) social roles of gender; (iii) gender equality in  
30  
31 education. (Glaschi, 2000; Leach, 2003; MacDonnald & Hara, 1994; Mephram, 2008;  
32  
33 Sørensen, 2007). Gender parity and gender equality in education mean different things:  
34  
35 reaching parity should be considered as a first stage measure of progress towards gender  
36  
37 equality in education (UNESCO 2003). In the past, textbooks tended to exhibit gender  
38  
39 stereotypes (Glashi, 2000) but in the last two decades the educational systems of most  
40  
41 countries have been centring their action against discrimination or inequalities of any order  
42  
43 (Leach, 2003). This surveillance includes text and images in school textbooks. In the present  
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45 study we analysed the presence of men and women in images associated to environmental  
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47 issues.  
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### 56 **Objectives and methodological approach**

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58 Environmental education embraces four important issues (Caravita *et al.*, 2008): (i)  
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60 *Ecosystems*, particularly related with the dynamics of systems; (ii) *Biodiversity*, as a central

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3 concept in the comprehension of evolution and of the policies of control and ecological  
4 management; (iii) *Pollution*, as the introduction of contaminants causing harm to the  
5 environment; (iv) and the *Use of Resources*, which are important topics involving values and  
6 beliefs, and that are central in the education for a sustainable future. In the present study we  
7 analysed these four important environmental education topics in textbooks of 14 countries  
8 from Western Europe, Eastern Europe and outside Europe.

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17 Furthermore, the textbook analysis focused the five dimensions required to reach  
18 environmental sustainability (Sachs, 1993): *spatial, economical, ecological, social* and  
19 *cultural* dimensions. The (i) *spatial dimension* incorporates a balanced configuration of the  
20 *local versus global and urban/rural versus natural environment*; (ii) the *economical dimension*  
21 looks at the *human management* of resources; (iii) the *ecological dimension* involves research  
22 and measures not only to reduce resources consumption but also to intensify resource saving  
23 technologies, in order to define rules allowing an appropriate environmental protection; (iv)  
24 the *social dimension* aims at reducing distance between life pattern of social groups; and (v)  
25 the *cultural dimensions* cover the acknowledgement of the peculiarity of each ecosystem,  
26 culture and local history. In this study we carried out quantitative and qualitative analyses of  
27 images on the topic environmental education in textbooks of 14 countries, having focused on:  
28 (i) local and foreign/global images; (ii) urban/rural and nature images; (iii) negative impact,  
29 human management and the beauty of nature; and (iv) men and women in images with  
30 negative and positive impact.

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51 The present study was developed within the large European project BIOHEAD-  
52 CITIZEN (FP6, STREP CIT2-CT-2004-506015; Carvalho, 2004) involving nineteen  
53 countries: thirteen European countries (Cyprus, Estonia, England, Finland, France, Germany,  
54 Hungary, Italy, Lithuania, Malta, Poland, Portugal and Romania), five African countries  
55 (Algeria, Morocco, Mozambique, Tunisia and Senegal) and one from the Middle East  
56 (Lebanon). The aim of this project is to deepen the understanding of how different aspects of  
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3 citizenship can be promoted through biology, health and environmental education. It is  
4  
5 intended to improve the understanding across different disciplines and across different  
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7 countries, specifically aiming at identifying key issues for improving the transmission of  
8  
9 science knowledge in the perspective of reinforcing the link between science and education  
10  
11 and contributing to a better citizenship in a knowledge based society (Carvalho, 2004). Two  
12  
13 main approaches have been carried out in this project: one, seeking teachers' and future  
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15 teachers' conceptions about biology, health and environmental issues and, the other, looking  
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17 at the same issues in current school textbooks in the same countries.  
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22 For the design of the BIOHEAD-CITIZEN grids to be applied in textbooks analysis,  
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24 four precise subtopics of environmental education being exemplar of interactions between  
25  
26 Science and Society and challenges in Citizenship were chosen. They were: Pollution, Use of  
27  
28 Resources, Ecosystems and Biodiversity (Caravita *et al.*, 2008). These grids of analysis were  
29  
30 the result of a collective and international work carried out by researchers from all the  
31  
32 countries involved in the project. For the grids construction, a sample of textbooks from all  
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34 countries was analysed in a project meeting, and an initial version of the grids was built.  
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36 Then, in each country, these grids were pre-tested on at least one textbook. The final version  
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38 of the grids took into account the results of this pre-test (Carvalho *et al.*, 2009; Tracana *et al.*,  
39  
40 2008; Tracana, 2009). This final grid was applied by each team in its country textbooks. The  
41  
42 problem of subjective interpretation in this kind of qualitative analyse, was controlled by  
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44 having two analysts applying separately the grids and cross-checking the findings afterwards.  
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50 In the present study we used a part of the long grid related to the qualitative and  
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52 quantitative images analysis (Table 1). To assess the occurrences of each indicator, the grid  
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54 was applied by noting the page numbers and the quantity of images found in each textbook.  
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56 The same picture could be analysed in different contexts, for example, one image of "local"  
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58 environment could also illustrate human "negative impact" in rural landscape. All images  
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60 were examined and grouped into categories according to Table 1: (i) local and "exotic"

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3 (foreign/global) environments; (ii) natural (with or without humans) and urban/rural  
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5 environments; (iii) negative impact, human management and the beauty of nature; and (iv)  
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7 men and women in environments with negative and positive impact.  
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12 **[Insert table 1 about here]**  
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17 It was considered to be an “exotic or foreign/global environment” if the image exhibited  
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19 clearly fauna, flora, geologic or geographic pictures of other countries or other world regions  
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21 than the textbook. “Natural environments” were images showing nature without the apparent  
22  
23 intervention of humans, such as forests, mountains and marine ecosystems, or  
24  
25 pictures/drawings of fauna and flora; “nature with human Activities” when the presence of  
26  
27 humans was evident. Images with “negative impact” included human activities of whatever  
28  
29 kind that were represented as causing damage to the natural ecosystems; images with human  
30  
31 “positive impact” included activities portrayed as being environmentally friendly or as direct  
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33 management in improving the environment, as reforestation. The number of men and women  
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35 present in images with negative and positive impact enabled to evaluate gender peculiarities  
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37 among textbooks.  
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44 For this study we selected textbooks for 14-16 years old pupils as at this age group  
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46 children are especially sensitive to environmental problems (Kellert, 1985; Sivek, 2002;  
47  
48 Prokop *et al.*, 2010). The current textbooks were selected, when possible, out of the most used  
49  
50 ones in schools, but in some countries only one official textbook was available. The corpus of  
51  
52 the present study was composed of 25 textbooks from 14 countries: 12 books from Western  
53  
54 European countries (WEc) – Finland (2), France (2), Germany (2), Italy (4), Malta (1) and  
55  
56 Portugal (1); 6 books from Eastern European countries (EEc) – Cyprus (1), Estonia (1),  
57  
58 Hungary (2), Lithuania (1) and Romania (1); and 7 books from Lebanon (3), Morocco (2) and  
59  
60 Senegal (2) (see Annex 1).

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3 In countries like Estonia, France, Italy, Lithuania, Malta, Portugal and Romania the  
4 four subtopics (Pollution, Use of Resources, Ecosystem and Cycles and Biodiversity) could  
5 be found in the same textbook whereas in other countries (Finland, Germany, Hungary,  
6 Lebanon, Morocco and Senegal) the four subtopics were found in separate textbooks. In this  
7 case, when more than one textbook covered complementary the four subtopics, the books  
8 were put together for the subsequent analysis, as shown in the Results (see table 2).  
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### 20 **Images in environmental education subtopics: Pollution, Use of Resources, Ecosystem** 21 **and Cycles, and Biodiversity**

22 Images are powerful tools for learning, giving important opportunities for analysis, discussion  
23 and group activities (Mowat, 2002). In textbooks, images illustrate what is written in the text  
24 and, usually, they are better memorised than the text itself (Meyers, 1990; Pozzer & Roth,  
25 2003; Korfiatis *et al.*, 2004). The first approach in the present analysis of textbooks concerned  
26 the number of pages and images on environmental education subtopics (Table 2 and Figure 1)  
27 as well as the proportion of the surface occupied by text and images per page (Table 3).  
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38 The four subtopics (Pollution, Use of Resources, Ecosystem and Cycles and  
39 Biodiversity), targeting around 14-16 years-old pupils, were found in textbooks of all  
40 countries, except those from Cyprus and Morocco which missed one subtopic, Biodiversity  
41 and Pollution, respectively (Table 2). The absence of the today important Biodiversity  
42 subtopic in the Cypriot current textbook can be due to the fact that this book was firstly  
43 published long time ago (in 1999), when this subtopic was not considered as important as it is  
44 nowadays, since the concept of Biodiversity was formally introduced in the American Forum  
45 of Biodiversity in 1986 (Thompson & Starzomski, 2007). The absence of Pollution in  
46 Moroccan textbooks may be due to the low concern given in this country to this issue. **None**  
47 of the textbooks from non European countries presented the four subtopics (Table 2).  
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[Insert table 2 about here]

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6 Of the analysed textbooks, those from Eastern European countries (EEc) have more pages  
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8 (mean = 73.3, Table 2) and more images (95.7) than those from Non-European countries  
9  
10 (NEc) (60.6 and 72.4, respectively) and Western European countries (WEc) (56.3 and 88.0,  
11  
12 respectively). In the EEc group, the Cypriote textbook is the one contributing with more pages  
13  
14 (190) and the Romanian one with more images (348). However the ratio of the number of  
15  
16 images and pages (I/P) is the same in both Eastern and Western European countries (1.6),  
17  
18 followed by NEc (1.4).  
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22 Figure 1 shows that the majority of the textbooks (18) have more images than pages  
23  
24 (being the Lebanon-05 textbook the one with higher proportion of images: 3.5), whereas only  
25  
26 seven (Lithuania, France-99, Italy-P, Senegal-86, Estonia, Cyprus and Morocco-S) have fewer  
27  
28 images than pages. Textbooks from different regions (WEc, EEc and NEc) are mixed along  
29  
30 the axes of Figure 1, showing that there is not a predominance of any region textbooks about  
31  
32 higher or lower I/P ratio. These results, together with those shown on Table 2, indicate that no  
33  
34 evident tendency of any region could be found in textbooks as far as the number of pages,  
35  
36 images and I/P ratio is concerned.  
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44 **[Insert figure 1 about here]**  
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46 We analysed not only the number of pages and images (Table 2 and Figure 1) but also the  
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48 space occupied by images and text (Table 3). For this, we made 3 groups concerning the  
49  
50 proportion of text and image per page: Group A – text surface larger than image surface;  
51  
52 Group B – text surface equivalent to image surface; Group C – text surface shorter than image  
53  
54 surface.  
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57 Textbooks from Western European countries, especially Italy and Malta, tend to have  
58  
59 a balanced distribution among the three groups A, B and C (Table 3). In contrast, Eastern  
60  
European countries tend to have higher proportions of Group A (42% for Pollution, 56% for

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3 Use of Resources and 33% for Biodiversity) whereas non-European countries have higher  
4 proportion of Group C (29% for Pollution, 29% for Use of Resources, 25% for Ecology and  
5 Cycles, and 32% for Biodiversity). These results indicate that Eastern European countries  
6 textbooks tend to have the pages occupied with more text than images, in contrast to non-  
7 European countries that tend to have the opposite: more images than text. The Western  
8 European countries distribute text and images more evenly.

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17 **[Insert table 3 about here]**

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20 Figures exemplify what the text is about and assist students in understanding and making  
21 sense. We agree with Pozzer & Roth (2003) when they refer that, on one side, the use of few  
22 images (as in textbooks: Morocco-S with  $I/P=0.2$ ; Cyprus,  $I/P=0.05$ ; Estonia  $I/P=0.6$ ;  
23 Senegal,  $I/P=0.06$ , Table 2 and Figure 1) often does not allow pupils to disclose what really  
24 matters and so the message may be missed; on the other side, too many illustrations (as in  
25 Lebanon-05 textbook,  $I/P=3.75$ ; Hungary-03,  $I/P=2.9$ ; Germany-05,  $I/P=0.5$ ; Romania,  
26  $I/P=2.7$ ) may distract attention and students can miss important textual information.  
27 Therefore, a balanced presence of images should be expected in textbooks.

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38 However, more important than a quantitative analysis of images in the text is their  
39 relevance, meaning and implication for learning. Such qualitative approach is the matter of  
40 the subsequent analysis on human-nature relations, having in mind the five environmental  
41 education dimensions proposed by Sachs (1993): spatial, ecological, economical, social and  
42 cultural dimensions.

### 53 **Local and foreign/global images**

54  
55 Images representing local and foreign environments may attract pupils' interest and challenge  
56 their curiosity and attention for the environment in general, instead of focusing only on their  
57 local, regional or national environment. We considered a foreign image if it exhibited clearly  
58 fauna, flora, geologic, geographic or cultural pictures from other countries or other world  
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3 regions, for example, Lithuania textbooks show images from Brazil, Burkina Faso, Denmark,  
4  
5 Great Britain and India.  
6

7  
8 In general, greater emphasis on local images rather than to foreign or global images is  
9  
10 given in textbooks (Figure 2): Italy-G, Senegal, Romania, Estonia, Finland, France-03, Italy-  
11  
12 P, Malta, Morocco, Portugal and France-99. In contrast, the Lithuanian textbook is the only  
13  
14 one giving much higher emphasis to foreign images. Other five textbooks have equal  
15  
16 proportion of local and foreign/global images (Figure 2): Hungary, Germany, Italy-B, Italy-M  
17  
18 and Lebanon.  
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22 **[Insert figure 2 about here]**  
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24  
25 When mainly foreign images are shown, like in Lithuanian textbooks, pupils may get the  
26  
27 message that these problems are not so serious in their own environment and, consequently,  
28  
29 they may feel that the solution of these problems is of the responsibility of such faraway  
30  
31 countries only and that they have no need for action. On the contrary, when pupils realize that  
32  
33 the same problems facing their country (local) are evident all over the world (global), they can  
34  
35 understand the need for coordinating efforts to provide sustainable solutions.  
36  
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38  
39 We think that textbooks for young people at the age of 14-16 years old should present  
40  
41 local and foreign images in a balanced way so that they get aware of a wider reaching view of  
42  
43 the geo-socio-cultural diversity of the world. This balance between local and foreign/global  
44  
45 images is important for pupils, since on one hand the local context “provides the opportunity  
46  
47 for generation of local knowledge informing and empowering action” (Gough, 2002a, p.  
48  
49 1212), on the other hand “thinking globally” allows “knowing and caring about the global  
50  
51 dimensions and significance of environmental problems and issues” (Gough, 2002b, p. 1218).  
52  
53 For example, people can be educated/empowered to act at individual level (e.g. buying a low  
54  
55 CO<sub>2</sub> emission car) to contribute for the prevention of the climate change at global level  
56  
57 (Rabonovich *et al.*, 2009). The slogan “Think globally, Act locally” used for the last three  
58  
59 decades in environmental education is associated to the connections between local knowledge  
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3 or experience and global needs or conditions. Different interpretations of this “thinking  
4 globally” has been a matter of deep analysis by several authors (Yencken *et al.*, 2000; Gough,  
5 2002a, 2002b), which goes beyond the scope of the present work.  
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### 10 11 12 **Urban/rural and nature images**

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15 We found that urban and rural pictures in textbooks often convey human effects on  
16 ecosystems. In contrast, nature is usually presented in the absence of humans, not only in  
17 wilderness but also in town green spots and villages, such as public gardens and farms  
18 (Figure 3).  
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25 **[Insert figure 3 about here]**

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27 Results showed a strict cultural difference between textbooks from all Western European  
28 countries and those from Eastern European countries and non-European countries as far as the  
29 presence of urban/rural images versus nature images are concerned. The former countries  
30 exhibit more images of urban/rural landscape rather than nature (Figure 4): Italy-G  
31 (urban/rural images 61 more times than nature), France-03 (1.1 more times), France-99 (11.5  
32 more times), Malta (3.2 more times), Italy-M (5.6 more times), Portugal (3.3 more times),  
33 Italy-B (1.2 more times), Finland (1.1 more times), Italy-P (1.1 more times), Germany (4.0  
34 more times).  
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46 In contrast, Eastern European countries and non-European countries present more  
47 images showing nature than urban/rural landscapes: Romania (nature 28 more times than  
48 urban/rural images), Senegal (15 more times), Estonia (8 more times), Morocco (15 more  
49 times), Lithuania (1.5 more times) and Hungary (1.1 more times) (Figure 4).  
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55 **[Insert figure 4 about here]**

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57 The above mentioned disproportions of images in textbooks can shape public opinion that  
58 nature (predominant in textbooks of Eastern European countries and non-European countries)  
59 is the opposite to socio-economic development (European countries) and, as noticed by  
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3 Rehmann-Sutter (2000), can promote the idea that nature exists and develops by itself without  
4  
5 intervention of human beings.  
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### 10 **Negative impact, human management and the beauty of nature**

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12 Images could be classified in four categories: (i) negative impact, images showing  
13 environmental damages caused by humans; (ii) human management, images showing  
14 humans' supervision and improvement of the environment; (iii) beauty of nature, images  
15 conveying aesthetics messages and expressing implicitly the importance of protecting nature;  
16  
17 and (iv) neutral images, those images that do not transmit any of the above ideas.  
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20 Textbooks of Western European countries show a large proportion of negative impact (NI)  
21 plus human management (HM): Italy-G, France-99, Portugal, Malta, Italy-M, France-03,  
22 Germany, Italy-P and Italy-B (Figure 5). Together, these pictures express the message of the  
23 human power over the environment, in both negative and positive senses.  
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34 **[Insert figure 5 about here]**

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36 Human management is absent in textbooks from Lithuania, Cyprus, Morocco and Italy-P  
37 expressing only the negative human influence (Figure 5). In these cases, pupils can interpret it  
38 as alarming messages suggesting that the environmental disturbance is so deep that this trend  
39 cannot be reversed and that humans can do very little or nothing for improving the situation.  
40  
41 Images that showed the beauty of nature (BN) and neutral images (Nt) are dominant in  
42 textbooks of Senegal and some Eastern European countries: Lithuania, Romania, Hungary,  
43  
44 Estonia and Cyprus (Figure 5).  
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53 These results show that textbooks from Western European countries express  
54 anthropocentric view of environment, highlighting the capability of humans to use and control  
55 the natural processes in a desirable direction (Salite, 2002), contrasting with Eastern European  
56 countries and non-European countries which tend to show the environment more associated to  
57 the beauty of nature, with little humans' influence.  
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### Men and women in images with negative and positive impact

The gender issue must be viewed within a sustainable community where the self-determination of women, as well as men, is important for the well-being of human societies within the well-being of the entire Earth community (UNESCO 2003). In this study we looked at the presence of humans in environmental education images, looking particularly at men and women presence in negative and positive impact images. Negative images are those referred above (showing environmental damages caused by humans), positive images are those showing environmental improvement and well-being.

In general, persons do not appear frequently in environmental education images. From a total of 2136 images, men could be found in 157 images (7.4%) and women in 134 (6.3%), being the difference between groups not statistically significant (*t*-test:  $p > 0.05$ ). Similarly, there were no significant differences ( $p > 0.05$ ) between the presence of men (125 occurrences, 5.8%) and women (129 occurrences, 6.0%) in positive impact images. In contrast, considerably less persons could be found in negative impact images and significant differences could be found between gender groups ( $p < 0.05$ ), being more men (32, 1.5%) than women (5 occurrences, 0.4%), transmitting the idea that males, rather than females, are associated to the negative actions towards the environment.

There are some images where persons appear as victims of the degradation of the environment, as the example of the Hungarian textbook, where images exhibit children playing in a nearby polluted river or next to the dirty and polluted area of a chemical factory (Figure 6).

**[Insert figure 6 about here]**

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3 However, most images expressing the human negative impact on the environment do not  
4  
5 include persons but only machines and polluted areas, as in the textbooks from Senegal,  
6  
7 Lithuania, Hungary, Italy-P, Italy-M and Estonia (Figure 7A).  
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10 **[Insert figure 7 about here]**  
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15 Interesting is the case of the Finish textbook that for the negative impact images showed only  
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17 men (10 occurrences, Figure 7A) whereas for the positive impact showed more women (70  
18  
19 occurrences) than men (23 occurrences) (Figure 7B). Women in negative impact images were  
20  
21 found only in Western European countries textbooks: Italy, Portugal, France-99 and Germany  
22  
23 (Figure 7A).  
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27 In contrast to non-European countries, in European (both Western and Eastern  
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29 countries) higher presence of women than men in some pictures could be found: Finland,  
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31 Lithuania, Hungary, Italy-G, Italy-M, Malta and Portugal (Figure 7B).  
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34 The fact that men are strictly more frequently presented in negative impact images and  
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36 women in positive impact ones, shows a clear association with the social representation of  
37  
38 men and women in society: men with the male active role in society and women with a  
39  
40 contemplative view in the beauty of nature.  
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### 46 **General remarks and conclusions**

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48 The analysis of environmental education images in textbooks of 14 countries enabled us to  
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50 distinguish some trends between Western and Eastern European countries and non-European  
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52 countries. Although no differences could be found in the number of pages, of images and in  
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54 I/P ratio between textbooks of the various regions, Eastern European countries textbooks tend  
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56 to have the pages occupied with more text than images, in contrast to non-European countries  
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58 that tend to have the opposite, more images than text. The Western European countries  
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60 distribute text and images more evenly.

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In contrast to the textbooks from Eastern and non-European countries, which tend to show the beauty of nature with little humans' influence, Western European textbooks tend to exhibit more images of urban/rural landscape (rather than nature), of human negative impact and of human management, expressing an anthropocentric view about the environment and highlighting the human power over it, either in destroying and consuming resources (negative impact) or improving the environment by managing it (positive impact).

Men are usually more present in textbook images than women. However, some images exhibiting more women than men could be found in textbooks from Western and Eastern countries, but never in non-European countries. In negative impact pictures, men are more often present than women, but non-European women are never present in such images. Women are more frequent in positive impact images than men.

In brief, this study on textbooks addressed to 14-16 years old pupils suggests that most countries should introduce a better balance between local and global images. Textbooks from Eastern European countries and non-European countries should give more emphasis to both human management and urban/rural images whereas those from Western European countries should pay attention to the beauty of nature. Furthermore, a balance in the presence of men and women in images (either with negative or positive impact) should be a matter of greater concern by all textbooks authors and publishers.

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For Peer Review Only

**Trend in environmental education images of textbooks from Western and Eastern European countries and non-European countries**

Tables


**Table 1.** Part of the grid constructed by the European project BIOHEAD-CITIZEN “Content of images: Humans and Nature” (above) and “Density of text and images for subtopic” (below) used in the present study

	Images of natural environments	Images of nature with human activities	Urban environment	Rural landscapes	Humans in environments		
					M	F	M+F
Images of local environments							
Images of “exotic” environments							
Images illustrating the negative human impact							
Images emphasizing the beauty of nature							
Images illustrating human management of environment							

Chapter devoted to (title of chapter)	Number of pages (or 1/2 pages) per part, or number of paragraphs (specify)	Pages (pp... to pp...)	Only text	Surface of text > surface of images	Surface of text = surface of images	Surface of text < surface of images	Only images

**Table 2.** Number of pages and images addressing the four subtopics Pollution (Pol), Use of Resources (UR), Ecosystems and cycles (EC) and Biodiversity (Bio) in 25 textbooks from 14 Countries.

Country	Number of Text Pages (P)					Number of Images (I)					I/P
	Pol	UR	EC	Bio	Total	Pol	UR	EC	Bio	Total	
<b>Western European countries (WEc)</b>											
Malta (1986)	8	4	39	6	<b>57</b>	14	12	67	11	<b>104</b>	<b>1.8</b>
Finland (2004)	59	25	-	-	<b>84</b>	137	47	-	-	<b>184</b>	<b>2.2</b>
Finland (2005)	-	-	18	14	<b>32</b>	-	-	30	30	<b>60</b>	<b>1.9</b>
France (2003)	10	5	5	7	<b>27</b>	22	5	5	6	<b>38</b>	<b>1.4</b>
France(1999)	10	4	33	12	<b>59</b>	25	3	9	14	<b>51</b>	<b>0.9</b>
Germany(1994)	11	7	47	-	<b>65</b>	8	19	60	-	<b>87</b>	<b>1.3</b>
Germany(2005)	-	-	-	19	<b>19</b>	-	-	-	54	<b>54</b>	<b>2.8</b>
Italy-G (2004)	7	2	34	6	<b>49</b>	8	2	57	8	<b>75</b>	<b>1.5</b>
Italy-M (2000)	7	9	28	9	<b>53</b>	19	18	63	9	<b>109</b>	<b>2.1</b>
Italy-B (2004)	20	60	36	18	<b>134</b>	31	95	57	20	<b>203</b>	<b>1.5</b>
Italy-P (2001)	18	18	16	3	<b>55</b>	5	9	29	3	<b>46</b>	<b>0.8</b>
Portugal (2004)	17	8	10	6	<b>41</b>	23	8	9	5	<b>45</b>	<b>1.1</b>
<b>Mean WEc</b>	<b>13.9</b>	<b>11.8</b>	<b>22.2</b>	<b>8.3</b>	<b>56.3</b>	<b>24.3</b>	<b>18.2</b>	<b>32.2</b>	<b>13.3</b>	<b>88.0</b>	<b>1.6</b>
<b>Eastern European countries (EEc)</b>											
Cyprus (1999)	112	23	55	-	<b>190</b>	16	24	55	-	<b>95</b>	<b>0.5</b>
Estonia (2002)	17	4	12	23	<b>56</b>	13	2	10	6	<b>31</b>	<b>0.6</b>
Hungary (2003)	4	-	4	3	<b>11</b>	13	-	13	6	<b>32</b>	<b>2.9</b>
Hungary (2004)	-	22	-	-	<b>22</b>	-	37	-	-	<b>37</b>	<b>1.7</b>
Lithuania(2000)	7	12	11	3	<b>33</b>	7	8	15	1	<b>31</b>	<b>0.9</b>
Romania(2000)	12	3	30	83	<b>128</b>	19	9	125	195	<b>348</b>	<b>2.7</b>
<b>Mean EEc</b>	<b>25.3</b>	<b>10.7</b>	<b>18.7</b>	<b>18.7</b>	<b>73.3</b>	<b>11.3</b>	<b>13.3</b>	<b>36.3</b>	<b>34.7</b>	<b>95.7</b>	<b>1.6</b>
<b>Non-European countries (NEc)</b>											
Lebanon (2001)	-	-	33	15	<b>48</b>	-	-	44	23	<b>67</b>	<b>1.4</b>
Lebanon (2004)	56	-	-	-	<b>56</b>	74	-	-	-	<b>74</b>	<b>1.3</b>
Lebanon (2005)	-	4	-	-	<b>4</b>	1	14	-	-	<b>15</b>	<b>3.8</b>
Morocco-A(2005)	-	9	78	-	<b>87</b>	-	29	189	-	<b>218</b>	<b>2.5</b>
Morocco-S (2005)	-	-	-	57	<b>57</b>	-	-	-	12	<b>12</b>	<b>0.2</b>
Senegal (1986)	5	-	139	15	<b>159</b>	4	-	58	35	<b>97</b>	<b>0.6</b>
Senegal (1996)	-	13	-	-	<b>13</b>	-	24	-	-	<b>24</b>	<b>1.8</b>
<b>Mean NEc</b>	<b>8.7</b>	<b>3.7</b>	<b>35.7</b>	<b>12.4</b>	<b>60.6</b>	<b>11.3</b>	<b>9.6</b>	<b>41.6</b>	<b>10.0</b>	<b>72.4</b>	<b>1.4</b>


 Textbook presenting the four subtopics.

**Table 3.** Proportion of text/image surface per page in each subtopic: Pollution (Pol), Use of Resources (UR), Ecological cycles (EC) and Biodiversity (Bio).

Country	Pol N*	A %	B %	C %	UR N	A %	B %	C %	EC N	A %	B %	C %	Bio N	A %	B %	C %
<b>Western European countries (WEc)</b>																
Finland (2004)	137	45	43	12	47	-	60	40	-	-	-	-	-	-	-	-
Finland (2005)	-	-	-	-	-	-	-	-	30	-	57	43	30	-	-	100
France (2003)	22	-	100	-	5	100	-	-	5	-	-	100	6	-	100	-
France (1999)	25	40	30	30	3	-	100	-	9	-	10	90	14	-	55	45
Germany (1994)	8	-	100	-	19	-	100	-	60	-	100	-	-	-	-	-
Germany (2005)	-	-	-	-	-	-	-	-	-	-	-	-	54	21	32	47
Italy-G (2004)	8	100	-	-	2	100	-	-	57	80	6	14	8	83	-	17
Italy-M (2000)	19	50	30	20	18	75	-	25	63	50	19	31	9	55	27	18
Italy-B (2004)	31	40	30	30	95	54	32	14	57	50	27	23	20	58	25	17
Italy-P (2001)	5	60	20	20	9	36	18	46	29	18	47	35	3	33	33	34
Malta (1986)	14	67	33	-	12	33	-	67	67	66	12	22	11	40	40	60
Portugal (2004)	23	-	-	100	8	-	100	-	9	-	-	100	5	-	100	-
<b>Mean WEc</b>	<b>24</b>	<b>34</b>	<b>32</b>	<b>18</b>	<b>18</b>	<b>33</b>	<b>34</b>	<b>16</b>	<b>32</b>	<b>22</b>	<b>23</b>	<b>38</b>	<b>13</b>	<b>24</b>	<b>34</b>	<b>28</b>
<b>Eastern European countries (EEc)</b>																
Cyprus (1999)	16	80	20	-	24	87,5	12,5	-	55	100	-	-	-	-	-	-
Estonia (2002)	13	100	-	-	2	100	-	-	10	25	75	-	6	100	-	-
Hungary (2003)	13	-	-	100	-	-	-	-	13	-	-	100	6	-	-	100
Hungary (2004)	-	-	-	-	37	50	50	-	-	-	-	-	-	-	-	-
Lithuania (2000)	7	71	29	-	8	100	-	-	15	-	100	-	1	100	-	-
Romania (2000)	19	-	-	100	9	-	100	-	125	-	100	-	195	-	100	-
<b>Mean EEc</b>	<b>11</b>	<b>42</b>	<b>8</b>	<b>33</b>	<b>11</b>	<b>56</b>	<b>27</b>	<b>0</b>	<b>51</b>	<b>21</b>	<b>46</b>	<b>17</b>	<b>35</b>	<b>33</b>	<b>17</b>	<b>17</b>
<b>Non-European countries (NEc)</b>																
Lebanon (1999)	-	-	-	-	-	-	-	-	44	-	-	100	23	-	-	100
Lebanon (2004)	74	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-
Lebanon (2005)	1	-	-	100	14	-	-	100	-	-	-	-	-	-	-	-
Morocco-A(2005)	-	-	-	-	29	-	-	100	189	-	24	76	-	-	-	-
Morocco-S(2005)	-	-	-	-	-	-	-	-	-	-	-	-	12	-	75	25
Senegal (1986)	4	100	-	-	-	-	-	-	58	64	36	-	35	-	-	100
Senegal (1996)	-	-	-	-	24	-	100	-	-	-	-	-	-	-	-	-
<b>Mean NEc</b>	<b>11</b>	<b>14</b>	<b>0</b>	<b>29</b>	<b>10</b>	<b>0</b>	<b>14</b>	<b>29</b>	<b>42</b>	<b>9</b>	<b>9</b>	<b>25</b>	<b>10</b>	<b>0</b>	<b>11</b>	<b>32</b>

A: text surface > image surface; B: text surface = image surface; C: text surface < image surface

\*Number (N) of images per textbook and frequency (%) of A, B and C.

 Textbook presenting the four subtopics.

**Annex 1**  
**List of analyzed Textbooks**

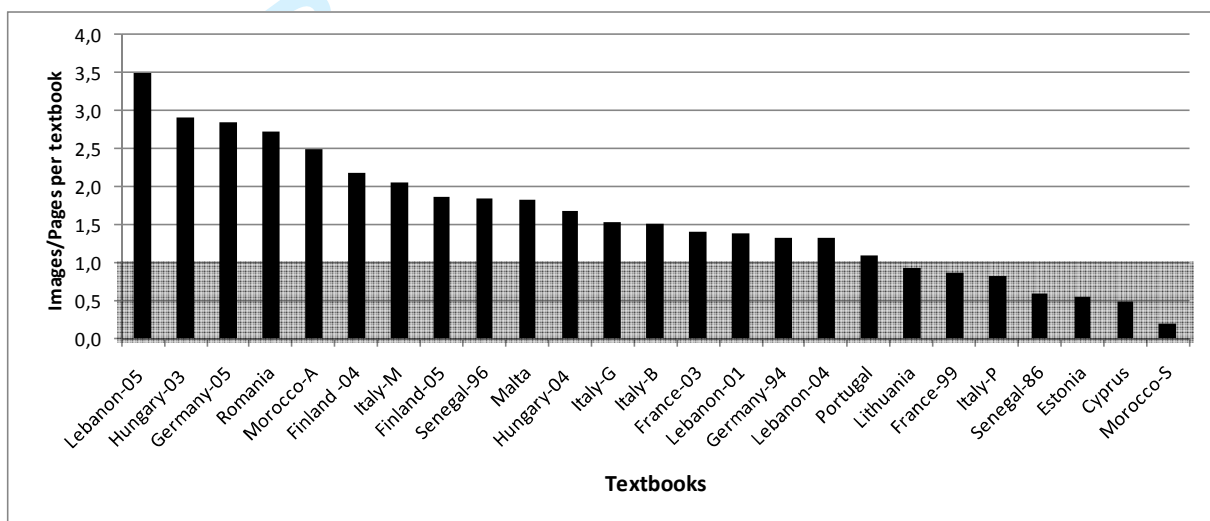
N <sup>o</sup>	Country	Pupils' age	Author(s)	Title	Publisher	Year
1	Cyprus	16-17	Michaelides, A. et al.	Επιστήμη του περιβάλλοντος. (Environmental science).	Ministry of education – Cyprus.	1999
2	Estonia	14	Martin, M.	Bioloogia põhikoolile III. (Biology for primary school III).	AS BIT	2002
3	Finland	15-19	Happonen, P., Holopainen, M., Sotkas, P., Tenhunen, A., Tihtarinen-Ulmanen, M. & Venäläinen, J.	Bios 1: Eliömaailma. (Bios 1: The world of living organisms).	Aalto, V./ WSOY.	2005
4	Finland	15-19	Happonen, P., Holopainen, M., Sotkas, P., Tenhunen, A., Tihtarinen-Ulmanen, M. & Venäläinen, J.	Bios 3: Ympäristöekologia. (BIOS 3: Environmental Ecology).	Aalto, V./ WSOY.	2004
5	France-03	14-15	Chapron, G., Charles, M., Duco, A., Grandouillet, D., Guibert, S. & Schmidt, F.	Sciences de la vie et de la Terre 3 <sup>e</sup> . (Life and Earth Sciences 3 <sup>e</sup> ).	Belin.	2003
6	France-99	14-15	Tavernier, R. & Lizeaux, C.	Sciences de la vie et de la Terre 3 <sup>e</sup> . (Life and Earth science 3 <sup>e</sup> ).	Paris: Bordas	1999
7	Germany	13-14	Bonora, V., Dieterle, A., Görz, G., Gotzler, H. & Libera, W.	Natura 8 – Biologie für Gymnasien Bayern (Nature 8 – Biology for grammar school, Bavarian edition).	Stuttgart: Ernst Klett Schulbuchverlag GmbH.	1994
8	Germany	14-15	Bonora, V., Dieterle, A., Görz, G., Gotzler, H. & Libera, W.	Natura 9. Jahrgangsstufe, Biologie für Gymnasium Bayern. (Nature 9, biology for grammar school, Bavarian edition).	Stuttgart: Ernst Klett Schulbuchverlag GmbH.	2005
9	Hungary	13-14	Gyuláné, A. & István, F.	A távoli tájak élővilága és az élőlények rendszere. (Fauna and flora of far lands and system of the living beings).	Dr. Paál Tamásné.	2003
10	Hungary	16	Makádi, M. & Taraczközi, A.	A Föld, amelyen élünk. (Earth, where we are living).	Hungary.	2001
11	Italy-G	14-17	Gainotti, A. & Modelli, A.	Biologia – Diversità e unità dei viventi Mod A – D (Biology - Difference and unity of the living Mod A – D)	Zanichelli	2004
12	Italy-M	14-17	Miller, K. R. & Levine J.	Il mondo della natura. Il punto di vista della Biologia Vol A-F (The world of the nature. The point of view of the Biology)	Edizioni scolastiche, Bruno Mondadori	2000



13	Italy-B	14-17	Boschetti, M. & Fedrizzi, E.	Nuovo Ecosistema Terra. Vol. SA (New Earth ecosystem. Vol. SA)	Minerva italica	2004
14	Italy-P	14-17	Piseri, A, Poltronieri, P. & Vitale, P.	Vivere. Percorsi modulari di Biologia. Vol.B. I viventi nell'ambiente (To live. Modular Units of Biology. Vol. B. Living beings in the environment.)	Loescher	2001
15	Lebanon	16	Dagher, J., Hajjar, Z., Safi, S. & Sabeh, M.	Life science (science section).	CNDPR.	1999
16	Lebanon	15	Jammal, N., Dagher, J., Ghorayeb, L., Hajjar, Z., Hossari, A., Sabeh, M. & Shbaro, C.	Life science.	CNDPR.	1998
17	Lebanon	14	Lebdeh, D.A., Dakrauh, R., Seif, N.A. & Jarjou, Z.G.	Life and Earth sciences.	CNRDP.	2000
18	Lithuania	15-16	Price, G. & Taylor, J.	Biologija. (Biology).	Vilnius: Alma Littera.	2000
19	Malta	13-16	Mackean, D. G.	GSCE biology.	GSCE	1986
20	Morocco-A	15-16	Addak, A., Hamid, A., Hamouch, A., Belaamiri, M., Assassi, N.E. & Jabbar, B.	منهل علوم الحياة و الارض (Almanac in the life and earth sciences)	IMARSSI, arts du 21° sciecle.	2005
21	Morocco-S	15-16	Sadki, A., Mokhlis, A., Elhodaigui, M., Elouardi, M., Khwadji, A., Benabboud, J., Ahguig, A., Bry, M.	المفيد في علوم الحياة و الأرض الجدد المشترك العلمي (The interesting in live and earth sciences)	Dar Attakafa Casablanca	2005
22	Portugal	14-15	Dias da Silva, A., Gramaxo, F., Santos, M. E. & Mesquita, A. F.	Terra, Universo de Vida – 2ª Parte. (Earth, Universe of life – 2ª Part).	Porto Editora.	2004
23	Romania	14-15	Mihail, A. & Mohan, Ghe.	Biologie - Manual pentru clasa a VIII- a. (Biology - Textbook for the 8 th class).	Bucuresti: Editura All.	2000
24	Senegal	17-18	Djakou, R. T. & Thanon, S. Y.	Ecologie – Géologie - Afrique intertropicale. (Ecology – Geology – Inter-tropical Africa).	Paris: Bordas.	1986
25	Senegal	14-15	Djakou, R. T. & Thanon, S. Y.	Géologie – Biologie. (Geology – Biology)	Editions Nathan, Paris.	1996

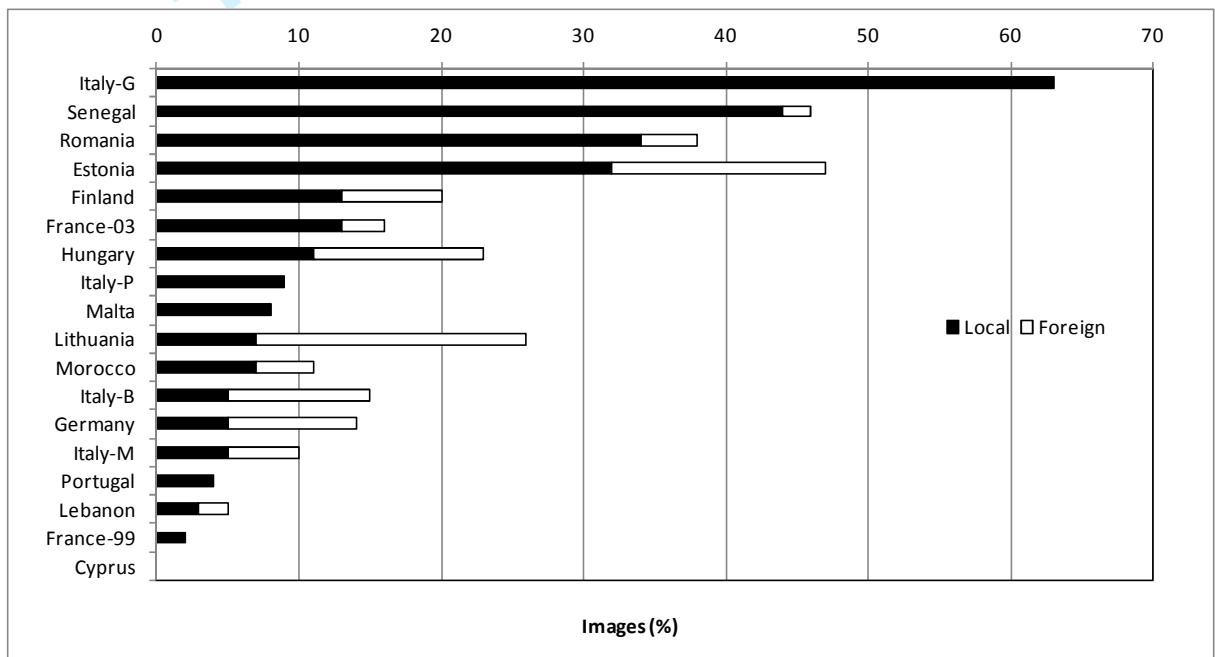
**Trend in environmental education images of textbooks from Western and Eastern European countries and non-European countries**

Figures



**Figure 1.** Proportion of the number of images and pages addressing Environmental Education in 25 textbooks from 14 Countries.

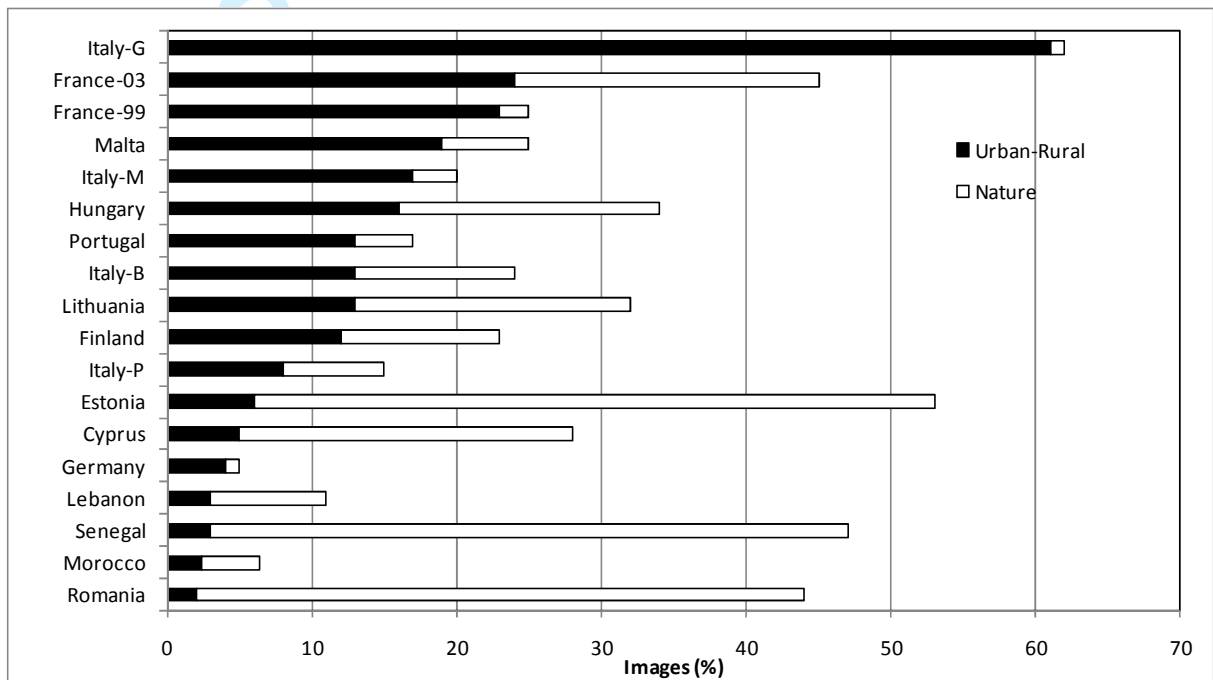
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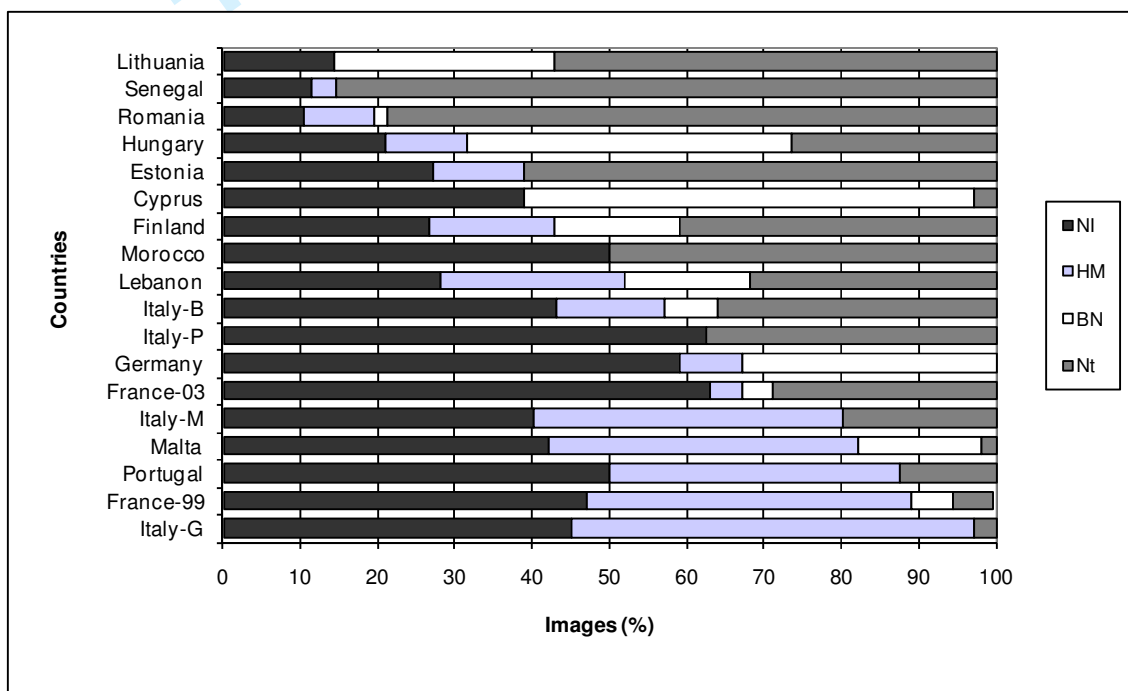
**Figure 2.** Proportion of local and foreign images exhibited in the four subtopics of Environmental Education in textbooks from 14 Countries.



**Figure 3.** Examples of images showing nature in urban and rural landscapes.  
A – Portugal textbook; B – France-99 textbook.



**Figure 4.** Proportion of Urban/Rural and Nature images exhibited in textbooks from 14 Countries.



**Figure 5.** Proportion of the Nature and Humans in the images of subtopics.

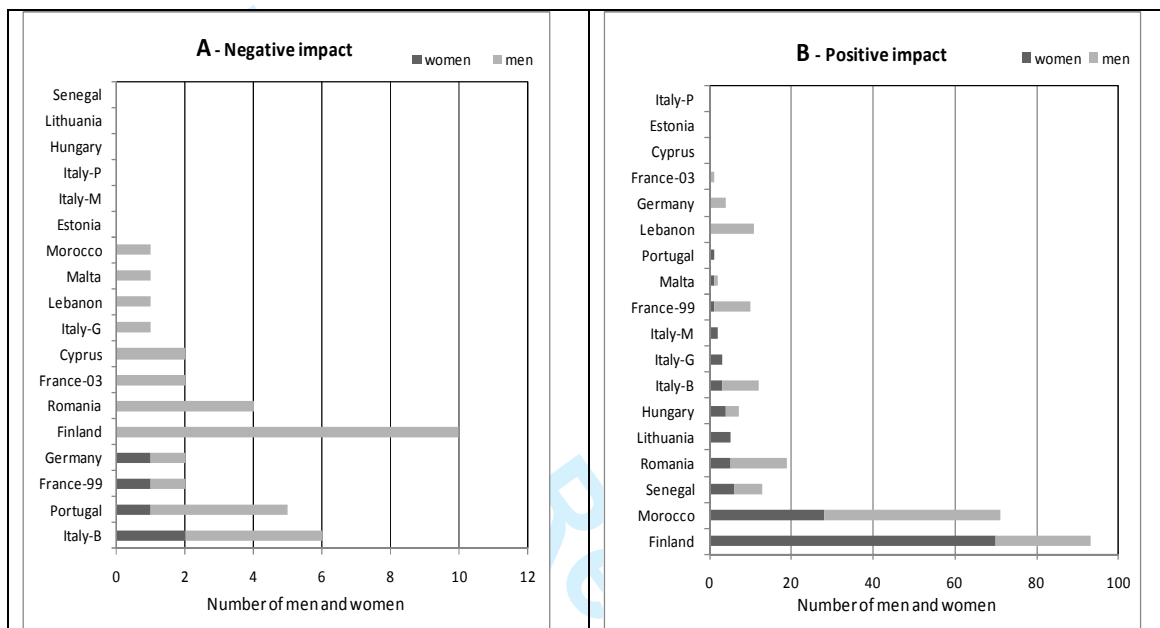
- NI – Images illustrating the *negative impact* by humans;
- HM – Images illustrating *human management* of the environment;
- BN – Images emphasizing the *beauty of nature*;
- Nt – *Neutral* images.

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**Figure 6.** Examples of negative impact images showing humans as victims of the polluted environment.  
Hungary textbook.

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**Figure 7.** Number of men and women exhibited in images with negative impact (A) or positive impact (B) of textbooks from 14 Countries. Note the scales are different.