Preliminary exploration of stake-holders perception of the environmental state and changes in the Pantanal wetland[1]

Julia MARTIN-ORTEGA[a], Antonio IORIS[b], Klaus GLENK[c]

[a] The James Hutton Institute
[b] University of Aberdeen
[c] Scottish Agricultural College

1. Context and objectives

This document presents the results of a preliminary exploration of stake-holder's perception of the environmental state of the Pantanal wetland and the environmental changes having taken place in the recent past and expected for the future. This research is part of the Pantanal Leverhulme Network and has been developed in the context of the PRONEX Project initial research activities.
The aim of this research is to provide with the initial contextualization for the wider and more profound study of socio-economic aspects in the Pantanal, to be integrated in a socio-ecological research plan.
This document is organized as follow. In section 2, the methodology employed and the data gathered are described. Section 3 presents the main findings. In section 4, conclusions and questions for future research are presented.

2. Materials and method

A qualitative methodological approach, based on the use of semi-structure interviews to relevant stake-holders, was used during the visit to the Cuiaba River Basin in March 2011. The sampling process was contingent to the development of a set of activities in the area in the context of the PRONEX Project and, therefore, it is not aimed at a full representativeness of all relevant stake-holders. Results should only be considered as a preliminary exploration.

A total of 18 interviews were made in a period of 7 days. Most of the interviews were done on an individual basis, expect for a couple of collective ones. Fourteen of the interviews were voice-recorded on live, for 2 of them a report made by the interviewer is voice-recorded. The two remaining are recorded by means of notes taken by the interviewer.

Six groups of different stake-holders can be identified among the sample: A full list of the people interviewed is provided in the annex.

1) Professional fishermen
2) Cattle farmers
3) Members of the Water Company of Cuiaba city (SANECAP)
4) Park rangers, environmental officers, environmental guides
5) Recreational fishermen
6) Local authorities (only one interview: Major of Barao Town)

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Figure 1. Image of interview to a traditional fisherman

The length and total number of questions changed across the different interviews, depending on the interviewed person and the circumstances in which the interviewed took place, but a common frame was consistently used:

1) Questions for characterizing/contextualizing the person interviewed. These included for example: *'Have you always lived here?'; 'When/How/Why did you come here?', 'What do you do here?'*, etc.
2) Questions aimed at obtaining the person's perception of the land management system and functioning of the Pantanal as an integrated system.
3) Questions related to the person's perception of environmental changes. For example: '*Have you observed any changes in the Pantanal since you arrived?'; 'Is the quality of the water good?, better or worse than before?, do you drink it?'; 'what about the changes in the flow of water?*'; '*what is the most important environmental change that you have observed?*', etc.
4) Questions related to the importance people attach to the maintenance of the ecological status of the Pantanal. For example: *'why is it important for you that the quality of the water is maintained?'*.
5) Questions related to the perception of the future and related to necessary interventions*: 'How do you see the region in the next 30 years?'; 'what do you think it is needed for the future?'*.

3. Findings

The following main results were found:

Fish decline and recreational fishing

Fishing is a very important activity in the area[2] and involves a number of different actors including professional and recreational fishermen. Two different categories of professional fishermen can be identified: traditional fishermen (Figure 2) who lived in the area for generations and use artisan

[2] In cities like Barao, commercial fishing is the main economic activity. The major of Barao informed us that out of the 3 million R$ of the municipality income, 2 million R$ come from commercial fishing.

fishing techniques, and newcomers (arriving in the 60s and 70s) who, it seems, use different fishing practices[3]. Near towns, the fishermen often have other sources of income, but in large areas of the wetland, fishing is the only or at least dominant source of income for a great number of households.

Figure 2.Traditional professional fishermen in the Pantanal

Among the recreational fishermen there are also two categories: i) weekend fishermen from nearby cities and ii) relatively wealthy recreational fishermen associated with the development of fishing and touristic facilities. The former seem to be significant in number, entering the area individually or in small groups, and frequently access the river system from the side of the road (Figure 3). The relatively wealthy recreational fishermen live in nearby cities but also travel from other regions (eg. Sao Paulo) to the Pantanal. They seem to be very significant in terms of quantity of fish caught[4]. Their presence is associated with the development of fishing facilities ('*peixequeiros*'), which often include accommodation, ice and restaurant facilities (

Figure 5). Fish are often fed in the surroundings of the *peixequeiros* (e.g., with soy bean bundles), to increase catching rates. Additionally, there are quota controls on the number of fish that professional fishermen can catch. The quotas appear to be controlled quite rigorously for professional fishermen, while control appears to be less stringent for recreational fishing.

[3] In some of the interviews with traditional fishermen it was pointed out that these new fishing practices would being more aggressive (for example, by using of nets). However, we do not have enough evidence supporting this statement. It is possible that the arrival of newcomer fishermen is related to the sugar cane company that was once operating in the river area,. A significant part of those people attracted by the plant stayed after its closure and became fishermen. Again, we do not have concrete evidence of this process available.

[4] There seems to be another type of recreation fishing, often called "sport-fishing", by which the fish is put back into the river, but this does not seem very extended and it is associated with 'ecological tourism'.

Figure 3. Recreational fishermen accessing the river from the side of the road from San Antonio to Barao

Figure 4. Recreational fishermen

Figure 5. View of a recreational fishing facility, *peixequerio*, from the river

In this context, the most relevant environmental problem perceived by almost all of the interviewed stakeholders was the decline in fish. This was qualified by a number of people (mostly professional fishermen but not only) as dramatic, and figures indicating a greatly decreasing rate are mentioned (80% decline was mentioned by one of the environmental agents interviewed). This phenomenon seems to be relatively recent (occurring over the last 10 years).

It was found that the development of tourist facilities does seem to have a very strong positive effect on local economy. Although some locals are being employed in the *peixequeiros*, wealthy recreational fishermen seem to bring with them most of their needs and hence make little use of the local services.

Another finding regarding the fishing relates to the access to the river. It was found that an increasing number of land owner are selling the land adjacent to the river for recreational fishing purposes (for the development of *peixequeiros* or more simple fishing facilities, such small decks). This 'privatization' of the access to the river, which is illegal according to Brazilian law, may make professional fishermen to travel further and concentrate their fishing activities at spots, which are not yet known by the recreational fishermen[5]. Two artisan fishermen interviewed in Barao (not part of the list – AI has notes), however, were not particularly concerned. The fishermen reported brief disturbances of fishing at times when the large Manso dam would flood the river.

New infrastructure and changes in flow regimes

Changes in the flow regime and its association with the development of new infrastructures (dams, dykes, roads, etc.), did not emerge as one of the most significant environmental changes perceived by people. However, when asked specifically about this, people report mixed effects. The development of water barriers has a clear positive effect for the circulation of commodities and the access to markets, facilitating trade. This is clearly perceived by the whole range of stakeholders interviewed.

It can also have positive effects for some of the cattle ranchers, who are less affected by the flooding in their land area and hence have larger areas of pasture available during the wet season. However, according to one of the cattle rangers, it is important for their cattle farming system to own both land that is flooded by the river, and land that remains dry during the wet season. We did not interview any farmer who experienced the opposite situation (i.e. suffering from more flooding currently than in the past) but we it is expectable that this may also be taking place.

The opening of markets due to the development of new roads has also had an impact on the local economy not without consequences for the fish decline described above. While the fishing activity was traditionally more of a subsistence type and only opened to local markets, the opening of the roads has allowed to increase the size of the markets and intensified the professional fishing as well

[5] We recorded one exception among professional fishermen regarding the perception of recreational fishing. Two local fishermen considered that the scale of the river system would allow them to always find places that are accessible with their traditional small canoes that are not accessible for recreational fishermen

as the recreational one. The development of the *peixequeiros* is probably also related to easier access for tourists.

Agrarian structure in the Pantanal[6]

A reduction of the average farm size has taken place in the lasts decades in the Pantanal. The typical Pantanal ranch used to be very large, but has declined since (a typical farm size nowadays ranges from 1,000 to 5,000 hectares. We did not find any specific reason for this beyond the natural "inheriting" process from parents to children[7]. Most of the farms (in the area we visited) were aiming for production of calves that would be sold – i.e. were "reproductive farms".

Smaller farms are more vulnerable to market fluctuations but also to changes in environmental conditions. During the wet season in the past, the ranchers were able to move the cattle to higher areas of their own land, while now some of them get their land completely flooded during the wet season and need to rent land from other owners to place their cattle. However, this does not seem to be, at least at this exploratory stage, a very dramatic problem. As discussed above, the development of the roads, acting as water dykes, has helped some farmers in this respect.

A final finding is that currently there are many cattle ranch owners who do not live in the area any more but have moved to Brazil's bigger cities. Sometimes they are renting their land out to other farmers and make investments in touristic facilities (mainly *pousadas*).

Figure 6. Cattle ranching in the Pantanal

Tourism (besides fishing)

Besides recreational fishing, tourism seems to be developing rapidly in the Pantanal. What the locals consistently call 'ecotourism' seems to be taking a significant role in the area, with the development of *pousadas*. The development of this type of tourism seems to be contributing to a change of the traditional Pantanal recreational vision of stereotypical men (mostly coming from Sao Paulo) for

[6] We refer here to the activities in the wetland, not the large plantations in the upland Cerrado.
[7] Still it should be noticed that we are talking about farm sizes very different from the ones in Europe. A 15.000 hectare ranch is not considered to be specially large. A 300 hectare ranch is considered to be very small.

'rough' recreational fishing. Foreign visitors (as well as Brazilians) increasingly come for bird and wildlife observation, walking and canoeing, etc. Ecological interpretation and recreational centres are also developing.

There is a consensus, however, that the impact of this type of tourism on the local economy and its effects in the Pantanal as a system is going to be minimal in comparison with the other activities (mainly the intense farming in the upland Cerrado). Important investments and private-public partnership are said to be crucial in the development of this type of tourism.

Figure 7. Ecotourism *pousada* in the upland Cerrado (Chapada)

Cuiaba City water supply and sewage

Only 23% of the Cuiba city sewage is currently being treated; 35% is collected, out of which 67% is treated. There are big investments plans to improve it (the target is to achieve 70% of water treatment). The financing for this is coming from the federal government, through the *Programa de Aceleração do Crescimento*. There do not seem to be significant health related problems due to problems with sewage treatment[8].

Beside sewage treatment problems, there are also problems relating to water supply. 50% of the population has water 24 hours a day, but 50% gets water on an intermittent basis (every other day).

Currently parts of the population do not pay for the recovery of the water service[9] and in very large areas there is no charge for the water at all. Currently the payment is based on quotas, but most of the people pay the minimum payment. Reportedly, the water company experiences problems with the payment morale of people and a low willingness to pay. There are plans for the implementation of volumetric billing. There are also problems related to low water pressure and infrastructure. Infrastructure for water supply and sewage treatment (especially pumping systems) are often vandalized.

In parallel to the infrastructure investment plans there is a communication campaign in place in order to raise awareness amongst the population.

[8] This needs to be checked, since there is only a single source of information comes (SANECAP).
[9] 30% of the water is lost by pipe leakage, and 30% of the water is not paid for by the users.

Visions of the future

We mostly found a relatively optimistic vision of the future, but with mixed nuances. It is difficult to derive clear conclusions of people's perception about the future. The most concerned with the future are clearly the professional fishermen. There is consensus, though, about the positive effect that the World Cup and the FIFA demands for it will have in the area. Also in terms of environmental consequences for the Pantanal (for example, the efforts being made in terms of improving sewage from the Cuiaba city).

4. Conclusions and research questions

Deriving from the findings discussed above, we have identified three main meta-themes for further research:

- Fishing and institutional conflicts
- Environmental problems (other than fish decline) and public perception
- Cuiaba City water supply and sewage: institutional setting, public profiling and willingness to pay for improved water services

From the set of environmental problems that have been identified by the natural scientists as potentially relevant in the area, the one that has come across as very strongly perceived by almost the whole range of stakeholders is the decline of fish in the Pantanal waters. It emerges very clearly that this decline has, at least to a very large extent, a socio-economic origin: the intense development of recreational fishing. We did not find evidence of a very pronounced perception of potential decline in water quality (due to, e.g., nutrients and pesticides coming from the upstream intense plantations, Figure 8) or changes in the flow of water due to barriers, such as dams and roads (an exception is the major of Barao, who mentioned clearly sediment and pesticides from upstream plantations and waste[10] and sewage from the Cuiaba city as important environmental problems affecting the river). The first research question that emerges from this finding is whether these effects do not yet exist, or if they have not yet attained a level at which they can be perceived by the population. Research proposal such as the initially prepared for the Leverhulme Trust (research grants) should maintain very strongly their stake-holder driver, but scientific judgment should be also included from the beginning.

[10] A difference in perception can be distinguished between pesticides and nutrients (not really visible) and garbage, which has a clear visual impact.

Figure 8. Upland Cerrado crop plantations

Regarding the fishing conflicts, many interesting research questions emerge, which require engaging institutional and political analysis: understanding the reasons why recreational fishing is still proliferating (apparently without any particular institutional regulation/control), while there is a clear perception of its negative impacts, what is the interplay/interlink between the different actors, the management of the “commons” (fish) in opposition to the management of the “public” (the river, and the access to it), why recreational fishing is not really bringing wealth to the locals (i.e. microeconomic dynamics).

Regarding the Cuiaba city water supply and sewage, research questions relate to the institutional setting and the barriers and opportunities for improvement (eg. the World Cup, the evolution of the city, the political dynamics, etc.). A very interesting issue regarding the profile of the water users and their willingness to pay for the improvement of service provisioning emerged as very relevant for the local authorities and could have a very direct and usefulness (it seems that it will also count with strong local support). Quantiative analysis (eventually based on monetary valuation) might have a role to play here. It is important to understand what SANECAP and local stakeholders perceive as useful information. Based on our meeting with SANECAP, it seems that people in Cuiaba only start to get used to the fact that they would have to pay for water services, and payments don't seem to get enforced in many cases. Understanding how the current charging system (and metering system) works and why it doesn't work (and for which parts of the population it works and for which it doesn't, plus how much people of are expected to pay and how this is decided), is very important information needed to design the WTP questions in a questionnaire. It is also important to understand better what services different parts of the population receive at the moment, and where SANECAP sees problems with the standard of these services, for example regarding drinking water quality (would/do locals drink the water from the tap?), service disruptions and restrictions to water supply. How are sewage treatment and (drinking) water supply linked? Water is currently sourced mainly from the river in the city - would an improved sewage system have an impact on the treatment cost? Where are the "problem areas" regarding sewage system, and how would the new infrastructure contribute to mitigate these problems?

It is also useful to know more about the research that has been done locally with customers. And to understand their vision: where do they want to get to in terms of water services and how do they want to finance it? Are there any targets they aim to achieve?

Other interesting topics relate to the social/spatial and inter-temporal identity related issues: the change of the profile of cattle ranchers (with their move to the city), the diversification of jobs of fishermen, the change of the image of the tourists, new comers and traditional views.

Figure 9. Traditional cattle ranchers

Figure 10. Old and new ways of life in the Pantanal

A high-level stake-holder analysis is already ongoing as part of the PRONEX Project, through the involvement of a master student from the Universidad Federal do Matto Grosso, and some of these research questions will be further explored as part of that analysis. A first phase is currently undergoing and is aimed to be completed by the end of May 2011. The plan is to expand the interviews across the whole catchment through the further involvement of Msc students. Annex II includes the questions that are currently being asked.

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Annex I: List of interviews

1. Owner of Pousada in Chapada.
2. Employee of Pousada in Chapada.
3. SESC Park Guide and Boat Capitan (Pocone) - not voice recorded
4. Collective interview to 3 fishermen in workshop in the Community of Bonsuceso in Vazia Grande.
5. Director of water utility company SANECAP.
6. Collective interview to 3 SANECAP technicians
7. Farmer from Pocone living in Cuiba (most of his land rented to others). Medium/large size farm.
8. Local professional fisherman in Comunidade do Poco (between Santo Antonio and Barao) - interviewed at his house
9. Recreational fishermen on the side of the bridge (between Santo Antonio and Barao) - not direct voice recorded (Ioris reporting)
10. School teacher interviewed at sport fishing facility (peixequeiro) (between Santo Antonio and Barao) - not voice recorded (Ioris reporting)
11. Big ranch cattle farmer interviewed in his farm in Santo Antonio
12. Local traditional professional fisherman in Barao.
13. Professional fishermen and environmental agent in Barao
14. Small rancher in Barao
15. Guide from the Pousada Mutum - not voice recorded
16. Matriarc at small fishermen community by the side of the river in Cuiaba Mirihna (between Barao en Mutum)
17. Wife of local fisherman and tourist boat capitan from small fishermen community by the side of the river in Cuiaba Mirihna (between Barao en Mutum)

Annex II: List of questions included in the high-level stakeholder analysis currently undergoing as part of the PRONEX Project.

1) Please, describe your sector and how it is organised.

2) What are the main activities and economic sectors in the Cuiaba River Basin?
- ask about different types of land use in the river basin.

3) How water is used by your sector in the Cuiaba River Basin?
- address consumptive and non consumptive uses.

4) Looking back at the last 20 years, have you perceived any significant changes in the river affecting your sector of activity? (water quality, flow regime…)
Does you sector have any restrictions to use water in the Cuiaba River Basin?

5) What is your opinion about the quality of the water in the river basin?
- would you drink directly from the rivers? explain why.

6) About other sectors that use water in the river basin, do you know what kind of use they make of water?

7) Are you aware of government policies and initiatives and what is your opinion about them?

8) Do you think that anything needs to change in relation to the management of the Cuiaba River Basin?

10) How do you see the future of the activities of your sector in the Cuiaba River Basin?