Observatory of the dynamics of interactions between societies and environment in the amazon

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1   Introduction

The Odyssea project brings together scientists and social actors from different groups and networks, with a long-term experience of the Amazon region. However, the disciplines, methods and sites of each group and network are different. One of the first challenges to constitute a global network and stimulate exchange between scientists was enabling to build a common foundation, epistemologically, conceptually and methodologically, from which to stand on together and move constructively throughout the Odyssea project.

Social network theory shows the importance of gradually enrolling members by building common interests (Akrich, Callon & Latour, 2006). The four steps in this process are 1/ "building the problem", by qualifying it, 2/ getting the actors interested in relation to this problem, then 3/ enrolling the actors, i.e. defining the complementary roles they can develop to solve the problem, and finally 4/ mobilizing them so they really engage in the process. These steps are not only valid for analyzing networks, but also for building them and carrying out a project (Lavigne-Deville, 2015).

To enable participant scientists to find common interests and then discuss them with social actors, the WP2 team chose to build a conceptual framework and methodology for cross comparing the different sites involved in the Odyssea project. This construction was gradual:

- At the scientific kick-off, in April 2016, researchers were invited to prepare, by site, a common presentation of the main stakes, the developed projects, results and remaining challenges. This allowed the mapping, across sites, of common features and specificities, while researchers could get to know the work developed by other groups in the various sites. This resulted in a first mind-mapping of main concepts that are dealt with within the Odyssea network.

- At the second common meeting, in November 2016, a WP2 session was facilitated by Marc Piraux, leader of activity 2.1, to define the first concepts for a common framework. This discussion involved both the reasons and methods to compare sites.

- In April 2017, a WP2 workshop was held, to move forward with the framework and define a first action plan to compare sites.

- From August to September 2017, a methodology was built and tested at a local level (rural communities) and at a municipal level (in Santarem), as pilot experiences, contributing to improve the framework and define main elements to be followed on other sites.

- In September 2017, a simplified version of the methodology was also used at a regional level, in Belém (Pará), with representatives of farmer unions and groups, to discuss their demands for an observatory. In this phase, the framework already served as a tool for building interest and mobilizing coalitions, as presented in the social network theory.

The central concept orienting the framework is adaptation to changes, linked to that of adaptive capacity and agency. However, these concepts are difficult to discuss as such with social actors and require a creative methodology to progressively build the understanding on forms of adaptation and the ways to become more pro-active in face of environmental changes.

From the beginning, the aim was to involve different scales, from community to municipality to region, as our working hypothesis is that the levers and contexts to promote adaptation are specific to each scale. By discussing the changing elements at each scale, actors can become conscious of levers at their own scale, but also of ways to connect to actors at other scales to have access to different levers.

This report presents the main steps during the process to build the common framework and test this methodology. The municipality of Santarem was chosen as the pilot site to apply the methodology, as research groups with diverse interests are already engaged in this area and have also built strong relations with social actors.

Two main outcomes are expected for 2018: applying the methodology in different communities of Santarem, to identify the common features and specificities of adaptation in each one; and applying the methodology in other sites, starting with the Northeast of Pará, close to Belem.

2 Progressively defining common concepts and structuring a framework

2.1 Mind mapping of the diversity of research within Odyssea

The scientific kick-off of the Odyssea project occurred in April 2016, in Pirenópolis (state of Goiás), with 50 researchers to discuss the great lines of the project and define the scientific programme until 2020.

The Odyssea team chose to develop the project on 5 main sites, each with its own specificities, but with contributions to common reflections (see table 1).

Table 1: Main characteristics and issues in each selected site

Selected sites	Structuration	Main issues
1- Manaus region (Amazonas)	floodplain, protected areas	Sentinel site for studying water-borne diseases within the Climate and Health Brazilian Observatory; Biodiversity and use of natural resources. Vulnerability to extreme events; Impacts of forest degradation;
2- Santarem (Pará)	floodplain, diversity of land arrangements, and the functioning of degraded terrestrial forests	River variation; Water-borne disease; Impacts of forest degradation;
3- Oyapoke region (Amapá and French Guyana)	River and road, agrarian settlements	Trans-border sentinel site for malaria transmission within the Climate and Health Brazilian Observatory; Biodiversity and use of natural resources;
4- Nordeste Paraense, close to Belem (Pará)	Road, agrarian settlements and large properties	Restoration of degraded land and of forests; Innovation towards a more efficient use of land to conciliate preservation and development;
5- BR 163 (Pará and Mato Grosso)	Road, large properties	Control of soy expansion; Restoration of degraded land;

To encourage crossing disciplines and working topics (water, biodiversity, health), researchers from each site were invited to prepare a common presentation of the main stakes, developed projects, results and remaining challenges.

This enabled to map, across sites, common features and specificities of the projects, while allowing the understanding of the whole set of research being developed in other sites.

This resulted in a first mind-mapping of main concepts incorporated in the Odyssea network research.

The main questions guiding the meeting were: i. The basis of Odyssea: great challenges in past and on-going research projects; ii. What kind of observatory do we want to build together? iii. What can be the contributions and interactions between participants?

Based on these guiding questions, participants discussed the diverse objectives for Odyssea in order to establish a common understanding for the observatory. In this way, researchers discussed key words in order to express their expectations regarding the project, which were organized in two categories: themes and objectives (for what?); and processes and tools (how?). The following key words allowed to refine the diverse expectations around what was to be constructed for the Observatory.

Table 2. Key words expressing the expectations around the Observatory

Themes and Objectives *An observatory to…*	Processes and Tools *An observatory, build together with society, to…*
• Manage and share knowledge; • Monitor (notion of validity) and inform; • Monitor long-term processes; • Predict and propose emerging scenarios; • Support the assessment and definition of public policies; • Support landscape and territorial governance; • Answer the demands of actors and identify contexts of socioenvironmental conflicts, related to ongoing projects.	• Build demands and products of the observatory with diverse actors (population; managers; decision makers); • Answer the challenges linked to socio environmental conflicts;

This exercise enabled to give a direction and a meaning to the overall objectives of the Odyssea project: share knowledge and build different methods and tools which can contribute to an Observatory of Environment and Society in the Amazon region. It also clearly showed the necessity to have driving concepts to orient the knowledge-building and monitoring of the project. A simplified conceptual map (Appendix 1) enabled the identification of types of information and engagement processes with society already in course on ongoing projects.

To structure these contributions, the map was built around three categories: i. Studied driving forces (or pressures); ii. Positive or negative impacts on the dynamics between society and the environment; iii. Diagnosis, actions, methodologies and approaches of each research and possible crossing discussions between projects.

Through this activity it was possible to identify common topics within the projects, such as: deforestation and forest degradation; environmental regularization; quality of water; and territorial governance. Researchers also showed common principles in developing their research projects: communication, social engagement in the research, interdisciplinary approaches, and integration with public policies.

2.2 A first conceptual framework

At the second scientific meeting, in November 2016, discussion regarding this first conceptual map was resumed with the whole group of researchers, with the aim of building the conceptual framework that would guide the observatory. The framework was progressively organized around the comprehension of land and water use, as an integrating concept, for being transversal and responding to the stakes of local actors (see appendix 2).

Frame 1. Definition of concepts composing the first conceptual framework (based on IGBP-LUCC)

Land cover refers to the physical characteristic of the earth's surface, captured in the distribution of vegetation, water, desert, ice, and other physical features of the land, including those created solely by human activities such as mine exposures and settlement.

Land use is the intended employment of and management strategy placed on land cover type by human agents, or land managers. Forest, a land cover, may be used for selective logging, for resource harvesting, such as rubber tapping, or for recreation and tourism. Shifts in intent and/or management constitute land-use changes.

Land-cover and land-use changes may be grouped into two broad categories: Conversion or modification. Conversion refers to changes from one cover or use type to another. For instance, the conversion of forests to pasture is an important land-use/land-cover conversion in the tropics, while abandonment of once permanently cultivated land and the regeneration of forests is taking place in parts of the mid-latitudes. In contrast, modification involves maintenance of the broad cover or use type in the face of changes in its attributes. Thus a forest may be retained while significant alterations take place in its structure or function (e.g., involving biomass, productivity, or phenology).

Driving forces are the forces that cause observed land use changes, i.e., they are influential processes in the evolutionary trajectory of the land use.

Process of land use change refers to all activities, most of them related, driven by social, economic or technical or cultural factors, that modify a land use to another.

This framework intended to separate the drivers of land use change from the impacts of land use change, referring to a DPSIR-type analysis (Drivers-Pressure-State-Impact-Responses). It addressed land use change through 4 questions:

> 1 - What is the current use of land or water and how has this use been changing: agricultural expansion and / or agricultural intensification, conversion or land use change?
> 2 - What are the pressures that induce these land-use changes, such as the expansion of agribusiness in traditional agricultural land or growing peri-urban areas?
> 3 - What drives land use change, directly or indirectly?
> 4 - What are the main impacts of these land use changes on human societies and ecosystems?

These questions were intended to promote a common reflection with local stakeholders regarding the logics behind their actions and decisions, so as to discuss adaptation. The objective was to provide elements for building different scenarios based on the evolution of their actions.

2.3 Deepening of the framework around adaptation

To move forward in this exercise, a workshop was held in April 2017, with a dozen of researchers most involved in WP2. The workshop featured two moments: first, some researchers with long-term experience on observatories were invited to share the way reflections were framed within their observatories, through DPSIR or vulnerability (see Appendix 3); then, all researchers discussed the framework in development.

Although the questions addressed by the first framework made sense for all researchers, the relevance of "land use" as the pivotal element was object of debate, since the theme was not central to Odyssea despite its importance. Referring to the initial questions of

the Odyssea project (see frame 2), the question of adaptation seemed to better aggregate research topics, so it was brought back to the center of the framework.

Frame 2. Key questions of the Odyssea project

- How have environmental and climatic conditions changed?

- How have populations adapted their practices to these changes?

- How do local actors imagine their adaptations to expected changes?

- Can these adaptations reduce their vulnerability and their environmental impact?

- How governance could promote adaptations to these changes?

Figure 1 presents the conceptual framework achieved in this workshop. It will probably still evolve until the end of the project, but it can already be used as a basis for field work in the near-future.

It was agreed the framework was supposed to address the following main question: how to reduce the vulnerability of populations? Or: how to reach a socio-environmental security?

A strong debate regarding the two concepts was taken by the observatory researchers: vulnerability could sound negative when used with populations but it had the advantage of having a strong theoretical basis. Socio-environmental security was a concept being developed within the Climate Network (Rede CLIMA), our partners from The Center for Sustainable Development at the University of Brasília (Brazil) (see Appendix 3). Although it had an interesting potential, as it proposes a positive mirror of vulnerability and enhances the social and environmental conditions of security, "vulnerability" and "adaptation" were chosen as the observatory's central concepts.

The framework used by the Climate Network (Rede Clima) defines that the vulnerability of a socio-ecological system will depend: on the *exposition* to disruptions, shocks and changes (what is external to the system); on the system's *sensitivity* according to its organization and characteristics (what is internal to the system); and on its *adaptive capacity*, the ability to manage and overcome changes (Adger *et al*, 2007, p. 720; Smit e*t al*, 2001; Lindoso, 2013; Lindoso e Rodrigues Filho, 2016).

How to reduce the vulnerability of the socio-environmental system ?
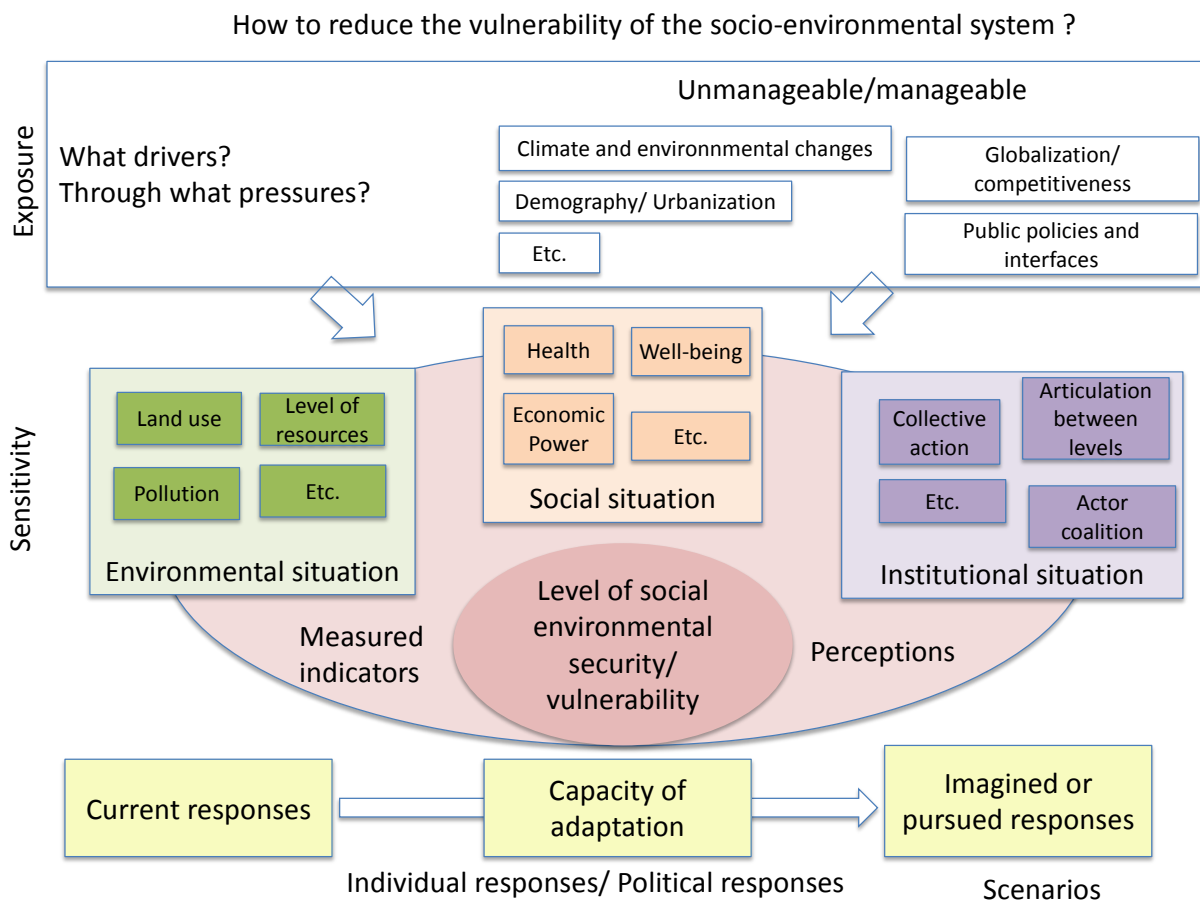
Figure 1 Conceptual framework of the Odyssea project

This new framework (Figure 1) was built by crossing the DPSIR and vulnerability frameworks, with vulnerability of the socio-environmental system as the central concept, depending on exposure and sensitivity, as defined below:

- The ***main drivers of changes or pressures*** affecting the socio-environmental system characterize the ***exposure***. The DPSIR framework separates drivers as being the overall forces, and the pressures as being the local translation of these drivers. Drivers and pressures were chosen to be kept together, as it was all a matter of scale. For example, soy expansion at a regional level can be seen as the pressure from global soy markets, which brings land use change; but at a local level, it can be seen as a driver, which translates into a pressure to use pesticides, which in turn affects water quality. Thus, in a multiscale perspective, they can often be assimilated one to the other. We preferred to refer to whether these changes can be unmanageable (e.g. climate change) or manageable (e.g. agricultural practices). This difference is very important in an adaptation perspective, as it enables to reflect on what the actors can do.
The many studies on DPSIR can help us identify these drivers and pressures which constitutes the exposure of the socio-environmental systems, such as this table based on Geits and Lambin (2002).

Table 3. Types of drivers and pressures (Geits and Lambin, 2002)

Economic factors	Market growth and commercialization
	Specific economic structures
	Urbanization and industrialization
	Specific economic parameters
Policy and institutional factors	Formal policies
	Informal policies
	Property rights regimes
Technological factors	Agro-technological changes
	Agro-processing technologies
	Other production factors
Socio-political factors	Public attitudes and values
	Individual and household behavior
Demographic factors	Population pressure
	Mobilities
	Natural increment

- The inner characteristics (*state*) of the socio-environmental system define its *sensitivity*, as they are responsible for making it more or less likely to suffer *impacts* when exposed to driving forces. In the new framework, this system depends on environmental, socio-economic and institutional situations, encompassing among others the following concepts: land use, level of resources, economic power, health and well-being, collective action, articulation between levels, actors coalition. In this framework, the state and the impacts are closely related, instead of being separated as in DPSIR. The idea is to better take into account the dynamics: a state evolves, according to the suffered impacts.

Given the multidimensional nature of socio-ecological systems, the monitoring of its dynamics is quite a challenge. Many debates were done regarding other frameworks that could be incorporated, such as the happiness index. However, since the objective was to discuss adaptation with stakeholders, it was decided for the non-aggregation of the various studied dimensions, but rather to select specific indicators according to stakeholders' demands. These indicators could either be measured, building on the project's scientific data, or approached through the perceptions of stakeholders. The Climate Network has compared measurements and perceptions, with such studies often revealing a certain discrepancy, reinforcing the importance of discussing these issues with the stakeholders.

- Finally, the *responses* of socio-environmental systems in relation to changes constitute the *adaptation* component in this framework. On one side, the current responses and on the other, the responses imagined or pursued by actors, to better deal with changes and become less vulnerable. The adaptive capacity here is the capacity to go towards the imagined responses. Adaptation of responses can be only a reaction, non-intentional, or it can be proactive, by identifying new possible responses. It can be both through individual answers or collective and political answers. One of the challenges is to build together scenarios that can help actors choose responses which will enable them to adapt better, through more concerted actions.

This framework satisfied the project team as it brought most of the components wished to be worked within Odyssea: understanding what brings change and how it translates at different levels; analyzing what are the environmental, social and institutional changes that occur; and engaging in a collective discussion regarding current responses and possible responses. The framework was shared and approved by other WP leaders. However, it was clear that it would still evolve once confronted to field reality, and to the process of validation for working with local stakeholders and their demands.

3 Proposing a methodology to implement the framework at different levels

3.1 A methodology to discuss change and adaptation

Since the beginning, Odyssea wishes to involve stakeholders as protagonists in the construction and consolidation of the observatory. The first framework was based on our different experiences regarding the demands of local stakeholders related to vulnerability and adaptation, from other research projects. After this first idealization, the next step was to confront this framework with the stakeholders' perceptions and demands regarding important topics. To engage this process, the challenge was to transform the conceptual framework into a methodology which would enable discussing its relevance with stakeholders.

Thus, a small team was established to build a first proposition of methodology, with several group and private meetings, to move forward on more specific issues. The main objective of the first field work was to become aware of stakeholders' perceptions around social, environmental and institutional changes in their region.

The process of organizing the fieldwork was initiated in August 2017. A key question guiding the initial debates was related to the target audience, to establish whom to invite to the first meeting. Two options were discussed. First, invite representatives of different sectors of civil society (NGO's, universities, employers' union, union of rural workers, territorial representation organization, among others), as we had done in April 2016. Or, second, focus on representative actors of a reduced number of sectors with more convergence between targets, goals and actions. Because of the diversity of thinking and institutional actuation, the second option was chosen and adopted, mainly to serve as a fist test of the methodology on the interface between research and civil society.

The small team defined organized the methodological process in three steps: perceived changes, possible scenarios and current adaptations, by highlighting what was already being done and what was important for future adaptation (Table 4).

Table 4 Methodological steps designed to discuss change

FIRST STEP - CHANGES	
Objective	Identify great changes in the region;
Guiding question	What are the greatest changes occurring in the region?
Method used	Three cards were handed to each participant. Participants presented their view on main observed changes to the group.
SECOND STEP- SCENARIOS	
Objective	Identify future scenarios
Guiding questions	1) What do you think will happen in the future? 2) What would you like to happen in the future? 3) What wouldn't you like to happen in the future?
Method used	Participants were divided in three random groups and were asked to draw together a picture for each scenario.
THIRD STEP- ADAPTATION	
Guiding question	What actions would lead to each of these scenarios?
Method used	Five cards were handed out to each group with the aim of identifying actions that would lead to drawn scenarios.

The methodology was developed with the aim of enabling to compare adaptation questions across the five sites selected within Odyssea. To build this methodology, Santarem was selected since several projects involving social actors were on-going in this location.

The levels in which field works are conducted significantly influence results, the identification of socio-environmental changes, and the capacity of adaptation measures identified by actors in a multi-scale perspective. Thus, a multi-scale approach can provide complementary results.

The methodology was tested at two levels: at a community level, in a district of Santarém, Lago Grande do Curuai; and at an inter-municipal level, in the city of Santarém, bringing together social leaders from different areas, including the neighboring municipalities of Belterra and Mojuí dos Campos.

It is important to point out that in both workshops actors were informed their participation was volunteer and that, at any time, they were free to leave. Before the workshop, the methodology to be applied was presented and approved by the presidents of the Union of Rural Workers[1].

3.2 Testing the methodology at a community level

The field work at the local level of Lago Grande do Curuai was held on September 15th, 2017 in the community of Curuai. The 11 participants in the meeting were students and previous students of the Rural Family School (previously involved in the ClimFabiam project), and Health Agents of Piraquara and Vila Socorro communities, previously involved in the master's research of Louise Cavalcante on water quality.

Table 4 presents the methodological steps that were followed and Figures 1 and 2 show some important moments of the workshop.

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[1] The Unions of Rural Workers of Santarem, Belterra and Mojui dos Campos were officially involved as partners in the Odyssea project at a seminar held in September 2017 in Belém, Pará, through the signature of a term of technical cooperation.

Figure 2. LGC Workshop - 1st stage: identification of major changes by participants

Figure 3. LGC Workshop - 2nd stage: presentation of the drawings / scenarios by the participants

The answers regarding great changes were mainly focused on environmental changes, such as deforestation, changes in water quality, pollution, climate change and warming, depletion of fish stocks and removal of timber.

The results of the second and third steps were structured according to important principles for adaptation. Table 5 synthetizes the answers of the participants.

Table 5 Results for principles of adaptation identified in the Lago Grande of Curuai

Scenarios	Principles of adaptation identified in relation to each scenario
Non-desired scenario	- Limit greed; - Diminish the weight of financial power; - Raise awareness and promote education; - Avoid illegal withdrawal of timber; - Make a bricks production, livestock, and more sustainable agriculture;
Desired scenario	- Technical assistance; - Increase partnership with the government; - Access to bank credit; - Work together with university research; - Develop community projects
Realist scenario	- Control the entrance of agribusiness; - Avoid the excessive use of pesticides; - Limit deforestation to cattle; - Promote accountability; - Ensure more sanitation.

Considering the answers, it was possible to note responses to changes at the local level are for the most part reactive strategies.

The methodology applied at the local level allowed to reach the expected results, which was to identify main relevant changes through the lens of civil society, as well as to start to understand what they consider necessary to adapt to these changes. Participants showed interest and satisfaction in the proposed discussions.

3.3 Testing the methodology at an inter-municipal level

Based on observations during the community-level workshop dynamics, a few adaptations in the method were realized during the preparation of the municipal level meeting in Santarém. Firstly, the question "What are the great changes identified in the region?" was changed to "What are the great socioenvironmental changes in the region in the past 10 to 15 years?". This aimed at instigating a broader reflection on the relationship between social and environmental changes. Secondly, for the scenarios, while at the local level each group was asked to draw a different scenario, at the municipal level each group only drew the most realistic scenario for the locality they were representing, so as to keep time for exchange between groups.

Nineteen representatives of social organizations of Santarém, Belterra and Mojuí dos Campos participated in the second workshop. Three groups were formed according to the municipality of each participant.

The answers regarding the great changes were more focused on the political and social organization of the territory and impact of elements that are not specifically from the territory, such as: political change, economic crisis, lack of infrastructure, among others. These answers often refered to a multiscale approach, since actors at different scales are able to present different perspectives on the same changes. Changes identified at the local level were also mentioned herein, such as climate change, deforestation, pollution, and others.

Figure 4. First step - identifying the major socio-environmental changes

Figure 5. Third step - identifying the principles of adaptation

In the second and third steps, regarding scenarios and adaptation, important differences appeared for each municipality. In relation to the answers at a local level which were "reactions to change", at this intermunicipal level, answers were much more proactive, about how to organize to be less vulnerable to change. The following table presents the answers by municipality.

Table 6. Principles of adaptation cited by the stakeholders of Santarem, Belterra and Mojui dos Campos

Municipality	Principles of Adaptation
Belterra	- Raise people's awareness; - Work in group; - Reforest; - Reforest the river margins; - Government commitment with people; - Bring together managers, schools and associations; - Guarantee the access to public college;
Mojuí dos Campos	- Reforestation; - Complying with public policies; - Complying with environmental law; - Monitoring; - Encouraging the local culture.
Santarém	- Consolidating the territory; - Broaden the campaign "*Não abra mão da sua terra*"; - Supporting and implementing policies of rural education and rural family schools; - Strengthening grass-root organizations - Receive juridical support

The multi-scale approach was crucial in assessing the diversity of answers regarding adaptation to the identified changes. Policies and institutional responses are more likely to be presented at a municipal scale, generally more linked to public policies. Individual and collective responses are more likely to be presented when the dynamics are held at the community level.

In these first workshops, we did not have time to discuss agency (who can act at chat level?) regarding the principles of adaptation. This is one of the future steps planned in the methodology at the local level.

3.4   Discussions at a regional level: defining priority demands and relevant knowledge

From the 27th to 29th of September, 2017, the 3rd Odyssea scientific seminar was held in Belém, Pará. The seminar had the objectives to identify the demands of the social actors involved in the project and define how existing data and experiences already developed by the researchers could contribute to inform these demands, and how the group could organize for the next steps.

Representatives of civil society organizations were invited to participate in the first day of the event. Table 7 presents the names and origins of each participant. At the end of the day, the organizations with whom we had already been able to discuss the terms of a partnership

signed it (Santarem, Belterra and Mojui dos Campos). The other organizations voiced their will to also follow in this partnership.

Table 7 Name and origin of civil society representatives - Belém seminar September 2017

Name	Origin or Representation
Manuel Edivaldo (Peixe Pau)	Union of Rural Workers of Santarém
Jacinto Farias (Índio)	Union of Rural Workers of Paragominas
Guilherme	Union of Rural Workers of Paragominas
Analice	Irituia cooperative
Neilton Miranda	Union of Rural Workers of Belterra
Antonio Valdir	Union of Rural Workers of Mojuí dos Campos
Antônio Gavião	Federation of Communities of Lago Grande do Curuai
Dione	Counsel of Traditional Populations - Tefé
Antônio	Union of Rural Workers of Abaetetuba
Edilson da Costa	President of the Association of remaining quilombos communities

To better identify specific changes and adaptations, the researchers and social representatives were divided into four working groups, according to the main topics which progressively emerged within Odyssea: 1) Interface with commodities; 2) Evolution of living conditions and well-being; 3) Access and degradation of natural resources; 4) Agroecological transition and productive inclusion. The results of each group were presented by the social representatives during a plenary round table. Figure 6 presents the representatives of civil society in the opening of the plenary roundtable.

Figure 6 Representatives of civil society in the opening of the plenary roundtable

Figure 7 Representatives of civil society in the opening of the plenary roundtable

The main problems identified in each group were often cross-cutting, such as adaptation to drought, issues linked to mining activities or other large infrastructure projects, timber extraction, increased use of agrochemicals and cancer, among others.

The framework and methodology applied at the local and municipal level were presented to the whole assembly, to gather critics or suggestions for improvement. The representatives from Santarém, Belterra and Mojuí dos Campos were invited to share their experience regarding this exercise. They said to be very satisfied with the workshops, which enabled to think together about future perspectives and about how to get organized to better deal with changes.

After some priority demands were formulated by social actors, researchers discussed whether past and on-going projects already had useful information, how this information could be used, and what could be done to advance in the consolidation of the observatory. Table 8 presents information that could be made available by on-going or past projects.

Table 8 Information of some past and on-going projects related to Odyssea

Project	Description
Duramaz	Climate change perception; Interaction between science and civil society; Food security;
Projeto Integrativo - Vulnerabilidade Socio-Ambiental (PI-SSA) / Rede CLIMA	Evaluation of public policies coherence to adaptation under climate change, governance, adaptation indicators and vulnerability to climate change in distinct Brazilian biomes;
Project Simbiose	System of indicators of biodiversity for actors use: terrestrial and aquatic biodiversity (Amazon river and Oiapoque);

Food Seca	Research on 5 municipalities in the state of Amazonas. Climate change, food security, child mortality in partnership with Lancaster University;
Rede Amazônia Sustentável	Biodiversity; Carbon, Hunting; Use of forestry products, income, etc. in partnership with Embrapa, ULAC, Stockholm Environment Institute.

4 Perspectives in building the framework

4.1 Reflections on the framework from the first tests

Table 9 presents the main results of the workshops, crossing changes and adaptation according to the dimensions of vulnerability defined in the framework.

Table 9 Principles of adaptation according to the dimensions

Dimensions	Mentioned changes	Principles of adaptation to change
Environmental	Climate change, temperatures Water levels, droughts Deforestation Water pollution Fish stocks	Limiting timber extraction, deforestation Reforest, restore riparian vegetation Monitor and fine (through partnership with government) Limiting greed Increase environmental consciousness Encourage responsibility Invest in basic sanitation
Socio-economic	Rural-urban migrations Agribusiness arrival Deserted communities Food composition Drugs, violence, prostitution Land sales Economic crisis	Enable access to credit and extension Increase rural education Encourage local culture
Institutional	Political (impeachment) Corruption	Increase partnerships with government Work with researchers Consolidate territorial governance Empower grassroots organizations Access to juridical support Enable access to universities Bring together managers, schools and associations

Based on this table, several considerations can be made to improve the methodology and the framework:

- The main changes identified are drivers, pressures and impacts: it is important to explore with stakeholders the different nature of changes (manageable/unmanageable, at what level) and the links between these changes;

- The changes mentioned relate to distinctive topics (water pollution, climate change): it seems important to discuss the topics separately, to then see how they converge or not;

- The reasons for current socio-environmental vulnerability (sensitivity) have not really been investigated in this methodology: it can be worth bringing this in future workshops;

- However, by identifying main principles for adaptation, instead of the reasons for vulnerability, the methodology enabled to put forward different fundamental dimensions for adaptation, which could be elements to observe within an observatory;

4.2   Role of the framework for the future work

The scientific meeting in September 2017, involving representatives of the social actors, was an important milestone to achieve a clearer vision of how the observatory will progressively be configured (Figure 7).
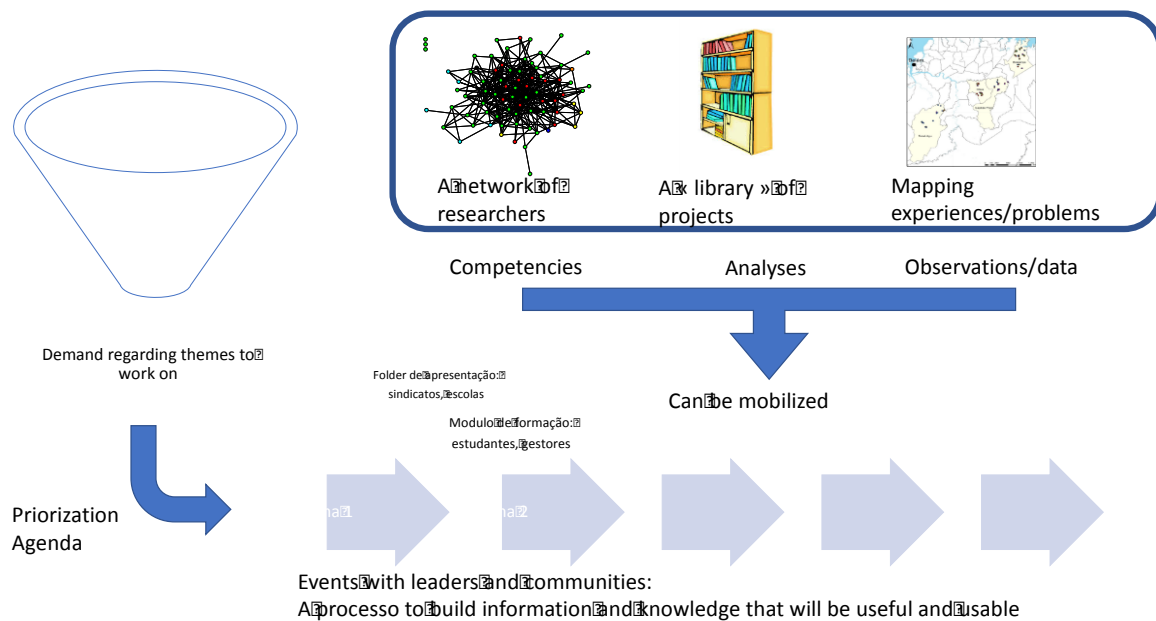

Figure 8 Towards a common vision of the observatory

The strong capital on which the observatory can be build is threefold:

- a network of approximately 100 researchers, with diverse competencies and long-term experience in the Amazon;

- a "library" of projects, past and on-going, which can be consulted for data, processes with actors, knowledge of different areas;

- and new mappings of experiences/problems which can be done specifically depending on the demands of the observatory.

Depending on the demands which will be identified between representatives of social actors, managers and researchers, this capital can be mobilized in a continuous process, in which different themes relating to the interaction between society and environment in the Amazon can be discussed. The objective is to progressively build information, knowledge and analyses which become more widely shared among the different stakeholders, to support action and adaptation.

Although the framework is still in discussion, its collective construction among researchers and with the social actors has enabled to share visions, concepts and methods. According to social network theory, it has enabled to better "build" the problem, around the issue of change and adaptation, and has gotten the actors (researchers and social actors) interested in this problem. The next two years of the project will enable the observatory to enroll the actors, and to define complementary researchers' roles within the observatory to address this problem.

In this construction of the observatory, the common framework is relevant in three ways: 1/ it orients the way the demands are addressed and how change and adaptation are discussed with social actors; 2/ it aggregates the discussions of researchers, enabling interdisciplinary considerations; 3/ it will enable to compare different sites involved in Odyssea. As a result, it will be possible to access the main changes in the territory and the ways people are adapting to changes in a regional perspective, allowing a broader comprehension of the socioenvironmental dynamics in the Brazilian Amazon.

Frame 3. Strategy for implementing the methodology

Each site has specific issues, which will be at the heart of discussions between researchers and stakeholders. In each of these site, the activities will be articulated at two levels: at the community level, with the populations themselves, and then within a common pole, with representatives of different communities. Activities common to these different sites will also be planned to bring together the main representatives of each site. The idea is to discuss with the actors at each level what can be done at this level to adapt to changes and what should rather be done in connection with other levels, to organize a multi-scale perspective on problems that people face and ultimately succeed in thinking about multi-scale governance to address these problems.

In the Santarem site, chosen as a pilot site, the idea is to develop the following activities in 2018-2019:

- Participatory workshops will take place in a dozen communities, chosen according to the issues tackled in this area (and taking advantage of the research and partnerships already undertaken by the researchers involved in Odyssea), in particular: adaptation to the great floods of the Amazon, rural-urban interface, soybean expansion, conservation challenges in the face of large forest fires. By comparing the different changes perceived by the inhabitants of each community and the adaptations already implemented (or wanted), the researchers will identify common points and the peculiarities of each site, to elaborate information accordingly to the needs.

- In these same communities, depending on the possibilities of researchers involved and on-going projects, surveys can be conducted regarding the individual perceptions of inhabitants in the face of changes and adaptations. In total, in the Santarem region, it is planned to have approximately 10 surveys per community, amounting to about a hundred surveys in total.

- In parallel, in the city of Santarem, representatives of the different zones of the region will be invited about every 6 months, first to make a zoning of the changes occurring, then to identify the main forms of adaptation, and then, to discuss this adaptation more specifically according to different themes that they have identified as relevant. These workshops will be based both on Odyssea's research data, on the participatory activities developed in communities, and on the surveys carried out.

In the other sites of the Odyssea project, the modalities for implementing this methodology may vary according to the amount of financial and local resources of each research team. The ideal would be for each site to have at

least one workshop with the representatives and approximately 3 workshops at the community level (with about 30 surveys), to have a transversal vision of perceived changes and adaptations implemented at the different levels. Although these five sites are a selection within a huge Amazonian region, they will nevertheless allow to grasp the main evolutions occurring and to choose with the actors engaged in the process of construction of the observatory what are themes that make sense for them.

According to the multi-level methodology we are planning (see frame 3), three priorities have been planned by the WP2 group for 2018:

- *Rapidly give continuity to the partnership initiated with representatives of social actors*: define the role of social actors within the governance of the observatory and define how the committee will be activated. It is fundamental to define working routines, create a certain institutionalization of the observatory and truly encourage learning conditions.

- *Define with social actors priority topics* to be discussed during workshops, and initiate first workshops in Santarem and in the Northeast of Pará. This will enable to start building concrete products for the observatory (what different processes and materials can be built around one topic);

- *Implement the pilot method to discuss changes and adaptation* at the level of 10 communities in Santarém (and maybe in other areas): as soon as the ethical agreement is received, these activities will be carried out. The main challenge will be improving the framework to compare results between community. In this perspective, the framework must better comprehend and express the composing elements of vulnerability concept: exposition, sensitivity, and adaptive capacity. This will enable to better classify how the great changes in the territory affect the sensitivity of the socioecological system, as well as how people are adapting to the changes.

References

Adger, W.N., S. Agrawala, M.M.Q. Mirza, C. Conde, K. O'Brien, J. Pulhin, R. Pulwarty, B. Smit and K. Takahashi. 2007. Assessment of adaptation practices, options, constraints and capacity. **Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change**, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 717-743.

Akrich M., Callon M., Latour B. 2006. **Sociologie de la traduction: textes fondateurs**, Presse de L'Ecole des Mines, Paris.

Callon M. (ed.) 1989. **La science et ses réseaux. Génèse et circulation des faits scientifiques**, La découverte / Conseil de l'Europe / UNESCO.

Global International Water Assessment (GIWA), 2001; European Envrionment Agency (EEA), Copenhaguen.

Lambin, E.F and H.J. Geist (Eds). Land-Use and Land-Cover Change. Local processes and Global Impacts. The IBGP Series, Springer-Verlag, Berlin, 2006, 222 pp. (A synthesis of LUCC Science)

Lavigne Delville P., 2015, « Un projet de développement qui n'aurait jamais dû réussir ? La réhabilitation des polders de Prey Nup (Cambodge) », Anthropologie & développement, n° 42-43, pp. 59-84.

Lindoso, Diego. (2013) **Vulnerabilidade e adaptação da vida às secas: desafios à sustentabilidade rural familiar nos semiáridos nordestinos**. Tese de Doutorado. Brasília: Universidade de Brasília.

Smit, Barry; Wandel, Johanna. 2006. Adaptation, adaptive capacity and vulnerability**.** In: **Global Environmental Change**. vol. 16. p. 282- 292.

Appendix 1. Cognitive map of relations between the concepts mobilized in the different projects

Elaboration: Carlos Hiroo Saito (April 2016)
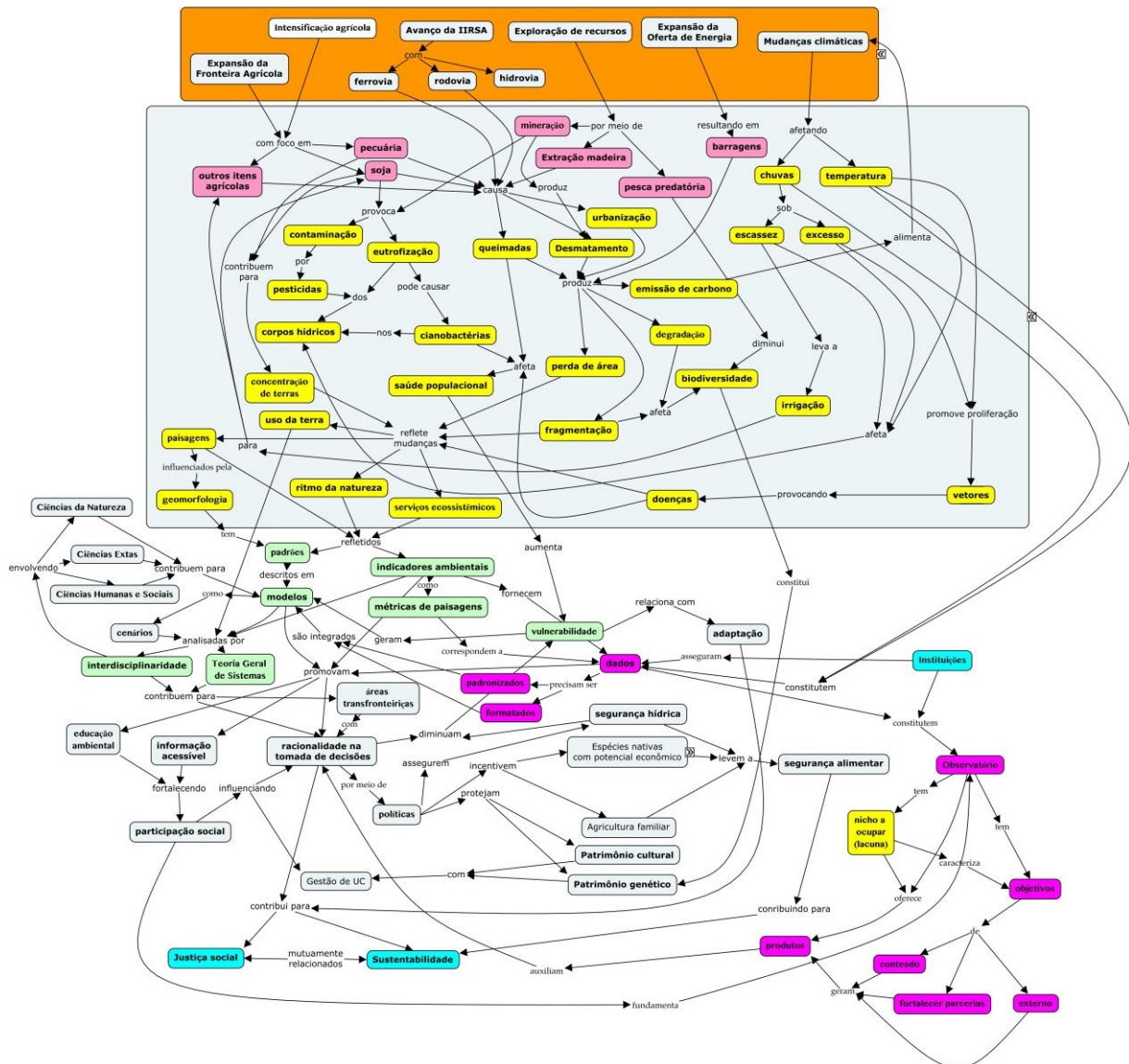
Graphic explanation: The vectors of changes (orange zone of the graph) are studied by focusing on the elements reported in light pink (eg the vector of change or pressure "expansion of the agricultural frontier" focuses on livestock or soy or other agricultural items) that interfere in some characteristics of the environment or social organization (words in yellow) and provoke changes that can be studied through different methods and approaches (green words). The common aims (reported in gray) are to promote environmental education, rationalization of decision making, etc. contributing to social justice and sustainability (final socio-environmental objectives in light blue). The Observatory (magenta) and the research developed within it allow, therefore, to provide data and standardized products helping decision making.

Appendix 2. First conceptual framework for task 2

Marc Piraux, January 2017

A conceptual framework is needed to structure task 2.1 in the different sites selected (Santarem, Nordeste Paraense, BR 163.). This framework comes from the initial reflection that was made at the Odyssea seminar in the month of November 2016 (see Appendix 1).

To guide task 2.1, we chose to organize it around understanding the current changes in land use (and water) as an integrating, cross-cutting and challenging element for local actors.

An understanding of the "driving forces of change" and its impacts is expected, especially in terms of the appropriation, quality and degradation processes of the resources used, in their social, economic and environmental dimensions. The challenge is, from these elements, to understand the possibilities of improving local actions, including public policies.

DEFINITIONS (source IGBP-LUCC)

Land cover *refers to the physical characteristic of earth's surface, captured in the distribution of vegetation, water, desert, ice, and other physical features of the land, including those created solely by human activities such as mine exposures and settlement.*

Land use *is the intended employment of and management strategy placed on land cover type by human agents, or land managers. Forest, a land cover, may be used for selective logging, for resource harvesting, such as rubber tapping, or for recreation and tourism. Shifts in intent and/or management constitute land-use changes.*

Land-cover and land-use changes *may be grouped into two broad categories: Conversion or modification. Conversion refers to changes from one cover or use type to another. For instance, the* **conversion** *of forests to pasture is an important land-use/land-cover conversion in the tropics, while abandonment of once permanently cultivated land and the regeneration of forests is taking place in parts of the mid-latitudes. In contrast,* **modification** *involves maintenance of the broad cover or use type in the face of changes in its attributes. Thus a forest may be retained while significant alterations take place in its structure or function (e.g., involving biomass, productivity, or phenology).*

Driving forces *are the forces that cause observed land use changes, i.e., they are influential processes in the evolutionary trajectory of the land use.*

Process of land use change *refers to all activities, most of them related, driven by social, economical or technical or cultural factors, that modify a land use to another.*

The framework is organized in two phases:

A. Understanding the actual changes in land use (and water), its drivers and its impacts

For this, each field work will be characterized in 4 steps synthesized in the figure below.
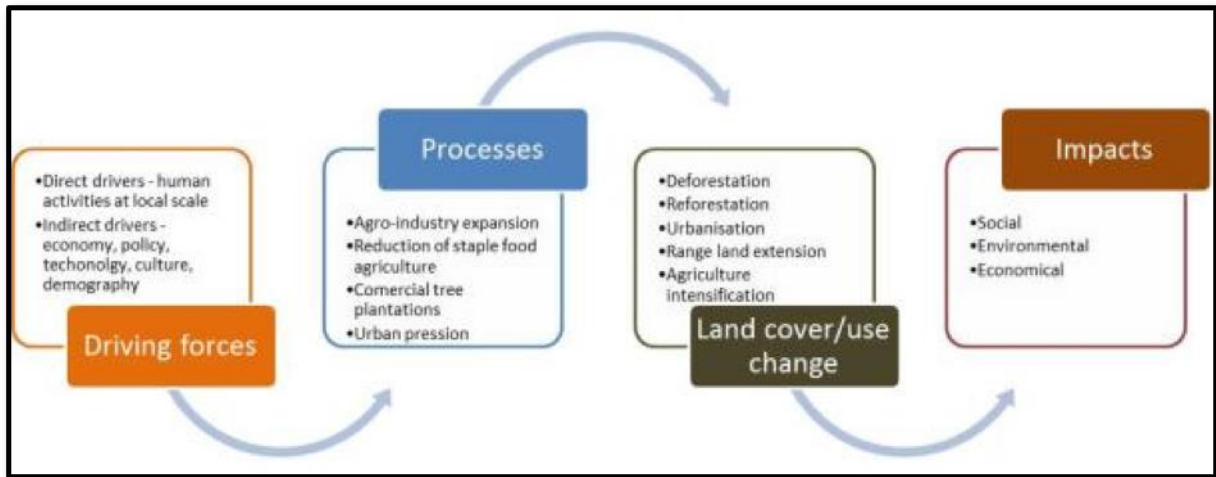
1 - What is the current use of land or water and how is this use changing: agricultural expansion and / or agricultural intensification, conversion or land use change? (Do we have to choose a time scale for this in the last 5 years?)

2 - What are the processes that produce these land-use changes, such as the expansion of agribusiness in traditional agricultural land or growing peri-urban areas?

3 - What drives land use change, directly or indirectly (following the drivers identified by Geits and Lambin (2002)?

Economic factors	Market growth and commercialization
	Specific economic structures
	Urbanization and industrialization
	Specific economic parameters
Policy and institutional factors	Formal policies
	Informal policies
	Property rights regimes
Technological factors	Agro-technological changes
	Agro-processing technologies
	Other production factors
Socio-political factors	Public attitudes and values
	Individual and household behavior
Demographic factors	Population pressure
	Mobilities
	Natural increment

4 - What are the main impacts of these land use changes on human societies and ecosystems?

- Social impacts (quantity of land available for food production, economic disparities in rural populations, new poverty patterns, new forms of governance and social innovations) and environmental impacts (pollution, biodiversity, soil erosion and other degradation of the soil ..) must make it possible to understand in particular two elements:

> • The use of natural resources (wood, biodiversity, land ...), knowing that changes in the use of resources include land use. The impacts of these land use modifications on the availability, appropriation and quality of resources will be diagnosed.

> • The consequences on the vulnerabilities of local populations.

From this action, we expect a spatially explicit knowledge of the major changes in land use in each field.

B. The second phase corresponds to understanding the logic of the actors' action related to the adaptation of rural populations. The challenge is to diagnosis how the results obtained in the first phase can serve for decisions and which decisions.
Analyzing the land use action model enables to understand the system of coexistence between uses of resources.

The objective is to provide elements for scenarios regarding the possibilities of actions evolution.

Organization

In each chosen field, these two phases can be constructed as follows:

- Analyse the "state of the art" regarding land use changes in the region based on existing literature,

- Seminars within the Odyssea project to analyze the main processes (driving forces, processes, assessing the social, economic and environmental impacts).

- Seminar with local actors reproducing the same sequence; the goal is to share a representation of the dynamics in relation to the land use challenge. It seeks to establish a scenario of co-construction of a dynamic model on this theme.

- Analysis of action logic, modeling, scenario elaboration, monitoring of local actors (identify with local actors how to develop (with whom, where ...) this task).

FRAMEWORK PREPARED AT ODYSSEA SEMINAR NOVEMBER 2016

What are the dynamics in terms of land and water use?

What are the drivers?

What stimulates the changes?

Set of international, national, regional and local projects. Matrix of public policies

Interactions between sectors

Relation society/nature

Transdisciplinarity

What relationships with society can be built through this process?

- Changes in land and water use
- Coexistence between resource use

How can it serve decisions and what decisions?

Logics of action

Social and environmental impacts (water) Health

Vulnerabilities Adaptation

What policies?

Stakeholders Coalitions

Responses

What alternative models? What scenarios? How to promote adaptations, what research?

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Appendix 3. Report on WP2 Workshop

Moving forward in the framing of the Odyssea observatory

Report: Emilie Coudel

April 12th-13th - CDS-UNB, Brasilia

Present:
Embrapa Amazônia Oriental: Joice Ferreira, Milton Kanashiro, Tatiana Abreu de Sá
UFPA-NCADR: Lívia Navegantes
UNB-CDS: Saulo Rodrigues, Carlos Hiroo Saito, Stéphanie Nasuti, Gabriela Litre, Daniesse Kasanoski
IRD: Marina Hohl, Laurent Durieux, Marie-Pierre Ledru
Cirad: Emilie Coudel, Christophe Le Page, Marc Piraux, Stéphane Guéneau, Jean-Philippe Tonneau

1. Building the Odyssea Observatory

1.1. Introduction
Emilie Coudel (Cirad) & Joice Ferreira (Embrapa) (coordination of WP2)

> Remembering the key questions of the Odyssea project:
> • How have environmental and climatic conditions changed?
> • How have populations adapted their practices to these changes?
> • How local actors imagine their adaptations to expected changes?
> • Can these adaptations reduce material and health vulnerability and their environmental impact?
> • How governance could promote adaptations to these changes?

Since the beginning of the project, in the seminars, 3 ideas of observatories have been raised, each involving different forms of interaction with society:
- Observatory of research projects (and development experiences?)
- Observatory capable of crossing data from public banks with data from research projects
- Observatory of alerts, where success projects or crises could be signaled

Workshop objectives:
• Deepen our wishes and goals for the Odyssea observatory
• Consolidate a framework to guide the processes of co-construction
• Prepare the September seminar:
- Start some processes (Santarém? Northeast of Pará?) to begin the co-construction and present the perspectives
- Define what the other WPs could bring in September?

Main elements of the debate:

- How to manage the interaction with the decision makers at such a politically sensitive moment?
  - Continue relationships that already exist (for example in the REDE CLIMA)
  - Make partnerships with people who are not so politically involved (eg CGEE)
  - Identify interministerial working groups in which we could insert these reflections
  - Involve other types of actors, for example Emater (Rural Extension Service), who are privileged observers and implementers, or the Bank of the Amazon, who is very interested in studies of this type, on indicators to understand the transition
  - Alerts versus "positive agenda" (showing things that work): have to have both, show vulnerabilities to reach resilience; Alerts are not only negative, they are important for risk prevention as well.

1.2. Building observatories: principles based on some examples
Jean-Philippe Tonneau (Cirad)

General considerations about observatories:
- *A territorial observatory is a social and technical device*: a social device because it is a community of actors that organize themselves around a challenge to act; a technical device because it is a set of means, instruments to collect, analyse, share, disseminate data, information and knowledge.
- *Lessons of failed experiences:* define a precise domain; need for a conceptual model to integrate the different themes; answer real needs and think about services; define the roles of each actor, complementarity and subsidiarity; financing.

4 examples of observatory:
- Observatory of land in Madagascar
- Observatory of land policies in Senegal (and land grabbing)
- Pollution Observatory in the Carribean
- Observatory of urban growth in Thau (South of France)

Main elements of the debate:
- The examples presented show political demands and financing: how to do in our case?
- Observatories differ from a geographical atlas through dynamics: important not to bring only static indicators

1.3. Conceptual elements of the Climate Network (REDE CLIMA) and the Integrative Project Socio-Environmental Security
Saulo Rodrigues Filho (UNB-CDS)

Objective of the Climate Network (REDE CLIMA): To offer an analytical capacity to subsidize political decisions
The Climate Network (Rede Clima) is entering its second phase, with transversal projects. The Center of Sustainable Development is leading an integrative project on social and environmental safety (SSA PI), applied to the São Francisco River basin.

> *Socio-environmental security is defined by the Climate Network group as "the property of social and natural systems that favors adaptation to climatic stresses. Such an effort goes a long way towards understanding the interconnections between sectors, scales and actors and towards integrated approaches that minimize trade-offs and potentialize synergies among sectoral policy responses. »*
> *(Report 1 of the Socio-Environmental Security Integrator Project)*

This concept is based on the Vulnerability / Resilience approach that has been used by the Climate Network in its first phase.

The objectives of the project are:
1. Development of a hybrid analytical framework (quali-quanti) for multi-scale evaluation of socio-environmental vulnerabilities to Climate Change
2. Map local vulnerability (case study) and regional vulnerability hotspots
3. Analysis of the institutional arrangements of Socio-environmental Governance from the perspective of adaptive capacity
4. Identify success stories in the governance structure and adaptive strategies at various scales

There was a change in the approach in determining the drivers, towards a retroactive approach: instead of relying on theoretical models that prove not so adequate regarding field reality, it is the field work that determines the most relevant factors in that reality.

There will be a phase of participatory workshops in June-July, with the institutional actors, with the intention of addressing 3 main questions:

- What is changing?
- What are you doing in relation to these changes?
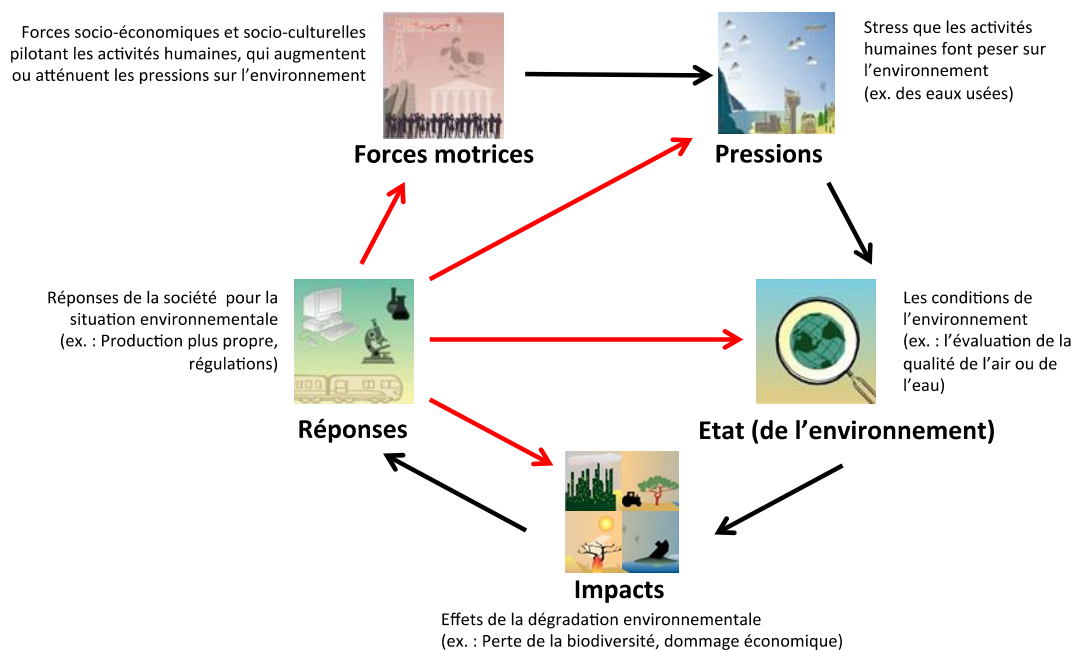- What are the barriers to change?

Elements of the debate:
- Definitions of resilience, adaptation, vulnerability: what is important is to adopt a shared operational definition by the group
- Often there is a discrepancy between perceptions and reality: this may help to think how to better adapt the indicators and see how to compare / debate the different representations between the actors

2. Deepening the analytical framework to guide the Observatory

2.1. Example of the framework DPSIR (Drivers, Pressures, State, Impacts and Responses)
Jean-Philippe Tonneau (Cirad)

Forces socio-économiques et socio-culturelles pilotant les activités humaines, qui augmentent ou atténuent les pressions sur l'environnement

Forces motrices

Stress que les activités humaines font peser sur l'environnement
(ex. des eaux usées)

Pressions

Réponses de la société pour la situation environnementale
(ex. : Production plus propre, régulations)

Réponses

Les conditions de l'environnement
(ex. : l'évaluation de la qualité de l'air ou de l'eau)

Etat (de l'environnement)

Impacts

Effets de la dégradation environnementale
(ex. : Perte de la biodiversité, dommage économique)

Sources: Global international water assessment (GIWA), 2001 ; European Environment Agency (EEA), Copenhaguen

The interest of this methodology is to think about the nature and quality of the answers (that can aim at different levels of the cycle: the impacts, the state, the pressure). Thus, one can privilege one entry through the answers, and then analyze the other elements.

Elements of discussion:
- Many critics exist regarding this framework, because it is deterministic, policy-oriented, erasing social conflicts and the difficulty to easily differentiate drivers/pressures or state/impacts
- It is the best way to discuss the different representations of local actors? is logic the best way to address them? It would be worth comparing the use of DPSIR with other methodologies (eg Principles-Criteria-Indicators method)
- When applying such methodologies in a participatory manner, how to deal with the diversity of representations and the asymmetry between actors? Construction of a collective representation, trying to put into question these different representations.

## 2.2. Rethinking the analytical framework in relation to adaptation
Marc Piraux (Cirad)

The analytical framework we built in December (2nd Odyssea seminar) had many elements in common with a DPSIR analysis. At its center was "the land and water use". However, the question of adaptation, which is central to Odyssea, came at the very end: how to bring this issue back to the center?

To move forward towards a conceptual framework capable of orienting the construction of the observatory, it needs:
- Define the focus: adaptation? vulnerability? Socio-environmental security?
- See how to measure indicators that make sense in relation to this? (or mainly take advantage of data that already exists in the projects associated with Odyssea)
- Zoning in some areas to spatialize the level of security / vulnerability, as well as to include dynamics
- Define what are the current and possible answers?

After a long collective discussion, we came up with a proposal for a more advanced framework, which places socio-environmental security or vulnerability at its center, trying to better contemplate Odyssea's main questions:
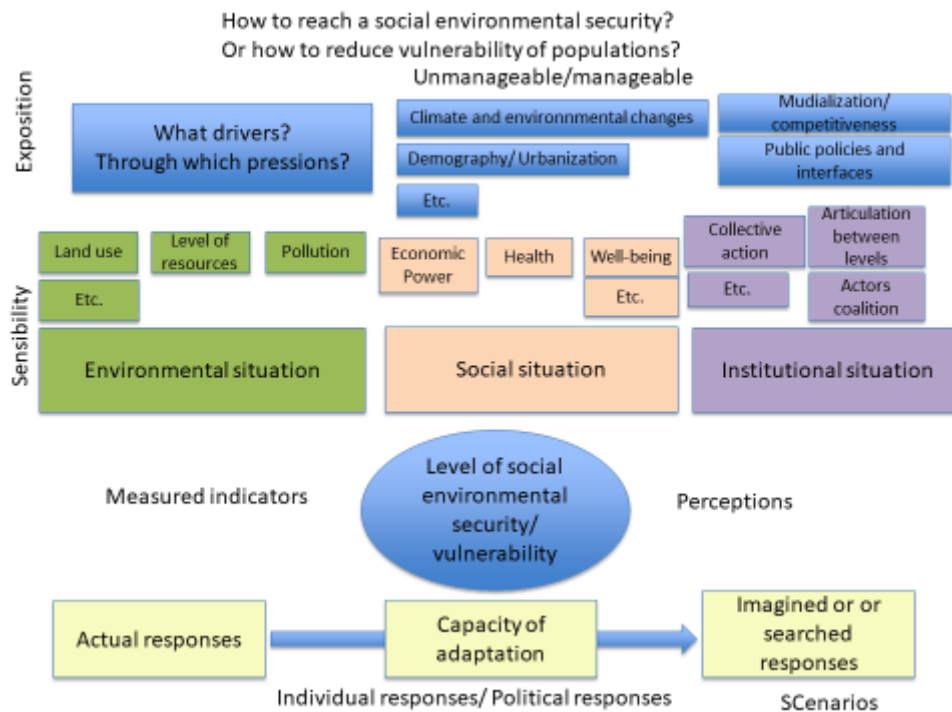
Main questions to be addressed:
- Can we rely on a concept such as "socio-environmental security"? there are already many debates and literature about vulnerability or food security, would it not be better to use the concepts that are more defined?
- This framework brings together the DPSIR and vulnerability (sensitivity / exposure / adaptation) framework: would it not be necessary to do more theoretical work before adopting this configuration? Or compare the application of each and build a synthesis of the frames from the analysis of what works in one and the other? The problem is that we have to move forward within the Odyssea project and do not have as much time and strength to apply various methodologies ... maybe we can start with this framework (to be improved) and see how to adapt it to be more relevant to field reality.