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### Abstract

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# Assessing the Cognitive Autonomy of Audiences Towards Environmental Media Messages

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Environmental issues are the subject of an increasing appropriation by the public, primarily through media messages. In this context, the citizens' ability to adopt a critical stance towards these messages has become crucial. We study the factors that affect the citizens' critical judgment towards forest-related media. The research presented in this paper seeks to assess the individuals' degree of cognitive autonomy towards forest-related media, and how it is influenced by their prior experience of forests. In this paper, we present a preliminary experiment requiring participants to read and react to three posters from different forest stakeholders. Fifty-two students (aged 16 to 20) from two schools (one rural and the other urban) participated in this study. Results show that subjects had a limited cognitive autonomy towards the media that were submitted to them, and that their degree of cognitive autonomy was not affected by their level of forest experience.

Keywords: Environmental communication, forests, media literacy, cognitive autonomy

## Introduction

Environmental issues are the subject of an increasing appropriation by the general public. The citizens' opinions on these issues may be significantly impacted by the strategic media messages that represent the natural environment and aim at raising their awareness, convincing them, and influencing them. We study the appropriation of these messages by the public in the specific context of tree- and forest-related communication. This paper presents the preliminary results of a study funded by the Public Service of Wallonia (Belgium), as a part of a European research programme entitled "Trees and forests: policies and communication (XIV<sup>th</sup> to XIX<sup>st</sup> centuries)."

Forests can be considered in a multitude of ways: as a place for recreation and leisure, as an ecosystem to be protected, as the earth's "green lung" playing a central role in the sustainability of the human environment, but also as an essential resource for our economies that needs to be managed responsibly and sustainably. There is actually not *one* forest, but *many kinds of* forests, the nature and situation of which can vary dramatically, depending on their location and on their usage.

The public's perception of forests is sometimes at odds with their actual state. For example, European citizens generally believe the forest surface to become smaller in Europe over the years, whereas it is in constant growth (Rametsteiner & Kraxner, 2003). There also seems to be a paradox between the positive image people have of forests and their products, and the negative image that the timber industry suffers from (Suda & Schaffner, 2004): although a majority of people like forests, and appreciate wood as a

natural material, they tend to see the laying of trees as a crime against the environment instead of as the sampling of a constantly renewed resource. More generally, the public seems to consider that the protection of the environment (including the preservation of biodiversity and the halt of deforestation) is not compatible with its exploitation as a resource. When faced with this apparent incompatibility, people generally tend to favour the second alternative: protecting the trees.

Furthermore, this opposition can only be strengthened by the type of media communication commonly adopted by both environmentalist associations and public and private institutions in charge of forest management. Media messages sponsored by these organisations typically follow the standards of advertisement: they rely on visuals more than on text, and use slogans with simple messages or “shock” images that tap into their audiences’ emotions rather than their rationality. These messages position their audiences as targets to be impacted, whose opinions only result from past media exposures, each organisation working to have their message override those of others, perceived as competitors.

Such communication strategies implicitly place their audiences in a “passive” and “massive” position. Indeed, a simplified universal message can only be assumed to be effective if its audience is viewed as a “mass” of identical individuals who react similarly to the same messages. In this view, the audience is also considered as passively receiving and assimilating messages that they are not expected to be critical about. The opinion of a “massive and passive” audience would then correspond to the mere reproduction of the messages they have been submitted to. This oversimplification of environmental media communication impedes the understanding and appropriation by the public of a complex concept such as that of sustainable management, which allows to articulate the different (economical, environmental, social) functions of forests : bio-diverse ecosystems to be protected, “green lungs” playing a key role in the viability of the human environment, places of leisure and rest, and economically important resources exploited in a responsible and sustainable way.

The research presented in this paper adopts an alternative view of media users. It aims at evaluating under which conditions the public is able to behave as active and competent media users, who can critically evaluate the representations of trees and forests in the media, situate the institutions that produce them with respect to one another, and articulate multiple viewpoints on forests into a coherent and complex vision.

## **Media Literacy and the Cognitive Autonomy of Audiences Towards Forest-Related Media**

The concept of media literacy (Aufderheide & Firestone, 1993; Silverblatt, 2001) enables us to define the public of environmental communication from this new perspective: as active users, competent in reading and evaluating forest-related media messages. We define media literacy as the set of skills that enable people to evolve in the contemporary media environment in a critical and creative, autonomous and socialized way (Fastrez & De Smedt, 2012). Media literacy includes the ability to *access* media, to *understand* and to critically *evaluate* media contents and different aspects of media, and to *create* communications in a variety of contexts (Aufderheide & Firestone, 1993; Bekkhus & Zacchetti, 2009; Buckingham, Banaji Carr, Cranmer, & Willett, 2005; Hobbs, 2010). In this research, we focus on the second aspect: the understanding and critical evaluation of media messages by individuals. It is, moreover, the aspect that appears as the most important in the definitions of media literacy available in the literature (Brandtweiner, Donat, & Kerschbaum, 2010; Tulodziecki & Grafe, 2010; Silverblatt 2001; Thoman, 1993), and the one aspect on which existing assessment tools have primarily focused (Arke & Primack, 2009; Hobbs & Frost, 2003; Quin & McMahon, 1993; Thoman, 1993).

Several studies explicitly associate media literacy and critical thinking skills (Alvermann & Hagood, 2000; Arke & Primack, 2009; Feuerstein, 1999; Kellner & Share, 2007), or more generally a critical approach of media (Silverblatt, 2001).

We have proposed a definition of media literacy competences in terms of four types of media-related tasks (Fastrez & De Smedt, 2012):

- reading (decoding, understanding, and evaluating media),
- writing (creating and diffusing one's own media productions),
- navigating (searching for specific media and exploring the diversity of media supplies),
- organising (categorising media with ad hoc typologies)

These tasks are applied to media as informational, technical and social objects. Media are informational objects as they are designed to represent things (real or imaginary) different from themselves through the use of different semiotic systems. They are technical objects as they were produced through a technical process, or as their usage involves a technical process. They are social objects as they weave social relationships between members of society.

In this study, we will use the phrase “cognitive autonomy” to refer to the individual’s ability to critically understand and evaluate media messages, as a part of their media literacy. The media literacy competences involved are related to reading and organising media in their informational dimension (e.g. what does this message say? What issue does it address? How does it frame this issue?) and their social dimension (who made this message. What were their intentions? How could different people interpret it?).

The question underlying by the notion of cognitive autonomy is the following: is the public able to see through the representations of forests in the media to detect persuasion strategies that they can distance themselves from? Or, on the contrary, do their own representations of forests result directly from their exposure to media, as they are unable to step back and identify these strategies?

Specifically, we define cognitive autonomy towards the media as the abilities required to (1) *understand* (i.e. identify the meaning of messages and the expressed points of view), (2) *contextualize* (i.e. identify the authors and their intentions, and situate them in their context), (3) *compare* (i.e. situate and contrast different messages and the intentions of their authors) and (4) *make critical judgments* (i.e. position themselves with respect to the expressed points of view) about media messages.

This study attempts to assess the subjects’ degree of cognitive autonomy in the specific context of their reception of tree- and forest-related media.

## Research Questions

Two research questions motivate our research:

1. To what extent is the public cognitively autonomous towards tree- and forest-related media?
2. What are the factors affecting this form of cognitive autonomy?

Specifically, this study presented in this paper attempted to evaluate the relationship between the subjects’ degree of cognitive autonomy and their prior experience with forests. Do the subjects who have greater prior experience with forests show a greater degree of cognitive autonomy towards forest-related media? Are they more easily able to distance themselves from the representations of forests in the media? Are they more prone to consider the forest from seemingly opposite standpoints such as its preservation and its exploitation?

## Method

### Participants

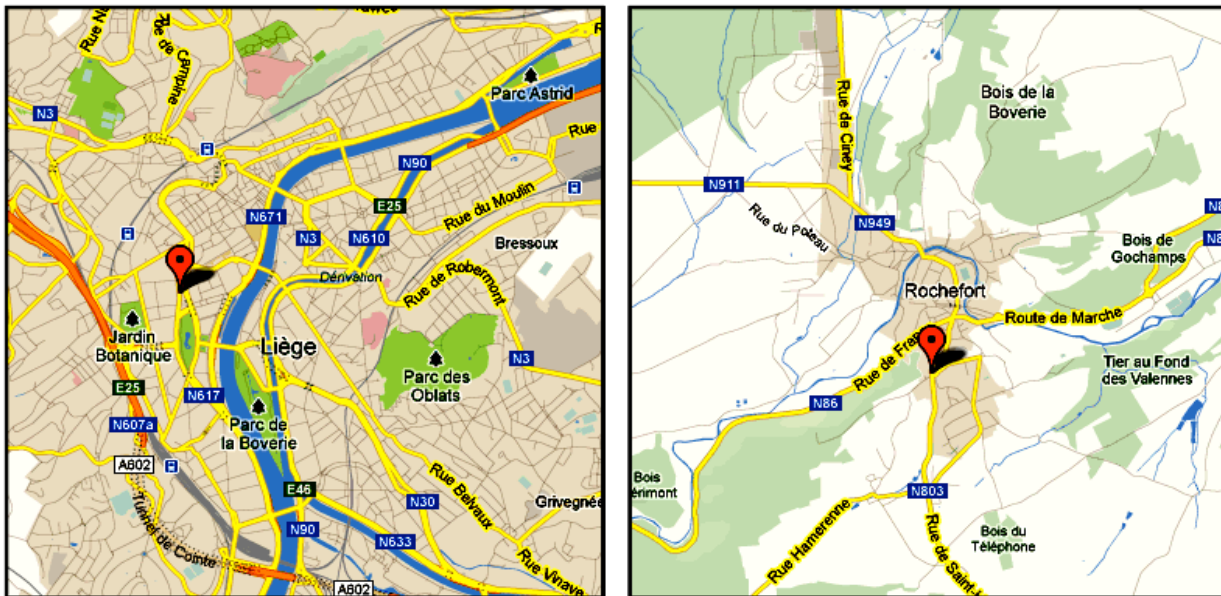
Fifty-two high school students ( $M_{\text{age}} = 17.25$  years, age range: 16-20 years) were recruited in two Belgian French-speaking high schools, one urban (Athénée Léonie de Waha, Liège) and the other rural, with forests nearby (Athénée Royal de Rochefort, Rochefort). Table 1 details the composition of our sample.

	N	Age		Gender		Grade	
		Mean	Std dev	Men	Women	11th	12th
Athénée Léonie de Waha (urban school)	29	17,10	1,012	12	17	29	0
Athénée Royal de Rochefort (rural school)	23	17,43	1,037	14	9	9	14

**Table 1: Sample composition.**

This age range was chosen as young people are particularly targeted by environmental communication (Janse, 2008; Potter, 2004; Rametsteiner, Eichler, & Berg, 2009; Rametsteiner & Kraxner, 2003), and they embody the future public that may be affected by the changes in wood and forest stakeholder communication strategies, in a medium-term future. Subjects participated in the study as part of their presence in school, and were not compensated for their participation.

The two schools were selected in order to compose a sample of respondents with different profiles with respect to their prior experience with forests. Figure 1 depicts the geographical environment of the two schools.



**Athénée Léonie de Waha**

**Athénée Royal de Rochefort**

**Figure 1: Geographical location of the two high schools.**

## ***Materials and Procedure***

Subjects were instructed to fill out a two-part questionnaire. The first part included seven questions on socio-demographic variables (such as age, gender and parents occupation) and nine questions on prior experience with forests, which were used to compute the respondents' Forest Experience Score (FES – see below). These questions focused on the number of forest visits the respondents made in the past year, the length of their longest visit, the types of activities they engaged in (e.g. camping, harvesting, observing, playing, wandering), and the extent to which they stayed on marked trails and paths.

The second part required subjects to read and react to three posters on trees and forests. The first poster was produced by *Greenpeace*, on the topic of deforestation reduction in the context of the 2009 Copenhagen climate summit. The second poster was produced by the French *National Committee for the Development of Wood* (CNDB) to advertise a partnership between *France Bois Forêt* (a French forestry interprofessional organization) and the French Ministry of Agriculture and promote the use of wood as a sustainable material. The third poster was produced by the *Forest Stewardship Council* (FSC) and supported by the *World Wildlife Fund* (WWF) to promote FSC's activity and label, and encourage its audience to buy FSC-certified wood and paper.

Questions in the second part of the questionnaire probed the respondent's understanding of each poster and its message, as well as their ability to identify the institutions that produced them, their intentions, and the types of people the posters were not intended to. Additional questions required the respondents to assess the compatibility between the three poster's messages, and to position themselves with respect to these messages.

## **Results**

In this section, we present the results from the questionnaire data analysis. Results are presented in the order of our research questions: first the assessment of the subjects' cognitive autonomy (in terms of understanding, contextualization, comparison and critical judgment), and then its relationship to their level of prior forest experience. Our hypotheses are that:

1. the subjects can show a certain degree of cognitive autonomy towards the media.
2. this degree of cognitive autonomy is positively correlated with the subject's level of forest experience.

## ***Description of the Posters***

Subjects were asked to describe each of the posters. Their answers were noted according to the presence of one or two of the two core components of the poster (identified by the researchers), yielding scores ranging between 0 (no core component present in the answer) and 2 (two core components present in the answer).

Description scores	Greenpeace	CNDB	FSC
0	5 (9.8%)	2 (3.9%)	4 (7.8%)
1	37 (72.5%)	20 (39.2%)	27 (52.9%)
2	9 (17.6%)	29 (56.9%)	20 (39.2%)
Total	51 (100%)	51 (100%)	51 (100%)

**Table 2: Distribution of description scores for each poster.**

As it appears in Table 2, the subjects' ability to describe the posters is limited, since only a minority of subjects achieved a score of 2/2. The *Greenpeace* poster appeared to be the most difficult to describe.

### ***Understanding of the Posters' Messages***

Subjects were asked to summarize the core message of each of the posters. Their answers were noted according to the presence of one or two of the two core ideas the poster expressed (identified by the researchers), yielding scores ranging between 0 (no core idea present in the answer) and 2 (two core ideas present in the answer).

Understanding scores	Greenpeace	CNDB	FSC
0	17 (33.3%)	18 (35.3%)	16 (31.4%)
1	28 (54.9%)	28 (54.9%)	30 (58.8%)
2	6 (11.8%)	5 (9.8%)	5 (9.8%)
Total	51 (100%)	51 (100%)	51 (100%)

**Table 3: Distribution of understanding scores for the each poster.**

As it appears in Table 3, the subjects' ability to understand the messages conveyed by the posters is limited, since only a minority of subjects achieved a score of 2/2.

### ***Contextualization: Identification of the Author***

Subjects were asked to identify (i.e. to name and describe) the authors of each poster (two for the *CNDB* and *FSC* posters, and one for the *Greenpeace* poster). Table 4 shows the results for this question.

Author identification	Greenpeace	CNDB	FSC
No author identified	1 (2%)	14 (27.5%)	1 (2%)
Authors partly identified	8 (15.7%)	35 (68.6%)	39 (78%)
Authors correctly identified	42 (82.4%)	2 (3.9%)	10 (20%)
Total	51 (100%)	51 (100%)	50 (100%)

**Table 4: Distribution of author identification for each poster.**

Only a minority of subjects failed to identify the Greenpeace poster's author. However, students struggled to identify *both* authors in the FSC and CNDB posters.

### ***Contextualization: Qualification of the Author***

Subjects were asked to select descriptors of the posters' authors in a list including the following items: "a non-commercial association," "an environmentalist NGO," "consumers," "a political party," "a governmental agency," "industrials," and "forest owners." Their answers were scored according to the following principles:

Greenpeace poster	Score
<ul style="list-style-type: none"> <li>• "an environmentalist NGO" or "a non-commercial association, an environmentalist NGO"</li> </ul>	2
<ul style="list-style-type: none"> <li>• "a non-commercial association"</li> </ul>	1
<ul style="list-style-type: none"> <li>• Any other selection</li> </ul>	0
CNDB poster	Score
<ul style="list-style-type: none"> <li>• "forest owners, industrials, a non-commercial association"</li> </ul>	2
<ul style="list-style-type: none"> <li>• Two correct items out of three or "a non-commercial association"</li> </ul>	1
<ul style="list-style-type: none"> <li>• Any other selection</li> </ul>	0
FSC poster	Score
<ul style="list-style-type: none"> <li>• "a non-commercial association, an environmentalist NGO, industrials"</li> </ul>	2
<ul style="list-style-type: none"> <li>• Two correct items out of three or "a non-commercial association"</li> </ul>	1
<ul style="list-style-type: none"> <li>• Any other selection</li> </ul>	0



Table 5 shows the results for this question.

Author qualification	Greenpeace	CNDB	FSC
No author qualified	19 (37.3%)	33 (64.7%)	27 (52.9%)
Authors partly qualified	3 (5.9%)	18 (35.3%)	23 (45.1%)
Authors correctly qualified	29 (56.9%)	0 (3.9%)	1 (2%)
Total	51 (100%)	51 (100%)	51 (100%)

**Table 5: Distribution of author qualification for each poster.**

Respondents performed similarly to the question requiring them to identify the authors of the posters, although their ability to qualify them correctly was weaker. Once again, the authors of the CNDB and FSC posters were more difficult to qualify than Greenpeace.

### ***Contextualization: Identification of the Author's Intentions***

Subjects were asked to select descriptors of the intentions of the posters' authors in a list including the following items: "to inform," "to convince," "to fight," "to raise awareness," "to entertain," "to sell," "to be obeyed," "to get noticed," "to obtain help," "to seduce," "to instruct," "to denounce," and "to scare."

The answers to these three questions were coded based on the following principles:

- Greenpeace poster:
  - Correct answers: to inform, to convince, to fight, to raise awareness, to denounce, to scare, to get noticed;
  - Neutral answers: to be obeyed, to obtain help;
  - Erroneous answers: to entertain, to sell, to seduce, to instruct.
- CNDB poster:
  - Correct answers: to inform, to convince, to fight, to sell, to instruct;
  - Neutral answer: to raise awareness;
  - Erroneous answers: to entertain, to be obeyed, to get noticed, to obtain help, to seduce, to denounce, to scare.
- FSC poster:
  - Correct answers: to inform, to convince, to fight, to raise awareness, to sell, to seduce;
  - Neutral answers: to be obeyed, to get noticed, to instruct;
  - Erroneous answers: to entertain, to obtain help, to denounce, to scare.

The answers were combined into one single score ( $\epsilon [-1;1]$ ) using the following formula:

$$(Ncs_i / Ncs) - (Nes_i / Nes)$$

where:

- $Ncs_i$  is the number of correct selections in the list;
- $Ncs$  is the total number of correct items in the list;
- $Nes_i$  is the number of erroneous selections in the list;
- $Nes$  is the total number of erroneous items in the list;

Figure 2, Figure 3 and Figure 4 show the distribution of these scores for the three posters.

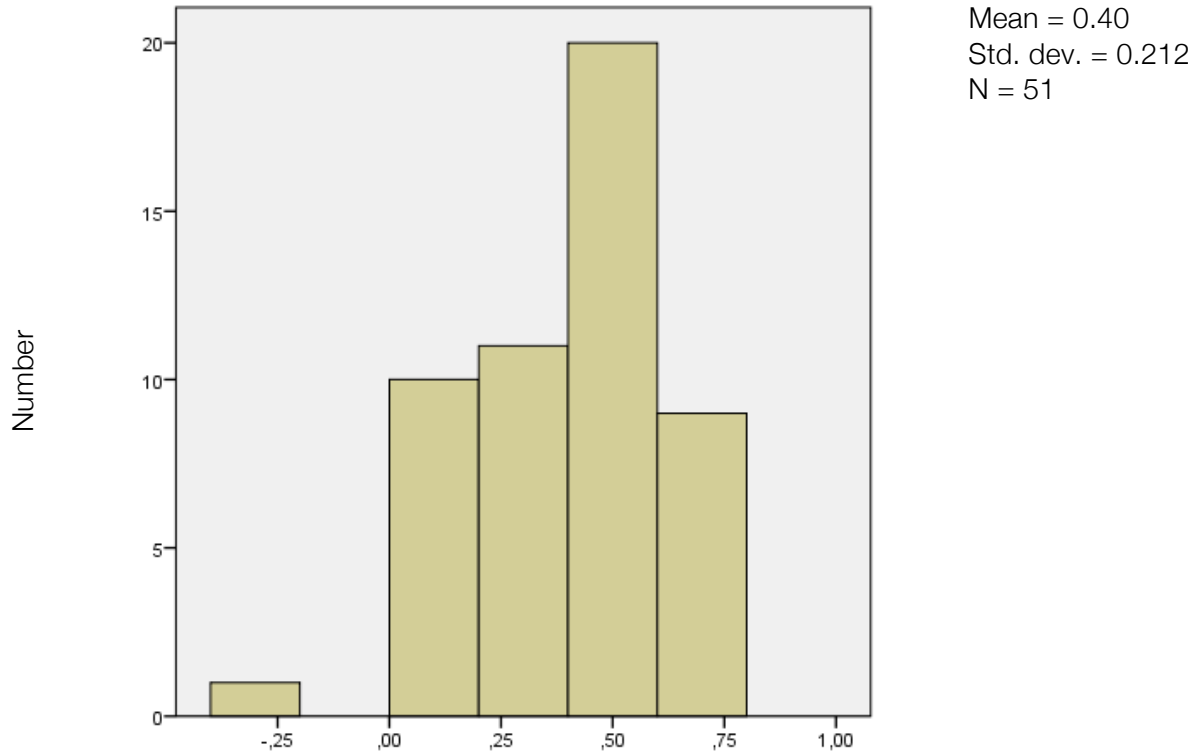
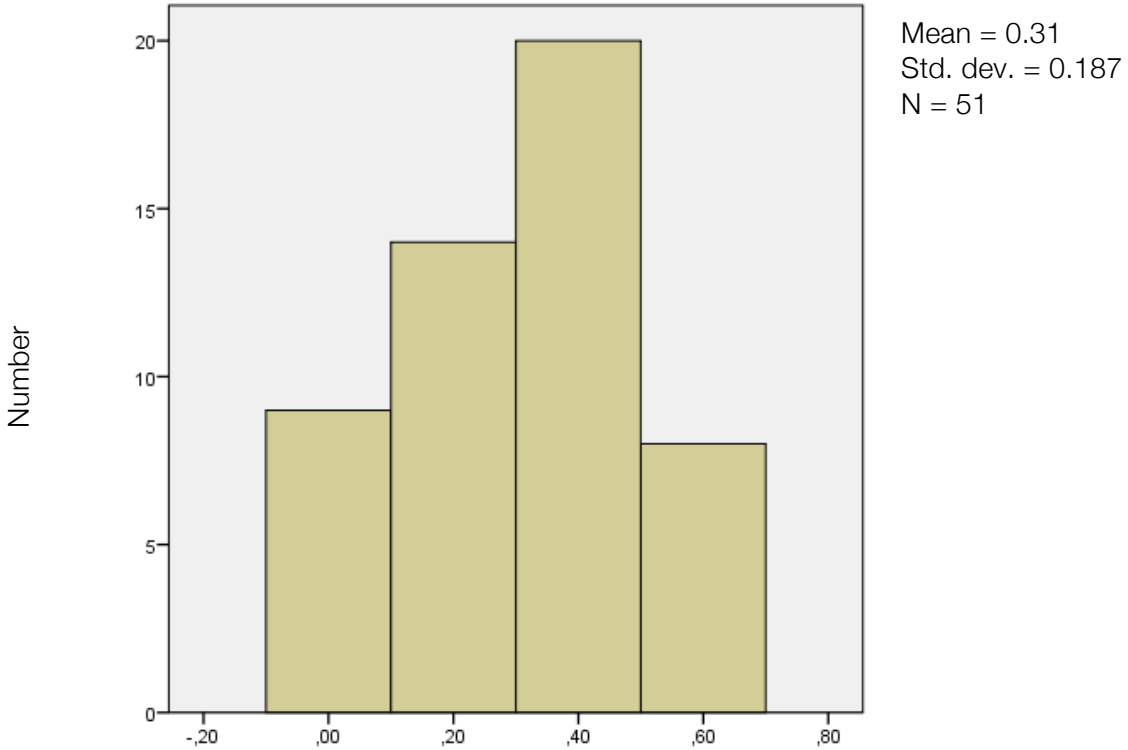
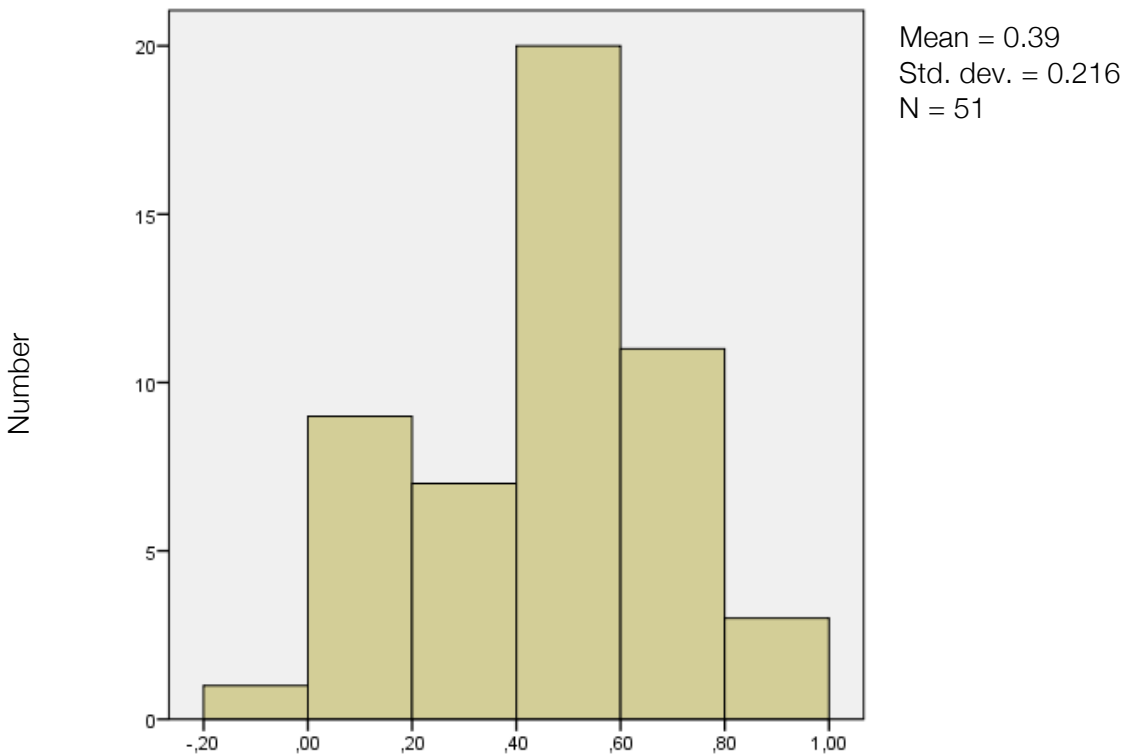


Figure 2. Distribution of author intentions identification score (Greenpeace).



**Figure 3. Distribution of author intentions identification score (CNDB).**



**Figure 4. Distribution of author intentions identification score (FSC).**

Respondents obtained mostly positive scores, which reveal their ability to identify, at least in part, the intentions of the authors of the three posters.

## Contextualization: Identification of the Posters' Non-Audience

Subjects were asked to describe the people that did not belong to the three posters' intended audience. Their answers to these open questions were coded according to the following principles:

Answer type	Score
"no one", "the people affected by the message" (e.g. "those who buy wood" for the FSC poster), "the people with opposite opinions" (e.g. "those who encourage the use of fossil energies" for the CNDB poster), "children".	0
"the people who are not affected by the message"	1
"the people who are already convinced by the message", "the members of the institution that produced the poster"	2

Table 6 shows the distribution of answers according to this coding.

Non-audience identification score	Greenpeace	CNDB	FSC
0	40 (78.4%)	41 (80.4%)	44 (86.3%)
1	5 (9.8%)	2 (3.9%)	2 (3.9%)
2	6 (11.8%)	8 (15.7%)	5 (9.8%)
Total	51 (100%)	51 (100%)	51 (100%)

**Table 6: Distribution of non-audience identification scores for each poster.**

The vast majority of respondents failed to identify who the three posters were not intended to, thereby demonstrating their difficulty in determining the limits of their intended audience.

## Comparison of the Posters

Subjects were asked to identify potential contradictions between the posters' messages, for each possible pair of posters. Their answers were assigned one point for each correct description and justification of the contradiction or compatibility between each possible pair of posters. Hence, the highest possible score was 3. The correct answers were:

- The Greenpeace poster *does* contradict the CNDB poster: the latter encourages the use of wood as an ecological material, whereas the former claims that laying trees is detrimental to the environment.
- The CNDB poster *does not* contradict the FSC poster: both promote the use of wood as a material, even though the latter encourages a responsible use.
- The FSC poster *does* contradict the Greenpeace poster: the former encourages a responsible use of wood as a material, whereas the latter suggests trees should not be laid at all.

Table 7 shows the results for this question.

Comparison score	N <sub>Subjects</sub>
0	6 (12.5%)
1	25 (52.1%)
2	7 (14.6%)
3	10 (20.8%)
Total	48 (100%)

**Table 7: Distribution of comparison scores.**

Only a fifth of the subjects were able to correctly compare the posters' messages.

### ***Learning from the Posters***

Subjects were asked whether they had learned anything from the posters. Their answers were coded according to the poster(s) the respondent had learned something from. Table 8 shows the results for this question.

Poster cited	N <sub>subjects</sub>
None	39 (75%)
CNDB	5 (9.6%)
FSC and CNDB	1 (1.9%)
Greenpeace	1 (1.9%)
All	6 (11.5%)
Total	52 (100%)

**Table 8: Distribution of posters the respondents learned something from.**

Most subjects declared that had not learned anything from the posters. Within the group of respondents who declared they had learned something, the CNDB poster was the most frequently referred to.

### ***Critical Judgment: Poster of Choice***

Subjects were asked the following question: "If you had to choose a poster to show for a better future, which one would you choose? Why?" Table 9 shows the distribution of the respondents' answers to this question.

Chosen poster	N <sub>subjects</sub>
None	1 (2,1%)
Greenpeace	24 (50,0%)
CNDB	8 (16,7%)
FSC	14 (29,2%)
All	1 (2,1%)
Total	48 (100,0%)

**Table 9: Distribution of chosen posters.**

The Greenpeace poster was chosen by one subject out of two, which makes it the most frequently chosen poster, followed by the FSC poster

We expected the subjects to make their choice based on the three posters' messages. However, their answers were divided into two categories: those whose choice of poster was based on the persuasion techniques it used ("because this poster shocks" or "because this poster is the prettiest"), and those based on the message content ("because this poster advocates stopping deforestation"). A third category failed to choose or justify their choice. Table 10 shows the results for this question.

Justification of choice	N <sub>Subjects</sub>
Persuasion techniques adopted	17 (37%)
Message content	21 (45,6%)
No justification	10 (17,4%)
Total	48 (100%)

**Table 10: Distribution of choice justifications.**

Less than half of the subjects made their choice based on the posters' contents.

### ***Critical Judgment: Agreement with the Posters' Messages***

Subjects were asked whether they agreed with the following statements, each of which corresponds to the message of one of the three posters.

- Statement #1 (CNDB): *"Wood is a sustainable material that can help fight climate change"*.
- Statement #2 (FSC): *"It is possible to preserve forests while buying wood"*.
- Statement #3 (Greenpeace): *"Stopping deforestation worldwide is necessary to curb climate change"*.

Table 11 shows the results for this question.

Agreement	Statement #1	Statement #2	Statement #3
Disagree	11 (22.9%)	10 (20.8%)	14 (29.2%)
Neither agree nor disagree	10 (20.8%)	10 (20.8%)	12 (25%)
Agree	27 (56.3%)	28 (58.3%)	22 (45.8%)
Total	48 (100%)	48 (100%)	48 (100%)

**Table 11: Distribution of positions towards the three statements.**

The majority of subjects expressed their agreement with statements # 1 and # 2. Statement #3 had a lower agreement rate, even though it corresponds to the message of the Greenpeace poster, which was the poster chosen most often "for a better future."

Table 12 shows the results for tests of independence (Pearson's chi-square tests) between the distributions of positions towards the three statements, by pair of statements.

	Statement #1 x Statement #3	Statement #2 x Statement #3	Statement #1 x Statement #2
$\chi^2$ (dl = 4)	0.199	0.705	7.010
Sig.	0.995	0.951	0.135
N	48	46	46

**Table 12. Tests of independence between agreements to the three statements.**

Results show that the agreement to each statement is independent from the agreement to the two others: for any given respondent, agreeing with one statement is not related to (dis)agreeing with another statement.

Considering that these three statements are not all compatible between one another, and should have yielded non-independent judgments, we computed a score estimating the coherence of each respondent's positioning relative to all three statements, according to the following rules:

- Statement #1 and #2 are considered to be compatible, but in compatible with statement #3.
- Each respondent having expressed the same position (agreement or disagreement) towards statement #3 and one of the other two statements receives a coherence score of zero points.
- Each respondent having expressed the same position (agreement or disagreement) towards statements #1 and #2 and the opposition position towards statement #3 receives a coherence score of two points.
- Each respondent having expressed a given position (agreement or disagreement) towards statement #3, the opposite position towards one of the other two statements, and a neutral position towards the last statement receives a coherence score of one point.

- Each respondent having expressed the same position (agreement or disagreement) towards statements #1 and #2 and a neutral position towards statement #3 receives a coherence score of one point.
- Each respondent having expressed a given position (agreement or disagreement) towards any of the three statements and a neutral position towards the two others receives a score of one point.

Table 13 shows the distribution of these coherence scores.

Coherence score	N <sub>Subjects</sub>	
	0	25
1	16	(33.3%)
2	7	(14.6%)
Total	48	(100%)

**Table 13: Distribution of coherence scores.**

Results show that the majority of subjects positioned themselves incoherently with respect to the three statements. Only one subject out of six expressed a fully coherent position.

## ***Forest Experience Score***

In order to evaluate the relationship between the respondents' prior experience with forests and the different components of their cognitive autonomy towards forest-related media, a Forest Experience Score (FES) was computed for each respondent, based on the following formula

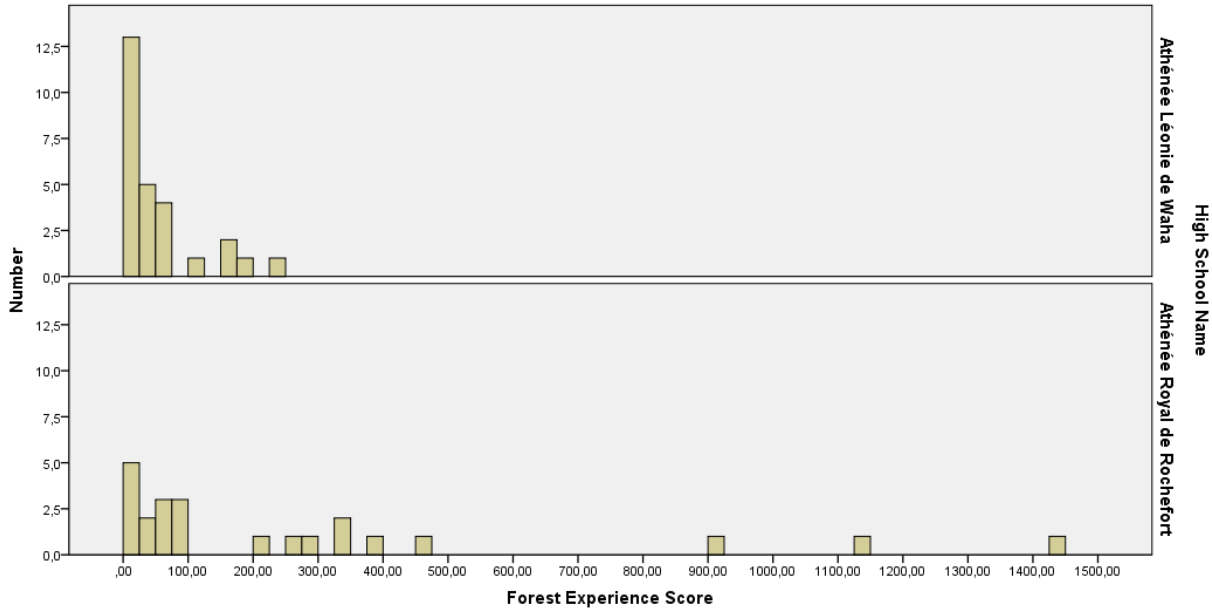
$$FES_i = ECDb_i \sqrt{(ACb_i * PC_i)} + ECDf_i \sqrt{(ACf_i * PC_i)}$$

where:

- $ECDb_i$  is the estimated cumulative duration of the respondent's visits in Belgian forests in the past year (in hours—see appendix 1);
- $ECDf_i$  is the estimated cumulative duration of the respondent's visits in foreign forests in the past year (in hours—see appendix 1);
- $ACb_i$  is the forest activity coefficient for stays in Belgian forests ( $\in [1,2]$ , with 1 corresponding to activities involving light interaction with the forest, and 2 corresponding to activities involving intense interaction with the forest—see appendix 2);
- $ACf_i$  is the forest activity coefficient for stays in foreign forests ( $\in [1,2]$ —see appendix 2);
- $PC_i$  is the “use of marked trails and paths” coefficient ( $\in [1,2]$ , with 1 corresponding to “always uses marked trails” and 2 to “never uses marked trails”—see appendix 3).

Figure 5 shows the FES distribution, grouped by high schools.





**Figure 5: Distribution of the Forest Experience Score within the two high schools.**

This distribution was significantly different between the two schools (Mann-Whitney's U test:  $p = 0,005$ ), which confirms the relevance of their choice as a means to recruit respondents with varied prior forest experience profiles.

The FES distribution did not differ significantly between boys and girls (Mann-Whitney's U test:  $p = 0,567$ ), neither was it correlated with the respondents' age (Kendall's tau-b =  $0,130$ ;  $p = 0,232$ ) in our sample.

## ***Relationship Between Cognitive Autonomy and Prior Experience of Forests***

We evaluated the relationship between our respondents' cognitive autonomy towards forest-related media and their prior experience with forests by performing a number of analyses crossing the FES and with the different variables presented in the previous sections of this paper. Table 14 summarizes the variables used in these analyses, as well as the correlation and association tests that were used.

Variable crossed with FES	Test
Poster description score	Kendall's tau-b
Poster message understanding score	Kendall's tau-b
Author identification score	Kendall's tau-b
Author qualification score	Kendall's tau-b
Author intentions identification score	Kendall's tau-b
Non-audience identification score	Kendall's tau-b
Statement of having learned something from the posters (yes/no)	Mann-Whitney U test
Poster of choice "for a better future"	Kruskal-Wallis test for independent samples
Type of poster choice justification	Mann-Whitney U test
Agreement with statement #1, #2 and #3	Kendall's tau-b
Coherence score	Kendall's tau-b

**Table 14: Variables used in correlation or association tests with the FES**

Contrary to our expectations, only two of these analyses returned statistically significant results:

- The message understanding score for the FSC poster was positively correlated with the FES (Kendall's tau-b = 0.227;  $p = 0,049$ ).
- The author intentions identification score was positively correlated with the FES (Kendall's tau-b = 0.299;  $p = 0.005$ ).

Subjects with higher prior forest experience appeared to better understand the FSC poster's message, as well as the intentions underlying its design. No other significant correlation or difference between groups with respect to the FES was found.

## Discussion and Future Work

The results of this preliminary study are twofold. On the one hand, subjects demonstrated a limited degree of cognitive autonomy when asked to understand, contextualize, compare, and make critical judgments about forest-related media messages.

Respondents understood the posters in part, and were able to identify their authors to some extent, although they seemed to have a hard time qualifying them correctly. Greenpeace seemed to be the easiest author to identify and qualify, even though in the case of the FSC poster, most of the text that appeared on the poster was dedicated to the explanation of the Council's mission.

Furthermore, respondents were more able to detect the authors' intentions than to identify the limits of their intended audiences. When it comes to comparing the posters' messages, two thirds of the respondents were unable to describe more than one relationship between them correctly.

The critical stances the respondents made towards these posters were often inconsistent. The Greenpeace poster was chosen more often than the two others as the one to be "shown for a better future" (mostly on the basis that it was shocking), even though it had the lowest agreement rate of all three posters, and was almost never cited as being the source of learning something new. Moreover, the positioning they showed towards the statements summarizing the posters' messages was mostly incoherent.

It is likely that, compared to other types of messages, poster-type messages like those used in our questionnaire are information vectors that fail to support the public in developing coherent and complex views on forest-related issues.

On the other hand, the hypothesis that the level of prior experience with forests influences the degree of cognitive autonomy towards forest-related media was invalidated, as almost no statistically significant relationship could be found between these two sets of variables.

Following the preliminary study presented in this paper, we conducted a larger survey based on the same research protocol with a revised questionnaire. The tests involved a sample of 145 students from three high schools: two general education schools (one located in a urban area and the other in a rural one), and a third school offering a curriculum in agro-forestry, in order to further investigate the role of forest experience, in terms of formal education in addition to informal interaction with the forest milieu. The data collected for this second study are currently under analysis.

The research presented in this paper is the first step of a longer research project, with a double intended contribution. On the one hand, it aims at producing methods for assessing how citizens develop a critical stance towards strategic media messages. On the other hand, it seeks to determine the factors that may positively influence the cognitive autonomy of media users, supporting them in building a complex and organized understanding of forest-related issues presented in the media.

We intend to consider four such factors. The first two are related to the media user profile of individuals: (a) the intensity of their media practices and (b) the media education which they have benefited from. The second two are related to their knowledge and experience of forests (c) their experience of the forest (as evaluated in the present paper) and (d) their education in the field of forestry. Our goal is to provide a theoretical model of the respective effects of environmental knowledge and media education, as well as the interaction of these two factors, on the cognitive autonomy of individuals towards representations of the natural environment in the media.

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## Appendices

### *Appendix 1: Estimated Cumulative Duration of Forest Visits*

The estimation of the total yearly duration of our respondent's forest visits relies on their answers to four questions:

- For visits in Belgian forests:
  1. "Last year (these last twelve months), how many times have you been in a forest?"
  2. "What was the duration of your longest forest visit last year?"
- For visits in foreign forests:
  1. "These last five years, have you been in a forest? If yes, how many times?"
  2. "What was the duration of your longest foreign forest visit these past five years?"

We used the distribution of the longest forest visit durations in our sample to calculate an estimation of the cumulative duration of each of our respondents' visits. This estimation prevents us from assuming that all visits of a given respondent had the maximum duration they indicated.

<b>Longest visit duration</b>	<b>N<sub>subjects</sub></b>
Less than an hour	4
One hour	9
Half a day	23
One day	10
More than one day	6

**Table 15: Distribution of longest Belgian forest visits in our sample**

We assumed that the distribution of a given respondent's  $n$  forest visits follows the cumulative distribution that can be calculated based on the distribution of the longest forest visit durations in our sample (e.g. see for the longest Belgian forest visits), limited to the possible durations for that respondent. For example, if a respondent declared that he went to a forest 20 times last year, and that his longest visit was half-a-day long, we compute the duration of his visits as follows:

Visit duration	Proportion of visits	Estimated cumulative duration
Less than an hour (0,5h)	$4 / (4+9+23) = 0.111$	$0.1111 * 20 \text{ visits} * 0,5 \text{ h} = 1,11 \text{ h}$
One hour (1h)	$9 / (4+9+23) = 0.25$	$0.25 * 20 \text{ visits} * 1 \text{ h} = 5 \text{ h}$
Half a day (4h)	$23 / (4+9+23) = 0.638$	$0.638 * 20 \text{ visits} * 4 \text{ h} = 51,11 \text{ h}$
Total		$1,11 \text{ h} + 5 \text{ h} + 51,11 \text{ h} = 57,22 \text{ h}$

This computation was applied to Belgian forest visits as well as to foreign forest visits, and yielded two estimations:

- $ECDb_i$ : the estimated cumulative duration of the respondent's visits in Belgian forests in the past year;
- $ECDf_i$ : is the estimated cumulative duration of the respondent's visits in foreign forests in the last five years, divided by five in order to obtain a yearly average;

## Appendix 2: Forest Experience Scores: Forest Activity Coefficient

Answers to the question “For what reasons did you visit a forest last year?” and “For what reasons did you visit a forest abroad these last five years?” were coded into scores, according to the degree of interaction with the forest they indicated:

Answer from the questionnaire (multiple choice in the list)	Score (STA)
To observe (the fauna, the flora, ...)	5
To harvest wood, to pick fruits, to hunt, etc.	5
To go camping	4
To play (roleplay, boy scouts / girl scouts, etc.)	4
To practice a sport (running, biking, horseback riding, trailing, etc.)	3
To follow a guided tour	2
To go for a walk	2
To pass through it on my way to another destination	1

Based on these scores, the activity coefficient ( $AC_i$ ) was computed for each respondent using the following formula:

$$AC_i = 1 + ((STA_i - 1) / (\max \{STA_1, \dots, STA_n\} - 1))$$

where  $STA_i$  is the highest score for a given respondent's different forest activities. This coefficient exists between 1 and 2.

### ***Appendix 3: Forest Experience Scores: forest trail use coefficient***

Answers to the question “Last year, whenever you were in a forest, you circulated...” were coded into scores, according to the degree of interaction with the forest they indicated:

<b>Answer from the questionnaire (single choice in the list)</b>	<b>Score (SC)</b>
Always on marked trails and paths	1
Very often on marked trails and paths	2
Often on marked trails and paths	3
Sometimes on marked trails and paths	4
Rarely on marked trails and paths	5
Almost never on marked trails and paths	6
Never on marked trails and paths	7

Based on these scores, the “use of marked trails and paths” coefficient ( $PC_i$ ) was computed for each respondent using the following formula:

$$PC_i = 1 + ((SC_i - 1) / (\max \{SC_1, \dots, SC_n\} - 1))$$

This coefficient exists between 1 and 2.