

Linking biodiversity conservation and education: perspectives from education programmes in Madagascar

Aina Brias-Guinart^{I,II,III}, Aili Pyhälä^{II,III}, Mar Cabeza^{I,III}

Correspondence:

Aina Brias-Guinart

Global Change and Conservation Lab, Organismal and Evolutionary Biology Research Program, Faculty of Biological and Environmental Sciences, University of Helsinki, Finland

Email: aina.briasguinart@helsinki.fi

ABSTRACT

Education is used to foster supportive behaviour for conservation. This paper examines how environmental education is implemented in Madagascar, and its potential for conservation. These reflections are based on literature insights and in-depth experiences from the field. We found that environmental education is only marginally integrated in the national curriculum and NGOs are the primary promoters. Evaluation methods focus on quantifying short-term changes in knowledge and attitudes, and interventions fail to integrate local knowledge, values and needs. We call for researchers to examine the long-term impacts, on governmental commitment and support, and for future interventions to be inclusive and locally meaningful.

RÉSUMÉ

L'éducation est un moyen utilisé pour encourager les comportements favorables à la conservation, en particulier dans les communautés locales vivant autour des aires protégées. À partir de la littérature et d'expériences sur le terrain, cette contribution examine les manières dont l'éducation environnementale est mise en œuvre à Madagascar, et son potentiel dans la conservation. Il a été constaté que, dans le cadre des écoles primaires, l'éducation environnementale n'est intégrée que de façon marginale dans le curriculum, et les ONG sont les principaux acteurs qui promeuvent l'éducation environnementale. Le principal cible les élèves pour conduire des activités dans le cadre strictement scolaire avec peu de visites dans les aires protégées. Les méthodes d'évaluation se concentrent sur la quantification des changements à court terme dans les connaissances et les attitudes, et non dans les comportements. Les interventions ne parviennent pas à intégrer les connaissances, les valeurs et les besoins locaux. L'influence de l'éducation sur le succès de la conservation reste floue, de sorte qu'il est proposé que la recherche examine également les impacts qualitatifs et comportementaux à long terme des interventions éducatives, l'en-

gagement et le soutien du gouvernement national, et que les futures interventions soient inclusives et significatives au niveau local.

INTRODUCTION

The IPBES Global Assessment on Biodiversity (2019) identifies education as a key point of intervention to enable transformative change towards sustainability. Education can strengthen conservation efforts by increasing knowledge, contributing to improved awareness and encouraging positive attitudes towards conservation (Jacobson et al. 2006, Heimlich 2010, Reibelt et al. 2014). For this reason, education programmes for communities living in or near protected areas are a common support strategy for conservation management (Heimlich 2010, Breuer et al. 2017, Superina et al. 2019)

Madagascar's unique biodiversity has attracted hundreds of international research, conservation and development institutions, which have advised relevant political bodies, including the Ministry of Environment and the Ministry of Education (MENETP 2016, WWF 2016), strongly influencing the national environmental and educational agenda (Waeber et al. 2016). Additionally, concerns about biodiversity loss have motivated non-governmental organisations (NGOs) to include environmental education in their work to promote conservation (Reibelt et al. 2014). Shared narratives among practitioners hold that education benefits conservation. However, studies investigating the long-term impacts of education programmes—both ecological and socio-cultural—are still scarce (e.g., Rakotomamonjy et al. 2015, Richter et al. 2015, Balestri et al. 2017).

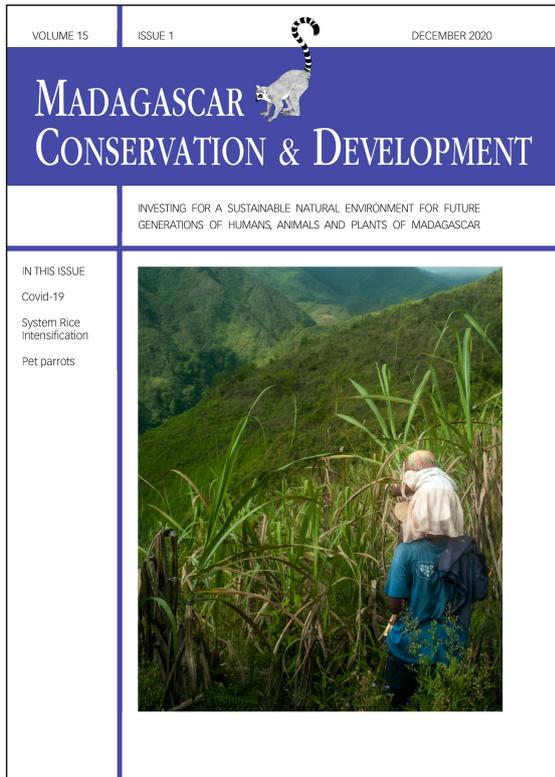
The international conference held by the Association for Tropical Biology and Conservation in Antananarivo in 2019 drew attention to the urgent need for the national government to address the decline of biodiversity in Madagascar (Ivato Petition 2019 based on Jones et al. 2019). During the conference, environmental education

I Global Change and Conservation Lab, Organismal and Evolutionary Biology Research Program, Faculty of Biological and Environmental Sciences, University of Helsinki, Finland

II Development Studies, Faculty of Social Sciences, University of Helsinki, Finland

III Helsinki Institute of Sustainability Science, University of Helsinki, Finland

Citation Brias-Guinart, A., Pyhälä, A., Cabeza, M. 2020. Linking biodiversity conservation and education: perspectives from education programmes in Madagascar. *Madagascar Conservation & Development* 15, 1: 35–39. <http://dx.doi.org/10.4314/mcd.v15i1.4>



Madagascar Conservation & Development is the journal of Indian Ocean e-Ink. It is produced under the responsibility of this institution. The views expressed in contributions to MCD are solely those of the authors and not those of the journal editors or the publisher.

All the Issues and articles are freely available at <http://www.journalmcd.com>



Contact Journal MCD
info@journalmcd.net for general inquiries regarding MCD
funding@journalmcd.net to support the journal

Madagascar Conservation & Development
 Institute and Museum of Anthropology
 University of Zurich
 Winterthurerstrasse 190
 CH-8057 Zurich
 Switzerland

io@i

Indian Ocean e-Ink
 Promoting African Publishing and Education
www.ioeink.com

 MISSOURI BOTANICAL GARDEN

Missouri Botanical Garden (MBG)
 Madagascar Research and Conservation Program
 BP 3391
 Antananarivo, 101, Madagascar

was presented as a timely tool to help achieve long-term success in conservation while considering human well-being. This paper reflects on the different ways in which environmental education is implemented in Madagascar and its potential to address the urgent challenges currently facing conservation initiatives.

The reflections we provide in this perspective piece are derived from extensive literature insights, and months of fieldwork in Madagascar including, but not limited to, a range of key informant interviews with relevant stakeholders related to environmental education in Madagascar (conducted in November and December 2018). These are used to elicit a variety of perspectives, including from: (i) representatives from civil society organisations, (ii) authorities from the Ministry of Education, Ministry of Environment and Madagascar National Parks, (iii) directors and practitioners from conservation NGOs, (iv) researchers, (v) primary school directors and teachers, (vi) local community customary leaders, touristic guides, villagers and (vii) participants from the education programmes themselves. By weaving together these different strands of data, we provide a general overview of the status quo of environmental education in general, with a particular focus on long-running education programmes situated near protected areas. Moreover, we scope needs and opportunities for change across the broader context and suggest new directions for future research in the field of environmental education in Madagascar.

ENVIRONMENTAL EDUCATION IN MADAGASCAR: SCHOOLING AND THE ROLE OF NGOS

Strategies of environmental education within the current Malagasy school system remain weak (Reibelt et al. 2014, Schüßler et al. 2019). Representatives from NGOs and primary schools equally agree that environmental education is largely lacking in practice in primary education and when it is present, with a curriculum designed at the national level, it lacks site-specific content. “The curriculum is very fixed and teachers do not have the time, the skills or the motivation to adapt it to include environmental education topics” [Primary school Director]. Moreover, the Malagasy educational system presents a series of dysfunctions and equity issues. Primary school exclusion is one of the biggest challenges: a large majority of children are deprived of a complete cycle of quality primary education, including over one million children who are not attending school, for a number of reasons (d’Aiglepiere 2012). Additionally, the percentage of students continuing from primary to secondary school is relatively low (65.4% national average in 2014–2015) (PSE 2017), with strong inequalities among regions (from 17 to 87%) (ibid). Therefore, primary schools remain the sole formal education for a majority of children, particularly in rural areas (Reibelt et al. 2014), and thus are the target of most of the NGOs that we interviewed. Worryingly, there is also a lack of professionally trained teachers in rural areas due to national budget restrictions, leading instead to a reliance on community recruited youth to step in as teachers (67% of all teachers in 2014–2015) (PSE 2017).

In the past decades NGOs have been filling gaps in the formal school system by providing education material (Dolins et al. 2010) and promoting new approaches to move from teacher-centred learning towards non-traditional participatory methods (Reibelt et al. 2014). Researchers have also begun to engage more in environmental education with local schools and communities (Rakotomamonjy et al. 2015), lobbying for the integration of environmental education in the official school curriculum (Jolly 2012). NGO education interventions are usually not undertaken in isolation, but inte-

grated within broader sustainable livelihoods programmes such as reforestation, trainings on agriculture and renewable energy, ecotourism, health, and alternative livelihoods.

Protected areas have been the principal conservation strategy in Madagascar (Gardner et al. 2018). Thus, environmental education interventions have been mostly conducted around protected areas by international, national and local NGOs, targeting primary school children (Schüßler et al. 2019). Similarly, the conservation NGOs we interviewed work around protected areas (see Table 1 as an example), and mostly target primary school children, while the educational activities are varied and range from lecture-based activities to school gardens, hands-on experiments, radio programmes, creation of educational material, and environmental clubs. The frequency of the activities can vary from a single day intervention—all of the interviewed NGOs celebrate, for instance, the World Lemur Day—to an entire academic course with regular weekly sessions.

LINKING EDUCATION WITH BIODIVERSITY CONSERVATION: OUTCOMES AND IMPACTS

A common assumption amongst NGOs and protected area managers is that improved conservation outcomes can be reached through educational interventions (Richter et al. 2015). However, it is still unclear to what extent education programmes are having an impact on conservation and which might be the pathways for such impacts. Practitioners interviewed recognise that despite having

Table 1. Similarities and differences amongst conservation education programmes (EP) conducted near protected areas (PAs). These particular NGOs were visited in-situ and illustrate some of the longest-running programmes in Madagascar.

Variables comparing the diversity within the education programmes that NGOs are conducting:

- Target: Participants of the education programmes. The vast majority target primary school children;
- Educators: Most NGOs use their own employees to implement the education programmes (external), while others train the teachers from primary schools (trained teachers);
- Setting: Education activities often take place within the school settings (school). In some cases, the participants go to the NGO’s facilities (MFG and MWC);
- Frequency: Number of sessions that each participant attends. This varies from a single time (MFG), to several sessions over the course of one year (Mitsinjo and MFG), to every day during the school term (CVB);
- Starting date: Year when the specific education programme started;
- Topics: Content of the education programme;
- PA visit: Number of visits inside the nearby protected area by the same participant;
- Evaluation: Type of evaluation conducted to assess the impact of the education programme; *Others includes external evaluation, project presentation evaluation and participant evaluation.

Note: The interviews were done in French whenever possible, and when necessary supported with Malagasy simultaneous translation by Malagasy research assistants. We obtained free, prior, informed consent from each participant, guaranteeing to each interviewer anonymity and confidentiality. The mentioned organisations (Centre Valbio, Mitsinjo, MFG and MWC) have agreed on the content and publication of this table)

	 Centre Valbio	 Mitsinjo	 MFG - Ivoloina	 MWC - Alaotra
Main EP	Valbio - Ranomafana	Mitsinjo - Andasibe	MFG - Ivoloina	MWC - Alaotra
Target	children	children	children	adults
Educators	external	external	trained teachers and external	external
Setting	school	school	Ivoloina & school	NGO camp
Frequency	every day during 1 year	4 times/month during 1 year	~ 30 sessions during 1 year	one-off
Starting date	2015	2013	1996	2018
Topics	conservation	environment	environment, French & maths	environment
PA visit	once a year	once a year	once a year	-
Evaluation	pre/post questionnaire and others*	pre/post questionnaire	pre/post questionnaire	-

long conducted environmental education, the threats to biodiversity—mainly deforestation— remain unresolved. They question whether this is due to internal factors - such as their approach to environmental education - or external ones - such as poverty and lack of livelihood alternatives. “Despite all the efforts in environmental education, there have been no outcomes, because of poverty, or insecurity. How can environmental education be effective?” [Madagascar National Parks regional representative]. However, some recognise that educational programmes may have further impacts beyond conservation, such as their contribution to well-being and positive youth development. Similarly, as argued by an environmental NGO representative working close to a large scale mining operation: “Education can make people less vulnerable to external factors such as abuses by mining companies”.

All interviewees agreed that there is a need for the scientific community to understand the role of education at all levels. As exemplified in Table 1, most of the programmes we studied evaluate their outcomes by quantifying short-term changes in knowledge and attitudes using pre- and post- intervention questionnaires, as has been done elsewhere (e.g., Breuer et al. 2017, Freund et al. 2019). Other studies that have evaluated longer-term impacts (one year after the intervention), have solely focused on changes in knowledge and attitudes (Rakotomamonjy et al. 2015, Richter et al. 2015, Balestri et al. 2017). Indeed, many educational strategies still focus on the provision of knowledge. Yet, the discourses of some of the education practitioners interviewed seem to be questioning the overly simplified assumption that knowledge directly affects people’s attitudes, which in turn motivates them to change their behaviour (Heimlich 2010).

While knowledge is a key factor in moving people towards action, it is rarely enough to motivate long-term changes in behaviour, especially when basic needs and value orientations are mismatched (Manfredo 2008). Therefore, it is essential to identify and recognise other key factors influencing behaviour. As an example, efficacy, having a sense of place, and social capital have been identified as key elements to consider in future education programmes (Krasny 2020). It therefore remains imperative to measure the impact of environmental education initiatives in order to evaluate their effectiveness in achieving conservation goals (Freund et al. 2019), yet conducting more comprehensive evaluations that go beyond simply measuring knowledge or attitudes towards charismatic species.

PARTICIPATION AND INCLUSIVITY IN EDUCATION PROGRAMMES

The conservation agenda has lacked an inclusive approach both in terms of the types of knowledge incorporated and representation of worldviews, interests and values (Pascual et al. 2017). Moreover, the voices, needs, and knowledge systems of local communities have rarely been heard in these processes (Corson 2017). Likewise, this study highlights the same caveats both in the designing of the national curriculum and in the planning and implementation of NGOs interventions (Reibelt et al. 2014, Schübler et al. 2019). Amongst the NGOs interviewed, there are differences in the extent of participation of local communities, local authorities and local teachers in the design and implementation of the education programmes, potentially compromising programme success. For some NGOs (Table 1), primary school teachers are involved in designing and executing the programmes, and they have a strong collaboration with some regional public institutions (e.g., Circonscriptions

Scolaires or CiSco, or school districts). For others, the education programmes are designed by the NGO and delivered by external educators instead of training local teachers. This can create conflicts between local and external teachers, and diminish the opportunities for future involvement on the project by local teachers. Finally, in line with others (Bekalo and Bangay 2002, Reyes-García et al. 2010), we argue that educational programmes should place a much stronger emphasis on the inclusion of local knowledge. NGOs, as opposed to the formal school system, have the flexibility to adapt the content and teaching methods—i.e., via field trips or informal instruction—to ensure that their education programmes are locally meaningful and recognise the richness of local wisdom.

Most environmental education programmes in Madagascar target children (Schübler et al. 2019). However, many practitioners stated that it is unclear how knowledge is further transmitted. “There are around 40 NGOs working in conservation in Madagascar, and we usually ask ourselves the same: when should we educate? And whom? If we educate children, we will see the impacts in 20 years” [International NGO representative]. A common justification is that those children will not only grow up into adults with responsible behaviour, but that they can also in fact educate their parents. However, there is a lack of agreement amongst practitioners as to whether children can or do educate their parents. Previous studies have demonstrated a transfer of environmental knowledge from child to parent (Vaughan et al. 2003, Damerell et al. 2013), although it has been difficult to infer the mechanisms by which knowledge is transferred (Rakotomamonjy et al. 2015). The education programme from the Alaotra region by Madagascar Wildlife Conservation (Table 1) represents an exception, being one of the few cases where the targets are adults as active natural resource users, and provides also an example on how to address the challenge to integrate local knowledge, perceptions and values into conservation education (Reibelt et al. 2018).

Further reflection needs to be given to the role of NGOs in education in Madagascar, and in environmental education in particular. Their role can be seen as contributing towards the achievement of internationally set goals, such as the Sustainable Development Goal 4 on quality education, which otherwise might not be met. Accordingly, NGOs can play a pivotal role in the provision of education (e.g. numeracy and literacy), addressing the challenge of access to school (Rose 2009), focusing their efforts on children and/or in strengthening the capacity of teachers that could act as promoters of education. Providing access to basic education in communities around protected areas could be a long-term investment to provide alternative livelihoods, and reduce the pressure on natural resources. Additionally, NGOs can have a role in advocacy by involving higher levels of the school system (Reibelt et al. 2014) and even adults, including policy makers, putting pressure to implement new policy plans. Despite all these potential roles, it should not be forgotten that most of the education programmes conducted by NGOs are highly (if not entirely) dependent on external funding sources and it is beyond their scope and capacities to support all schools and sectors with environmental education (Reibelt 2017). Therefore, the long-term feasibility of NGOs’ interventions also depends on the support of governmental organizations and the state, as NGOs are bounded both financially and legally, and should not substitute the education responsibility of the state (Schübler et al. 2019).

Nonetheless, there are a number of policy plans to incorporate environmental education and education for sustainable devel-

opment into the national curriculum, considering the education system as a catalyst to reach national and international sustainable development objectives (Ministère de l'Environnement et des Forêts 2013, PSE 2017). The aim of those plans is to promote education that prepares future generations to be responsible, supportive and committed citizens who participate in the country's socio-economic, cultural and environmental sustainability. What this means in terms of implementation remains open, and strong governance is needed to ensure that these education policies actually contribute to an improvement also in the quality of the education system. Political instability and lack of collaboration between Ministries may instead slow down the implementation of these plans.

FURTHER STEPS

These reflections are relevant beyond the Malagasy context, and raise intriguing questions regarding the influence of education in a context of high priority for conservation, but also where poverty and natural resource dependency represents an acute challenge. It thus emerges from several studies and our own experiences that environmental education strategies in Madagascar depend – almost exclusively – on the role of NGOs. Yet it remains unclear what the impacts of the present education programmes are. We see the potential for improvements in conservation outcomes both in terms of quality and in terms of quantity. First and foremost we call for research to understand the narratives behind those education programmes and, at the same time, to conduct impact evaluation to measure long-term changes, focusing not only on knowledge and attitudes, but also on other possible outcomes, such as behaviour, in order to better understand why or how certain programmes work or not. Meanwhile, it is important to recognise that not all the possible outcomes from environmental education can be measured, nor should its importance be diminished as a result.

While the role of NGOs has been – and is likely to remain – crucial (Schübler et al. 2019), their bounded resources as well as constraints brought by the geographies of their programmes limit the scalability of their interventions, and thus will not be enough to tackle the ongoing biodiversity threats. While researchers around the world have highlighted the urgent need for governmental commitment to directly address the decline of biodiversity in Madagascar, we take this a step further to call for government commitment in education at large, and to better integrate environmental education across the national programme, as a tool to support biodiversity conservation whilst improving the well-being of local communities.

It has been widely suggested that the future of protected areas depend on the support from their immediate neighbours (Brockington 2002). Education programmes should not exclusively answer the needs of the conservation agenda, as a tool for disseminating benefits of the protected areas and encouraging local support for them. Instead, it is key that governmental and non-governmental practitioners consider local community needs, concerns, values and knowledge systems to ensure that future education programmes are inclusive, culturally rooted and locally meaningful.

ACKNOWLEDGEMENTS

This research was funded by the Global Change and Conservation Lab and the Doctoral Program of Interdisciplinary Environmental Sciences from Helsinki University. We would like to give special thanks to Eric Marcel Temba and to Santatra Andriamitandrina for

their advice and logistical support. Also, we would like to thank Dr. Lena Reibelt for insightful discussions before and after the trip to Madagascar. We also thank all the people interviewed, particularly the NGOs that kindly invited us to visit their projects. Finally, endless thanks to Marketta Vuola, for so many shared moments, reflexions and laughs.

REFERENCES

- Balestri, M., Campera, M., Nekaris, K. A. I. and Donati, G. 2017. Assessment of long-term retention of environmental education lessons given to teachers in rural areas of Madagascar. *Applied Environmental Education and Communication* 16, 4: 298–311. <<https://doi.org/10.1080/1533015X.2017.1348275>>
- Bekalo, S. and Bangay, C. 2002. Towards effective environmental education in Ethiopia: Problems and prospects in responding to the environment-poverty challenge. *International Journal of Educational Development* 22, 1: 35–46. <[https://doi.org/10.1016/S0738-0593\(00\)00076-6](https://doi.org/10.1016/S0738-0593(00)00076-6)>
- Breuer, T., Mavinga, F. B., Evans, R. and Lukas, K. E. 2017. Using video and theater to increase knowledge and change attitudes—Why are gorillas important to the world and to Congo? *American Journal of Primatology* 79: e22692. <<https://doi.org/10.1002/ajp.22692>>
- Brockington, D. 2002. *Fortress Conservation. The Preservation of the Mkomazi Game Reserve, Tanzania*. Indiana University Press, Bloomington.
- Corson, C. 2017. A history of conservation politics in Madagascar. *Madagascar Conservation & Development* 12, 1: 49–60. <<https://dx.doi.org/10.4314/mcd.v12i1.4>>
- d'Aiglepierre, R. 2012. Primary School Exclusion and Ways to Improve Inclusion in Madagascar. UNICEF, New York. Available online <https://www.researchgate.net/profile/Daiglepierre_Rohen/publications>
- Damerell, P., Howe, C. and Milner-Gulland, E. J. 2013. Child-orientated environmental education influences adult knowledge and household behaviour. *Environmental Research Letters* 8, 1: #015016. <<https://doi.org/10.1088/1748-9326/8/1/015016>>
- Dolins, F. L., Jolly, A., Rasamimanana, H., Ratsimbazafy, J., Feistner, A. T. C. and Ravoavy, F. 2010. Conservation education in Madagascar: Three case studies in the biologically diverse island-continent. *American Journal of Primatology* 72, 5: 391–406. <<https://doi.org/10.1002/ajp.20779>>
- Freund, C. A., Achmad, M., Kanisius, P., Naruri, R., Tang, E. and Knott, C. D. 2019. Conserving orangutans one classroom at a time: evaluating the effectiveness of a wildlife education program for school-aged children in Indonesia. *Animal Conservation* 23, 1: 18–27. <<https://doi.org/10.1111/acv.12513>>
- Gardner, C. J., Nicoll, M. E., Birkinshaw, C., Harris, A., Lewis, R. E., et al. 2018. The rapid expansion of Madagascar's protected area system. *Biological Conservation* 220: 29–36. <<https://doi.org/10.1016/j.biocon.2018.02.011>>
- Heimlich, J. E. 2010. Environmental education evaluation: reinterpreting education as a strategy for meeting mission. *Evaluation and Program Planning* 33, 2: 180–185. <<https://doi.org/10.1016/j.evalprogplan.2009.07.009>>
- IPBES, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. 2019. *Global Assessment Report on Biodiversity and Ecosystem Services*. Bonn, Germany. Available online <<https://ipbes.net/global-assessment>>
- Jacobson, S. K., McDuff, M. D. and Monroe, M. C. 2006. *Conservation Education and Outreach Techniques*. Oxford University Press, Oxford.
- Jolly, A. 2012. Challenges of Environmental Education in Madagascar. In: *Proceedings of the Conference Environmental Education in Madagascar*, pp 27–28. University of Sussex, Brighton.
- Jones, J. P. G., Ratsimbazafy, J., Ratsifandrihamanana, A. N., Watson, J. E. M., Andri-anandrasana, H. T. et al. 2019. Last chance for Madagascar's biodiversity. *Nature Sustainability* 2: 350–352. <<https://doi.org/10.1038/s41893-019-0288-0>>
- Krasny, M. E. 2020. *Advancing Environmental Education Practice*. Cornell University Press, Ithaca
- Manfredo, M. J. 2008. *Who cares about wildlife?* Springer, New York.

- MENETP, Ministère de l'Éducation Nationale et de l'Enseignement Technique et Professionnel. 2016. Mahazoarivo: le Gouvernement a approuvé le Plan Sectoriel de l'Éducation et les Partenaires Techniques et Financiers ont remis leur lettre d'endossement. Accessed 21 January 2020 <<http://shorturl.at/oHIJ9>>
- Ministère de l'Environnement et des Forêts. 2013. Décret N° 2013-880 fixant la Politique Nationale de l'Éducation relative à l'Environnement pour le Développement Durable (PEREDD). Available online <<https://www.environnement.mg/wp-content/uploads/2018/10/PEREDD.pdf>>
- Pascual, U., Balvanera, P., Díaz, S., Pataki, G., Roth, E. et al. 2017. Valuing nature's contributions to people: the IPBES approach. *Current Opinion in Environmental Sustainability* 26–27: 7–16. <<https://doi.org/10.1016/j.cosust.2016.12.006>>
- PSE, Plan Sectoriel de l'Éducation 2018–2022. 2017. Ministère de l'Éducation, Antananarivo. Available online <<https://planipolis.iiep.unesco.org/fr/node/6526>>
- Rakotomamonjy, S. N., Jones, J. P. G., Razafimanahaka, J. H., Ramamonjisoa, B. and Williams, S. J. 2015. The effects of environmental education on children's and parents' knowledge and attitudes towards lemurs in rural Madagascar. *Animal Conservation* 18, 2: 157–166. <<https://doi.org/10.1111/acv.12153>>
- Reibelt, L. 2017. Communities, Teachers, Conservationists – Deconstruction and Reconstruction of Environmental Education in Madagascar. Unpubl. Ph.D. thesis, University Hildesheim, Hildesheim. <<https://doi.org/10.18442/764>>
- Reibelt, L. M., Richter, T., Waeber, P. O., Rakotoarimanana, S. and Mantilla-Contreras, J. 2014. Environmental education in its infancy at Lake Alaotra, Madagascar. *Madagascar Conservation & Development* 9, 2: 71–82. <<https://dx.doi.org/10.4314/mcd.v9i2.3>>
- Reibelt, L. M., Stoudmann, N. and Waeber, P. O. 2018. A role-playing game to learn and exchange about real-life issues. In *Learn2Change—Transforming the World through Education*. R. Hembrom, T. Holthoff, G. Janecki, S. Laustroer, M. Rolle and L. Zulu (eds.) pp 163–171. VNB e.V., Hannover.
- Reyes-García, V., Kightley, E., Ruiz-Mallén, I., Fuentes-Peláez, N., Demps, K., et al. 2010. Schooling and local environmental knowledge: Do they complement or substitute each other? *International Journal of Educational Development* 30, 3: 305–313. <<https://doi.org/10.1016/j.ijedudev.2009.11.007>>
- Richter, T., Rendigs, A. and Maminirina, C. P. 2015. Conservation messages in speech bubbles-evaluation of an environmental education comic distributed in elementary schools in Madagascar. *Sustainability* 7, 7: 8856–8880. <<https://doi.org/10.3390/su7078855>>
- Rose, P. 2009. NGO provision of basic education: alternative or complementary service delivery to support access to the excluded? *Compare: A Journal of Comparative and International Education* 39, 2: 219–233. <<https://doi.org/10.1080/03057920902750475>>
- Schüßler, D., Richter, T. and Mantilla-Contreras, J. 2019. Educational approaches to encourage pro-environmental behaviors in sustainability educational approaches to encourage pro-environmental behaviors in Madagascar. *Sustainability* 11, 11: #3148. <<https://doi.org/10.3390/su11113148>>
- Superina, M., Cortés Duarte, A. and Trujillo, F. 2019. Connecting research, management, education and policy for the conservation of armadillos in the Orinoco Llanos of Colombia. *Oryx* 53, 1: 17–26. <<https://doi.org/10.1017/S0030605318000790>>
- Vaughan, C., Gack, J., Solorazano, H. and Ray, R. 2003. The effect of environmental education on schoolchildren, their parents, and community members: a study of intergenerational and intercommunity learning. *The Journal of Environmental Education* 34, 3: 12–21. <<https://doi.org/10.1080/00958960309603489>>
- Waeber, P. O., Wilmé, L., Mercier, J.-R., Camara, C. and Lowry II, P. P. 2016. How effective have thirty years of internationally driven conservation and development efforts been in Madagascar? *PLoS ONE* 11, 8: e0161115 <<https://doi.org/10.1371/journal.pone.0161115>>
- WWF. 2016. Le concept de l'Éducation pour le Développement Durable est Intégré dans le Système Éducatif Malgache. Accessed 21 January 2020 <<http://shorturl.at/kLV45>>