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Social mapping and environmental education: dialogues from participatory mapping in the Pantanal, Mato Grosso, Brazil

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ABSTRACT

This article illustrates the steps taken to enact a new methodology for participatory social mapping by the Environmental Education, Communications and the Arts (GPEA) Research Group of the Federal University of Mato Grosso (UFMT). The aim of Social Mapping is to record the identities, territories and socio-environmental conflicts experienced by social groups, based on their own namings and narratives, rather than relying on those more typically generated or provided by researchers or theorists. As such, it offers an important dialogical pathway for environmental education practices, in that it highlights the intrinsic relationship between culture and nature, and reinforces the understanding that the loss of one implies the disappearance of the other.

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Introduction

This article illustrates how the production of a Social Map of the State of Mato Grosso, Brazil contributes to environmental education practices. It highlights how a local participatory mapping project carried out in the Pantanal community of São Pedro de Joselândia closely echoes key principles of environmental education, in that it recognises different cultures, helps address the challenge of reconstructing sustainable societies, and can give fresh expression to values such as environmental justice, belongingness and democracy.

The work is based on the assumption that participatory mapping should be carried out by the groups it concerns together with environmental education researchers, in order to support important dialogical elements to environmental education and its research. In our experience, such an orientation will draw heavily on everyday life in the community, evoke thoughts and actions that wrestle with distinct local themes, share meaning-making, and surface the challenges of securing socio-environmental sustainability in a particular territory.

At its heart, our particular social mapping methodology (see Sato, Silva, and Jaber-Silva 2014, for more detail) maps the identities and socio-environmental conflicts experienced in a given territory, based on the namings and narratives expressed by the vulnerable social groups that inhabit that territory. Through the narratives we come closer to the essence of these identities that construct different meanings of what it means 'to be-in-a-group' (Guattari 1990). In fact, vulnerable social groups are often 'identities of resistance', always at the mercy of a historic negligence. In this instance, these are reinforced by the hegemonic economy of agri-business that

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reigns over (their territories) and advances on the so-called 'empty spaces' in the state of Mato Grosso. However, social mapping can help rejects, by showing a rich cultural mosaic of identities has always coexisted in such diverse environments, even if it is often rendered invisible and/or are scarcely known due to a hegemonic power.

As we have shown (Sato, Silva, and Jaber-Silva 2014), there are many social groups not being considered when creating public policies and these are left exposed to the many impacts and socio-environmental conflicts that mark the territory and the biomes of this Brazilian state. Related studies in environmental education, such as those reviewed by Lowan-Trudeau (2012), highlight the importance of considering self-narratives and valuing knowledge. Elsewhere, we note that for Buber (2001), identities are co-created and delineated in encounters with the Other, while an essential otherness is only established in relation to an I-THOU rather than an I-It relationship. In some cases, the emergence, strengthening or annihilation of the identities of the groups studied takes place in this encounter with the Other. Returning to Lowan-Trudeau (2012), we note he seeks to articulate the value of relating occidental and indigenous epistemologies using bricolage and métissage as models for research praxis that preference I-THOU over I-It epistemologies. In this, Lowan-Trudeau (2012, 126) emphasises that 'diversity is something that is much needed and highly beneficial to the ongoing development of environmental education research because we have never needed as much attention, knowledge, and ancient wisdoms regarding environmental crises as we do now, and will need, for future generations'.

The key principles of environmental education supported and developed by members of the Environmental Education, Communications and Art Research Group (GPEA) from the Federal University of Mato Grosso (UFMT) for work in this context are woven into the proposed mappings in various ways. A key aspect is foregrounding the value of recognising different cultures, prioritising the construction of sustainable societies, and enacting principles such as environmental justice and a sense of belonging and democracy, throughout local and regional practices of environmental education. An environmental education that demonstrates such political and ethical priorities promotes participatory citizenship; it also bids farewell to the naive tendency to carry out isolated or decontextualised actions. Above all, it aims to help build sustainable societies with environmental education as a philosophical framework for three intrinsically connected dimensions:

(a) A theoretical and conceptual dimension that changes the local epistemological field of environmental education; through
(b) Doing, acting and engaging in environmental education in line with a reflective and methodological practice fostering local experiences and co-experiences; fueled by
(c) An ideological foundation that operates as the substratum for one's values, beliefs, faith and ethical activities that marry the deontological substratum to a political orientation.

Ensuring these dimensions are all in play, we believe it possible to strengthen the conceptual field of popular environmental education through social mappings, by conducting these together with vulnerable social groups as an educational practice focused on cycles of action-reflection-action within a given socio-environmental reality, so as to transform that reality. With this in mind, the objective of this article is to illustrate this methodology in action, using a participatory mapping within Mato Grosso's Pantanal as a case in point. In order to achieve this, some important concepts must be discussed, including: The relationship between environmental education and the social map; the socio-environmental identities and conflicts of vulnerable social groups; the lifestyle of the Pantanal inhabitants in São Pedro de Joselândia, and the contribution of the social map to the formulation of public policies. We start with an overview of the methodology, and then the outcomes of the mapping experience carried out in the Northern Pantanal of Mato Grosso, before reflecting on the methodology, concepts and outcomes.

Participatory mapping in the Brazilian context: an overview

In recent years, there has been an upsurge in research conducted in Brazil with and by social groups, to better express collective identities by means of generating social cartographies (Sato, Silva, and Jaber-Silva 2014). Such initiatives help broaden the work of participatory mapping and mobilisation, forming important alliances between academic research, environmental education and social movements. We consider this articulation very important, because it can foster the development of a method and energy for resisting hegemonic formations aimed at controlling all territories and identities.

As noted in an earlier article (Sato, Silva, and Jaber-Silva 2014), in Brazil, a wide variety of cartographic methodologies have been developed and used. These range from simpler approaches such as the use of paper and pencil to draw a draft of a small territory by hand, to broader more technological approaches, such as the use of geographical information systems (GIS), global positioning systems (GPS), satellite images, photographs, and other ways of expressing and representing the local community being investigated.

The GPEA has been working with a methodological proposal named the Social Map. The key feature of this methodology is mapping out the identities of vulnerable social groups and their relationships with their environment, especially their vulnerabilities, conflicts and the processes of environmental injustice present in their territories. The ensuing Social Map draws attention to the many social groups that are facing numerous socio-environmental, including those not currently visible in public policies.

We began this study in 2008 through the 'Mapping of identities and territories in the State of Mato Grosso – Brazil' project (see Sato, Silva, and Jaber-Silva 2014, for further detail). The project was proposed and carried out by GPEA-UFMT with important contributions from various partners. It was not by chance that we chose to map social groups and their conditions of vulnerability; it was rather an identity-giving choice made by the researchers, inspired by Homi Bhabha (1994). We chose to think about territory in terms of its margins, the experiences of its minorities, and socio-environmental conflicts (Sato, Silva, and Jaber-Silva 2014). Enacting this in the local region, it requires identifying the legacy of the processes of colonization that demarcate the territory of Mato Grosso, particularly through its recent economic focus on 'agribusiness'. It also allows us to address recent calls for a pedagogy of the land, as proposed in a special issue of 'Environmental Education Research', pushing for environmental education to contribute to decolonization and the dismantling of brutal colonial perspectives underlying many of the socio-environmental conflicts experienced by indigenous peoples (Tuck, McKenzie, and McCoy 2014).

Different pathways can be followed to achieve such proposed goals of social mapping. The steps taken here started with presenting a global landscape making it possible to map the different social groups and socio-environmental conflicts throughout the State of Mato Grosso (Sato, Silva, and Jaber-Silva 2014). For this phase, two seminars were conducted on social mapping in 2008 and 2010, in the city of Cuiaba, capital of the State. The Seminars were widely supported by local social movements and the State Secretary of Environment (SEMA), as well as the Planning and General Coordination Secretary (SEPLAN).

In carrying out these two seminars, we brought together approximately 500 participants from 54 different municipalities. There were, in all, more than 70 indigenous representatives from different Indigenous Lands and various regions of the State. In addition, there were social groups and movements, such as representatives of the *quilombola*[1] communities, Pantanal communities, rubber tappers, people affected by the dams, artisans, gypsy peoples, ecologists, professional and craft fishermen *morroquianos,*[2] advocates of the solidarity economy, peasants and family farmers, among other important groupings.

As narrated previously in Sato, Silva, and Jaber-Silva (2014), the two seminars led to the formation of Working Groups (WG) as follows: *Pantaneiros* (peoples of the Pantanal); Peoples of the Cerrado; Indigenous Peoples; *Quilombolas*, and Family Farmers. The mapping process conducted

by each one of the WGs was led by a facilitator and a record keeper, with members of the GPEA-UFMT and social movements involved too. The facilitator conducted the discussions following a semi-structured interview script, facilitating the activities and raising debates on the issues generated within each group. A record keeper accompanied the discussions, making notes of the main points narrated, and prepared a final report for the group. The generating questions asked each participant: (a) if they belonged to some social group, which group, and what they called themselves; (b) if there was any other group they knew, which one; (c) whether the changes in the place they lived caused problems (socio-environmental conflicts); (d) what conflicts, which social groups were involved in the conflict, if there was declared violence; what types of violence, and whether they faced any death threats.

During the seminars, the recording of data involved writing down replies to the interview schedules, generating reports for each WG, as well as recording videos and photos of the various activities carried out during the seminars. In addition, some research subjects that represented the different social groups were interviewed individually; these interviews were recorded on video. In addition, another activity involved identifying the location of the mapped groups and their conflicts on printed maps of the State of Mato Grosso. The map used was the political-administrative territorial division map of the State of Mato Grosso (2010) at a scale of 1:1,500,000.

Identities and socio-environmental conflicts in the Pantanal of Mato Grosso

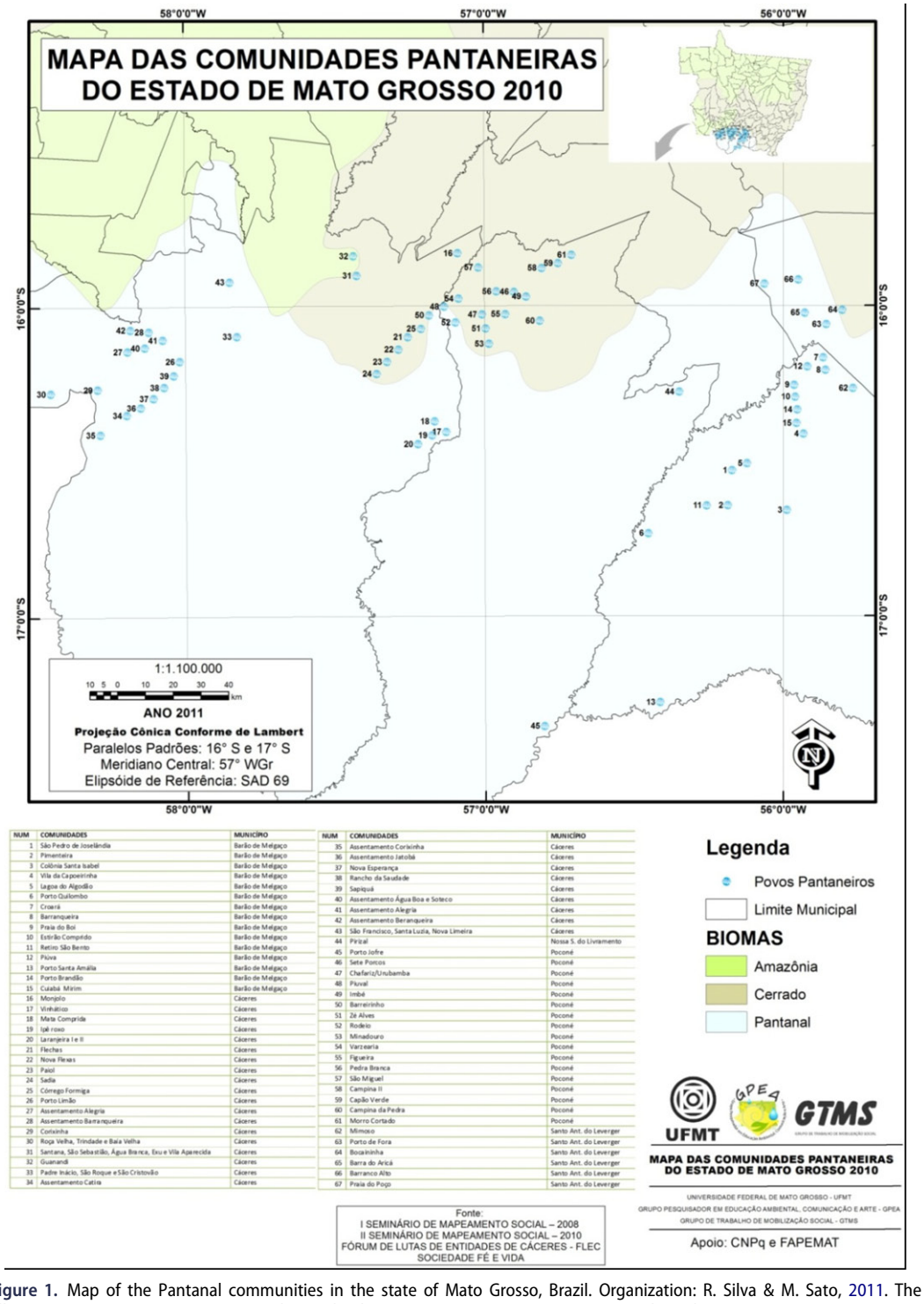
Social Mapping methodology then, was used to identify vulnerable social groups and the socio-environmental conflicts faced in trying to retain territories and identities.

The initial phase required gaining an understanding of the 'overall' landscape of Mato Grosso, before seeking a local understanding by conducting an in-depth investigation of some of the social groups and their conflicts in the context of the Pantanal. We are acutely aware that the 'universes' or 'lifeworlds' mapped in this initial work do not cover all of the countless extreme, yet still not visible, situations of conflict in the Pantanal of Mato Grosso. However, it does shed light on various problems resulting from large-scale development projects imposed in this land, and it reflects important cases of socio-environmental conflicts that are consequences of the prevailing development model for the region. As shown elsewhere, this model leads to the destruction of ecosystems and the annihilation of particular ways of life in the region. Moreover, because territories, identities and temporalities are entwined in webs and mosaics that intrinsically weave the relationship of culture and nature, the loss of one implies the disappearance of the other (Jaber-Silva and Sato 2012).

From this perspective then, the preferred forms of environmental education that drive us as researchers are those which highlight the importance of preserving nature and adopting a political stance defending the rights of vulnerable local populations. Considering and debating the importance of these two complementary dimensions is essential to the social mapping project.

Vulnerable social groups

Just like flowing waters, the Pantanal is a place of constant movement, because the landscape is everchanging between periods of drought and flooding. Intertwined with the beauty of biological diversity, the region is inhabited by peoples with their own particularities who call themselves the *Povos Pantaneiros* (People from the Pantanal). They have a profound knowledge of where they live, revealed in a variety of cultural expressions such as their food, dance, stories, legends, and ecological practices. The cartographic spatialization of the Pantanal communities is represented in the 'Map of the Pantanal communities in the State of Mato Grosso' (Figure 1). For



NUM	COMUNIDADES	MUNICÍPIO
1	São Pedro de Joselândia	Barão de Melgaço
2	Pimenteira	Barão de Melgaço
3	Colônia Santa Isabel	Barão de Melgaço
4	Vila da Capoeirinha	Barão de Melgaço
5	Lagoa do Algodão	Barão de Melgaço
6	Porto Quilombo	Barão de Melgaço
7	Croará	Barão de Melgaço
8	Barranqueira	Barão de Melgaço
9	Praia do Boi	Barão de Melgaço
10	Estirão Comprido	Barão de Melgaço
11	Retiro São Bento	Barão de Melgaço
12	Piúva	Barão de Melgaço
13	Porto Santa Amália	Barão de Melgaço
14	Porto Brandão	Barão de Melgaço
15	Cuiabá Mirim	Barão de Melgaço
16	Monjolo	Cáceres
17	Vinhático	Cáceres
18	Mata Comprida	Cáceres
19	Ipê roxo	Cáceres
20	Laranjeira I e II	Cáceres
21	Flechas	Cáceres
22	Nova Flexas	Cáceres
23	Paiol	Cáceres
24	Sadia	Cáceres
25	Córrego Formiga	Cáceres
26	Porto Limão	Cáceres
27	Assentamento Alegria	Cáceres
28	Assentamento Barranqueira	Cáceres
29	Corixinha	Cáceres
30	Roça Velha, Trindade e Baía Velha	Cáceres
31	Santana, São Sebastião, Água Branca, Exu e Vila Aparecida	Cáceres
32	Guanandi	Cáceres
33	Padre Inácio, São Roque e São Cristovão	Cáceres
34	Assentamento Catiro	Cáceres

NUM	COMUNIDADES	MUNICÍPIO
35	Assentamento Corixinha	Cáceres
36	Assentamento Jatobá	Cáceres
37	Nova Esperança	Cáceres
38	Rancho da Saudade	Cáceres
39	Sapiquá	Cáceres
40	Assentamento Água Boa e Soteco	Cáceres
41	Assentamento Alegria	Cáceres
42	Assentamento Beranqueira	Cáceres
43	São Francisco, Santa Luzia, Nova Limeira	Cáceres
44	Pirizal	Nossa S. do Livramento
45	Porto Jofre	Poconé
46	Sete Porcos	Poconé
47	Chafariz/Unubamba	Poconé
48	Piuval	Poconé
49	Imbé	Poconé
50	Barreirinho	Poconé
51	Zé Alves	Poconé
52	Rodeio	Poconé
53	Minadouro	Poconé
54	Varzearia	Poconé
55	Figueira	Poconé
56	Pedra Branca	Poconé
57	São Miguel	Poconé
58	Campina II	Poconé
59	Capão Verde	Poconé
60	Campina da Pedra	Poconé
61	Morro Cortado	Poconé
62	Mimoso	Santo Ant. do Leverger
63	Porto de Fora	Santo Ant. do Leverger
64	Boaininha	Santo Ant. do Leverger
65	Barra do Aricá	Santo Ant. do Leverger
66	Barranco Alto	Santo Ant. do Leverger
67	Praia do Poço	Santo Ant. do Leverger

Figure 1. Map of the Pantanal communities in the state of Mato Grosso, Brazil. Organization: R. Silva & M. Sato, 2011. The ollowing computer programs were used to make the maps: ESRI ArcGis/ArcMap (10.0) and Corel Draw X5.

this particular study, one of the groups studied more intensely was the Community of Sao Pedro de Joselândia, located in the municipality of Barão de Melgaço biome - Pantanal.

Encounters from past to present between settlers and indigenous nations that inhabit the Pantanal plains are typically conflict ridden. Siqueira (2002) notes that the place was traditionally inhabited by the Bororo, Guarani, Xarayes, Guana, Guato, Guaykuru, Payagua and Kadiveu peoples. The Xarayes, Guaykuru and Payagua were completely annihilated in clashes that pitted bows and arrows against the firearms of the colonizers. Very few of the Bororo, Guarani, Guato and Kadiveu peoples remain; they were defeated and enslaved by the settlers, their previous ways of living underwent enormous cultural changes, and these peoples have been largely confined to much reduced territories in Mato Grosso and Mato Grosso do Sul.

The seminars showed we can record the presence of 47 different ethnic groups in the whole State, living on what was historically 78 indigenous lands. The Indigenous Peoples who inhabit the region of the northern Pantanal live in the municipalities of Barão de Melgaço and Santo Antonio do Leverger; there are also the indigenous peoples who inhabit the Guato Indigenous Lands in the Baía de Guato (Bay of Guato); while the Bororo indigenous peoples have their current territory on the Perigara land and the Tereza Cristina Indigenous Land.

The *Quilombola* Peoples (black descendants of run-away slave communities) are found in all five municipalities studied, plus five communities in Cáceres, seven in Nossa Senhora do Livramento, twenty-six communities in the municipality of Poconé, and one in Santo Antonio do Leverger.

Men and women who work as artisans can be found throughout the territory. Their crafts are often important local cultural references, such as handcrafted artefacts using various raw materials. Wood carving artisans make trays, wooden spoons, mortars and pestles, canoes and troughs. They also produce looms, presses, mills, carts, ox-carts and their typical musical instrument, the *viola de cocho*.

The identity of the *Ribeirinhos* (riverine communities) is most strongly expressed along the margins of rivers and streams in the wetlands. They live along the riverbanks and their main activity is fishing. Some groups practice agriculture either on flood plains (*varzea*) or on solid ground. Their cultural identity is more closely linked to the water than the land; typical livelihoods revolve around the activities associated with professional fishermen/craft fishermen; bait sellers; boatmen; ferrymen and canoeists.

The Peasants and Family Farmers are present in various locations in the Pantanal; some are part of resettlement projects and also identify themselves as resettled communities. There are 36 resettlement projects in the municipalities of the Pantanal. The activities of these groups are associated with agricultural activities, most of which are classified as extractive. In actuality, they gather fruit, roots, medicinal plants, wood, resins, oils, latex, and dyes. Those participating in extractive activities are typically scattered throughout the territory.

There are also groups that express their identities through various forms of spirituality, such as the *Benzedeiros*[3] who are people noted for their gift of healing attributed to their Christian faith, while others are noted for their curing abilities through the use of herbs, roots and medicinal plants.

Using technology to process the geo-referenced data, Figure 2 shows the spatialization of the social groups listed here. It is important to emphasise that most of the points on the map were geo-referenced according to their geographical coordinates; however, some points mark an approximate location obtained from the narratives of the groups surveyed. Points mentioned during workshops and interviews, when there was information available, were subsequently confirmed by consulting secondary data, such as scientific articles, as well as technical and academic reports.

Socio-environmental conflicts

Mato Grosso is covered by three distinct biomes: the Amazon biome is the largest, covering 480,215 Km^2 (53.6%); the Cerrado occupies 354,823 km^2 (39.6%) of the total area of the State;

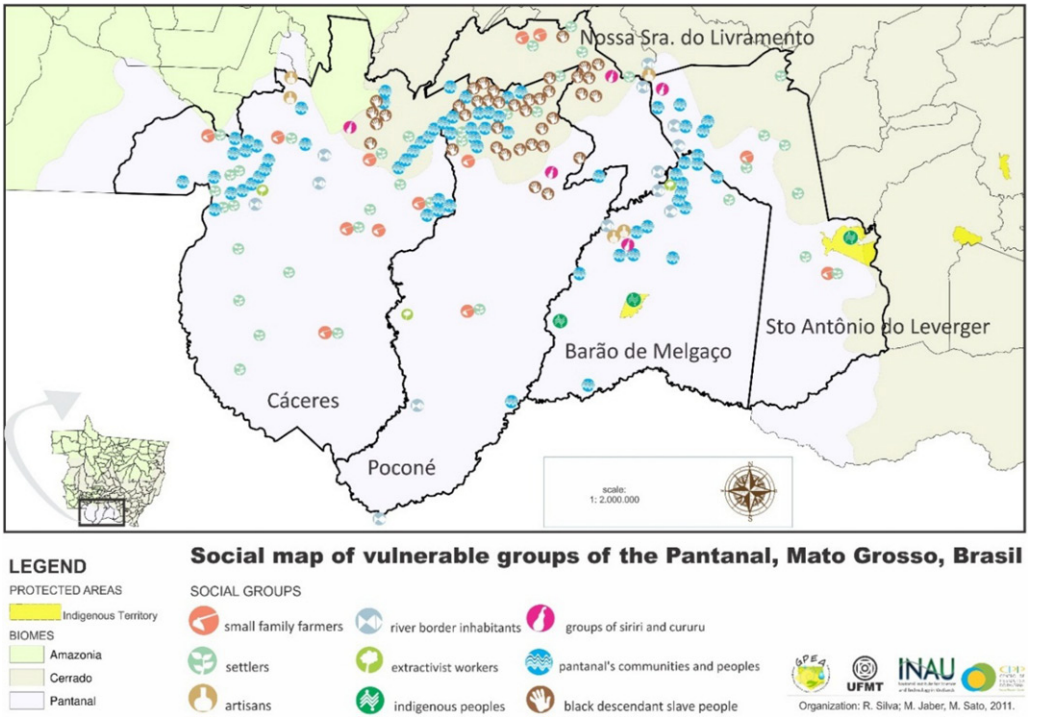


Figure 2. Map of the Pantanal Social Groups, Mato Grosso, Brazil. Organization: R. Silva, M. Jaber & M. Sato, 2011.

and the smallest biome is the Pantanal, covering 60,885 km^2 (6.8%). In essence, the Pantanal comprises an area of floodplains in a mosaic overshadowed by larger ecotones that include the Amazonian and Atlantic forests, Cerrado, Chaco and some characteristics of the Caatinga region (SEMA 2010; Silva 2011).

The major activities impacting the Pantanal highlighted by the seminars include: disputes for land; deforestation; slash-and-burn agriculture; water pollution (coming from the plateau); the increase of erosion and sediment load; haphazard tourism; fishing and predatory hunting; the threat of small power stations and waterways.

Among the causes of conflict mentioned by the social groups, disputes over land are the most common, and these are referenced to the historical context of the region. In this, the Pantanal is characterized by a high degree of land ownership concentrated in the hands of a few landowners. Since colonial settlement, the region has been heavily exploited throughout all economic cycles. This began with mining activities (especially gold extraction), the subjugation of indigenous peoples for slave labour, the extraction of plant products, and more recently, changes made to the land for agricultural and livestock breeding activities.

Another serious issue in this region is deforestation, stemming from a variety of causes, but amongst which livestock breeding is singled out as a primary factor. Native vegetation, especially *cerradão* and pre-colonial grass pastures, have been replaced by pastures planted to feed cattle, including exotic species such as *Brachiaria humidicola*. The conversion of native vegetation in the highlands into crops and pastures without due consideration of their suitability to the environment, in addition to the destruction of habitats, have accelerated erosion processes along the edges of the Pantanal. An immediate result is an increase in sediment load in the rivers on the plains, a situation that favours flooding, which in turn causes serious damage to the fauna and flora, and the economy and livelihoods of social groups in the region.

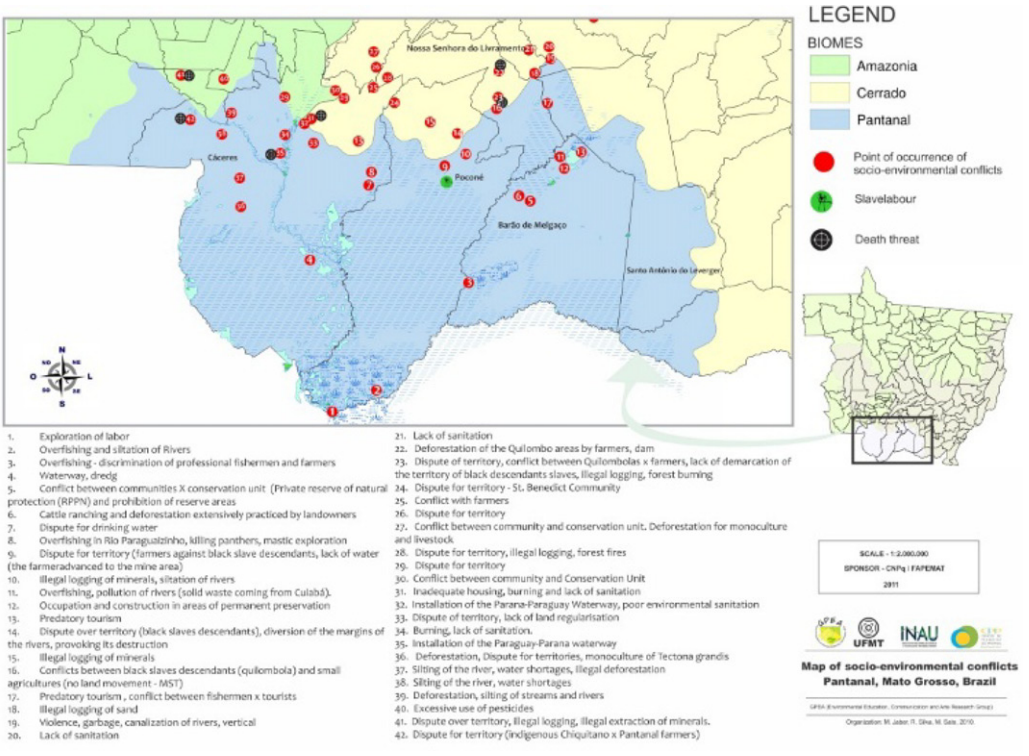


Figure 3. Map of the main socio-environmental conflicts in the Pantanal. Organization: M. Jaber, R. Silva & M. Sato, 2011.

The installation of small hydroelectric plants and the threat of the Paraguay-Paraná waterway are another cause of conflict. The Paraguay Basin alone, that forms the Pantanal, has 24 small hydroelectric plants in operation (Rossi 2011). Furthermore, development of the Paraguay-Paraná waterway is a threat to the people of the Pantanal. The project is considered controversial owing to the lack of detailed assessment of its socio-environmental impacts. The lack of social accountability is highlighted by social movements in Cáceres, with people protesting against the installation of this project and the jeopardy it brings to the Paraguay River, its environs and peoples.

Although the prevailing political discourse emphasises the importance of development projects to the production of wealth, it is argued that these activities have not offered improved quality of life for the residents of the region. This can be observed in the poverty and inequality map of Brazilian municipalities (IBGE 2008), where the poorest locations in Mato Grosso are concentrated in the region of the Pantanal. We recognize that all environmental imbalances result in social dilemmas for the economically disadvantaged layers of society, and the Pantanal is an example of environmental injustice brought about by economic interests that neglect local cultures and conditions. Many of these conflicts are recorded in the 'Map of socio-environmental conflicts in the Mato Grosso Pantanal' (Figure 3), on which it was possible to record 42 locations experiencing clashes and confrontations as communities engage in the defence of the environment and local cultures. It is worth pointing out that we are aware that there are many other conflicts in the region that have not been recorded on the map, but we believe that this map starkly illustrates many of the harsh realities faced by these social groups.

Sao Pedro de Joselândia: the local mapping of a community in the Pantanal

After the social mapping seminars, researchers from GPEA-UFMT undertook the investigative phase of the local landscape study, primarily using an ethnographic approach. As we were

interested in the lifestyle and the expressions of identity of these groups, studies were carried out in the field with participant observations, conducting semi-structured and unstructured interviews, workshops, and meetings *in loco* with some of the aforementioned communities. It was possible to conduct some longer interviews using an interview schedule associated with the objectives of social mapping. In addition, we sought to identify the experiences that had contributed to building their identities as social groups, as well as surfacing the conflicts and injustices that had been affecting them. All this information was gathered from their own narratives.

One of the main groups studied in the local mapping was the Pantanal Community of Sao Pedro de Joselândia. The mapping workshops with the community were carried out at the local school with several researchers from the GPEA-UFMT. The workshops combined art and environmental education activities, and educational materials and thematic maps were made together with the participants. Key features of the data obtained in these workshops are presented below.

The village of São Pedro de Joselândia (Figure 1, community #1) is a district in the municipality of Barão de Melgaço, situated between two of the largest rivers that flow into the Northern Pantanal: the Cuiaba and the São Lourenço rivers. According to the 2000 Census carried out by the Brazilian Institute of Geography and Statistics (IBGE), the village of Joselândia had 2,483 inhabitants living in 592 households, and includes the following communities: São Pedro, Mocambo, Pimenteira, Retiro São Bento, Colônia Santa Isabel, Capoeirinha, and Lagoa do Algodão (Pignatti and Castro 2010). São Pedro is located on the outskirts of the Private Reserve of Natural Heritage (RPPN) SESC Pantanal (SESC 2011), one of the sites of the Ramsar Convention on internationally protected wetlands.

São Pedro is a community within the Joselândia village. With its beautiful landscapes, it is an environment that readily demonstrates how a *pantaneiro* (inhabitant of the Pantanal) identity indexes the cyclical dynamics of the waters of the Pantanal (*habitat*), generating a distinctive lifestyle and coexistence with this ecosystem (habits). *Pantaneiros* learn to 'read' and interpret signs from nature, such as the flowering of the *Cambará* trees. If the flowering is intense it is a sign of high rising river waters, if the Cambará show just a few flowers it means that the next rise will be a slight one. Although they are often closely associated with the activities of peasant farmers, and some also work as artisans, certain Pantanal residents call themselves 'extractivist workers' because their activities involve the extraction of wood for local use, fruit, seeds, oils, honey and medicinal plants in their daily activities.

While there were previously many fields in Joselândia for community use, these started being fenced off in the 1950s (SESC 2011). Field reports indicate that the fences have led to a decrease in the common use areas within the community. Some areas formerly dedicated to common use are nowadays the property of ranchers. Interviewees emphasised that there are still some areas of common use where livestock roam free. These areas are totally flooded during the rainy seasons, creating a bay that residents use as a fishing area; during the dry periods the same area is used for grazing cattle.

In addition to the ecological continuities and disruptions to these described in their daily practices, another common thread that runs through their narratives of identity is a direct, interdependent and intrinsic form of contact that members of these groups have with the Pantanal ecosystem. Nevertheless, interviewees pointed out important changes that have taken place in this ecosystem. The naming of the *Baía da Fartura* (Bay of Affluence) itself was because of the historic plenitude of piranhas able to be caught there. Yet, according to local reports, the volume and quality of the catch has decreased, the 'waters too,' and 'It's all because they've messed up nature'. In addition, 'there has been a drastic reduction in the Cambaras and with this there has also been a lot less rain'. Such reports also illustrate how changes in the landscape have also changed the identity of the people from the Pantanal, in that their lifestyles and its temporalities are largely determined by the peculiarities of this habitat, as they follow the rhythm of the waters of the Pantanal.

The village of São Pedro de Joselândia, offering as it does a microcosm within the Pantanal, reflects other interpretations and responses to wider forces driving change in the region. Records show that the lack of planning and integrated management in the Mato Grosso territories exposes the fragility of the ecosystems and the difficulties experienced by the groups that live there to adapt to changes. The sustainability of the territories and the improvement of the quality of life of the peoples that inhabit the Pantanal depend on an understanding of the complexities that surround this ecosystem. This includes recognising the direct interdependence of the lowlands with the highland areas - in this case, across the entire Upper Paraguay River Basin - because it is impossible to guarantee the sustainability of the Pantanal and the improvement of the quality of life of the Pantanal people without understanding the environmental conditions and impacts changes to these may bring.

Popular environmental education and social mapping methodology

Ultimately, generating understandings of the conditions and issues both within and beyond these communities relies on an educational process. Equally, there are many ways to think about and implement environmental education. Locally, it can be done from a more naturalistic or spiritualized perspective, through mandalas or planting trees leading towards healthy nutrition, agro-ecology or Permaculture, an approach that is strong throughout Brazil. A more technical approach can be used too, in terms of licensing, inspection or laws. There is also a political approach that tries to relate to social movements and popular education too. There is certainly no one single way to practice environmental education according to this or that structuring principle, nor one which is automatically most correct or truthful for this or any other region.

However, one of the key challenges faced by environmental educators is, are they developing or offering a contextually appropriate, formative process that helps engender those values that support respectful relationships between society and nature in particular places? In other words, does popular environmental education challenge the scenario where economy becomes the sole basis of our thoughts and reckonings as to what is valuable or appropriate as education? It is at this point that our particular commitments as environmental educators surface: our work aims to foster a reorientation towards those values and choices, that help reconstruct realities and those lifestyles that will afford greater respect to natural diversities and cultural differences. This does not mean orienting towards predetermined, uniform models, but an understanding that there is no single path and that identities of resistance and the multiple ways to achieve sustainable societies – always in the plural form - must be strengthened.

Thus, whenever the question of 'popular education' is raised, while many people in Brazil may still consider it an unimportant pedagogy or that it is limited to the technical aspects of adult literacy, we beg to differ. Freire (1974) argues that the transformational character of the liberation of the oppressed envisages hope as a driving force for the construction of identities, especially of vulnerable groups (the oppressed). In this sense, social mapping is inspired by popular (environmental) education, which aims to establish dialogue and is understood as a pedagogical project meant to highlight the culture of social groups in their dialogue with the environment. It is this production of popular environmental knowledge that merges culture and nature as an existential and political process, and in this way, may also contribute to scientific knowledge.

This is because the outcomes of participating in a local social mapping are co-mediated by a set of experiential activities for participants that are arranged as a critical journey. The journey appreciates the significance of community life experiences, and these are recorded and reflected upon as key features of identities and lifestyles, cultural and artistic expression, territories, and associated problems, impacts, injustice and socio-environmental conflicts, as well as organisation and resistance tactics experienced by the mapped group.

The affinities between such a methodology of social mapping and the political stance taken on by popular environmental education provides an important formative field for the identities of the subjects involved too. It favours a critical and transformational reflection on contemporary realities and the challenges of socio-environmental sustainability. Accordingly, our premise is that environmental education must be politically embodied and embedded in the arena of disputes, threats and dilemmas far beyond any culture-nature harmonies often associated with a naïve point of view. Thus rather than favour a vision of a technicist education that disseminates and transmits knowledge - what Jickling and Wals (2008) referred to as a 'transmissive' environmental education - our approach supports a transformative education that pursues an emancipating course in which participants are builders of their own stories, their knowledge, identities and territories.

Social mapping and public policies: fruits harvested on the journey

As we hope we have shown, our studies have been guided by the way we interpret environmental education and how we partner this with a social mapping methodology. In the midst of political, demographic, historical and geographic maps, we deliberately seek to give voice to vulnerable social groups in their struggles and tactics.

We believe that such mappings are an important instrument to induce reflection and action by those involved in the process of 'democratising the environment', articulating more broadly the specific environmental and social conditions and associated experiences of those who need environmental justice in Mato Grosso. Such social mapping processes and their outcomes can serve as a reference point for governments and civil society when drawing up public policies in order to consider the different identities and socio-environmental conflicts, focusing on social participation as one of the driving forces of conceptual, political and scientific change. Nevertheless, we also recognise that mappings do not solve conflicts, particularly because those taking place in a dynamic context, interwoven as this is by various continuities and discontinuities that are fluid and open to a variety of influences, just like the Pantanal itself. Thus, as an ethnographic form of study, it cannot offer a census nor is it an exhaustive survey, but a panorama of the current situation; in other words, a portrait that is in parts, fleeting.

Guerin (2004), however, recommends that to reduce the effects of ephemerality, we should commit to an ongoing examination of the groups in conflict, whether they be analysed using maps, diagnoses, or case studies. This is to ensure that across time and space, we contribute to a body of historicised knowledge of socio-environmental contexts in the region. It should also be recognised that there is no need to proffer a solution to each one of these conflicts, but that the studies should be widely disseminated to formulate public policies that do by helping protect marginalised groups. Thus, by means of mapping, we can disrupt the 'culture of silence' (Freire 2000), and seek to strengthen the participatory formulation of public policies, positioning that as the appropriate arena to address conflicts, given its historic role as a venue for 'contesting powers' through democratic means despite the enclosure of the commons and privatisation of land and policy-making.

Transcending a culture of silence in this way means knowing how to listen to multiple voices; furthermore, it ensures a publically-recognisable audience for the many forgotten voices excluded from prevailing hegemonic development models. The survival of these communities is closely linked to the right to remain in their territories in the first place; it also requires conditions of social inclusion and visibility that ensure dignity and the right to distinct forms of living. Popular environmental education can be part of this collective movement of resistance, in that it favours ways of thinking and doing that seek to support and build viable alternatives to any sole pathway presented by a hegemonic rationality.

Social mapping methodology primarily contributes to this endeavour by providing local, contextual socio-ecological information. Furthermore, as a methodology for popular environmental education, it may contribute to the visibility and viability of its participating groups, offering a chance to speak and be heard, and positioning them as protagonists in the formulation of public policies that may strengthen the autonomy of their identities and their territories.

As researchers and advocates of such work and outcomes, we can already list some of its fruits. These include published results of this mapping that have already been taken up by the social groups involved in the study, and their follow through on that has become part of their own socio-cultural projects, resulting in a policy platform for the different struggling social groups. For example, the information from this mapping served as a basis for drafting the 2012/2013 Report on the State of Human Rights and the Lands of Mato Grosso. Another consequence is that the social mapping methodology has been recognised by the government of the State of Mato Grosso through SEPLAN. In this, a critical intervention has been on the establishment of a commission of peoples and social groups formed during the 2nd Social Mapping Seminar; this commission seeks to be instrumental in articulating the 1st State Conference of these groups to collectively build a State Policy proposal for Peoples and Traditional Communities. Finally, the social mapping developed in Mato Grosso is being implemented in other Brazilian states, experiments are taking place in Espírito Santo, Paraná, and recent talks may lead to a partnership with the state of Pernambuco.

It is clear however, that the methodology does not produce 'answers' or immediate solutions to socio-environmental conflicts, and we are aware the research results are not enough to resolve the struggles of the Pantanal. Mato Grosso is one of the most violent states in Brazil, presenting many cases of injustice, slave work, or big farmers owning large tracts of unproductive land. Socio-environmental conflicts remain invisible too often, as the economy grows to further enrich wealthy people, maintaining the same hegemonic *status quo*. Nevertheless, a social map can make visible landscapes once invisible and previously ignored, revealing their diversity and intense colourations. In other words, it provides a methodology for environmental education that helps bring together all those who are campaigning for an ecology of resistance, using the power of the strongest weapon we still have, and that nobody can take away: hope. We trust the research with social groups and the identified conflicts may contribute to further efforts and activities that can help the government, social movements and society itself to elaborate more just public policies.

Notes

1. These are black communities, descendants of runaway slaves who only recently had their territories and culture recognized.
2. These are communities that inhabit a fragile ecosystem region with low hills or slopes (morro) which gives the genesis of the identity "morroquiana".
3. Benzedeiro are people able to bless others using roots, leaves, water, or simply prayers.

Notes on Contributors

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