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Perception and nature connectedness among secondary school students in a degrading environment: case of CEG Anosindrafilo, Alaotra-Mangoro region, Madagascar

Perception et attachement à la nature chez les élèves du secondaire dans un environnement dégradé : cas du CEG Anosindrafilo, région Alaotra-Mangoro, Madagascar

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Abstract: Environmental education has been applied in the Alaotra-Mangoro region for decades. Despite this, the region is in the top 3 of deforestation in Madagascar. The environment is deteriorating. Studies have been conducted to discover the possible causes of this situation, but none has focused on the perception of the natural environment by the population living there and their attachment to this environment. There is a paucity of literature on the subject. Without such information, it is difficult to develop a theory of behavioural change and an effective environmental education programme for conservation and sustainable development. This study questions the population's attitude towards Alaotra-Mangoro. The aim is to explore people's feelings about their natural environment and whether they are connected to it. A case study was conducted at CEG Anosindrafilo in May 2020 through a survey adapted from Mayer & Frantz (2004:513) and Cheng & Monroe (2012:41). For each statement, a 5-point Likert scale was used. The results obtained can help decision makers better select target populations and elaborate effective environmental education programmes for the region.

Keywords: environmental education, natural environment, perception, place attachment, Alaotra-Mangoro

Résumé: L'éducation environnementale est appliquée dans la région Alaotra-Mangoro depuis des décennies. Malgré cela, la région est dans le top 3 de la déforestation à Madagascar. L'environnement se détériore. Des études ont été menées pour découvrir les causes possibles de cette situation, mais aucune n'a porté sur la perception de l'environnement naturel par la population qui y vit et leur attachement à cet environnement. Il y a peu de littérature sur le sujet. Sans ces informations, il est difficile de développer une théorie du changement de comportement et un programme efficace d'éducation environnementale pour la conservation et le développement durable. Cette étude interroge l'attitude de la population envers Alaotra-Mangoro. L'objectif est d'explorer les sentiments des gens à propos de leur environnement naturel et s'ils y sont connectés. Une étude de cas a été réalisée au CEG Anosindrafilo en mai 2020 à travers une enquête adaptée de Mayer & Frantz

(2004 :513) et Cheng & Monroe (2012 :41). Pour chaque énoncé, l'échelle de Likert à 5 points a été utilisée. Les résultats obtenus pourront aider les décideurs à mieux sélectionner les populations cibles et à élaborer des programmes efficaces d'éducation environnementale pour la région.

Mots clés: éducation environnementale, environnement naturel, perception, attachement à un lieu, Alaotra-Mangoro

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1. Introduction and the research problem

Madagascar, despite having received considerable international conservation and development attention in the past decades (Horning 2008:428), is still one of the poorest countries (UNDP 2013:27) facing continuous degradation of its natural environment and an ongoing loss of its unique biodiversity (Reibelt 2017:100). Forests are among the ecosystems that undergo degradation. These losses and degradation of Madagascar's forests have multiple causes. Although *tevy ala* and *tavy* have (salash-and-burn agriculture) always been among the most worrying factors (Clark 2012:64, Ratsisompatrarivo and Rasoamampianina 2016:36), deforestation for the purposes of cash crop agriculture, for the settlement of rapidly expanding or migrating populations, and deforestation favoured by access roads have recently become major concerns in some regions (Ratsisompatrarivo and Rasoamampianina 2016:36). The highest regional deforestation rates have been recorded for the Boeny, Atsimo Andrefana and Alaotra-Mangoro regions (ONE, DGF, FTM, MNP, CI 2013:12). From 2002 to 2022, Alaotra-Mangoro lost 157 kha of humid primary forest, making up 40% of its total tree cover loss in the same time period. The total area of humid primary forest in Alaotra-Mangoro decreased by 30% in this time period (Global Forest Watch 2022). The Alaotra Mangoro case study showed that even various and decade-long environmental education interventions targeting several stakeholder groups and using different educational approaches have had only a limited impact (Schüßler 2019:12).

Numerous studies have been conducted on Alaotra-Mangoro. Most of these studies focus on ecology, economics and conservation biology. Among the studies on environmental education, Ratsimbazafy (2021) focused on four main points, namely (i) the local population's perception of previously conducted environmental education, (ii) environmental indicators of the impact of environmental education, (iii) social indicators of the impact of environmental education, and (iv) economic indicators of the impact of environmental education. Reibelt (2017) examines knowledge, attitudes and perceptions of natural resource users toward environmental values of Lake Alaotra. She assesses the prospects of implementing EE in public primary schools. She also examines the significant life experiences of active conservationists. Moreover, Reibelt et al. (2017:1) explored formative influences on individuals who actively contribute to nature conservation and environmental education (EE) in Madagascar. Schüßler et al. (2019:3) reviewed 248 EE interventions throughout Madagascar. We highlight how EE can promote pro-environmental behaviors and show the major obstacles it faces, using Madagascar's Lake Alaotra as a case study area. Furthermore, although Dahely (2023:231) suggested the introduction of an environmental information and/or education system to better establish sustainable community management, he focused his work on combating forest exploitation for charcoal production in the Ambatondrazaka district.

All in all, to our knowledge, no study of the local population's attachment to the local environment has yet been conducted. There is a paucity of literature on the subject. Without such information, it would be difficult to develop a theory of behavioural change and an

effective environmental education programme for conservation and sustainable development in the region. This work therefore questions the population's attitude towards Alaotra-Mangoro. The aim is to explore people's feelings about their natural environment and whether they are connected to it. To achieve this goal, two hypotheses were proposed: (i) Alaotra-Mangoro maintains its natural aspect and (ii) the target communities are not connected to their environment.

2. Materials and methods

The study was conducted in May 2020 at the *Collège d'Enseignement Général (CEG)*[1] Anosindrafilo, District of Ambatondrazaka, in the Alaotra-Mangoro region, east-central Madagascar (17°48'0"S, 48°22'0" E). The school was chosen for a case study because of its location between urban and rural areas. Since its opening in 2010, both urban and rural students have attended it. What's more, it is a public school. The majority of students attending the school are unable to leave the region for the capital or another large city because of limited financial resources. Therefore, they may be reliable later on for any local environmental protection and conservation effort.

The perception and sentimental values of the study community were investigated using a survey adapted from Mayer & Frantz (2004:513) and Cheng & Monroe (2012:41). Ten statements in Malagasy were put forward to discover the study group's feelings and perceptions of their natural environment.

For each statement, a 5-point Likert scale, also known as "scaled questions", is used. The respondent expressed agreement or disagreement on a scale of 1 to 5.

1. Disagree totally
2. Disagree
3. Neutral modality
4. Agree
5. Agree totally

The probability sampling technique was used to give everyone in the target group the same chance of being chosen to take part in the survey. The group was classified into four strata based on their grades – from 6^{th} to 9^{th} Grades. Each stratum was randomly sampled to equally represent all parts of the population. Then, cluster sampling was used for the final data collection. The overall study population was divided into clusters (Acharya et al. 2013:331). After identifying sample pockets with the school principal and administrative staff, we included these pockets in their entirety in the sample. Representatives of pupils in 6^{th}, 7^{th}, 8^{th} and 9^{th}Grades were selected as clusters. Therefore, there were 192 respondents out of 349 students, of which 96 were boys and 96 were girls. The average age of the respondents was 14 years.

The survey was conducted as follows:

Stage 1: Clusters were grouped together.
Stage 2: Presentation by the school principal
Stage 3: We explained the aim of the survey.
Stage 4: Distribution of survey forms and explanation of procedures
Stage 5: Collection of completed survey forms after 30 minutes.

XL STAT software was used to process and analyze the data collected. The metric used is the percentage of the most frequent responses. The distribution of responses is represented on graphs that show the number or percentage of students for each major statement. To test each hypothesis, responses were analysed using Chi2 test.

[1] Secondary school

3. Findings and Results

The aim of this study was to investigate secondary school students' feelings about their environment and connexion to it. Two hypotheses were advanced. The first assumes that Alaotra-Mangoro retains its natural features. The second assumption assumes that the target population is still connected to Alaotra-Mangoro. The survey using the Likert scale revealed the following results.

3.1. The natural environment of Alaotra-Mangoro

Alaotra-Mangoro is widely recognised as a region rich in water. It also abounds in animals. The following graphs show the students' perceptions of these subjects.

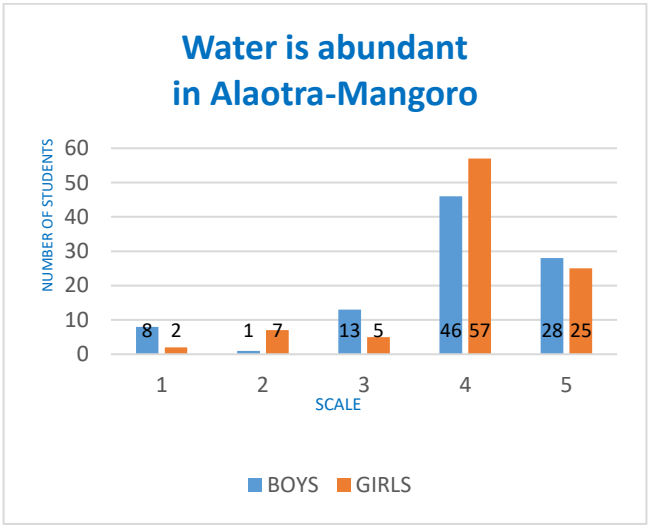

Figure 1: Students' perceptions of water in Alaotra-Mangoro

As far as water in the study area is concerned, the number of boys and girls who find it abundant is very high. However, those who disagree that water is still plentiful are small in number.

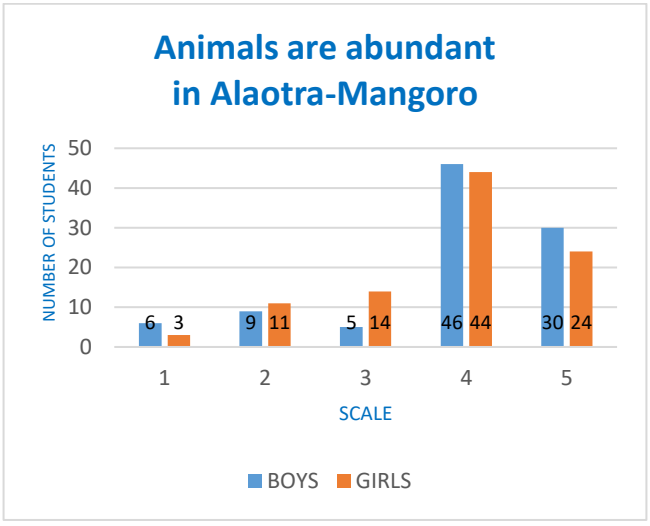

Figure 2: Students' perceptions of animals in Alaotra-Mangoro

According to this graph, the majority of the respondents found that animals are still abundant in Alaotra-Mangoro. Only a small number of those interviewed revealed that they disagreed on the abundance of animals in the area.

As for nature in Alaotra-Mangoro, 68% (n=130) of the students think that it is still possible to enjoy it. Moreover, according to 61% (n= 117) of these students, this region is still a place of great natural beauty. Trees play an important role in this according to 66% (n= 126) of the respondents.

Yet, only 15% (n=28) of respondents strongly agreed that people can be well connected to nature in Alaotra-Mangoro. There were more boys (19/28) than girls (9/28). At the same time, 22% of the respondents did not agree that it is possible to connect with nature in Alaotra-Mangoro. In addition, an unexpected result was found. The number of people who think it is possible to breathe fresh air in Alaotra-Mangoro is 43% (n= 83); this is below the average.

3.2. Connectedness to Alaotra-Mangoro

To better understand the target population, we needed to investigate several indicators. Their attachment or connectedness to their environment was one of them.

Table n° 01: Connectedness of the target population in Alaotra-Mangoro

SCALE	BOYS	GIRLS	TOTAL	PERCENTAGE
1	11	20	31	16%
2	18	31	49	26%
3	11	18	29	15%
4	33	20	53	28%
5	23	7	30	16%
TOTAL	**96**	**96**	**192**	100%

69% (n=132) of respondents were more satisfied in Alaotra-Mangoro than elsewhere. However, only 50% (n=96) felt that there was no better place to live than Alaotra-Mangoro. Table 01 shows the trend in the connectedness of the target population to Alaotra-Mangoro. Only 44% (n=83) of them felt a sense of attachment to this region. The percentage of those who totally agree that Alaotra-Mangoro is a part of themselves and cannot be separated from themselves is 16% (n=30).

The (Khi^2) independent test result is as follows:

Khi^2 (observed value)	19.4736
Khi^2 (critical value)	9.4877
DDL	4
p-value	0.0006
Alpha	0.05

Since the calculated p-value is lower than the level of significance alpha=0.05, we must reject the null hypothesis H0, and retain the alternative hypothesis Ha. The risk of rejecting the null hypothesis H0 when it is true is less than 0.06%. To conclude, the target communities are connected to their environment.

4. Discussion

This exploratory research questioned people's environmental attitudes toward Alaotra-Mangoro. Concerning Alaotra-Mangoro's natural environment, according to Figure 01, the majority (81%) of the study population tend to perceive water as still abundant in Alaotra-Mangoro. This may be because the region possesses two major wetlands, namely Alaotra and its watersheds (722 500 Ha)[2] and Torotorofotsy (9 764 Ha)[3]. Actually, there are 18 lakes distributed in four districts, 1 artificial lake, 1 temporary lake, and about 30 rivers in Alaotra-Mangoro.[4] Alaotra is classified as the largest freshwater ecosystem in Madagascar (Rafidimanana 2013:13).

4.1.A natural setting with polluted air?

Despite the destruction of these wetlands for various reasons, including the management of rivers and the intensification of agriculture, water remains abundant. Boys and girls agree. Nevertheless, the number of those who strongly agree on this abundance tended to decrease: 28/96 of boys and 25/96 of girls.

Animals are also perceived as numerous. 75% of the respondents find them so. This confirms the discovery of Ratsimbazafy (2021:31) that wild animals have become more numerous after the environmental education carried out previously.

In addition, we discovered in this study that it is still possible to admire nature in Alaotra-Mangoro. The area is still a place of natural beauty despite the fact that it recorded a primary forest loss of 8.33 Kha in 2020. In any case, 66% (n=126) believe that trees play an important role in this natural aspect of the region.

On the other hand, an increasing number of respondents (31%, n=60) find that they can no longer breathe fresh air in their own region. Girls are more sensitive than boys. Indeed, only 36 girls out of 96 against 47 boys out of 96 said that they can breathe fresh air in Alaotra-Mangoro. This could be due to various reasons related to pollution caused, for example, by smoke from bush fires and forest fires, extensive livestock farming, uncontrolled use of pesticides, and poor waste management.

Our results allowed us to understand the feelings and perceptions of the study community regarding their environment. The hypothesis that Alaotra-Mangoro maintains its natural appearance is confirmed. Nevertheless, the air no longer satisfies most of the study community.

4.2.Towards a detachment of the population

Concerning the connectedness of the target population to Alaotra-Mangoro, three major results were obtained. On the one hand, it is obvious that 69% (n = 132) are satisfied with this region. A downward trend is observed when compared with other regions. In fact, only 50%, or half, think Alaotra-Mangoro is much better than the others. On the other hand, only 43% (n=83) of the respondents agreed that they could not be separated from Alaotra-Mangoro. An undeniable percentage (42%, n=80) of people are no longer attached to it. Girls are more

[2] https://rsis.ramsar.org/fr/ris/1312?language=fr (accessed : July 09, 2023)
[3] https://asity-madagascar.org/blog/uncategorized/torotorofotsy-celebration-national-de-la-journee-mondiale-des-zones-humides-2023/ (accessed : July 09, 2023)
[4] https://www.pnae.mg/tbe/region-alaotramangoro.html (accessed: July 09, 2023)

numerous (n=51) than boys (n=29). In other words, it would be better to entrust environmental protection and conservation programmes to boys rather than girls, since the latter are mostly likely to leave Alaotra-Mangoro. However, another study is needed to analyze this phenomenon. In any case, the hypothesis that the target population is connected to their region is biased.

4.3. Feelings and perception of the target community for a better environmental education programme

Most studies on environmental education programmes for conservation and environmental education for sustainable development have focused on primary school students. This may be because "Primary schools represent the only opportunity for the majority of Malagasy people to participate in formal education (and) less than 30% of the Malagasy population acquire the final grade of primary school education" (Schüßler, Richter and Mantilla-Contreras 2019:5). Our study, on the other hand, was directed towards students in secondary education, particularly in middle school. College students are certainly better instructed and closer to adulthood, where they will become actors of conservation and sustainable development in their own environment.

There are many suggestions put forward by researchers for better environmental education for conservation and/or sustainable development. Schüßler, Richter and Mantilla-Contreras (2019:13) propose awareness raising and knowledge building on environmental issues as a step towards pro-environmental behaviours. Rafidimanana (2013:50-51), to develop a change of attitude among students, relies on the assessment of each subject taught, the use of books, and the allocation of time to students so that they can express themselves. For the development of environmental education, Ramilison (2011:47) goes so far as to propose an analysis of structures, the diagnosis of the area, the inventory of cultural factors, the preparation of educational tools, the training of educators, and the establishment of a system of performance evaluation of the current programme. Reibelt (2017:120) suggests that the needs, concerns, and local value systems should be analyzed to draft environmental education programmes.

All these studies draw well-deserved attention to environmental education for conservation and/or sustainable development in the Alaotra-Mangoro region. Despite this, they failed to address the feelings of the target communities, including their connectedness to their environment. The perception of the target communities was also minimised regarding the state of the natural environment in Alaotra-Mangoro. Our study addressed these points because we consider these elements essential before designing and developing environmental education programmes. Indeed, man is the main actor in conservation and sustainable development, because he is a conscious being. How can we develop an environmental education programme for him if we do not even know what he feels and thinks? How can we motivate him to protect the environment if he is not connected and has no attachment to it?

According to Waeber et al. (2016:9-10),

> Conservation is intricately intertwined with development, especially in biodiversity-rich tropical countries such as Madagascar, where a majority of the population lives in rural areas and depends directly on natural resources. Many policy adjustments have been made to address conservation and development issues jointly in Madagascar, but internationally-supported efforts have barely affected rural people. Yet these same poor, rural people are the ones profoundly altering the island's landscapes to meet their basic, daily needs, and in the process they have the greatest overall impact on the country's ecosystems and biodiversity. The formulation of policies to promote conservation and development goals and the identification of strategies and actions need to include and involve these key actors.

This study is an indispensable preliminary to such inclusion. It allows us to examine the natural environment in Alaotra-Mangoro from the viewpoint of the local population - in this context, that of college students who will soon become actors of conservation. It also makes it possible to identify key people on the front line in the fight against environmental degradation and destruction. Once these steps are completed, it would be interesting to embark on a sociocultural and economic study of the key people identified.

5. Conclusion

To conclude, this exploratory study brought out the perception of the natural environment of Alaotra-Mangoro by the students – in this case, those of the middle school students of Anosindrafilo. The study also revealed the degree of attachment of these students to their environment. In short, the study community finds that Alaotra-Mangoro maintains its natural aspects. Water remains abundant. Trees are an important part of the ecosystem. However, less than half of the study community was satisfied with the air quality. A very small number are still attached to this region. Girls, in particular, are very detached from this environment; however, the reasons for this detachment have not been further explored in this study. We limited ourselves to exploring the feelings and perceptions of the study community. As a follow-up to this research project, prior to the design and development of an effective environmental education programme for the region, it is necessary to conduct a complementary study on the gender approach to the social and economic situation of the target population. Social psychology related to the environment is also another relevant line of research.

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Appendix

SURVEY STATEMENTS

1. Mitana toerana lehibe eto Alaotra-Mangoro ny hazo.
   Trees play an important role in Alaotra-Mangoro.
2. Toerana ahitana rano betsaka Alaotra-Mangoro.
   Alaotra-Mangoro is a place where we can find plenty of water.
3. Toerana ahitana biby sy vorona maro Alaotra-Mangoro.
   Alaotra-Mangoro is a place where we can find many animals and birds.
4. Toerana voajanahary tsara tarehy Alaotra-Mangoro.
   Alaotra-Mangoro is a place of natural beauty.
5. Toerana ahafahana mifoka rivotra madio Alaotra-Mangoro.
   Alaotra-Mangoro is a place where we can breathe fresh air.
6. Toerana ifandraisana amin'ny natiora Alaotra-Mangoro.
   Alaotra-Mangoro is a place where we connect with nature.
7. Toerana fakana aina eo anivon'ny zavaboahary Alaotra-Mangoro.
   Alaotra-Mangoro is a place where we can relax in the midst of nature.
8. Tsy misy toerana tsara onenana mihoatra an'Alaotra-Mangoro.
   There is no better place to live in than Alaotra-Mangoro.
9. Mamokatra sakafo betsaka Alaotra-Mangoro.
   Alaotra-Mangoro produces plenty of foods.
10. Tsapako hoe toy ny ampahany tsy azo sarahina amiko ny faritra Alaotra-Mangoro.
    I feel that Alaotra-Mangoro is a part of me that cannot be separated from me.