

RESEARCH MASTER THESIS



Universiteit Utrecht



**Environmental Services:
Land use change and land access dynamics in the Delta del
Paraná - Argentina**

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Abstract

The Delta del Paraná, a complex of wetlands covering the last 300km of the Paraná River in Argentina, provides several benefits to populations living inside and nearby. Considered as a marginal area regarding its historic economic development, the wetlands inside the Delta del Paraná have maintained its ecological integrity throughout the last centuries. However during the last decade the region is experiencing a period of profound transformation with the entrance of new actors and land use changes. This thesis intends to describe the environmental importance of the ecosystem in the provision of environmental services, to illustrate the changes that are currently taking place, and to focus on how are the new actors accessing to the land, aiming to create a better understanding of the local developments. Throughout qualitative research tools and participatory observation, the thesis describes and analyzes the formal and informal mechanisms with which new powerful actors are gaining access to land over old land users and owners. It is concluded that the current dynamics observed in the entering of actors and land uses occurring in the Delta del Paraná, enhanced by a lack of control by governmental agencies and an intricate legal framework, negatively affects the environmental sustainability of the ecosystem and the wellbeing of local and regional populations.

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List of Acronyms

ES – Environmental Services

FDI – Foreign Direct Investment

IIRSA – Iniciativa para la Integración de la Infraestructura Regional Sudamericana (Initiative for the Integration of the Regional Infrastructure of South America).

INTA – Instituto Nacional de Tecnología Agropecuaria (National Institute for Agricultural Technology)

PEA²– Plan Estratégico Agroalimentario y Agroindustrial Participativo y Federal 2010-2020

PIECAS-SD – Plan Integral Estratégico para la Conservación y el Desarrollo Sostenible para la Región del Delta del Paraná Comprehensive (Strategic Plan for the Conservation and Sustainable Development for the Paraná Delta Region)

UNEP – United Nation Environmental Programme

Introduction

Human life has historically depended on products and services provided by the ecosystems as they offer several benefits to society including products like food, water, fuel and fiber, or services like climate regulation and disease control, and even non-material services like spiritual benefits (Millennium Ecosystem Assessment, 2005). The provision of these environmental services (ES) depends on the ecological integrity of the ecosystem, meaning that the ecosystem has the inherent capacity to self-repair to an end-state that is normal for that system (Neimanis, et al., 2012). As “changes in these services affect human well-being through impacts on security, the basic material for a good life, health, and social and cultural relations” (Millennium Ecosystem Assessment, 2005; p.5), a sound management of ecosystems that ensures and maintains the provision of its ES is essential for the progress towards sustainable development and to achieve the Millennium Development Goals.

Wetlands are considered one of the most productive ecosystems in the world (Stolk et al., 2006) covering around 1.28 million hectares of the Earth’s surface, an area 50% bigger than Brazil. They can be described as “areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters” (Ramsar Convention on Wetlands, 1971). Water is the primary factor controlling the wetland environment; however these ecosystems are not considered as terrestrial or aquatic as they can be both at the same time or seasonally be terrestrial or aquatic. The hybrid water-terrestrial characteristic of wetlands augments the difficulty to manage it in a sustainable way, as they “are often at the crossroads of a number of disciplines with no specific discipline of their own” (Loiselle et al., 2001; p.192).

This complexity results in the fact that environmental degradation is more prominent within wetland systems than any other ecosystem on Earth as the UN Millennium Ecosystem Assessment (2005i) points out. Usually decision and policy makers fail to consider the importance of the provision of ES by only looking for short-run income productive activities that maximize the provision of one ES and tending to an “increasingly serious degradation in the capability of ecosystems to provide these services” (Millennium Ecosystem Assessment, 2005; p.27). Pressure for land use is very strong because wetlands are usually viewed as unproductive or marginal lands from an economic point of view (Stalk et al, 2006). In the last 100 years, around 50% of the original area covered by wetlands has been lost, mainly in the temperate regions of the Northern Hemisphere (Stalk et al. 2006).

Nowadays wetlands in the tropical and subtropical regions of the South American continents are being threatened by the expansion of the commodity agricultural frontier (Ramsar Convention Secretariat, 2006; Marsh et al., 2005) fostered by a high global demand for food and fuel (Borras, 2011; Borras & Franco, 2010; Cotula, 2011). With agricultural prices to increase in the following decades (OECD/FAO, 2010) agriculture will continue and increasingly become an attractive investment option. However the rampant increase in population numbers will also augment the demand for other ES like climate change mitigation, groundwater replenishment or

water purification (Millenium Ecosystem Assessment, 2005). With such a great demand for ES, policy and decision makers should implement an ecosystem management approach that considers the tradeoffs in between these ES in order that the ecological integrity of ecosystems is not degraded (Millenium Ecosystem Assessment, 2005).

In this thesis I will focus on the Delta del Paraná, a floodplain (riverine wetland) of more than 17.500 km² around the last 300 kilometers of theParaná river in Argentina(Malvárez, 1997).The Delta del Paraná plays an important role for the surrounding region;among other functions, it acts as a flood buffer and water purification and provider ecosystem (Kandus et al. 2010). With more than 15 million people living in the surrounding area (PIECAS, 2011), the provision of its ES is extremely important for the local and regional livelihoods. Nevertheless, actual developmental processes do not seem to consider them. The Delta del Paraná area is a concrete example where the claim of land by new actors for the development of agrarian and other productive activities,appears to confront with the idea of sustainable use of the Delta. Mayor investments for the construction of infrastructure works that modify the hydrological regime of the floodplain endangering the provision of several pivotal ES which affects human wellbeing of local and regional populations (Taller Ecologista, 2010).

In order to better understand how the complex relationship observed nowadays in between people and nature in the Delta del Paraná through the emergence of new actors and land uses affecting the provision of the ES, this thesis will be guided by the following research question:

To what extent actual dynamics in the context of land grabbingoccurring in the middle and upper Delta del Paraná affect the environmental sustainability of the region?

The present thesis work is structured as it follows in 6 chapters. First, I will present the theoretical framework used and provide a state-of-art knowledge on the core concepts of the thesis which are“sustainable use and ecosystem services”, “political ecology”, “land grabbing” and “access to land”. Second, I will describe the objective and importance of this research together with the conceptual framework and the methodology used. Third, I will present the environmental importance of the area of research: the Delta del Paraná. Fourth, I will present the current changes occurring in the research area, describing its drivers and implications. Fifth, I will put forward and describe who are the new actors involved, their motivations and how are they gaining land access. Finally I will arrive to a conclusion about the implications that the actual dynamics occurring in the Delta del Paraná have for the future of the region in particular in terms of environmental sustainability and provision of its pivotal ES. A list of references used for writing this thesis and an appendix can be found at the end.

1. Theoretical Framework

1.1. Sustainable use and ecosystems services

In 1971 several nation states gathered at Ramsar, Iran, to sign the Convention on Wetlands of International Importance – agreed by Argentina in 1991- with the aim to promote the conservation and wise use of wetlands. In this thesis, the term sustainable use of a wetland will be used to refer to the “wise use” concept established in the Convention, defined as “the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development” (Ramsar Convention on Wetlands, 1971). For this convention, the ecological character is defined as “the combination of the ecosystem components, processes and services that characterize the wetland at a given point in time.” This definition highlights the importance of wetlands as provider of pivotal goods and services for society.

In 2005, UNEP carried on a large research known as the Millennium Ecosystem Assessment (2005) which intended to examine the integrity of ecosystems in order to provide guidelines for decision makers, and looking forward to transmit the message that “human well-being and progress toward sustainable development are vitally dependent upon improving the management of Earth’s ecosystems to ensure their conservation and sustainable use”. Ecosystems provide several resources and processes which people benefit from them. These are known as Ecosystem Services and four (4) categories can be identified: (1) Provisioning Services are those goods obtained from the ecosystem, (2) Regulating services are those services obtained from the regulation of ecosystem process, (3) Cultural services are non-material benefits people obtain from ecosystem, and (4) Supporting services are those necessary for the production of all other ES. This last group can also be understood as ecosystem functions, “defined as a subset of the interactions between ecosystem structure and processes that underpin the capacity of an ecosystem to provide goods and services” (de Groot et al., 2010). This interaction among ecosystem services is a fundamental characteristic of ecosystems because a change in an ES can lead to a change in another ES (See figure 1) (Bennet et al., 2009), evidencing the strong interconnection in between all components of the ecosystem (Radudsepp-Hearne et al., 2009). Furthermore, provision of ES can change by the effect of direct drivers such as changes in land use, technology, or climate change (Millennium Ecosystem Assessment, 2005).

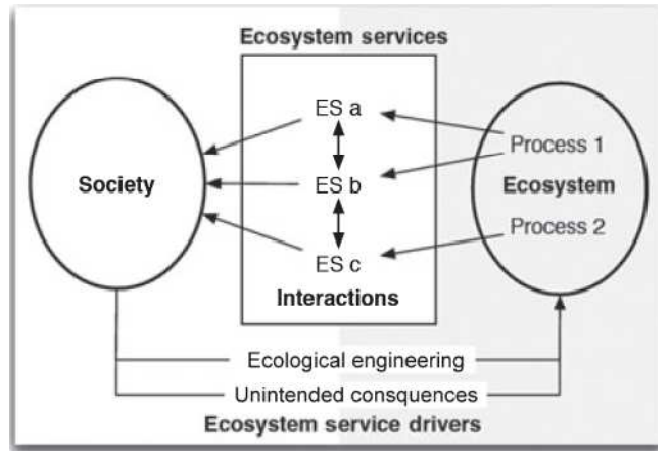


Figure 1 - Relationship in between ES (Bennet et al., 2009)

The interconnection in between ES and human wellbeing proposed in the Millennium Ecosystem Assessment (2005) intends to link environmental and human condition. According to Tallis et al. (2009), behind this connection it is assumed that “conservation and development projects should be able to achieve both ecological and social progress without detracting from their primary objectives”. The relationship between the provisioning of ES and constituents of human well-being is presented in the following figure (Fig. 2).

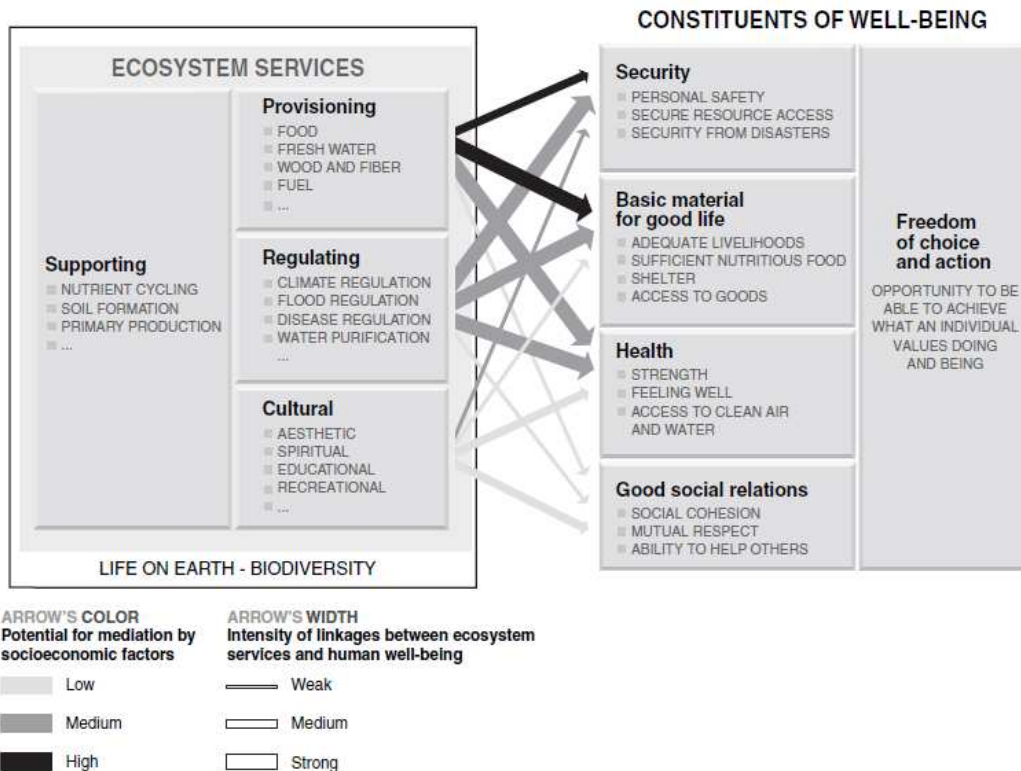


Figure 2 – Relationship between ecosystems services and human well-being (Millennium Ecosystem Assessment, 2005)

1.2. Political Ecology

Similar to the political economy framework which intends to introduce concepts of relative power at many levels in the economic analysis, political ecology intends the same but in the environmental and ecological analysis, therefore refusing apolitical theories (Greenberg & Park, 1994). This arrives from “a common premise that environmental change and ecological conditions are the product of political process” (Robbins, 2004; p. 19). Political ecology accepts the idea that costs and benefits associated with environmental change are for the most part “distributed among actors unequally”, which inevitably reinforces or reduces social and economic inequalities (Bryant and Bailey, 1997).

In this framework, researchers should answer in a context of environmental change, who profits and losses from these changes and who takes what from whom, with the objective to show the undesirable impacts of policies and market conditions in the destruction of natural ecosystems while showing that certain social and environmental conditions are not inevitable (Robbins, 2004).

Political ecologists intend to “explain environmental constraints through evaluating the influence of variables acting at a number of scales and influences within another, to understand the possibilities for action by actors operating within broader political and economic structures, but without falling into the trap of economic reductionism” (Bryant & Bailey, 1997; p.2) By promoting a thorough understanding of the causes of environmental destruction, political ecology believes that there are better, less exploitative and more sustainable ways of doing things (Robbins, 2004).

1.3. Land grabbing

During the last years of the first decade of the XXI century, capital accumulation strategies as a response to the convergence of multiple crises –food, energy, climate change, financial-, and within a context of a globalized world economy with liberalized land and food markets, boosted the flow of FDI and domestic capital towards large-scale land acquisitions worldwide (Borras et al., 2012).

Nevertheless, land grabbing in this globalized world should not be considered as a new process, as many large-scale land acquisitions occurred worldwide in previous eras (White et al. 2012). As McMichael (2012) argues, “the term ‘grab’ invokes a long history of violent enclosure of common land to accommodate world capitalistic expansion”. The international division of labor which defines the developing world as provider of commodities seems to be confirmed nowadays.

Albeit rush for land in previous times was mostly encouraged by Northern countries, nowadays we can find an emerging “South-South” dynamic, where economic powerful countries from the South, like Brazil, China and the Arabs states, play a significant role (Borras et al, 2011). A vast amount of financial assets from these countries, as well as from the developed world, are oriented to food-productive and land available countries (Cotula, 2012; Zoomers, 2011).

Several conditions in the global economy have enhanced the proliferation of large scale acquisitions worldwide at current times. Cotula (2012) argues the actual process to be an impulse of the combination of: (1) an increasing global supply and demand for agricultural commodities, (2) a 'financialization of agriculture' – understand as an increased attractiveness of land as an investment option for financial institutions looking for a lower risk portfolio-, and (3) proliferation of public policies from states all around the world encouraging and enhancing large-scale land acquisitions.

Despite most of the land purchase cases observed in the field all around the world correspond to meet the current global demand for industrial-agricultural products (Cotula, 2012), several other processes can be identified as driving this land grab era. Annelies Zoomers (2010) identifies 7 processes, contributing to a broader analytical framework to understand nowadays land rush. The first two processes have already been explained above; (1) the demand for cheap food crops and (2) the demand for non-agricultural products and biofuels. A third process is (3) the development of protected areas, nature reserves, ecotourism and hideaways; conservation efforts worldwide are also playing an important role in the land grabbing process. Fourth is (4) the construction of Special Economic Zones, large scale infrastructure and urban extensions. The fifth driver presented is (5) large scale tourist complexes. Sixth are (6) the retirement and residential migration. Finally, (7) land purchases by migrants in their countries of origin are considered as another process driving the actual rush for land. It is of vital importance to consider this differentiation beforehand in order to understand in a broader context the local implications of this extensive and multifaceted process of land grabbing

In addition, Borras et al. (2012) bring into consideration a different analytical framework when understanding the actual land grabbing process in Latin America. Instead of focusing in the foreignization of property, it is argued that it propels a better analysis to look into the character and direction of change in social relationship, as national and domestic elites play a key role in land and agriculture investment, rather than a major presence of FDI like in African countries. Borras et al. (2012) argue that land grabs should be understood and identified as having the characteristic of re-concentrating land-based wealth and power.

Given the previous discussion presented, in this thesis land grabbing will be understood as it follows: "the capturing of control of relatively vast tracts of land and other natural resources through a variety of mechanisms and forms that involve large-scale capital that often shifts resource orientation into extractive character, whether for international or domestic purposes, as capital response to the convergence of food, energy and financial crises, climate change mitigation imperatives, and demands for resources from newer hubs of global capital" (Borras et al., 2012).

One of the main concerns expressed by different authors regarding the land grabbing process is what are the longer term-implications for the future of the environmental sustainability of an area (Borras et al., 2011), which is the core question for this thesis regarding the Delta del Paraná.

1.4. Access to land

A first and accurate conclusion of the current global land grab is that it is causing radical changes in the use and ownership of land. As access to land is of vital importance for conservation and promoting local and sustainable development (source), contemporary land grab should become a key environmental issue.

Ribot and Peluso (2003) access framework, intends to expand the analysis from “bundle of rights” notion to “bundle of powers”. This definition acknowledges that owning a certain natural resource does not necessarily imply having access to it and benefiting from it. The authors express that access analysis research should identify and map the mechanisms by which access is gained, maintained, and controlled. These mechanisms aforementioned should be understood as the means, processes, and relations by which actors are enabled to gain access to land. In addition, mechanisms can be rights-based or illicit. Therefore several issues should be paid attention to like property, entitlement relations, illicit actions, relations of production and the histories of all these (Ribot and Peluso, 2003). As this access framework focuses on who benefits from things and acknowledges the importance of power relations in this, it fits well into a political ecology analysis, which looks beyond purely legal expressions of right and is concerned with exposing the role of underlying and less tangible power structures.

Furthermore, Peluso and Lund (2011) described the actual expansion of industrial agricultural as a new stage in the debate around land control, the latter understood as “practices that fix or consolidate forms of access, claiming, and exclusion for some time” (Ribot & Peluso, 2003). What defines the Delta del Paraná as a new frontier of land control is the emergence of new actors and land uses that challenges the previous socio-economical relationships that historically predominated in the region, which is then reflected in a dynamic process of land transfers.

This land transfers aforementioned are usually not visible. They usually imply a transfer of rights, therefore only documents are transfer, and in some cases documents are not even present. Moreover, it might be possible to find two different realities: *de jure* and *de facto*. As expressed above, owning a land title not always fully guarantees the right to benefit from the land. The existence of historical or cultural ties in between the land and the original population is a barrier to the implementation of new modes of production (Zoomers, 2003). This complexity in the transfer of land rights, and later on in the use of land, calls for a better analysis at different levels.

2. Research objective and research methods

2.1. Research objective and questions

As it will be clear throughout this thesis, changes in the land use in the Delta together with new technological investments are shifting the provision of pivotal ES that historically have been provided by this ecosystem to local and regional populations. Hence, the main objective behind this thesis is to describe and understand to what extent actual dynamics observed in the context of land grabbing in the Delta del Paraná affect the environmental sustainability of the region. Consisting of an inventory and exploratory research, it will intend to describe the environmental importance of the region in the provision of ES, to illustrate the changes that are currently taking place, and to focus on how are the new actors accessing to the land, aiming to create a better understanding of the problems of this region in order to provide information that can be used by policy makers to address the problems.

Therefore the research and sub-research questions that will guide this thesis and that will need to be answered in order to fulfill the research objective are as it follows:

To what extent actual dynamics in the context of land grabbing occurring in the middle and upper Delta del Paraná affect the environmental sustainability of the region?

1. *Which is the importance of the ecosystem services provided by the Delta del Paraná?*
 - *Which are the ecosystem services provided?*
 - *On which environmental conditions of the ecosystem the provision of these services depend?*
 - *How is the history of the provision of the ecosystem services in the last centuries?*
2. *What land use changes are currently taking place in the region?*
 - *Which are the drivers behind current land use changes?*
 - *What are the implications of these land use changes in the provision of ecosystem services?*
3. *How are the new actors involved in current changes in the Delta del Paraná gaining access to land?*
 - *Who are the involved actors? Who is offering and selling land? Who is demanding and buying land?*
 - *Which are their characteristics and motivations?*
 - *Which are the different mechanisms of gaining access to land?*
 - *How is the land tenure history and actual situation in the Delta del Paraná?*
 - *Which are the policies implemented in the context of sustainable development of the region?*

2.2. Conceptual Framework

Given the introduction and the presentation of the theoretical background together with the research objective, the following conceptual framework (See Fig. 3) has been developed. The conceptual framework is an adjustment for this thesis of the Millennium Ecosystem Assessment Conceptual Framework (Appendix 1).

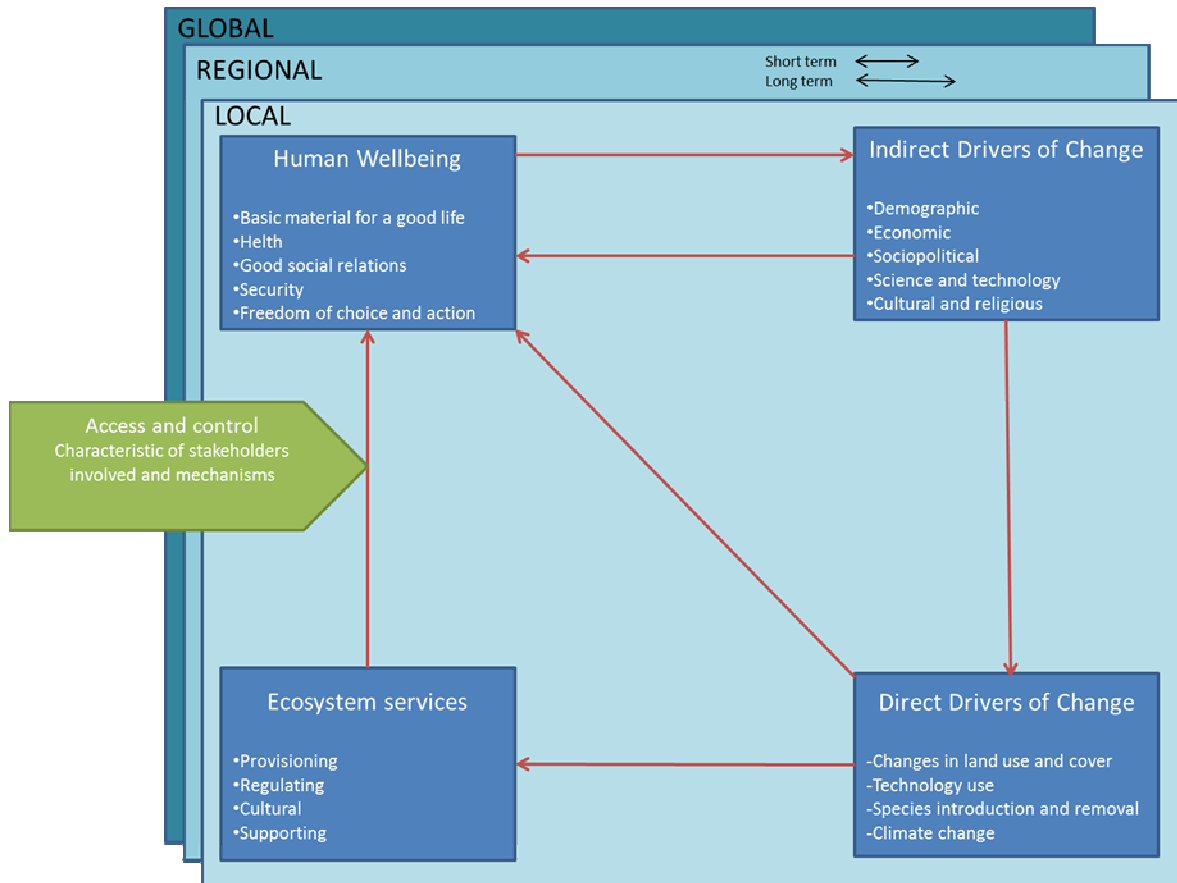


Figure 3 - Conceptual Framework (own source)

The reasoning behind the Millennium Ecosystem Assessment Framework is as it follows: changes in factors that indirectly affect the ecosystems can lead to changes in factors directly affecting the ecosystem. The changes in the ecosystem cause ES to change and thereby affecting human well-being. However linkages are not linear and unidirectional, as indirect and direct drivers of change can also modify human wellbeing (Carpenter et al., 2008). In addition, feedbacks can be different at particular locations or time scales.

In this framework I have added the access framework concept presented in the previous chapter, as accessing to the land also means benefiting from the ES provided. Therefore this conceptual framework fits with the political ecology framework which intends expose who is winning and who is losing from this new rearrangement in the access to ES.

2.3. Methodology

Field research for this thesis was focused in the upper and middle Delta del Paraná in Argentina. The 17.500km² that compose this floodplain are divided in between 3 provinces of Argentina; Buenos Aires, Santa Fe and Entre Ríos and hierarchically below a total of 19 municipalities have a share of their territory within the Delta del Paraná ecosystem as expressed in the following table.



Table 1 - Municipalities in the Delta del Paraná and share of each province in the total territory (Source: PIECAS, 2011)



Figure 4 - Map of municipalities in the Delta del Paraná (PIECAS, 2011)

During research (February - May 2013) I was based in Buenos Aires, while the writing of the thesis (June – July 2013) I was based in Utrecht.

Regarding the field research, and in order to answer to the abovementioned research questions, a research data collection strategy based on the gathering of written material, interviews and participatory observation in the field was carried on. During the month of February and March 2013 semi-structured interviews with local NGO's, research institutes and governmental agencies from the main cities that surround the Delta were realized, i.e.: Buenos Aires, Campana, Baradero, San Pedro, Villa Constitución Rosario, Santa Fé, Paraná, Diamante, Victoria and Ibicuy. Furthermore literature available from local research organizations and

universities was collected. Later on, the research was divided in 2 sections which were carried on simultaneously in between the months of April and May 2013.

Section A, consisted in analyzing the formal, more visible, land access mechanisms. First, I analyzed advertisements for land sales in 3 of the major newspapers of the surrounding cities to understand the land market dynamics of the Delta. All these are printed once a week and have a special section for land sales advertisements. I conducted phone interviews/questionnaires with the people who are offering land for sale in order to discover the characteristics of this group, the reason why they are/were selling the land, and the frequency and speed at which parcels are sold. In addition, interviews with 9 real estate agencies from cities neighboring the Delta region were conducted (See Appendix 3) to get a better understanding of the dynamics of the formal market. Still regarding Section A, interviews with governmental organizations which are in charge of the management of fiscal land were carried on.

Section B, consisted of assessing the informal land access mechanisms. Considering financial and time limitations, the research was carried on in the Delta area in front of the cities of Baradero and San Pedro. Throughout a snowball tactic, semi-structured interviews with local government officials, community leaders, cattle ranchers, isleños (local population) and continental citizens with land in the Delta region were carried on in order to get a better understanding of the land transfer process of the last decade in this region. Unfortunately, the relatively inaccessible, service-poor and flood-prone area in which local population lives has been a mayor limiting factor to achieve interviews. Given financial limitations, it was very hard to contact several isleños (local population of the Delta del Paraná) as private transport is needed to reach most of these communities. Therefore secondary information from a 2011 master thesis of a Dutch student was used (Roodhuyzen, 2011). This research focused in the informal land access mechanisms that occurred in the Baradero islands during the last decade, with plenty of interviews with local isleños.

3. The Delta del Paraná

In this chapter I will answer the first sub-question that guides this thesis.

Which is the importance of the ecosystem services provided by the Delta del Paraná?

First I will describe its ecological integrity, with the objective to clearly expose the importance of the hydrological regime as the most important feature of the ecosystem, and which conditions the provision of ES. Furthermore I will present the pivotal ES provided by this ecosystem; I intend to highlight the importance in the relationship in between the hydrological regime and the provision of ES, and the importance of the ES for local and regional populations.

Later on in this chapter I will describe the socio-environmental history of the Delta in the last centuries, describing into detail the land uses and policies implemented in relation to the hydrological regime and the provision of the environmental services. My intentions in this part of the chapter are to differentiate the development processes in between the lower Delta with the middle and upper Delta and to show how the productive activities that persisted throughout the last centuries coupled with the flooding regime of the area.

“The Delta, seen from its natural attributes or from its socioeconomic characteristics, is an atypical area within the region around, with particular and well defined internal processes but that has always existed in strong relationship to the external sector with which it interacts” (Galafassi, 2001).

3.1. The ecological integrity of the Delta del Paraná

The Delta del Paraná is the last wetland complex of the Paraná-Paraguay Wetland Corridor, the largest wetland corridor of the world which starts in The Pantanal in the state of Mato Grosso, Brazil and extends for more than 3.400km (Neif et al., 2005). The Delta represents the last 300km of the 4.000km of the Paraná River before it flows into the Rio de la Plata River, and has an area of around 17.500km². The area has a subtropical climate due to the effect of large amount of water bodies around (Baigún et al., 2008). The juxtaposition of different flora and fauna found in the Delta del Paraná results from a combination of subtropical species from the Chaco and the Paranaense Jungle which arrive through the Paraná River- the only large river in the world that passes through a tropical and a temperate region-, and from species from the surrounding Pampa region (Stancich et al., 2010). Native varieties of pastures cover around 96% of the area while only the remaining 4% is cover by native riparian forest (Kandus et al., 2011).



Figure 5 - The Delta del Paraná in the La Plata basin (Stancich et al., 2010)

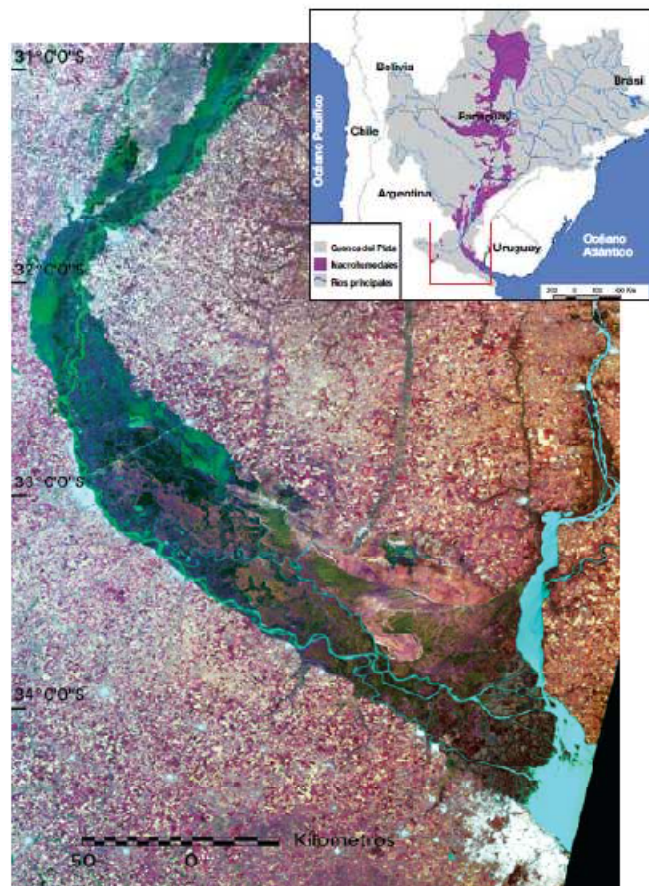


Figure 6 - Satellite image of the de Delta del Paraná (Kandus et al., 2010)

The Delta del Paraná can be better described as a floodplain (see Fig. 5), identified by Wetland International as one of the 5 categories of wetlands (Stalk et al., 2006). Described as an area that is “periodically inundated by the lateral overflow of rivers or lakes, and/or by direct precipitation of ground water” (Junk et al. 1989: 112), the flood pulse –“the pulsing of the rivers discharges”- is the most important and the most biologically productive feature of the ecosystem (Junk et al., 1989); when water floods the floodplain it conditions the functioning and the structure of the wetlands (Kandus et al., 2011). Flood pulses in the Delta depend on two conditions of the floodplain: its hydrological and geomorphologic characteristics.

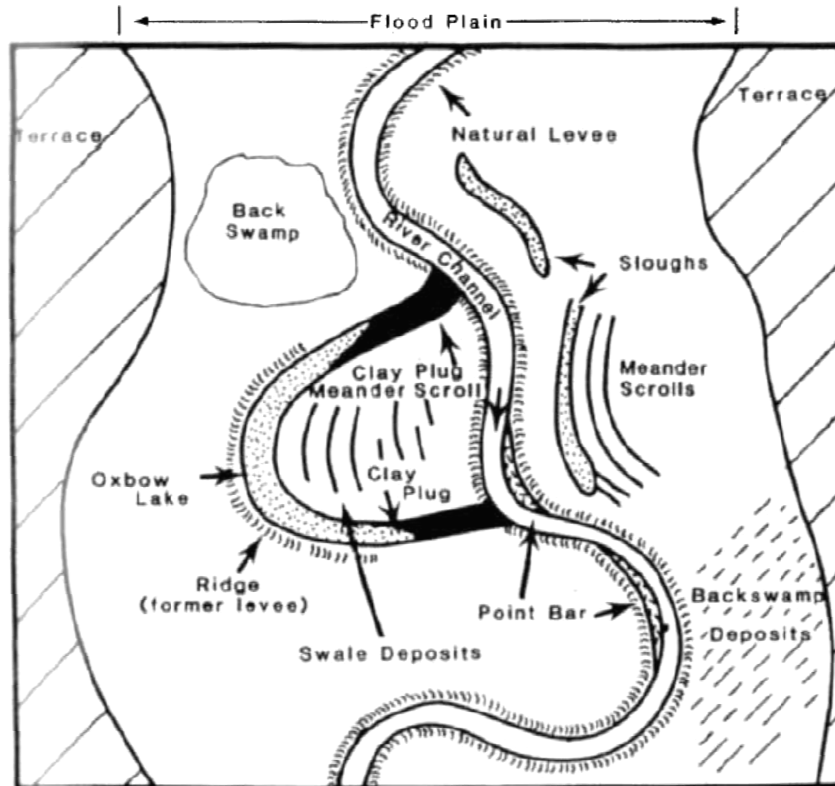


Figure 7 - Schematic representation of a floodplain (Mitsch et al, 2009)

Regarding the hydrological regime of the Delta, the flood pulse is affected by the periodic risings of the Paraná, Uruguay and other tributaries rivers of the Delta, and by high tides and “sudestadas” (strong wind from the South East) coming from the Rio de la Plata (See Fig. 6). For this, the area experiences periods of high and low water level constantly in different parts and at different moments. Flood pulse is also influenced by climatic processes defined by the general circulation of the atmosphere and anomalies such as El Niño-Southern Oscillation (Kandus et al., 2011). This last process has influenced the last 4 extraordinary floods of the last 20 years (1992, 1998, 2007, 2009-2010).

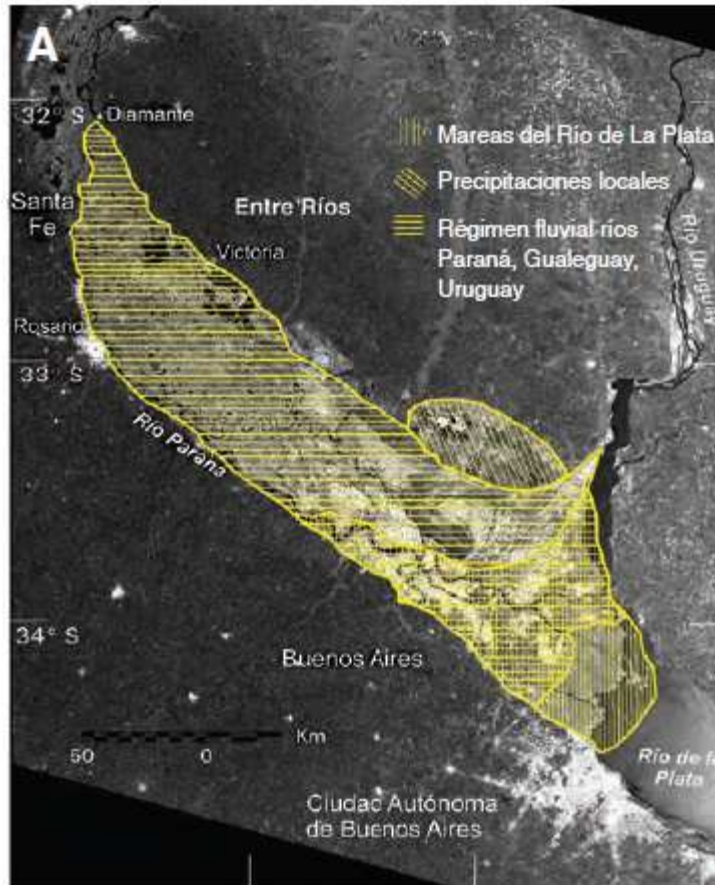


Figure 8 - Outline of areas with different dominant flooding regimes – (Blanco y Mendez, 2010)

Regarding the geomorphologic characteristic of the area, the landscape was shaped by previous processes of marine ingressions and regressions around 5,000 BC together with the actual hydrological regime that brings a large amount of sediments. Blanco & Mendez (2010) describe a complex landscape region “which highlights an ancient coastal plain with beaches, lagoons and barrier islands and estuarine modeling areas and ancient deltas”. In rough terms, the Delta can be divided in 3 sections. The upper Delta includes the portion located between the start of the region and an imaginary line that crosses the area joining the cities of Victoria (province of Entre Ríos) and Rosario (province of Santa Fe). This sector is relatively higher from the topographical point of view and has an important regional slope. Its landscape is composed of numerous lagoons (Blanco & Mendez, 2010). The Middle Delta is the area located in between the previously indicated imaginary line until another imaginary line linking the towns of Campana (Buenos Aires province) and Ibicuy (province of Entre Ríos). Most of these environments are of marine origin, subsequently modified by the action of fluvial processes. It is a predominantly flat area composed of several rivers and streams (Blanco & Mendez, 2010). Most of the wetlands in this section are of fluvial origin. The Lower Delta constitutes the last section of the region. It includes ancient landforms areas of marine origin and areas where sedimentation brought by the Paraná River is constantly forming new islands in the estuary of the Río de la Plata. Around 100 million tons per year of sediments are brought by the Paraná River, most of it coming from the Bermejo River. The

distinguishing landscape feature of this sector is the presence of numerous islands with natural riverside levees (Blanco & Mendez, 2010).

Taking into account these two environmental conditions (the hydrological and geomorphologic), Malvárez (1997) divided the region in 14 wetland ecological units (See Fig 7). This partition presents the Delta as an extensive macro-mosaic of wetlands, on which each of the ecological units provides different ES (Blanco & Mendez, 2010). Although this thesis doesn't include an analysis of the detailed ecological units (see Appendix 2 for a better description), this division evidences that each units presents singular conditions for the development of different productive activities.

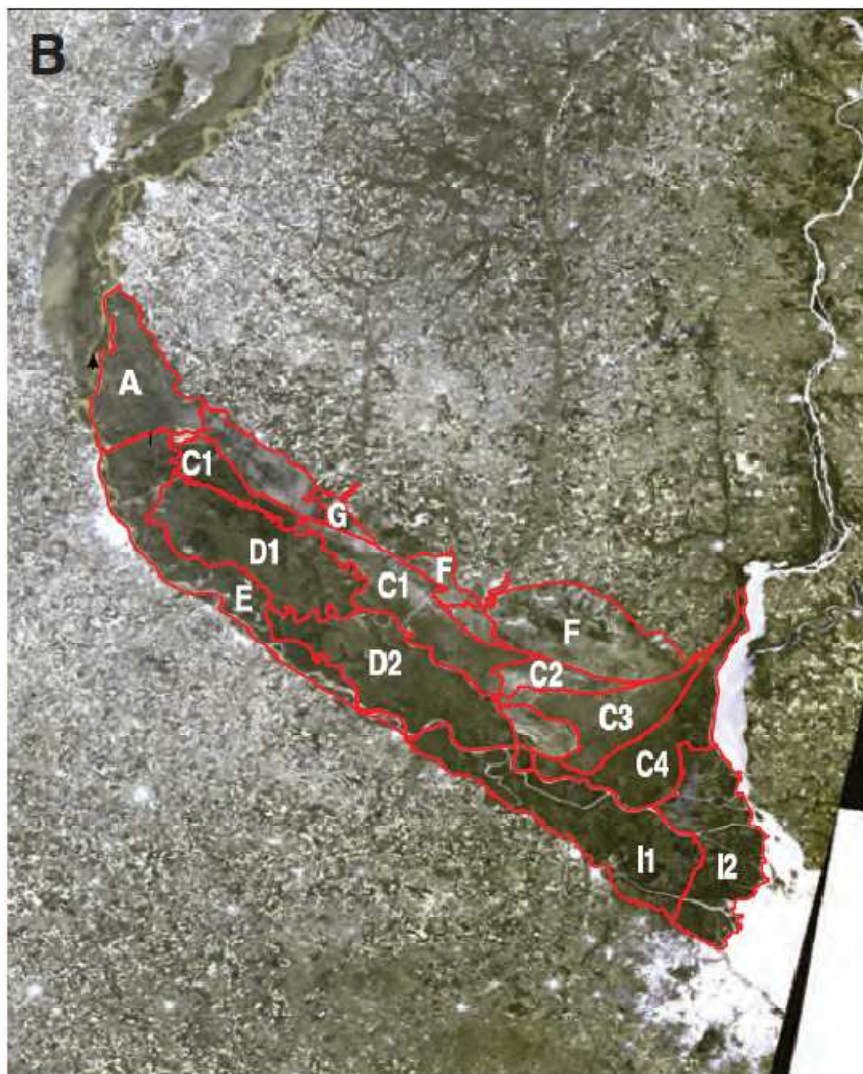


Figure 9 - Wetland Ecological Units of the Delta del Paraná – (Malvarez, 1997 from Blanco & Mendez, 2010)

3.2. Ecosystem Services of the Delta del Paraná

In the following paragraphs I will present and describe the most important ecosystems services provided by Delta del Paraná as identified by Wetlands International (Kandus et al.

2010).The provision of these services stresses the social, environmental and economic worldwide importance of this floodplain.

1. **Flooding buffer:** the wetlands inside the Delta retain the excess of water brought by rivers and rain and slowly let it out, reducing the possibility of water flooding to surrounding areas. As the flood pulse is very dynamic, unpredictable and extensive, this service avoids that water flows over urban and industrial areas in the Buenos Aires - Rosario Axis.The lower altitude of the Delta than its surrounding region and the continuous high herbaceous vegetal cover helps to the retention and storage of fresh water.This regulating ES has important implications for the human wellbeing as health and security; however it is also very important as directly influencing the provision of other ES. This ES can be identified as regulating and supporting ES.

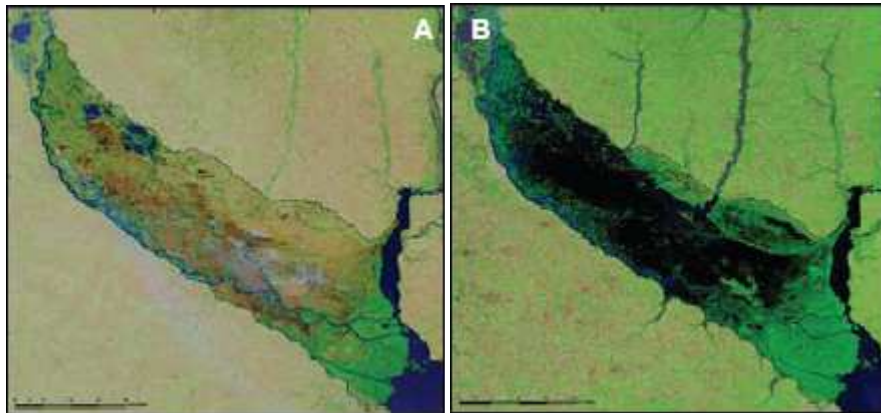


Figure 10 - Picture A was taken in June 2008 during a dry period while Picture B was taken in April 2008 during a high water level (Kandus et al. 2010)

2. **Water purification:**the herbaceous vegetal present in the Delta helps in the sedimentation and retention of material in suspension in the water that slowly flows through the Delta. Biological process like degradation of organic compounds, nitrogen recycling or precipitation of phosphorus and metals, give the Delta the image of a big kidney. This ES can be identified as regulating and provisioning ES.

3. **Primary productivity and carbon storage:** in wetlands, CO₂- one of the principal gases causing the global climate change- is transformed to vegetal biomass (primary production). Most of the times the productivity inside the Delta -measure as the amount of biomass produced- is even higher than industrial crops. This primary production is expressed in a large supply of herbaceous plants, used as natural forage for cattle or for basketry production, as well as feed for local animals. Wetlands are one of the most productive ecosystems in the earth and retain a large amount of carbon dioxide available worldwide.This ES can be identified as regulating and supporting ES.

4. **Fish biodiversity:** around 200 species of fish have been found in the Delta del Paraná. Around all year, sportive, industrial and subsistence fishing make use of the fish fauna available in the Delta. In addition, fish constitute the sustenance of a large number of animals.This ES can be identified as provisioning and supporting ES.

5. **Cattle forage:** Natural forage available in the Delta represents the feed source for several native species like *ciervo de los pantanos*, *carpincho* and *coipo*, and also introduced animals like cows, horses and sheep. The quality of the natural forage for cattle ranching found in the Delta is similar to the exotic forage used in the Pampa region.

6. **Native forests:** nowadays native forests cover only 4% of the total area of the Delta, composed mainly of *ceibo*, *algarrobo*, *tala*, *espinillo* and willow.

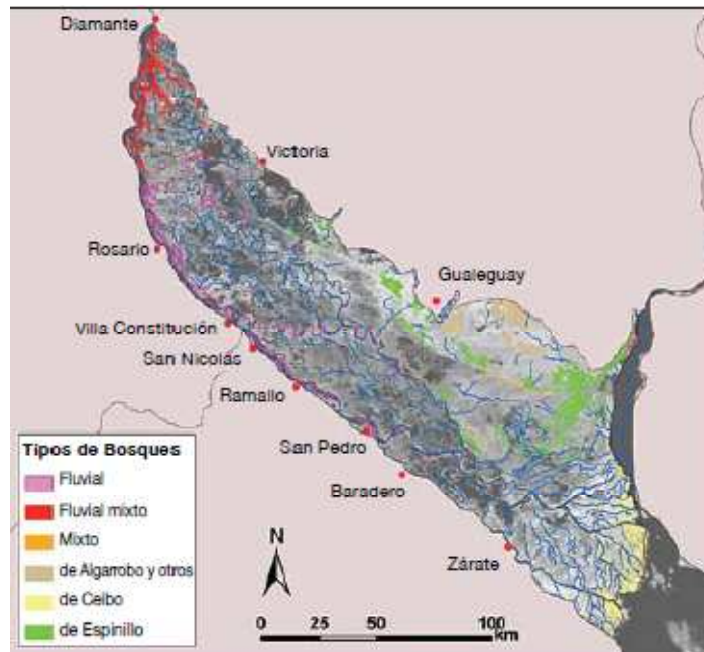


Figure 11 – Native forest in the Delta del Paraná (Kandus et al., 2010)

7. **Vegetation cover uses:** more than half of the 632 vegetal species found in the Delta have some type of real or potential use. From medicinal and edible to stimulants and technological (use as resin or oil), they represent a good opportunity for sustainable development plans of the Delta which haven't been explored yet. This ES can be identified as provisioning.

8. **Apiculture:** this activity is one of the economic activities most developed by small familiar units, adapted to different environments and flowers found in the region. Of high importance is the pollination service offered by the bees and other insects. This ES can be identified as provisioning and supporting ES.

9. **Artisanal fishing:** Fishing is one of the most traditional productive activities in the Delta. The *sábalo* is the most fished species, found mostly in inner lagoons, being the flood pulse an important variable for the supply of this type of fish. This ES can be identified as cultural and provisioning.

10. **Wild fauna:** the Delta del Paraná contributes to the sustaining of biological diversity and it provides habitat for the subsistence and reproduction of a large amount of wild species. Around 430 animal species can be found in the Delta, converting this area in an incredible

biodiversity hotspot. Several of these species are used by local isleños for the provision of meat and fur. This is a provisioning ES.



Figure 12– Local fauna (own source)

11. **Tourism and recreation:** several touristic and recreation options are available in the area, being sportive hunting, nautical sports, beaches, sport fishing and ecotourism the most practiced. This is a cultural ES.

Other ES provided by the Delta (but not mentioned in the Blanco & Mendez (2010) report) are soil formation (sediment retention and accumulation of organic matter), educational (opportunities for formal and informal and training), and aesthetic and spiritual services.

3.3. The environmental history of the Delta

“Environmental history provides a powerful reminder that ecological change is not unidirectional. Despite the propensity of some environmental historians to tend to see degradations as a one-path, landscapes over time usually show ongoing change, fluctuations, declines, and recoveries. Some of the seemingly wildest landscapes are the product of deliberate planning in the remote past, while many of the most apparently stable ecosystems have been subject to fluctuations in the past.” (Robins, 2004)

As the region has been considered marginal for historians, social researchers and governmental institutions for the last centuries, secondary and academic research from previous decades are very seldom. In addition, most of the data available correspond to the lower section of the Delta del Paraná, while secondary data from the middle and upper Delta is scarce or null, and mostly found in testimonies and diverse opinions of the people that live and work there. During this section it will be clear that the lower Delta had a different development path than the middle and upper Delta, mostly because of its proximity to Buenos Aires. Therefore it is important not only to understand the historical relationship of the whole area with the surrounding regions, but also the historical relationship in between the 3 different sections of the Delta.

Indigenous populations inhabited the Delta del Paraná before the arrival of Spanish colonizers in the XVI century. Guaraníes occupied the southeast of the region while Chanaes groups lived in the northwest section of the Delta (Galafassi, 2004), living from fishing, hunting and gathering activities. Recent discoveries by local university researchers concluded that the construction of embankments of around 3 meters high that cover up to 10.000m² in order to control flood was a common practice in between the Chanaes. These embanked areas were also used for the development of small scale agriculture of corn, bean and pumpkin (Argentina Investiga, 2013). With the arrival of European, these indigenous populations were brought to the newly founded towns in the continental part in front of the Delta, leaving an unpopulated Delta for a while.

It was at the end of the XVI century that the first cows and horses were introduced in the Delta, where they found a propitious area for living. In 1627 around 100.000 cows wildly pastured the upper and middle area of the Delta del Paraná, most of them owned by Hernandarias, founder of Santa Fe (Stancich et al., 2010). These cattle were used for the provision of meat and leather for the cities of Santa Fe and around. With a large amount of cattle that reproduced in wild state, *vaquerías* started to be promoted (concessions for herding and killing cattle), and later on the land was divided into big estancias owned by local elite (Stancich et al, 2010).

Modern history of the Delta started with the landscape occupation by *criollos*¹ during the XVIII century and first half of the XIX century. With no presence of permanent settlements, activities inside the Delta region were based in the direct extraction of natural resources to be used in the cities in the growing surrounding region, led by Buenos Aires that was slowly transforming in a dynamic international port for exports and imports for the Viceroyalty of Peru and later on for the Viceroyalty of the Rio de la Plata; fruits from native trees, timber and fuel from the forests, and fur and meat from wild species. However, during the aforementioned period, local settlers started to get to know the environment and fertility of these lands, preparing the conditions for a second period of occupation which started in the end of the XIX century and beginning of the XX century (Galafassi, 2004).

This new period was characterized by a pronounced transformation of the natural landscape, with the construction of permanent settlements and the intensive growth of fruit trees by small scale familiar economical units. Criollos in a first stage, and later on Europeans, started to arrive in large amounts to this region of Argentina. Attracted by a dynamic economy, low land prices and policies that promoted appropriation of land, population got to its historic maximum of 40.000 around 1930, most of them in the lower Delta (Galafassi, 2004). During this period the Delta experienced a large loss in the vegetation cover but not in the land productivity, as management techniques were based in the use of the natural flood cycle which constantly renewed the organic matter. Fruit trees of orange, apple and peach, and tree plantation of poplar and willow trees replaced the "*bosque blanco*"² that once cover the region. The Delta was not set up as an area that produced goods for export as this role was exclusively for Pampa region (Barsky & Gelman, 2009), so close to Delta but so different in geography and culture, therefore the islands continued to generate primary products for the growing Buenos Aires-Rosario industrial /urban axis.

While this process was strongest in the lower Delta region near Buenos Aires, in the middle and upper Delta there were seldom cases of fruit growing units –only in front of the cities of Rosario and Santa Fe (Stancich et al., 2010), therefore continuing with the natural resource extraction model from the previous period, and with the consolidation of extensive cattle ranching. Traditional cattle ranching in the Delta region is locally known as "*ganadería de islas*", as it differs from animal husbandry activities in the surrounding agricultural areas. Historically, cattle was brought for the fattening process (*de invernada o de veraneada* depending of the time of the year cattle is brought) while raising and breeding was done mainly in the North-East region of Argentina. Farms were not delimited; rivers and streams act as limits. Investments were rarely occurring, as well as birth and sanitary controls. Furthermore, fire has been a traditional tool used by local cattle ranchers at the end of the winter to kill weeds and promote the growth of "better and softer" pasture for cattle.

Around the end of the first half of the XX century, several changes in the conditions which had allowed the proliferation of small growing fruit farms resulted in a process of crisis and

¹ People with European origin but born in the American continent.

² Bosque Blanco is the name given to the native riparian forests that cover the Delta del Paraná.

transformation of the social-economical relations in the Delta. The emergence of more competitive fruit producing areas in the Pampa region of San Pedro and in the Valle de Rio Negro in Patagonia, promoted by the industrialization-substitution-imports strategy developed by the Argentinean government, ruined the fruit industry of the Delta in a few years (Galafassi, 2002). In the other hand, wood demand from forestry plantations steadily grew for the next decades- as several cellulose factories and sawmills were constructed in the margin of the Paraná River- radically changing productive relations in the area. As the latter productive activity was based in higher capital investments, several small fruit producers who couldn't access capital were expelled from the area. From 18.200 hectares with fruits trees grown in 1942, this number went down to 9.300 hectares 10 years later. In 1969, and after a big flood in 1959 which made the transformation apace, there were 2000 hectares and nowadays there are no more than 200 hectares with fruit trees in the Delta (Galafassi, 2002). Those small farmers who stayed adopt a diversification activity strategy with a subsistence objective based on apiculture, basketry and fishing or hunting. The disappearance of family economic units in the Delta affected demographic structure considerably. From the economical unit of 10-20 hectares in the previous period, the forestry economic unit was estimated in between 150 hectares. For 1960 only 22.000 of the 40.000 habitants that lived in 20 years before were still living in the region (Galafassi, 2002). In addition, a vast amount of the *criollos* and European population that inhabited the area were replaced by a flow of population coming from the interior of the country, a process which occurred also in Buenos Aires and biggest cities of the country (Barsky & Gelman, 2009).

Forestry industry became the main economic activity in the lower Delta and it started to be promoted by governmental policies in the middle and upper Delta (Galafassi, 2004ii). In Entre Rios, during the military period of the 1970's around 80.000 hectares were embanked and sold to private companies. For the year 1969 more than 110.000 hectares were planted with poplar and willow trees all over the Delta (Blanco & Mendez, 2010). The size of farms, as well as its technological investment, became larger once they were more far away from Buenos Aires, most of them belonging to big forestry companies which promoted a tech-forestry activity with the construction of embankments to reduce flooding risks and to obtain better economical returns (Galafassi, 2002). The proliferation of bigger units of forestry plantations managed as enterprises with high technological investment and embankments implicated a strong transformation in the natural dynamic of the ecosystem. The maximizing characteristic of these farms determines that they select the most yielding productive strategies, implying a transformation and adaptation of the natural environment to the exigencies of a higher productivity (Galafassi, 2002). However in 1982-1983 after a big flood in the area resulted in the ceasing of activities for most of the forestry companies in the middle and upper region, as infrastructural works done in the farms were not enough to control the flood and the companies didn't have the financial capacity to reinvest (Galafassi, 2002). A large amount of the farms that could keep on after the big flooding were and are still in the lower Delta, which nowadays is the area with the highest concentrations of salicaceae plantations worldwide with more than 60.000 hectares (Rossi et al., 2006), with most of these plantations situated in embanked fields (Blanco & Mendez, 2010). This new social and economic configuration contributed to the process of

Pampeanization of the lower Delta -understand as the transformation of the landscape following the model promoted in the Pampa region, an intensive agricultural one-.

To conclude this historic analysis, there are several fundamental variables that have always been present in the development of this region and which articulation has influenced to the socio-economic condition of present times, as identified by Galafassi (2004). These are: (1) natural environment composed of a permanent interaction in between aquatic and terrestrial components, (2) proximity to the Buenos Aires and Rosario urban axis, (3) marginal nature of the land in terms of its market price and process of occupation, (4) high productivity but with strong environmental constraints, (5) production directed linked to the exploitation of natural resources or agricultural activities implemented both to market conditions and ecosystem services supply.

4. The transformation moment for the middle and upper Delta region: land use changes and its implications



Figure 13 – Local hut in the Baradero Delta region (own source)

In this chapter of the thesis I will answer the second sub-question presented in this thesis.

What land use changes are currently taking place in the Delta del Paraná?

Major focus will be given to cattle ranching and industrial agriculture. However other new (or old) land uses like urban expansion, roads and infrastructure, tourism and conservation plans will be presented in order to give a broader view of the transformation.

I will explain which the implications of these changes are in the environmental integrity of the Delta.

As I showed in the Chapter 3.3., the middle and upper Delta region followed a quite different development processthan the lower Delta over the last centuries, although it was influenced by the developments of the lower Delta and experienced several transformation.The socio-economical context until the end of the XX century was mostly composed of subsistence activities by local isleños together with and extensive cattle ranching developed by local populations in a small scale and in a larger scale by local elites from the continental part, and seldom cases of industrial fishing and mining (mostly sand) that hired local population. Therefore a rather marginal conception of the area compared to the surrounding Pampa region, but as well to the lower Delta, was perceived and addressed by most actors.



Figure 14– An isleño hut in Baradero Islands (own source)



Figure 15 – Horses and goats owned by Isleños (own source)

Nevertheless the landscape of the middle and upper Delta del Paraná is nowadays experiencing a radical change in its land uses.

4.1. Land use changes

4.1.1. From *Ganadería de Islas* to Pampas Cattle Ranching

The proliferation of industrial agricultural crops- mostly soya- has rearranged land use all over the country's landscape (Bravo et al. 2010) (See Appendix 3 for a better description of global and national drivers behind the expansion of the soya frontier). Cattle which previously pastured in the Pampa regions have been pushed into this fragile ecosystem by the expansion of soya plantations. As livestock rates in the country have been maintained almost constant, a need for

new pasture areas was needed. It is estimated that the amount of cattle increase almost 1000% from 1997 (160.000 cattle heads) to 2007 (1.500.000 cattle heads) in the upper and middle Delta (Blanco & Mendez, 2010), changing from an extensive seasonal livestock strategy (*ganadería de islas*) to a more intensive and permanent one.



Figure 16 – Cows pasturing near the Rosario-Victoria road (own source)

Although nowadays “*ganadería de Islas*” strategy is still the most used between cattle ranchers, new producers with different management techniques brought from the Pampa region have been attracted by one of the ES of the Delta; the provision of cheap and high quality natural forage offered by the large biomass productivity of the ecosystem. In addition, Argentina’s biggest consumer centers are very near, as well as exit ports for exporting meat (Stancich, et al., 2010). Nevertheless, the biggest limiting factor is the rising water levels -as cattle is usually taken out before the typical high water level periods- and its poor accesses, increasing transport costs and loss risks

With the arrival of new cattle ranchers, new efficient strategies from the Pampa region are being implemented. A new management technique is the obstruction of water courses, in order to reduce risks of flooding, as well as the construction of facilities and introduction of machinery. All of these resulted in a higher animal per hectare relationship, usually above the 0,5/0,6 heads per hectare stocking rates recommended by specialists. However this rate depends on the climate conditions, water levels, forage quality and other variables of the land analyzed, enabling rates to be higher or lower (Stancich et al., 2010). In some cases, rates observed by local NGO’s are around 2 heads per hectare. As land availability depends on the water level, when water is too high for the

development of cattle ranching, cows are taken out by swimming to the “other side” or by rafts that can take up to 30 animals. The sharp increase in the amount of cattle has taken governments and local producers to develop new facilities for the entry and exit of animals to the region. However, as it is still hard to predict the degree and duration of rising water levels, possibilities for livestock planning are limited. In the high flood of the March of 2007 it is estimated that tens of thousands of cows died because there was not enough facilities to take the cattle out in time.

A factor that has influenced in the arrival of new cattle ranchers to the upper and middle region of the Delta is the construction of Rosario-Victoria road in 2003, which crosses the Delta from one border to another (See Fig. 20). This had a strong impact as the islands became visible and accessible for producers and investors. In this area alone (Victoria Department islands), livestock rose more than 400% from 2002 to 2009, and the amount of livestock farms increased from 230 to 489 (See Fig. 21) (Stancich, et al., 2010).



Figure 17 – View of the Rosario-Victoria road crossing the Delta (Google Earth, 2013)

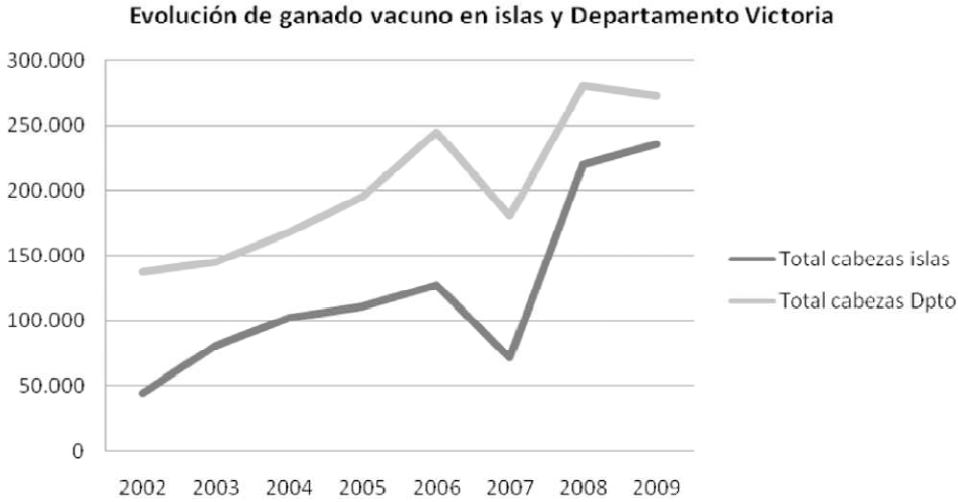


Figure 18 – Amount of cattle on islands and department of Victoria (Stancich et al., 2010)

With the ramping increase of cows in the region, burning –as a weed control strategy- in the island went out of control around the winter and autumn of 2008. Smoke interrupted normal life in the surrounding national roads and even arrived to the cities of Buenos Aires and Rosario. During these months around 16% (280.000 hectares) of the total Delta was burned (Stancich, et al., 2010), evidencing the lack of control and planning of this activity in the area. However not all of the burning corresponds with cattle ranching expansion, but also to the clearance of pasture for the development of industrial agriculture as I will explore next.



Figure 19- Fire in the Delta in 2007 (Wikipedia and Carlos Barthalou)

4.1.2. Industrial agriculture

Industrial agriculture of crops has started to be developed in this area in the last years, as local stakeholders estimate that nowadays around 50.000 has of soya and other crops are planted in the Delta region (La Nación, 20123), even though this activity is prohibited by most of the municipalities in the region.

Although the amount of hectares embanked for agricultural production are still low compared to the total area of the Delta (around 3%), the size and extension of the farms is what concerns more to different actors. In order to be economically profitable farms have to be at least composed of thousands of hectares -as large and expensive infrastructural works are needed-, and as different from the Pampa region where the economical strategy is centered in the capacity to organize and coordinate a network of contracts (Manuel-Navarrete et al., 2005). While in the Pampa region a small farmer with only 10 hectares can lease its land to a lessee which will work the land for an established price, in the Delta large infrastructure and machinery are needed to be invested, resulting in a land concentration process. Therefore there are few actors producing

industrial crops in the Delta and as they form part of local elite; their names are known by everyone working in the region as I will explain in the following chapter (Chapter 5).

Several local factors have encouraged the expansion of industrial crops. First, as processing and exporting facilities of most of Argentina's industrial crops production is based in the coast of the Paraná River in front of the Delta, transport costs are considerably lowered, compared to new agricultural areas like the Chaco region, where crop have to be transported for more than 1,000km in order to be exported. The Port of Greater Rosario together with San Lorenzo and General San Martín, are the most important agricultural cargo sectors of Argentina, through which about 70% of Argentine exports of grains, vegetable oils and byproducts are embarked. Around 34 port terminals exist around in the Delta region. In addition, there are 8 biodiesel factories installed on the banks of the Paraná River.



Figure 20 – Cargo area in the Paraná River near Rosario (Source: Wikipedia)

Secondly, crops productivity is exceptionally high, as yields are higher than the mean in the Pampa region. Soya producers near the city of San Nicolás have informed a local NGO that they are having extraordinary yields ranging from 38 quintals per hectare up to 65 qq/ha in some batches (personal communication), when national average for the year 2013 is around 25,5 quintals per hectare, and in the best agricultural area of Argentina mean yields are around 35 qq/ha (Portal del Interior, 2013). The “virgin” Delta lands present a large amount of organic matter available which results in sky rocking yields. Nevertheless, experts express that the Delta land is not good for agriculture and that these high yields can only be maintained in the short run (INTA).

Finally, agro-investors have also been attracted by the low price of land compared to the surrounding region, where actual prices per hectare ranging from US\$10.000 to US\$16.000. In the

Delta nowadays prices start from US\$250 and can go up to US\$2000, depending on the accessibility and flood risk of the area. However, 10 years ago prices were down to below 100 dollars per hectare.



Figure 21 - Price of land in the surrounding Pampa region (Compañía de Tierras, 2013)



Figure 22 - Crop plantation after harvest in the Delta (own source)

4.3.3. Infrastructure works

The Delta del Paraná is positioned in a strategic location as it is the connection to the ocean from the wide network of rivers that composed the La Plata basin, one of the most economically active areas of South America, covering the territories of Brazil, Argentina, Uruguay, Bolivia and Paraguay. This results that large infrastructural projects are planned around and inside the Delta region, and with a stronger pace after the creation of IIRSA. A total of 34 relevant infrastructure works have been identified to have influence inside the research area by the environmental baselines research for the PIECAS.

However, these infrastructure projects are not intended to develop the Delta considering it as a different ecosystem than the one around, but to produce the same development path of the Pampa. Subsequently infrastructure works are usually implemented to improve communications and connections in between the areas that surround the Delta (and therefore crossing it through the middle), but not to improve life conditions of people living inside the Delta. Other two representative cases are the construction of the Baradero Port in the islands area of Baradero and the expansion of the Ibicuy port in Entre Rios. Both of these ports to be constructed inside the Delta are planned for the loading and exporting of agricultural raw materials. In the Baradero port project it is planned to construct a road crossing the 30.000 hectares of islands of the department in order to construct the port in the Paraná River.

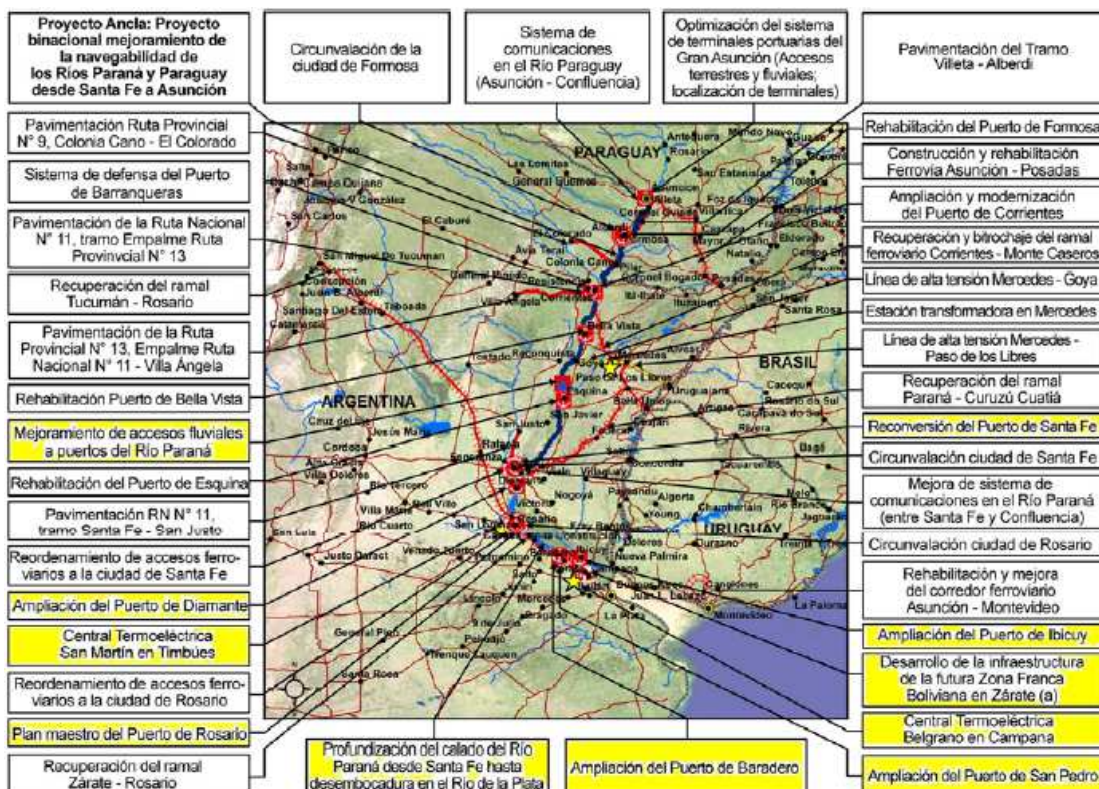


Figure 23 – Infrastructure projects from IIRSA in the Delta and surrounding region. In yellow are the projects that directly implemented in the research area. (PIECAS, 2011)

4.1.3. Urban growth

Twenty-three (23) urban projects developed as gated communities are constructed or planned to be in the Delta region nearby the cities of Buenos Aires, Rosario and other important urban cities (Fabricante et al., 2012). Although in the lower Delta this is considered as the main concern, the upper and middle Delta are also experiencing the rise of various residential and touristic projects and this driver is expected to grow in the short run, extending urban use in the floodplain (Blanco & Mendez (2010).

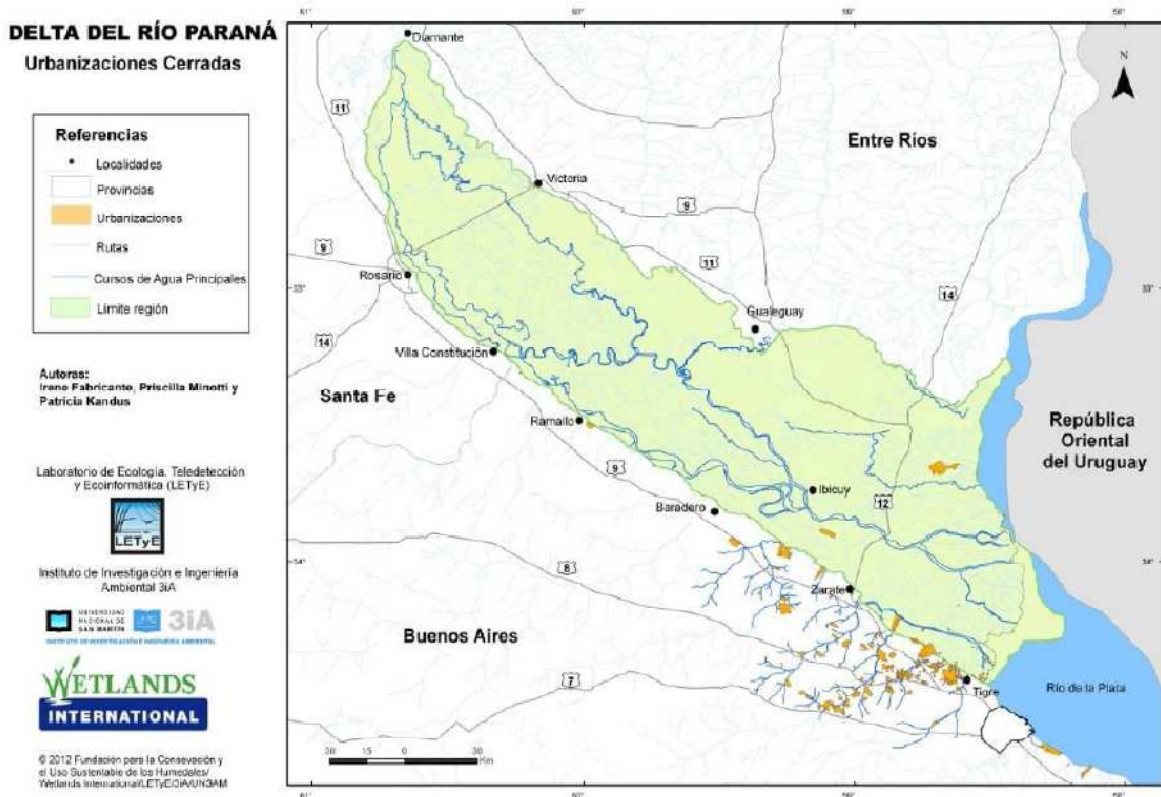


Figure 24 - Closed urban communities in the Delta del Paraná – (Fabricante et al. 2012)

In the Victoria Islands, a complex of more than 20 hectares known as “Los Marinos” is being developed in order to construct weekend house for people coming from the city of Rosario (Diario Victoria, 2013). In the Delta section of Islands del Ibicuy, near the town of Villa Paranacito, a 5.000 hectares area is being sold in small units of 1 to 5 hectares for the development of nautical farms with pecans productive development. Another recent project is the Barrio Náutico Talavera; this project being developed in a 250 hectares area just 30km from the Zárate Brazo Largo Ferrovial Complex, is selling 209 small units that range from 8000m² to 20.000m² for a price of US\$1000 the hectare.



Figure 25 – Barrio Náutico Talavera (<http://www.nauticotalavera.com.ar/>)

4.1.4. Conservation units

As it has been mentioned in the theoretical framework, worldwide land for rush in the last years has also been driven by the expansion of conservation units, and the Delta del Paraná is no exemption of this territorialization process. Nowadays there are 34 conservation areas in the region: 3 corresponding to national control, 11 to provinces, 12 to municipalities and 8 managed by privates or private/public partnerships. All together they cover around 987000 hectares and more than 70% of these conservation units were created after 1990. Nevertheless less that 1 percent of this area is considered as in an acceptable state, while 60 % of the total conservation area is identified as having an insufficient management and around 40% have no control yet (PIECAS, 2011).

4.2. Changes in the hydrological regime and in environmental services

As I explained in Chapter 3, the flood pulse of the Delta del Paraná is the most influential characteristic of the ecological integrity of the ecosystem and therefore in the provision of ES. Following the Millennium Ecosystem Assessment Conceptual Framework, changes in this flood pulse can take to changes in the human well-being of local, regional and global populations.

Nowadays, this flood pulse is being modified by anthropogenic interactions in the hydrological regime. In order to reduce flood risks - needed for the implementation of intensive cattle ranching techniques from the Pampa, the development of industrial cropping for infrastructure and urban projects-, several infrastructure investments are being constructed in the last decades in the region (although they are forbidden by most municipal and provincial laws). The following enlists the most common techniques:

- Obstructing of water courses: this technique consists in cutting the course of certain streams or ponds in order to avoid the entrance of water from bigger rivers during ordinary high water levels (See Fig. 29).
- *Ataja repuntes*: are small dams that prevent ordinary high water levels to flood the area.

- Embankments/levees: the elevation of the ground level over the ordinary high water levels (See Fig. 29). Usually they are high enough to avoid being water pass during extraordinary high water levels.
- Dikes/Polders: (See Fig. 30 and 31) is an area surrounded by embankments that can go over 7meters high and that inside have a system composed of ditches, canals and sluices to regulate any input or output of water (See Fig. 26).



Figure 26– Drainage system in an agricultural field in the Delta (own source)



Figure 27 - Embankment in the Baradero Islands (own source)

Blanco & Mendez (2010) mapped the embankments and dammed areas in the Delta del Paraná (Fig.20), and concluded that a total of 203.019,87 has of the Delta are dammed

(corresponding a 11,6% of the Delta Area) and that around 875km of embankments were constructed up the year 2010. Although the majority of these dammed areas are used for forestry plantations in the Lower Delta (around 50%) and constructed during the 70's and 80's, nowadays the construction of new embanked areas (or reparation of old embankments) is occurring in the middle and upper Delta for agricultural purposes. This new expansion of dammed areas matched with an extended dry period where high water levels were almost inexistence (up to the big flood in 2008).

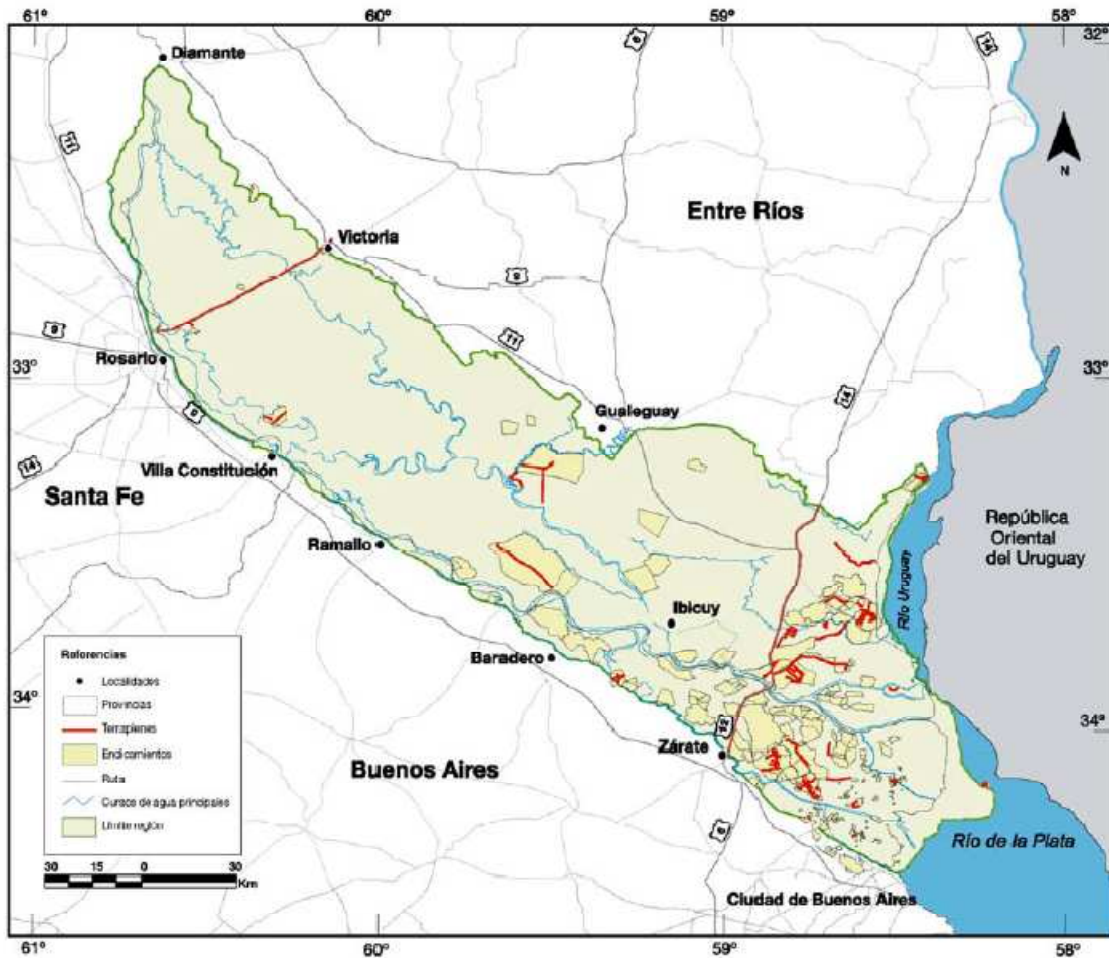


Figure 28 – Dykes and Embankments in the Delta del Paraná (Blanco & Mendez, 2010)

During conversations with workers of the *Secretaría de Medio Ambiente* (Environment Secretary) de Entre Rios they mentioned a research they had done in the Delta part of Entre Rios where they concluded that 57.790 hectares are dammed; 52% used for Agriculture and 37% for cattle (personal communication). However other local organization of Entre Rios expressed that the number is much higher, with up to 300.000 hectares embanked, showing the lack of control and reliable information in the region.

Furthermore, the amount of embanked areas, levees or blocked waterways undergoes constant changes. During extraordinary high water levels, these constructions can collapse. In times of low water when water level is projected to rise in the short term, it is common to see repairing,

strengthening or extension work in the levees, as it can be observed in the figure 28. There are also some cases that the embankments or the obstructions are destroyed by the isleños.



Figure 29 – Embankment works in the Baradero Delta region (own source)

Following the conceptual framework developed, changes in the provision of ES need to be analyzed at different spatial scales. Although work at different spatial levels is scarce and limited to the perceptions of local populations and impact in their local livelihoods, several conclusions can be made by observing the area and talking with different stakeholders involved.

At the farm/local level, effects on the provision of ES vary upon the combination of the water management technique used and the accompanying land use. On one hand, the damming of permanent or semi-permanent flooded areas, also known as "polder", is mostly performed with the goal of developing agricultural activities. A total of 7 cases have been discovered during the research. There seems to be no connection of any type in between all the cases, as the mode of spatial expansion observed is in patches. The following map (Fig. 28) has been developed with the information collected during the research and shows the location of embanked farms that produce agricultural crops. On the other hand, the logging of waterways is principally developed among livestock producers, and most cases appear in the Delta section near the Rosario-Victoria of the highway. A local base organization has mapped 17 cases in the area in front of Rosario (terraplenesenlrio.com.ar)

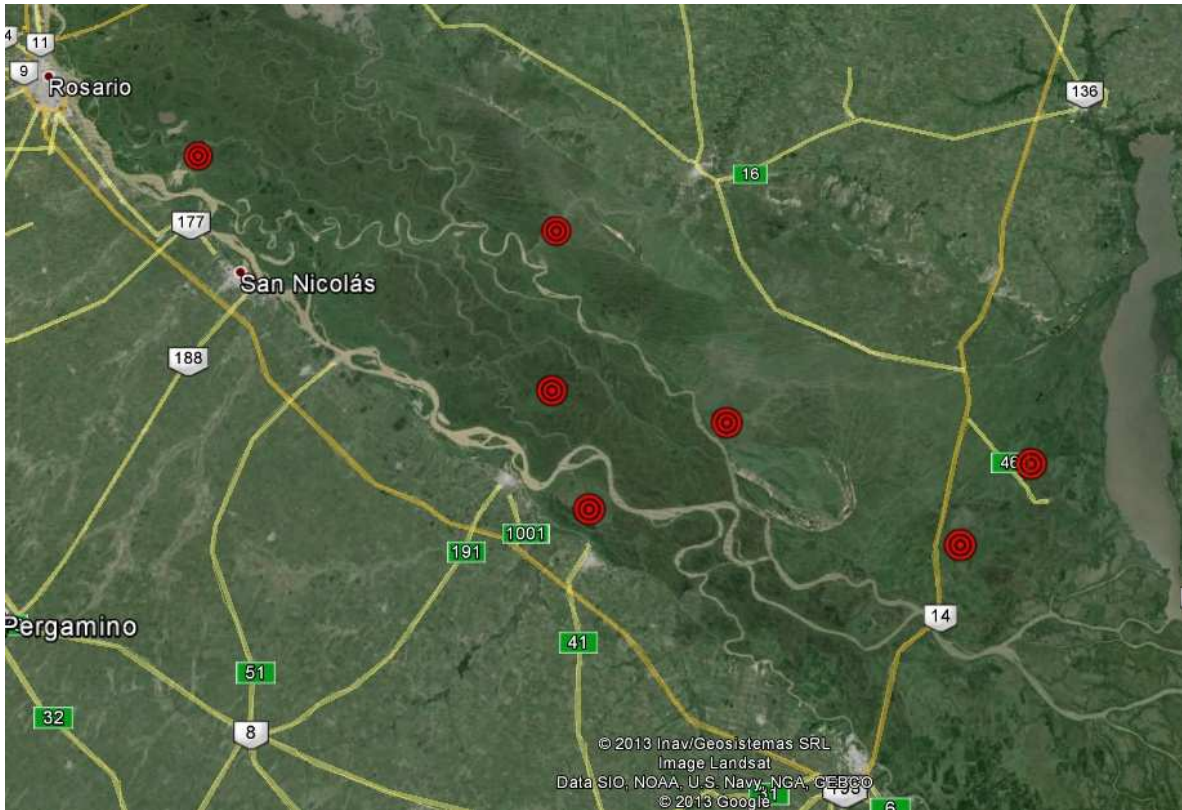


Figure 30 – Agricultural crop plantations in the middle Delta using Google Earth (own source)



Figure 31 - Blocking of water courses (Source: “El Paraná no se toca” Facebook)

According to Wetlands International report (Blanco & Mendez, 2010) the obstruction of water courses may affect "substantially the operational structure of the wetlands" (Blanco & Mendez, 2010). The strongest impacts occur in biodiversity and in those ES in which local population livelihoods are most dependent, such as the provision of game animals and fish. Although the hydrological regime is obstructed during ordinary flood pulses, in cases of extraordinary high water levels, flooding usually breaks the blockages and therefore the land returns to its land-water relationship. In addition, these areas usually present overgrazing, leading to a sharp decline in plant load.

In the embanked area, the change on the provision of environmental services is extremely strong, as all of the surface water is drained through canals and pipes. In addition, and different from the obstructing of water courses, water is not allowed to enter during extraordinary high floods (although there are cases that the embankments that protect the areas are broken by the high water levels). Therefore the wetlands ecosystem in the farm is transformed into a terrestrial ecosystem. Moreover, impacts of the introduction of the soya technological package in the ecological integrity and in the provision of ES are much stronger; there is a complete loss of the natural vegetation cover (see Figure 21) while the use of glyphosate prevents the growth of any other vegetation or wild life in the area. This pictures a radical change in the ES provided: almost all of the ES mentioned in chapter 3 stop being provided in order to provide just one: commoditized crops. Many researchers agree that an "ecosystem management that attempts to maximize the production of one ecosystem service often results in substantial declines in the provision of other ecosystem services" (Bennet et al., 2009).



Figure 32– Satellite image of Bem-Agri embanked farm near the town of Villa Constitución (Google Earth)

At the regional level a productive activity that is having a strong impact is beekeeping, usually developed by islanders or small cooperatives. In one hand, cowstend to destroy many components of bee flora while the impact of agriculture is even worse due to extermination of bees by the use of glyphosate.

According to Blanco & Mendez (2010) most affected environments have been depressions, with the consequent loss of important herbaceous species. These ecosystems play a "key role in water regulation, serving as buffers of high water levels due to its ability to slow the speed of the water, and acting as filters for sediment retention and as nutrient-rich freshwater storage that prevents the rise of underground saline water" (Blanco & Mendez, 2010). Furthermore, they lose their role as climate regulators as their evapotranspiration capacity is lost.

Unfortunately, to date, there hasn't been yet a study examining the joint effects of embankments and dykes in the region as a whole. One of the reasons is that the amount of embanked area is still considered small for some actors. However, it is perceived that an increase in the embanked areas will have a devastating effect for the local and regional environmental sustainability, as the lack of a comprehensive water plan will produce an irreversible transformation of the area towards becoming an extension of the Pampa region. The permanent or semi-permanent characteristic of the ecosystem is being changed towards one with temporary water without it. If this trend continues at the regional level it will strongly decrease the buffering capacity of water surpluses, with attendant consequences to the villages and human activities not only in the Delta but in the surrounding region.

Nevertheless, this direct relationship between ES provision and human wellbeing is not as direct as it is assumed. One of the strongest critics around this relationship arises from the fact that in the last centuries albeit the decline in the majority of the ES, global human well-being has increased (Millennium Ecosystem Assessment, 2005). Therefore it is rational to wonder if environmentalist reasoning that environmental degradation will tend to poverty and collapse is right. Refusing the hypothesis that human wellbeing is not being measured right, Raudsepp-Hearne et al. (2010) intends to explain this "environmentalist paradox" through three other hypotheses that elucidate this difference in theory and practice. The first (1) hypothesis establishes that wellbeing depends mostly on food which is the ecosystem service that has grown the most. The second one (2) is that technology has decoupled well-being from nature, as humans depend to a greater extent more and more in technology than in ES. The last hypothesis (3) is that there is a time lag after ecosystem service degradation affects negatively human wellbeing. As it is clear, ecosystem science still has weak understanding of the impacts that environmental destruction has on human well-being, and knowledge on these types of relationships needs a critical understanding of the complexity behind human-nature systems.



Figure 33 – Satellite image of embanked farm near the town of Ibicuy (Google Earth)

5. Access to land in the Delta del Paraná

In this chapter I intend to elucidate the third sub-question presented in this thesis.

How are the new actors involved in current changes in land use in the Delta del Paraná gaining access to land?

Therefore I will inquire into how land access is gained by the actors behind this “new frontier of land control” described in the last chapter. As my hypothesis is that the access to land gained by these new actors also implies the access to the environmental services of the land, it is important to understand from a political ecology framework who these new actors are, how they gain access to land and what motivates them. Furthermore, attention will be given to those actors “offering” the land and to the land tenure history and status in the Delta in order to give the reader a better understanding of land access dynamics in the region. At the end of this chapter I will present and shortly discuss the actual policies being implemented and affecting the entrance of new actors and new land use changes in the region.

A myriad of different actors introducing new land uses are entering the region in the last years. In order to better answer the objective of this chapter, it will be differentiated in between the different land tenure status present in the region, as expressed in the following figure (Fig. 35).

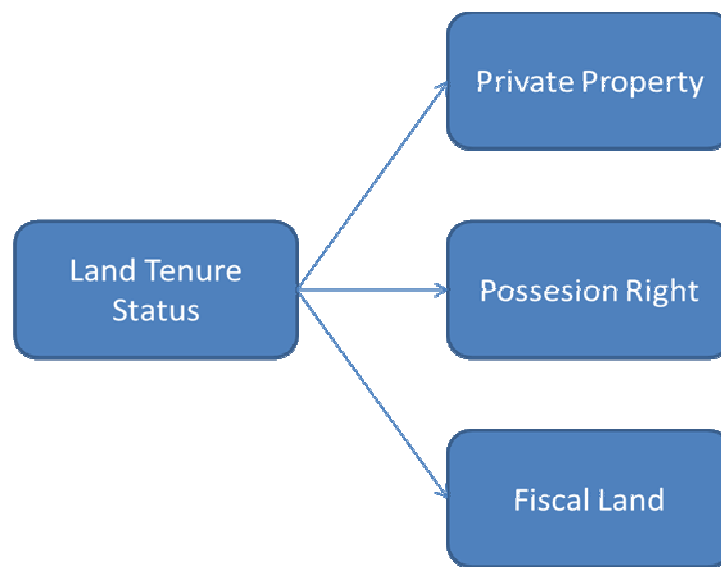


Figure 34– Land tenure status in the Delta del Paraná (own source)

5.1 Actors and mechanisms of gaining access to land

5.1.1. Private Property

The current dynamics observed in the entrance of new actors and land uses in the Delta del Paraná estimates a dynamic land market. It is presumed that the price difference in between the Delta region and its neighboring Pampa region –together with all the global, national and regional drivers explained before- results in a rush of plenty of new actors to buy land in the area (Manuel-Navarrete et al. 2005; p.31); prices are up to 20 times lower in the Delta. However, formal channels of access through a visible land market are rather unused, mostly due to ill-property right situation of private property in the area. Farms ranging from 1.000 hectares and up to several thousands in the middle and upper Delta, were sold to forestry companies during the second half of the 20th century, most of them near good fluvial access routes (Galafassi, 2002). However, a big flood in 1982-1983 resulted in the ceasing of activities for most of the forestry companies in the middle and upper region, as infrastructural works done in the farms were not enough to control the flood and the companies didn't have the financial capacity to reinvest (Galafassi, 2002). Nowadays these forest companies went mostly bankrupt and local populations live there with an irregular land tenure status (see chapter 5.1.2 for a better description of the land tenure status of local isleños).

“It is a very informal market. Nobody wants go get there (for real estate agencies). Usually fields don't have paper. So we (for real estate agencies) can't do anything” (Conversation with a real estate agency from San Pedro).

In addition, some nowadays macro factors like the currency exchange control³ or the promulgation of the “Ley de Tierras”⁴ have also influenced to hamper the development of a dynamic and formal land market. In 2012 data from the *Cámara Argentina de Inmobiliarias Rurales* (Argentinean Rural Real State Chamber) estimates that rural real estate market was reduced in up to 70% due to these factors all over the country (Diario La Nación, 2013).

“Since last year, transactions in the area have been reduced in at least 85% percent because of the currency exchange control. Nobody wants to agree in the price of the dollar.” (Conversation with a rural consulting that works selling land in the region of Diamante and Victoria, Entre Rios)

³The National government has decided to limit the amount of foreign currency being bought and sell to an almost inexistence market, with the consequence of the development of a black foreign currency market with prices up to 50% higher. In addition land prices in Argentina have historically been established in dollars in the last decades resulting in the current real estate market fall.

⁴ Régimen de Protección al dominio Nacional sobre la propiedad, posesión o tenencia de las Tierras Rurales (*Domain Protection Scheme National ownership or possession of the Rural Land*) – Law N°26737. Promulgated in December 2011 this law establishes a limit of 15% to the total rural lands in Argentina by foreign ownership. In addition, one foreign owner can't have more than 1000 hectares in the “Zona Núcleo” (Core Zone - the most productive Pampa area) or its equivalent in other regions as determined by the Ministerial Council of Rural Lands. Furthermore, the law established that rural land acquisition is not considered as an investment because it is a nonrenewable natural resource provided by Argentina.

Real estate agencies interviewed during the research agreed that in the last 2 years, the land market in the Delta has seen a considerably reduction in its dynamics.

“The last land we sold in the islands was 3 year ago for 300 dollars per hectare. There were 300 hectares sold buy a man who was about to retire. The one who bought wanted to do some productive activity, but plenty investment was needed because of flooding so I don’t know what he did.” (Conversation with a real estate agency in Villa Ramallo).

On top, as results in Table 2 about advertisements in online media show, most of the land offer corresponds to large size farms, usually over 500 hectares and up to thousands of hectares. A total of 11 advertisements were found during the period in between March and April 2013. This is because in these cases it becomes economically viable to real estate agencies to manage it.

Municipality	Size (hectares)	Price (US\$/hectare)
Islas del Ibicuy – Entre Ríos	350	1000
Islas del Ibicuy – Entre Ríos	400	1000
Escobar – Buenos Aires	200	1500
Victoria – Entre Ríos	39	1300
Paraná – Entre Ríos	3450	750
Paraná – Entre Ríos	3500	750
Gualeguay – Entre Ríos	3882	800
Islas del Ibicuy – Entre Ríos	446	2000
Victoria – Entre Ríos	8000	150
Gualeguaychú – Entre Ríos	1710	-
Gualeguaychú – Entre Ríos	700	111

Table 2 – Online Advertisements (own source)

“Fields start above 500 hectares. For less is economically unviable for us. Renting a boat to go and see it costs like 1500 pesos and it takes at least half a day.” (Conversation with a real estate agency from San Pedro, Buenos Aires).

Furthermore, in previous years during the boom of soya plantations in the Pampa region, transactions through a formal land market were seldom. When newspapers of some of the most important cities neighboring the region and with a strong connection to the Delta region were analyzed, only 3 advertisements were found (analyzing the classifieds of more than 5 years of 3 newspapers of the cities of Baradero, San Pedro and Victoria)(see Table 3). All of these advertisements correspond to local inhabitants of these cities that observe the increase in the price of land as a good opportunity to sell the lands. The table below presents the amount of advertisements related to the Delta region found in the newspapers.

Newspaper Name	City – Province	Years Analyzed	Delta advertisements
Semanario La Opinión	Baradero – Buenos Aires	10	0

La Opinión Semanario	San Pedro – Buenos Aires	5	1
Diario Paralelo	Victoria – Entre Rios	6	2

Table 3–Land sale advertisements in local newspapers (own source)

“My family had a small piece land in the islands, less than 100 hectares since a long time in the Islands. When prices went up and we needed money for our house we decided to sell the land.” (Interview with a former owner of land in Baradero).

The non-presence of a visible formal market for land in the region allows interfere that most land transfers of private property are achieved through less visible mechanisms. As most of the interviewees expressed, the purchase and sale are between boundaries or local actors that through some contact are selling the land (acting as a kind of informal real estate agency inside the Delta).

“We don’t sell land in the island. Usually what is sold there is in between boundaries, so it doesn’t go through a real estate agency” (Conversation with a real estate agency in Diamante, Entre Rios).

Furthermore, new land uses not always correspond to new actors accessing to land. There are some cases of people who own land in the Delta since various decades and are now starting to use the land, as cattle ranching became a highly profitable activity. This shows the “new” attention that the region has started to receive by old owners.

“Together with the massive arrival of livestock to the islands we saw two different actors arriving. Some are cattle ranchers from the Pampa who bring their cows to the region. And others are those who had land in the Delta but not used it and now see that they have a very profitable economic use” (Conversation with a local NGO from Buenos Aires Province).

As it has been mentioned before, during the second half of the XX century large areas were sold to private forestry companies, however the activity never flourished like in the lower Delta. Although some companies went bankrupt, several others still exist but didn’t use the land for a productive purpose. Nowadays these lands are mostly being bought by a national elite composed of large national companies, high class businessmen and politicians (or strongly related to them), who are slowly transforming the middle Delta region in a *fiefdoms* region. Victorio Gualtieri, a powerful businessman from the neoliberal Argentinean era, bought 5.000 hectares in the 90’s to an extinct forestry company and through informal mechanisms he has obtained around 50.000 hectares nowadays in the Islas the Ibicuy area (See chapter 5.1.2.). Pedro Pou, ex-president of the Buenos Aires Province Bank owns around 50.000 hectares, most of them embanked, in the island area of Gualeguay municipality. The Escenassy family, owner of Banco Galicia, one of the biggest private banks of Argentina, and Fernandez, former Minister of Economy of Argentina, both own 30.000 hectares in the Delta region.

"The Delta is becoming an area of fiefdoms. People linked to the economic and political power buy land and do what they want" (Conversation with a local small farmer from Villa Paranacito, Entre Rios).

"There has been a process of land concentration in a few hands in the last years." (Local NGO activist from San Pedro).

After the big flood of 2007, this concentration process seems to have been exacerbated. As conditions for a fast and organized evacuation of the large amount of cattle in the area were not planned, thousands of animals were lost. Those who were able to take out their cattle but had no place to put it had to sell it for a low price, around \$900 per cow. Just a couple of months after, when the water was in normal levels again for the development of cattle ranching, cattle prices were up to \$3000 per cow. Small cattle ranchers who didn't have the financial means to buy new cattle couldn't reincorporate to the activity, with the selling of the land usually to bigger boundaries producers. The big flooding also caught the attention for several new cattle ranchers which had arrived to the Delta in the previous years without a good knowledge about the region

"Some people started to leave the area. They saw this as a good investment like 8 years ago. But now with all the flooding they don't want to know nothing about it. It is not easy to work in the Delta." (Conversation with real estate agency from Gualeguay).

"There were around 1 million heads in 2009; when the flood came it was a disaster with substantial mortality, as before we had a long period of low water levels of the Paraná that permitted land that are not normally suitable for being underwater, to be occupied. This part of the Delta (for the middle Delta) has always been pastoral, but with a load of about 150,000 head. Now we have that amount but only in this part of the island (for the Islas de Ibicuy municipality). Anyway, in the Delta in general, there is no longer the amount of the time before the flood" (Conversation with a local producer from the municipality of Islas de Ibicuy)

Furthermore a new and emblematic case that has emerged in the last years in the region is agricultural trusts: Alto Pecan and Pecan Retiro. Developed by Faro Capital S.A. and UNCO S.A., companies that work in the "development and operation of non-tradition agribusiness ventures" (Faro Capital, 2013), they have promoted the aforementioned trusts in the region of Villa Paranacito where they sell nautical farms with pecans productive development. They have bought 5.000 hectares to Noelma S.A. (a big chicken meat producer in Entre Rios) some years ago and are now selling terrains in between 1 and 5 hectares. However, nowadays Pecan trees have been burned out in order to start producing soya and other cereals and oilseed, as they have invested in the construction of dikes and embankments that control floods over extraordinary levels.

Another emblematic case because of the size and quality of the dykes and embankments made is Bem-Agri S.A. This company owned by two Dutch brothers has "dried" through a polder system around 12.000 hectares in order to plant agricultural crops and developed cattle ranching. Informants said that they have made two embankments of more than 8 meters high and that land was bought to "some lawyers from Buenos Aires" around 10 years ago.

5.1.2. Possession Right

A research carried on by the Secretaría de Agricultura Familiar identified 63.843 families with land tenure conflicts over the land they used to farm all over Argentina, covering more than 9.000.000 hectares. In 91,6% of the conflicts identified, the family had no property rights, but however more than 70% had possession rights as backed by the Argentinean Civil Code (Gigena et al., 2013). The Código Civil in the article 2.351 expresses that possession exists when a person behaves as if it was the owner of certain right and is effectively and exclusively exercised. This term should be differentiated with tenancy, where the property is recognized to belong to another. The Civil Code gives the rights of adverse possession, also known as "*ley veinteañal*" (*twenty year law*), where the possessor (having the possession rights) has the right to have the property after using it for 20 years or more, and if it has behaved as a "good" owner (paying taxes, using the land, building infrastructure improvements). Although the process to obtain property rights after the twenty years period seems to be straightforward when read in the Civil Code, it is a very long and expensive process (for isleños standards).

In the Delta, most of the Isleño population has an irregular land tenure status, usually dispersed all around the area on the shores of streams and rivers. In the islands corresponding to the municipality of Victoria around 1.000 people live in the 370.000 hectares; information regarding the land tenure status of the 326 homes surveyed in the Victoria islands resulted that only 39 were owners (12%), 226 didn't possess a regular tenure status (70%), while 51 homes (28%) were grouped as having some type of tenancy contract with the owner of the land (Donadille et al., 2010).

For this section I focused in the islands in front of the city of Baradero where it is estimated that around 100 families live in the 30.000 hectares of islands in front of Baradero, usually having possession rights as they are living and working for several decades on lands owned by extinct forestry companies as it can be observed when analyzing the names of the owners in the cadastral maps of the municipality of Baradero (See Fig. 11).



Figure 35 – Cadastral map of Baradero Islands (own source)

In this last decade, this area has seen a tremendous change in the ownership. Nevertheless, there has been only one (1) big buyer; Antonio Pazzaglia. This large agriculture producer from the area of San Antonio de Areco in the Buenos Aires Pampa bought a piece of land several decades ago (as it can be observed in the cadastral maps of the city of Baradero). In the last decade he has been buying possession rights to isleños that live in the area usually throughout a 3 item agreement with them:

1. Purchase of possession rights for a price several times below the market price⁵, but relatively high for isleños standards.
2. Job opportunity as keepers in the land.
3. Permission to keep their cattle in the land.

Isleño population have perceived this agreement as a good opportunity in most of the cases, as in a first impression local livelihoods seem to be maintained (they can live the in the same place and keep their cattle) while in addition they receive a job and some thousands of pesos, a large amount for their financial standards.

⁵ Informants working in the area told me about a possession rights purchase in 2008 of 280 hectares for AR\$100.000 (around 11 dollars the hectare) in the islands of San Pedro.

“He gives them work. And allows them to stay on their land. I understand that for many islanders is a good opportunity, so they are accepting it” (Conversation with a small cattle rancher from the Baradero Delta region).

A positive impact of the increase in cattle in the islands is the effect it had in the demand for specialized workers in the livestock industry. Cattle ranching offers isleños an opportunity to use their local knowledge in the area. It is estimated that around one worker is needed every 500-1000 cows. Their work consists in the control and caring of cattle health, or maintenance of facilities (sheds, fences and machineries). Temporary jobs for vaccination or movement of animals are also required. Standard working conditions are usually not met, and salaries are below the minimum wage level (Stancich et al., 2010). Although local population has been able to supply with their work to these growing workforce demands, several ranchers have brought workers from other cattle ranching regions like Corrientes or the North of Santa Fe. However, industrial agriculture is pushing isleños away as their local knowledge is not required for the installation of this economical activity, usually resulting in migrating to more marginal lands inside the Delta, at longer distances from schools and from the cities they have relationships with. Others have gone to live in the cities nearby the Delta as I was informed during the research.

“Some of them have gone to the coastline of the city of San Pedro. They still have a small hut that they use when they go out fishing. Then they sell it in the town or they do some “changas” (occasional jobs) to survive” (Conversation with local journalist).

“And of course the isleño, and I mean not only the humblest, is absolutely helpless and the logical tendency is to abandon their land.” (Conversation with a local isleño cattle rancher from the Islas de Ibicuy department”.

This evidence shows that isleños are not aware of the legal rights that the *“ley veinteañal”* in the Argentinean Civil Code offers them. Although there are some cases of isleños resisting or trying to do the adverse possession process the most common has been that they accept selling the possession rights to the newcomers. In addition, intimidation and threat strategies by the newcomers have also been mentioned by informants and other research done in the area.

After the purchase of possession rights by this new actor, property rights are obtained through the corresponding process established in the adverse possession process. He has been able to obtain the property rights thanks to strong political contacts and powerful financial situation in order to accomplish all requirements needed by law.

“He (referring to Pazzaglia) has a strong contact in the government (of Buenos Aires province). Therefore he can obtain the property rights through the people from cadastral offices in La Plata (capital city of Buenos Aires). For isleños this is impossible. They have no contacts there and it is a very expensive process in money and time.” (Conversation with a worker from the Municipality of Baradero).

Nowadays Pazzaglia has the ownership of more than half for the total 30.000 hectares of Baradero islands. Property rights are registered to 2 companies owned by him: Antonio Pazzaglia and Stonhedge S.A.. In addition he also owns a few thousand hectares in the island region in front of Campana and San Pedro. When cadastral maps of the 90's are compared with the actual area that local informants say that Pazzaglia controls nowadays, it is mostly land previously owned by forestry companies that went bankrupt decades ago.

A similar strategy seems to be identified by another actor in the Lechiguanas islands; Victorio Gualtieri. The starting point is usually the buying in legal terms of a piece of land, and later on through informal mechanisms more pieces of land are accessed.

"In the last decade there has been a stronghold of about 50.000 hectares that are held by Gualtieri (cited as figurehead of ex-Argentinean president Eduardo Duhalde), that began with the purchase of 5.000 embanked hectares to the Mazzaruca establishment in the 90's, which was engaged in forestation of eucalyptus for YCF to Rio Turbio (...), and later on appropriated through intimidation of around 45,000 hectares of the Lechiguana Island" (Conversation with a local producer from the municipality of Islas de Ibicuy).

The new land Gualtieri is buying was previously owned by Las Lechiguanas S.A., a public-private forestry founded in the 1970's which intend to embanked 80.000 hectares but that after the big flood of 1983 stop its activities and bankrupt.

5.1.3. Fiscal Land

The economic and political marginality that has characterized the middle and upper regions of the Delta for the 19th and 20th century can be observed in the fact that up to beginning of the 21st century a large part of this region was still fiscal land. During those times differences in the land tenure policies can be found in between the Buenos Aires and Entre Rios region of the Delta. Economic development in the Buenos Aires side enhanced a stronger and clear state control in the land tenure system; throughout several provincial laws which intend to give *de facto* land tenure status, more than 200.000 hectares were given to private hands (see Galafassi (2004) for a better description of this process). In the other hand in the Province of Entre Rios, the small importance of the Delta in compared to the Litoral/Pampa region of Entre Rios, the most dynamic economic region of whole Argentina during those times (Barsky & Gelman, 2009), reduced state intervention to the minimum. For example the 250.000 hectares that correspond to the Lechiguana Islands in the Gualeguay department of Entre Rios, were only determined to be from the Province of Entre Rios in 1944 (Página Judicial, 2013), and in the Victoria department, up to nowadays around 200.00 hectares in the Delta region of the municipality are still fiscal lands (Stancich, 2009). Historically this fiscal land was used in a discretionary way: Isleño or cattle ranchers with precarious or irregular tenure or local governments' leaders that use these lands for their personal economic interests (Stancich, 2009).

With the soya boom in the Pampa region and the expulsion of cattle to marginal areas, pressure for developing economical productive activities in fiscal lands of the Delta del Paraná by new actors increased abruptly. In the middle region, especially in the islands of Victoria in the Entre Rios side of the Delta, with the construction of the Rosario-Victoria road connection in 2003 that crosses the Delta through the middle, the emergence of new actors was even stronger. In less than 10 years the price of an hectare in this area was multiplied by 20 (from US\$50 to US\$1000) and the amount of cattle grew in more than 400% (in the Victoria Department the amount of cattle increased from 55.000 in 2004 to 143.600 in 2006) (Stancich, 2009).

The entrance of these new actors in this section of the Delta was characterized by the proliferation of irregular appropriation status. The government of Entre Rios said that at least 100.000 hectares are being appropriated and used by private parts without legal consent. Cattle ranching are the productive activity developed in most of this usurped land as large investments needed for agricultural production are very risky. The lack of control from governmental agencies together with a tangle of different municipal and provincial laws, results in a complex situation of irregular appropriation.

Nowadays, most of these land users are intending to obtain the property rights through the adverse possession process, increasing public-private conflicts. In Gualeguay department, of the 45.000 hectares corresponding to fiscal lands, private actors have measured and register at the cadastral office around 58.500 hectares in order to start the adverse possession process (Derf, 2013). There are plenty of emblematic cases going on during these days, which represent the informality around land tenure that occurs in the Delta. In the islands in front of the city of Rosario, but that belong to the Victoria department (Entre Rios) a field of around 2.200 hectares, donated by an environmental philanthropist to the city of Rosario and that in 1999 was intended to be transformed to a natural reserve by the government of Rosario, is nowadays occupied by a local cattle rancher that has embanked and closed several watercourses.

The Entre Rios state is going through a long dispute against these new land users and is constantly looking for alternatives to recover the access to these lands. For example some years ago, the provincial government sanctioned the law 10.092 that intended to lease around 100.00 hectares of fiscal land in Entre Rios to a private-public provincial company for the development of rice and other agricultural activities for 99 years. Although this project was approved in December of 2011, several weeks after it was suspended due to the critics of several environmental and social organizations.

Nowadays, as one of the requirements is that the land is “effectively occupied” and most of these newcomers don’t live in the region, the provincial state is expecting to re-obtain the administrative power over these lands again (although there are some cases that privates receive the property rights because they effectively live there or because of political contacts). For these reason, a judge from the province of Entre Rios decided to change the legal status of around 90.000 hectares of land in the Delta region from fiscal lands to “public goods”, prohibiting leasing or adverse possession process.

However, before the lands owned by the provincial state were declared as public goods, a reaction of governmental agencies in order to control the proliferation of irregular appropriation of land in the Delta was the leasing of fiscal lands, as in 2004 the provincial government of Entre Rios sanctioned the Ley N°9.603 for the islands of Entre Rios.

A total of 128.350 hectares of land were leased for a 3 year term to 109 awardees for a price of five (5) kilos of live cow per hectare and year (in that year the price per kilo of live meat was AR\$2,171). 99% percent of the land leased was used for cattle ranching activities (Stancich, 2009), with 60% of the producers coming from Entre Rios, 30% from Santa Fe and the rest from Buenos Aires and Chaco, some of them capitalized as trusts (Donadille et al., 2010).



Figure 36 – Cattle ranching near the Rosario-Victoria road (own source)

This law emerged as a response to the process of occupation of the islands, however it didn't intend to promote a new land use plan, but it legitimized the irregular occupation process. Motivations behind the promulgation of this law were to *"end the anachronistic and discriminatory mechanism empowering the executive to grant tenure or parcels of land to friends of those in power"* (Carlos Gaberlino in Stancich, 2009). In addition, it was also the intention of this new law to generate new sources of income for local governments and specially to finance a fund to promote fishing industry. Nevertheless, this last argument had no strong validity as only AR\$1.600.000 (around US\$500.000) per year could be raised (Stancich, 2009). Nowadays, this law has claudicated and the cattle ranching activities are again carried on in a precarious land tenure situation as explained before.

5.2. Current Policies

At a national scale, plans in the middle/short-run for the economy are to promote an increase in the production of agro industrial crops. After more than 30 years without a national strategic plan in the agricultural arena in Argentina, the national government developed the “Plan Estratégico Agroalimentario y Agroindustrial Participativo y Federal 2010-2020” (PEA²). With the objective to “generate a shared vision of the future for the whole industry, with input from all stakeholders that integrate it”, 500 meetings with more than 700 actors of the sector involved were carried on –although critics agree that the plan presents the vision of the agro-industry (Carballo Gonzalez, et al., 2012)-, the plan final version intends to change the actual composition of Argentine agriculture of primary production of low or no value to be exported, to one that emphasizes the added value from the industrial processing of raw materials (Ministerio de Agricultura, Ganadería y Pesca, 2010).

Regarding industrial crops, the PEA² plans to increase the grain production to 160 million tons for 2020, an increase of 57% from the year 2010. For this it is estimated that acreage will need to increase from 33 million hectares in 2010 to 42 million hectares cultivated in 2020 (a 27% increase). The following table (Table 2) shows the expected increase in acreage for the main industrial crops. Regarding livestock production, the PEA² plans an increase of 46% in the number of heads of cows, from 49 million to 54 million.

Crop*	2010	2020	% increase
Soya	18,3	22	20%
Sunflower	1,5	2,5	67%
Corn	3,5	5,7	63%
Weat	3,6	7,5	108%

*in million of hectares

Table 4 – Increase in acreage for main industrial crops (Data source PEA²)

For Argentinean economy, and as well for the Argentinean state finances, agricultural exports represents a unique opportunity to increase the flow of foreign currency in the country, after the 2001-2004 default process which has left the country outside of the international financial markets. Nowadays, almost 90% of the total production of soya is exported, representing US\$15.474 million, and export taxes for soya are established in 35% of total exports (Teubal, 2011). This income is mainly spent in massive conditional social cash transfers (Gudynas, 2010) and in a “soya fund” (30% of total soya export taxes go to the “*fondo sojero*”) used for infrastructural investments in between provincial and municipal agencies (INTA, 2012).

With this future prospects ahead, is it possible to protect the pivotal environmental services this area offers confronted to a national process of continuous increase in industrial agriculture acreage and in food and fiber ES? In 2008 only when the smoke of thousands of hectares being burned at the same time ended with fatalities in the surrounding routes and disturbing everyday life of Buenos Aires citizens, society as a whole -including the state- understood that the actual transformation of the Delta needed some type of control and sustainable planning, in order to maintain the steady supply of the essential ecosystem services of this floodplain. The smoke was

the visible effect of the ungoverned arrival of new land users and uses that were occurring in the region in the last years. With the media attention of what was going on in the middle and upper Delta, the national government represented by the Secretaría de Ambiente y Desarrollo Sustentable de la Nación (Secretariat of Environment and Sustainable Development of the Nation) together with the provincial governments of Entre Rios, Buenos Aires and Santa Fe decided to sign the letter of intent of PIECAS-DP. The PIECAS-DP (*Plan Integral Estratégico para la Conservación y el Desarrollo Sostenible para la Región del Delta del Paraná* - Comprehensive Strategic Plan for the Conservation and Sustainable Development for the Paraná Delta Region) is nowadays the largest and strongest political instrument created in the last years in order to promote and organize conservation and sustainable development of the area. This letter laid the foundation and conditions for the development of the PIECAS-DP as a land management tool with the following central objectives:

- protect, conserve and sustainably use the biodiversity and natural resources of the area,
- maintain or restore the structure and ecological functions of the ecosystem,
- promote sustainable development, and
- ensure the participation of all stakeholders by proposing institutional mechanisms that give value to sectorial contributions within the legal and institutional government system.

With the first stage completed – composed of a baseline environmental research and strategic environmental assessment –, in November 2012 the signatories agreed with the creation of a land management tool, which is nowadays being developed. This tool will intend to define those sustainable productive practices for the region and promote synergies in between these. The plan should follow an ecosystem approach based on an integrated management of the Delta in the whole La Plata Basin and on the “wise use” concept established in the Ramsar convention. However, it's been more than five years after the signing of the PIECAS-DP, and the expected territorial plan is still missing - although it is understandable that it is a process that takes time. Meanwhile activities that threaten environmental sustainability of the Delta continue to be developed and expand, demonstrating the state (un)capacity to manage the new challenges that globalization is introducing in respect to policy and decision making in the country. National agricultural policies expressed in the PEA² 2010-2020 that enhance the expansion of agricultural acreage in more than 25% for the year 2020 seem to tackle-down with sustainable development plans promoted by the PIECAS-DP, as pressure for new land for the development of these activities will continue to grow, expanding the places inside the Delta that will become part of the “new frontier of land control”.

6. Conclusion and Outlook

In this last chapter I summarize the results of the previous analysis and give a final conclusion to the core research question of this thesis,

to what extent actual dynamics observed in the context of land grabbing occurring in the Delta del Paraná affect the environmental sustainability of the region?

This thesis aims to evaluate how the current dynamics in the context of the land grabbing process occurring in the Delta del Paraná are affecting the environmental sustainability of the area.

The Delta del Paraná as a macro-mosaic of wetlands provides several pivotal ES for local and regional populations, all dependent on the most characteristic feature of the floodplain, its flood pulse. Flood buffering, water purification, fish biodiversity, primary productivity and carbon storage are some of the services provided by this ecosystem and that benefits society. Albeit several transformations and uses that the area experienced throughout the last centuries, demand for ES has maintained rather low compared to what the area seems to be available to offer. Local populations have coupled their activities with the hydrological regime of the Delta, while the surrounding populations have only demanded the provision of several ES in a low amount and during intermittent periods. Additionally, technological investments to control flood risks in the middle and upper Delta never really succeed. Therefore this ecosystem, although modified by human intervention, has always maintained its ecological integrity allowing the provision of ES.

In the last decade however multiple new actors determined the use of the wetlands: Agricultural producers of cattle and soya from the Pampa, local and foreigner capitalists looking for new areas of investments, investment trusts attracting small investors from the surrounding cities into agriculture, cattle ranching and urbanization, and last but not least old owners of land in the Delta who see an opportunity to obtain a return from their land. All of these new actors have encountered old actors living and working in the area, such as *isleños*, small cattle ranchers from the surrounding towns and large cattle ranchers from previous decades.

The new actors gain access to land in the Delta by making use of several mechanisms like land market, irregular appropriation, leasing of fiscal lands and purchase of possession rights. These mechanisms depend on several factors and conditions that are unique in this area, primarily in the land tenure status of the Delta which presents a myriad of different and complex status ranging from private lands to fiscal lands and possession rights of local population in lands owned by extinct forestry companies. Furthermore, a weak and confuse regulatory framework exists composed with inconsistencies in policies implemented before but also in current times: The Delta del Paraná region presents a devious and intricate institutional background with a large amount of jurisdictions involved. Governance efforts are determined either by its absence or by its presence as supporter of the new actors, ending up always favoring the expansion of the new land use.

However the changes in land use and technologies have a strong influence on the capacity of wetlands to provide multiple ES. In fact they are producing considerable changes in the ecological integrity of the wetlands, which are unseen in the history of the Delta de Paraná: Cattle ranching, agriculture, urbanization expansion and infrastructure works are the land uses that together with effective techniques to control the flood pulse of the Delta are leading to a trade-off in between ES, maximizing the provision of one and tending to a serious degradation in the capability of the wetlands to be a provider of multiple ES. As a result the historical, ecological character of the ecosystem is at risk.

Based on the definition of “sustainable use of wetlands” underlying this thesis, it therefore has to be concluded, that the actual dynamic of land grabbing in the Delta del Paraná is negatively affecting the environmental sustainability of the region.

The conclusion of this thesis is in line with the opinion of many researchers stating that the “extrapolation of the pampas production model to extra-pampa regions presents obvious symptoms of environmental unsustainability” (Manuel-Navarrete et al., 2005; p.5).

However, the transformation cannot be seen as “new” due to the current productive activities do not take into account the characteristic flood pulse of the area. This has already been the case for forestry activities in the area decades ago. What indeed increases the significance of the current development is the fact that the Delta del Paraná is being incorporated into the global commodity market, becoming linked to developments in other localities of the world. Land use for the production of industrial crops is developed in order to supply food and energy to people in foreign countries, and not to the surrounding urban/industrial axis as it has been historically.

Given the government plans to increase the harvest area for agricultural production in Argentina by almost 30% until 2020 the need increases to work sustainable solutions for the current development in the Delta del Paraná:

First, there is a need to find and strengthen certain productive activities that respect the hydrological regime and other ecosystem services of the area. Sustainable cattle ranching, beekeeping and eco-tourism are considered the best options by different actors, although clear practices and infrastructure should still be developed.

Second, Zimmerer (2006) arguments that nowadays globalization has “forced conservation to interfere increasingly with agriculture and other types of livelihoods and resource use”, what many authors call the 3rd wave of conservation. One of the new aspects of this 3rd wave is the incorporation of sustainability in the conservation concept, meaning that social and economic aspects are as important as environmental for the conservation of an area or ecosystem. With this new conception, conservation and agriculture and resource use should no longer be seen as perfect substitute land uses but as complementary. In a way this enhances the multifunctional

aspect that agriculture can have, not only as provider of food, fiber and fuel, but also in maintaining the provision of essential environmental services of the ecosystem where the productive activity is being developed (Renting et al., 2009). Development plans in the Delta del Paraná should avoid the promotion of an industrial and intensive agriculture and other resource use that overlooks the fact that “landscapes simultaneously produce multiple ecosystem services that interrelate in complex dynamic ways” (Bennet et al., 2009). The importance is to understand that the real value of a wetland is in the provision of its regulating services. An ecosystem service valuation in the Pantanal de Mato Grosso in Brazil concluded that 75% of the total value of ecosystem services in the area comes from regulating services (Moraes et al., 2009), evidencing that the total economic value of the unconverted floodplain is higher than a converted one.

Third, there is the need to promote and build a cohesive and inclusive regulatory framework for the entire Delta region. It is needed in order to solve the historical problem of land tenure in the Delta while improving access to justice and titling programs for local population and to promote a formal land market in order to reduce concentration of land in few hands. Furthermore the regulatory framework should clearly and explicitly prohibit the use of environmentally unsustainable techniques, such as the construction of dams and embankments for drying large areas, the use of agrochemicals and the use of fire as weed control, while also defining Ramsar areas that are important for conservation.

Finally, it is likely that global climate change and deforestation in the La Plata River Basin result in higher water levels of the Paraná River leading to an increased demand for many of the ecosystem services of the Delta del Paraná floodplain like flood control when absorbing high water levels (Barros, 2005). This is especially important to protect the poor people homes usually located in areas with a higher risk to be flooded. In addition, the biggest urban and industrial axis of Argentina surrounds the Delta. It is therefore crucial to better understand the interconnection in between the provision of multiple ES of the Delta del Paraná and the human wellbeing of surrounding population.

Therefore the role of politics has to be emphasized strongly: policy decision makers need to stop an overly-narrow focus on limited ES and promote a sustainable development of the region that pays detailed attention to the trade-offs in between current and future ES of this ecosystem, while enhancing synergies in between them. It is necessary to improve the understanding of the trade-offs in between ES as to identify the tipping point of this ecosystem; the big doubt is still how far (or near) actual developments are from a “no return point” of the wetlands of the Delta del Paraná.



Figure 37– Sunset in the Delta del Paraná

References

- AméricaEconomía(2013) Producción de Soja de Argentina y Brasil alcanza record en campaña 2013. [Online], Available at:<http://americaeconomia.com/negocios-industrias/produccion-de-soja-de-argentina-y-brasil-alcanzaria-record-en-campana-201213> [Accessed 02/05/2013]
- Argentina Investiga (2013) La vida en el Delta entrerriano, como hace más de mil años [Online], Available at:http://infouniversidades.siu.edu.ar/noticia.php?titulo=la_vida_en_el_delta_entrerriano_como_hace_mas_de_mil_años&id=1458 [Accessed 12/06/2013]
- Barbier, E.B. (2007) Frontiers and sustainable economic development. *Environmental Resource Economics*, vol. 37, pp. 271-295.
- Barros, V., Doyle, M., and Camilloni, I. (2005) Potential impacts of climate change in the Plata Basin. *Regional Hydrological Impacts of Climatic Variability and Change: Iguacu, Brazil*.
- Barsky, O. and Gelman, J. (2009) *Historia del agro Argentino*. 3era edición, Buenos Aires:Editorial Sudamericana
- Bailey, R.G. (1996) *Ecosystem Geography*. Springer: New York.
- Bennet, E.M., Peterson, G.D. and Gordon, L.J. (2009) Understanding relationships among multiple ecosystem service. *Ecology Letters* 12, pp. 1394-1404.
- Bravo, A.L, Centurion Mereles, H.F., Dominguez, D.I. (2010) *Los señores de la soja: La agricultura transgénica en América Latina*. Buenos Aires: CICCUS-CLACSO.
- Burachik, M. (2010) Experience from use of GMOs in Argentinean agriculture, economy and environment. *New Biotechnology*, vol. 27, pp. 588-592.
- Borras, S.M. Jr., Franco, J.C., Gómez, S., Kay, C. and Spoor, M. (2012) Land grabbing in Latin America and the Caribbean. *The journal of peasant studies* 39 (3-4), pp. 845-872.
- Borras, S.M.Jr., Hall, R., Scoones, I., White, B. and Wolford, W. (2011) Towards a better understanding of global land grabbing: an editorial introduction. *The journal of peasant studies* 38 (2), pp. 209-216.
- Borras, S.M. Jr. and Franco, J.C. (2012) Global land grabbing and trajectories of Agrarian change: A preliminary analysis. *Journal of agrarian change* 12 (1), pp. 34-59.
- Bryant, R.L. and Bailey S. (1997) *Third World Political Ecology*. Routledge: London.
- Campo.cienradios.com.ar (2013) Cual es el verdadero valor de la soja argentina.[Online], Available at:<http://campo.cienradios.com.ar/2013/03/02/cual-es-el-verdadero-valor-de-la-soja-argentina/> [Accessed 18/06/2013]

- Carballo Gonzalez, C., Boucau, F.F. and Moreira, C.J. (2012) Plan estratégico agroalimentario y agroindustrial 2010-2020. Desafíos crecientes para un desarrollo rural sustentable. XVI Jornadas Nacionales de Extensión Rural y VIII del Mercosur. Facultad de Agronomía: Buenos Aires.
- Carpenter, S.R., Mooney, H.A., Agard, J. (2009) Science for managing ecosystem services: Beyond the Millennium Ecosystem Assessment. Proceedings of the National Academy of Sciences 106 (5), pp. 1305-1312.
- Compañía de Tierras, (2013) Valor de la Tierra en Argentina.[Online], Available at:<http://www.cadetierras.com.ar/estadisticas/valor-de-la-tierra-en-argentina/> [Accessed 30/06/2013]
- Cotula, L. (2012) The international political economy of the global land rush: A critical appraisal of trends, scale, geography and drivers. The journal of peasant studies 39 (3-4), pp. 649-680.
- Derf (2013) Entre Ríos: se disputan en la Justicia 25 mil hectáreas de islas fiscales. [Online], Available at:http://www.derf.com.ar/despachos.asp?cod_des=258657&ID_Seccion=42[Accessed 08/07/2013]
- Diario Victoria (2013)Continúan los loteos ilegales en las islas de Victoria [Online], Available at:<http://www.diariovictoria.com.ar/2013/03/continuan-los-loteos-ilegales-en-islas-victorienses/> [Accessed 28/06/2013]
- Donadille, G., Postma, J., Prol, L., Stanchich, E. and Vizia, C. (2010) Informe Socio-Económico Proyecto “Conservación de los humedales y los modos de vida asociados en el Delta del Paraná”. Fundación Humedales [Online], Available at:<http://lac.wetlands.org/LinkClick.aspx?fileticket=9uNUbZzaFKE%3d&tabid=2077&mid=9757> [Accessed 02/03/2013]
- Eakin, H. and Lemos, M.C. (2006). Adaptation and the state: Latin America and the challenge of capacity-building under globalization. Global Environmental Change 16, pp. 7-18.
- FARN(2013) Ley de Bosques: 5 años con pocos avances. [Online], Available at:<http://www.farn.org.ar/newsite/wp-content/uploads/2013/02/Ley-de-Bosques.-5-a%C3%B1oscon-pocos-avances-Enero-2013.pdf> [Accessed 02/02/2013]
- Fabricante , I., Kandus, P. and Minotti, P. (2012) Urbanizaciones Cerradas en Humedales: Análisis espacial en el Delta del Paraná y en las Llanuras Aluviales de sus principales tributarios en Sector Continental de la Provincia de Buenos Aires. Buenos Aires: Fundación Humedales.
- Faro Capital (2013)[Online], Available at: <http://www.farocapital.com/faro-empresa.php> [Accessed 22/06/2013]
- Galafassi, G. (2009) La predación de la naturaleza y el territorio como acumulación. Revista Herramientas 42.

- Galafassi, G. (2004) Colonización y conformación moderna del Delta del Paraná, Argentina (1860-1940). *Revista complutense de Historia de América* 30, pp. 111-130.
- Galafassi, G. (2002) *Crisis, transformaciones productivas y cambios en la estructura agraria: la región del Delta del Paraná en la segunda mitad del siglo XX*. IN: Modernización y crisis. Transformaciones sociales y reestructuración capitalista en la Argentina del siglo XX. Bernal: Universidad de Quilmes.
- Galafassi, G. (2001) Explotaciones familiares, división del trabajo y producción en el Delta del Paraná. *EIAL* 11(1). [Online], Available at: http://www1.tau.ac.il/eial/index.php?option=com_content&task=view&id=447&Itemid=208 [Accessed 04/06/2013]
- Goldfarb, L. (2012) The frontiers of genetically modified soya in Argentina. Possession rights and new form of Land Control and Governance. International conference on Global Land Grabbing II. 2012. Ithaca – NY.
- Gudynas, E. (2010) Agropecuaria y Nuevo extractivismo bajo los gobiernos progresistas de América del Sur. *Territorio*, vol 5., pp 37-54.
- Gigena, A., Gomez, F., Weinstock, A.M., Bidaseca, K. (2013) Relevamiento y sistematización de problemas de tierra de los agricultores familiares en la Argentina. Buenos Aires: Ministerio de Agricultura, Ganadería y Pesca de la Nación.
- Kandus, P., Minotti, P. and Borro, M. (2011) Contribuciones al conocimiento de los humedales del Delta del Río Paraná. Herramientas para la evaluación de la sustentabilidad ambiental. San Martín: Universidad de San Martín.
- Greenberg, J.B. and Park, T.K. (1994) Political Ecology. *Journal of political ecology* 1, pp. 1-12.
- de Groot, R., Fisher, B., Christie, M. (2010) Ecological and Economic Foundations. Chapter 1 Integrating the ecological and economic dimensions in biodiversity and ecosystem service valuation. [Online], Available at: http://www.teebweb.org/ecological-and-economic-foundations-authors/#tabbed_box_1 [Accessed 12/07/2013]
- International Planning Committee for food sovereignty (2013) [Online], Available at: <http://www.foodsovereignty.org/Aboutus/WhatisIPC.aspx> [Accessed 12/05/2013]
- Kandus, P., Quintana, R.D. and Bo, R. (2006) Patrones de paisaje y biodiversidad del Bajo Delta del Paraná. Mapa de ambientes. Grupo de Investigaciones en Ecología de Humedales. Universidad de Buenos Aires: Argentina.
- Kandus, P., Morandeira, N. and Schivo, F. (2010) Bienes y Servicios Ecosistemáticos de los Humedales del Delta del Paraná. Fundación Humedales/Wetlands International. Buenos Aires, Argentina.

- La Nación (2012) Cepo a la compra de tierras: pierde el país y gana la región. [Online], Available at:<http://www.lanacion.com.ar/1565809-cepo-a-la-compra-de-tierras-pierde-el-pais-y-gana-la-region> [Accessed 17/06/2013]
- La Nación (2012) Historia y Leyenda de gauchos en el Delta del Paraná. [Online], Available at:<http://www.lanacion.com.ar/1510302-historia-y-leyenda-de-gauchos-en-el-delta-del-parana> [Accessed 17/06/2013]
- Loiselle, S., Rossi, C., Sabio G. and Canziani, G. (2001) The use of systems methods in the sustainable management of wetlands. *Hydrobiologia* 458, pp. 191-200.
- Malvárez, A. I. (1997) El Delta del Rio de Paraná como mosaico de Humedales. Laboratorio de Ecología Regional – UBA: Buenos Aires
- Manuel-Navarrete, D., Gallopín, G., Blanco, M. (2005) Análisis Sistemático de la agriculturización de la pampa húmeda argentina y sus consecuencias en regiones extra-pampeanas: sostenibilidad, brechas de conocimiento e integración de políticas. CEPAL: Santiago de Chile.
- Mc Michael, P. (2012) The land grab and corporate food regime restructuring. *The journal of peasant studies* 39 (3-4), pp. 681-701.
- Ministerio de Planificación Federal (2013)[Online], Available at:www.minplan.gov.ar/notas/1919-argentina-es-el-primer-exportador-biodiesel-del-mundo [Accessed 02/06/2013]
- Ministerio de Agricultura, Ganadería y Pesca, (2010) Plan Estratégico Agroalimentario y Agroindustrial Participativo y Federal 2010-2020. Ministerio de Agricultura, Ganadería y Pesca: Buenos Aires.
- McCullough, E.B., Pingali, P.L. and Stramoulis, K.G. (2008) The transformation of Agri-Food Systems, FAO and Earthscan, London, p. 17.
- Millennium Ecosystem Assessment (2005) *Ecosystems and Human Well-being: Synthesis*. Island Press: Washington, DC.
- Millennium Ecosystem Assessment (2005) *ECOSYSTEMS AND HUMAN WELL-BEING: WETLANDS AND WATER Synthesis*. World Resources Institute: Washington, DC.
- Mitsch, W.J., Zhang, L. and Gosselink, J.G. (2009) *Wetlands Ecosystems*. New Jersey: Hoboken Wiley.
- Moraes, A.S., Sampaio, Y. and Seidl, A. (2009) Quanto vale o Pantanal? A avaliação Ambiental Aplicada ao Bioma Pantanal. Embrapa Pantanal: Corumbá.
- Muradian, R., Walter, M. and Martinez-Alier, J. (2012) Hegemonic transitions and global shifts in social metabolism: Implications for resource-rich countries. Introduction to the special section. *Global Environmental Change*, vol. 22, pp. 559-567.

Neif, J.J. (1990) Ideas para la interpretación ecológica del Paraná. *Interciencia* 15 (6), pp. 424-441.

Newell, P. (2009) Technology, Food, Power: governing GMO'S in Argentina. pp. 253-281. From Clapp, J. and Fuchs, D. (2009) *Corporate Power in Global Agrifood Governance*. MIT Press: Cambridge. [Online], Available at: <http://www.scribd.com/doc/73018608/BW-Corporate-Powerin-Global-Agrifood-Governance-Food-Health-And-the-Environment> [Accessed 08/06/2013]

Página Judicial (2013) La Justicia entrerriana entregó a particulares una porción de islas.

[Online], Available at: <http://www.paginajudicial.com/justicia-entrerriana-entrego-particulares-una-porcion-islas>[Accessed 07/07/2013]

Peluso, N.L. and Lund, C. (2011) New frontiers of land control: Introduction. *The journal of peasants studies*, vol. 38, pp. 667-681.

Ramsar Convention on Wetlands (1976) *Convention of Wetlands of International Importance especially as Waterflow Habitat*[Online], Available at: http://www.ramsar.org/cda/en/ramsar-documents-texts-convention-on/main/ramsar/1-31-38%5E20671_4000_0 [Accessed 16/06/2013]

Ramsar Convention Secretariat (2006) *The Ramsar Convention Manual: a guide to the Convention on Wetlands (Ramsar, Iran, 1971)*, 4th ed. Ramsar Convention Secretariat: Gland, Switzerland.

Raudsepp-Hearne, C., Peterson, G.D., Bennet, E.M. (2009) Ecosystem service bundles for analyzing tradeoffs in diverse landscapes. *Proceedings of National Academy of Sciences* 107 (11), pp. 5242-5247.

Raudsepp-Hearne, C., Peterson, G.D., Tengo, M. (2010) Untangling the Environmentalist's Paradox: why is human well being increasing as Ecosystem Services Degrade? *Bio Science* 60 (8), pp. 576-589.

Renting, H., Rossing, W.A.H., Groot, J.C.J., Van der Ploeg, J.D. (2009) Exploring multifunctional agriculture. A review of conceptual approaches and prospects for an integrative transitional framework. *Journal of Environmental Management* 90, pp. 112-123.

Ribot, J.C. and Peluso, N.L. (2003) A theory of access. *Rural Sociology*, vol. 68, pp. 153-181.

Richards, P.D., Myers, R.J., Swinton, S.M. and Walker R. (2012) Exchange rates, soybean supply response and deforestation in South America. *Global Environmental Change*, vol. 22, pp. 454-462

Rodriguez J. (2009) *Consecuencias Económicas de la difusión de la soja genéticamente modificada en Argentina, 1996-2006*. pp. 155-259. En Bravo, A.L, Centurion Mereles, H.F., Dominguez, D.I. (2010) *Los señores de la soja: La agricultura transgénica en América Latina*. Buenos Aires: CICCUS-CLACSO.

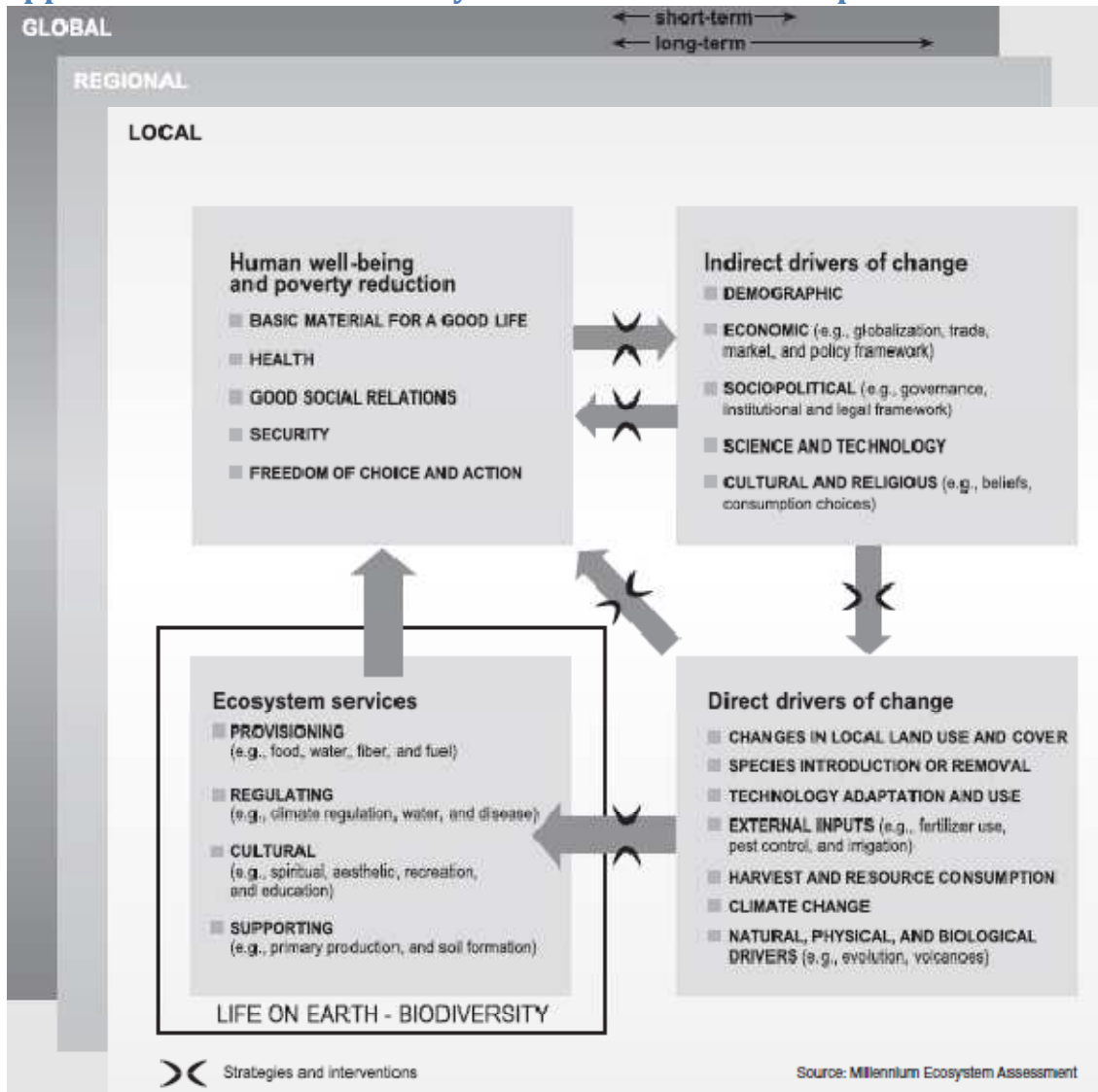
- Rodriguez, J. (2006) Soja genéticamente modificada y apropiación de renta agraria: el caso argentino”, Congreso sobre Agrobiotecnología, Derechos de Propiedad y Políticas Públicas, Corrientes. [Online], Available at: http://www.elmegafono.net/v2/images/PDF/informe_Javier%20Rodriguez.pdf [Accessed 16/06/2013]
- Robbins, P. (2004) Political Ecology: A critical introduction . John Wiley & Sons Ltd: West Sussex.
- Rossi C.A, Torra, E.A.; Gonzalez, G.L. (2006) Evaluación de los recursos forrajeros en un sistema silvopastoril del Delta del Paraná. IV Congreso Latinoamericano de Agroforesteria para la Producción Pecuaria Sustentable. Cuba, 2006.
- Stancich, E. (2009) Islas del Paraná: La última frontera. La ley de arrendamiento de Entre Ríos y el proceso de ocupación de los humedales del Delta. Rosario-Paraná: Taller Ecologista y M´Bigua, Ciudadanía y Justicia Ambiental.
- Stancich, E., Martínez, A., Ruiz, F. (2010) Humedales del Paraná. Biodiversidad, usos y amenazas en el Delta Medio. Rosario: Taller Ecologista.
- Scheidel, A. and Sornam, A.H. (2012) Energy transitions and the global land rush: Ultimate drivers and persistent consequences. *Global Environmental Change*, vol. 22, pp. 588-595.
- Tallis, H., Kareiva, P., Mariver, M. and Chang, A. (2007) An ecosystem services framework to support both practical conservation and economic development. *Proceedings of National Academy of Sciences* 105 (28), pp. 9457-9464.
- Teubal, M. (2011) Expansión de la soja transgénica en la Argentina. From: Promesas y peligros de la liberación del comercio agrícola. Pérez, M. et al. (2009) AIPE and GDAA: La Paz
- Trigo, E.J. (2011) Quince años de cultivos genéticamente modificados en la Agricultura Argentina. [Online], Available at: http://www.argenbio.org/adc/uploads/15_anos_Estudio_de_cultivos_GM_en_Argentina.pdf [Accessed 05/06/2013]
- UN, 2011. World population to reach 10 billion by 2100 if fertility in all countries converges to replacement level. United Nations Press Release. New York
- White, B., Borrás, S.M.JR., Hall, R., Scoones, I. and Wolford, W. (2012) The journal of peasant studies 39 (3-4), pp. 619-647.
- Zimmerer, K.S. (2006) *Globalization & New Geographies of Conservation*. The University of Chicago Press: Chicago.
- Zoomers, A. (2003). Land liberalisation and sustainable development in Latin America: Unravelling the land sales market of Santa Cruz, Bolivia. *International Development Planning Review*, 25(3), pp.245–262.

Zoomers, A. (2011) Introduction: Rushing for land: Equitable and sustainable development in Africa, Asia and Latin America. *Development* 54 (1), pp. 12-20.

Zoomers, A (2010) Globalisation and the foreignization of space: seven processes driving the current global land rush. *The journal of peasant studies* 37 (3), pp. 429-447.

Appendix

Appendix 1- Millennium Ecosystem Assessment Conceptual Framework



I - (MEA, 2005)

Appendix 2 - Real estate agencies interviewed during the research

Real Estate Agency	City
Arnaldi Propiedades	Baradero – Buenos Aires
Inmobiliaria Buena Maizon	Baradero – Buenos Aires
Inmobiliaria Bennazar	San Pedro – Buenos Aires
Propiedades Avenali	Ramallo – Buenos Aires
Inmobiliaria Boduso	Diamante – Entre Ríos
Campodino Propiedades	Diamante – Entre Ríos
Inmobiliaria Risso	Victoria – Entre Ríos
Miguel Guridi – Negocios Inmobiliarios	Victoria – Entre Ríos
Benitez Rolando Negocios Inmobiliarios	Guaaleguay – Entre Ríos

II - (Own Source)

Appendix 3 – Wetland Ecological Units

UEH	Patrón de paisaje	Régimen hidrológico	Vegetación
A	Lagunas no vegetadas y patrón de espiras de meandros finos. Albardones altos en tramos del Paraná	Río Paraná. Inundación estacional.	Albardones y espiras: bosque misto fluvial. Media loma: pastizal y pajonal de paja de tachar. Bajos: praderas de herbáceas acuáticas latifoliadas y graminoides.
B	Constituido por grandes superficies cubiertas de agua con algunas isletas, que se corresponden a antiguos albardones.	Río Paraná. Inundación estacional.	Isletas con praderas de herbáceas graminiformes con algunos árboles aislados.
C1	Alternancia de cordones arenosos subparalelos y depresiones anegables. Los caucos son escasos.	Río Paraná inundación estacional.	Cordones: pastizal bajo y árboles aislados. Depresiones anegables con praderas de herbáceas graminiformes y latifoliadas.
C2	Alternancia de cordones arenosos subparalelos y depresiones anegables. Los caucos son escasos.	Río Paraná y Río Gualeguay. Inundación estacional compleja.	Cordones: pastizal bajo aparecen comunidades halófitas. Depresiones anegables con praderas de herbáceas graminiformes y equisetoides.
C3	Alternancia de cordones arenosos y depresiones anegables amplias. Cursos de agua transversales a los cordones.	Río Paraná y Uruguay hacia el este. Inundación estacional compleja.	Cordones: pastizal con isletas y cordones de bosque de espinillo. Depresiones anegables con dominio de juncuales.
C4	Alternancia de cordones arenosos y depresiones anegables y formaciones de albardones asociados al Río Uruguay. Situación de transición con el Bajo Delta insular.	Río Paraná y, hacia el este, Uruguay y hacia el sur-este, maras del Río de la Plata. Régimen complejo.	Cordones: pastizal con isletas y cordones de bosque de espinillo, ceibo, tala. Depresiones anegables con dominio de juncuales y pajonales de paja brava.
D1	Zonas inundadas en forma permanente y semipermanente, edensos esteros con cuerpos de agua abierta dispersos y albardones marginales y series de espiras de meandro que acompañan cursos menores.	Río Paraná (desde el curso principal y desde el Río Victoria). Prolongado tiempo de permanencia de las aguas.	Albardones: bosques bajos con sauces y también aparecen curupí y laurel. Media loma y bajos: praderas de herbáceas altas graminiformes y latifoliadas.
D2	Zonas inundadas en forma permanente y semipermanente, edensos esteros con cuerpos de agua abierta dispersos y albardones marginales y series de espiras de meandro que acompañan cursos menores.	Río Paraná y Paraná Pavón. Prolongado tiempo de permanencia de las aguas.	Albardones: bosques bajos con sauces y también aparecen curupí y laurel. Media loma y bajos: praderas de herbáceas altas graminiformes, latifoliadas y equisetoides (juncuales y pirizales).
E	Formas de origen fluvial: secuencias de altos y depresiones conformados por albardones y espiras de meandros.	Río Paraná. Tiempos breves de permanencia de agua.	Altos: bosques de sauce. Zonas deprimidas: comunidades de herbáceas latifoliadas o de herbáceas graminiformes flotantes.
F	Constituido por una planicie que se corresponde con una antigua albufera. Se encuentra a mayor altura con respecto al resto de la región, de la cual la separa una serie de cordones litorales arenosos.	Precipitaciones locales.	Matriz formada por una pradera de herbáceas graminiformes bajas sobre las que se encuentran isletas de bosque dominado por espinillo, algarrobos y tala.
G	Constituido por los antiguos deltas de los ríos Nogoyá, Cio y Gualeguay.	Ríos Paraná y Gualeguay. Tiempos intermedios de permanencia de agua.	Albardones: bosque con especies típicas de ambientes ribereños. Media loma: arbustal y bosques bajos. Bajos o bañados: praderas de herbáceas acuáticas.
H	Constituido por la isla Iticuy. Sector topográficamente elevado.	Río Paraná. Baja frecuencia de inundaciones.	Praderas de graminiformes bajas y praderas psamófitas.
I1	Patrón de islas y caucos de distinta magnitud. Islas grandes: conformadas por albardones perimetrales que rodean áreas deprimidas.	Río Paraná, y en menor medida maras del estuario Del Plata y sudestadas. Permanencia de agua moderada.	Albardones: bosque de sauce. Áreas deprimidas: juncuales o pirizales.
I2	Patrón de islas y caucos de distinta magnitud. Islas pequeñas: conformadas por albardones perimetrales que rodean áreas deprimidas.	Maras del estuario Del Plata y sudestadas. Permanencia de agua breve. Baja influencia del Paraná.	Albardones: bosque diversos. Media loma: bosques de ceibo. Bajos: pajonales de paja brava o en el frente de avance: praderas de herbáceas graminiformes, latifoliadas y equisetoides según las características hidrológicas de los sitios.

Appendix 4 - Global and National drivers of change

In this section I will shortly describe the global and national indirect drivers of change, with the objective to present them not as mere context but as extra-local drivers. I intend to convince the reader that the actual local development which will be described in the following chapter is just a small and visible part of a broader global process. We live in a flat world where global connections have become more complex and diverse, and understanding these connections is essential for the sustainable management approach towards ecosystems.

First I will shortly describe global drivers and how are these transforming the landscape and socio-economic observed in Argentina. Moreover I will focus in the drivers (technical, climate, economical and political) behind the expansion of the industrial crops, especially of genetically modified organism (GMO) soya.

With actual world population over 7billion and still growing apace to an estimated of 9.3billion in 2050 (UN, 2011), how to feed this growing population represents one of the major global concerns of the beginning of the XXI century. The dichotomy in between food security⁶ and food sovereignty⁷ reflects the complexity behind the global governance of food and agriculture, composed of a myriad of different actors and that takes place in and across many sites within the global political economy.

Agricultural product demand is being fostered worldwide by population growth, economic growth, international biofuel promotion policies and the emergence of new financial instruments related to agricultural commodities (Turzi, 2012). In this context, the emergence of China and other developing countries like Brazil, India and Russia, which join the developed world as major players in the demand for energy and materials (Fernandez Jilberto & Hogenboom 2010) -wishing to maintain a steady flow of inputs at reasonable prices and minimal risk- is consider to be the starting point of a new historical phase of capitalism (Muradian et al., 2012). This boom in the international trade for natural resources has reconfigured land use patterns in most South American countries (Richards et al., 2012; Gudynas, 2010).

It is estimated that for a 40% increase in world population, food production would need to increase by 70% (Deininger et al., 2011). Changing diets, growing energy demand and increasing rates of urbanization are also pushing up global demand for food and fuel coming from agriculture (Cotula, 2011). The result is a growing rush for land for farming production in the developing world (Borras, 2011; Borras & Franco, 2010). With agricultural prices to increase in the following decades (OECD/FAO, 2010) agriculture will continue and increasingly become an attractive investment option. In this context land pressure is an actual, controversial and urgent issue worldwide.

⁶“The World Food Summit of 1996 defined food security as existing when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life” (WHO, 2013).

⁷“Food sovereignty is the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems”. (International Planning Committee for food sovereignty, 2013).

In South America this land rush trend for agricultural production, has resulted in a land use change towards the use of genetically modified crops, being Monsanto's roundup ready soybean (RRS) the favorite in between the agribusiness sector, devoting in total around 40 million hectares to this crop (Bravo et al., 2010). In a first stage, production increased through intensification in historically agricultural areas of Argentina, Brazil, Uruguay, Bolivia and Paraguay. However, nowadays the land rush/agricultural frontier is expanding into low population density -mostly inhabited by indigenous and campesinos populations- and ecologically vulnerable areas which provide pivotal ES to local and regional populations (Gonzalez & Roman, 2009).

Argentina represents a paradigmatic case in the global discussion because of several reasons. First, with more than 19 million hectares of GMO (Genetically Modified Organisms) crops harvested in 2012 (Goldfarb, 2012), it is the second biggest GMO crop country producer after the US. Second, with less than 3 percent of FDI as proportion of GDP in 2012⁸ – one of the lowest in the Latin American continent – it confronts global trends that radical changes in land ownership and land use correspond to rapid increase of FDI (Zoomers, 2010). The Argentinean case seems to appear as an exception to the rule; most of Argentinean land grabbing process is carried on by domestic capitals (Bravo et al., 2010). Finally, with 1.600.000 tons of biodiesel exported in 2011, Argentina is the largest exporter of biodiesel worldwide – other 800.000 tons produced are consumed in the internal market- (Ministerio de Planificación Federal, 2013), therefore implications for what happens in Argentina are important for developmental policies which promote this source of renewable fuel. It is estimated that biofuels account for 37,2% of land areas acquired in the world during the 2001-2010 period (Cotula, 2012).

Furthermore, with more than 4.600.000 has of land that were previously dedicated to other productive activities like cattle, grain, dairy and fruits, displaced for soy production in the last 5 years (Barsky & Gelman, 2009), it is of vital importance to understand from a political ecology framework who are the winners in this new dynamic agricultural re-arrangement, and why and how has this been achieved. The exponential expansion of soybean plantations in Argentinarural landscape is rearranging social and production relationships throughout the whole country (Goldfarb, 2012; Teubal, 2011; Bravo et al., 2008). A neo-extractivism process – 99% of the total harvest is exported- composed of a (1) capital-intensive and low-cost technological combination package of RRS, no-tillage and industrial fertilizers -mostly glyphosate- which results in extraordinary profit margins, together with (2) new power relationships involving a small amount of multinational companies in the supply and commercialization of the aforementioned technologies and (3) governmental development policies promoting soya plantations over other land use alternatives, is increasing the amount of socio-environmental conflicts in the region (Gudynas, 2010; Dominguez & Sabatino, 2010). High deforestation rates, high cancer rates in small towns near soya plantations due to aerial application of pesticides, and the deaths of indigenous and campesino citizens for land tenure issues region in the last years are more and more often a common image in the country's agricultural landscape (Goldfarb, 2012; Bravo et al, 2009). A research carried on by the Secretaría de Agricultura Familiar identified 63.843 families with land tenure conflicts over the land they used to farm, covering more than 9.000.000 hectares. In 91,6% of the conflicts identified, the family had no property rights, but however more than 70% had possession rights as backed by the Argentinean Civil Code (Gigena et al., 2013).

⁸ Only 30% of the total FDI considered here corresponds to capital contributions, as most of the total FDI of the country corresponds to income re-investment because of barriers to remittance profits established by the country.

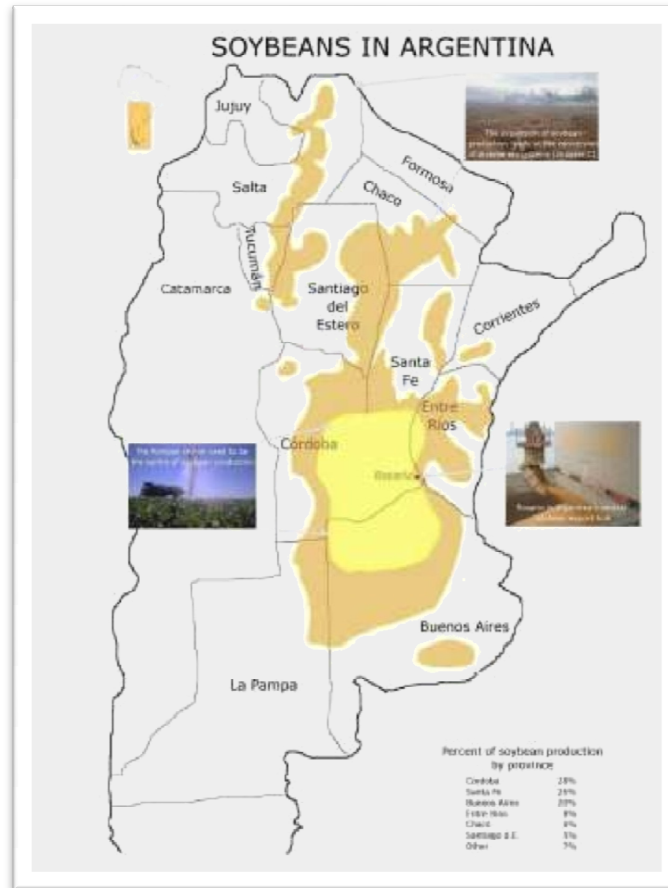
In the case of Argentina, the expansion of GMO soya, plantations has transformed the country's agricultural fame from the "Breadbasket of the World" to a "Soya Republic", based on an industrial-capitalist agriculture which tendency is capital-intensive, ongoing technological innovation, large-scale monoculture and oriented to international markets. The Argentinean economy has become again dependent in primary activities. More than in any period of the twentieth century the country depends only in one export product, increasing vulnerability to international shocks. With future prospects of a constant increase in the demand for Food, Feed, Fiber in the following decades the strengthen of a "Soya Republic" will challenge not only the state in Argentina, but also in Paraguay, Brazil, Bolivia and Uruguay.

Green Gold – Green Dessert

Since the 1970s, Argentina's soybean cultivation has been expanded progressively. Nowadays the country is the world's largest exporter of soybean oil and soybean meal – supplying about 45% of the world market - and the third country exporting soybeans after the USA and Brazil (Goldfarb, 2012). In 2009/10 Argentina reached a record soybean production of 52,7 million tons, and 55 million tons are expected for the 2012/2013 agricultural campaign (America Economía, 2013).

Argentina's steep production growth can be partly explained to a higher productivity. However, most of the rise resulted from an almost quadrupling in acreage (from 5.9 to 19 million hectares) (Teubal, 2011; Goldfarb, 2012). This increase in the amount of land devoted to soya has been at the expense of other sorts of production, land previously used for the cultivation of wheat, corn, sunflowers and sorghum (25 per cent), land previously used for the cultivation of rice, cotton, beans and oats (7 per cent), pastures and hay fields (25 per cent), and wild lands (including forests and savannahs; 41 per cent) (Barsky & Gelman, 2009). Nowadays, more than 50% of total agricultural land in Argentina is dedicated to soybean cultivation (Goldfarb, 2012).

Initially, Argentinean soybean cultivation was limited to the Pampa region. However, since the 1970s, and mostly in the last decade, soybean acreage has been spreading progressively into other regions (Manuel-Navarrete et al., 2005; Bravo et al., 2010). Its farming frontier is being pushed into forested provinces in the North of Argentina, most notably Chaco, Salta and Santiago del Estero, and in a lesser extent to the Delta region and the Patagonia (Goldfarb, 2012) (See Fig. 13). This increase in the production is accompanied with drastic rates of deforestation: data suggest that 250,000 hectares of land are deforested yearly. Unfortunately deforestation rates haven't been considerable reduce seen the sanction of the Native Forests Law in 2007, and 1.145.044 hectares of forest have disappeared since then (FARN, 2013).



IV - Soybean production in Argentina (Bravo et al., 2010)

Drivers of agriculture frontier expansion

More than 90 per cent of the soybeans produced in Argentina are exported for animal protein feed supplements and vegetable oil (Bravo et al., 2010). Soy pellets the principal by-product from the grinding process of soybeans, are primarily used for animal feed and sourced to EU countries. Several policy developments have contributed to the growing European demand. First of all, the introduction of lower EU tariffs for animal feed compared to that for other agricultural imports has stimulated the import of feed (Richards et al. 2012). Another influential policy development has been the introduction of EU animal feed regulations which prohibited the use of meat and bone meal in animal feed following the outbreak of mad-cow disease, thereby increasing reliance on imported soy.

In addition, albeit high-income countries were traditionally the principal importers of soy and its derivate, over the last years the growth in Argentinean exports has particularly been attributable to rising demand from developing economies such as China and other Asian countries (Fernandez Jilberto & Hogenboom, 2010).

Another significant driver which should not be neglected is the increasing market demand for biofuels. With soybeans constituting a popular input for biofuel production, this expansion pushed demand for soybeans further. Increasingly, Argentinean land is dedicated to soybean cultivation for biodiesel production (Scheidel & Sorman, 2012). With 1.600.000 tons of biodiesel

exported in 2011, Argentina is the largest exporter of biodiesel worldwide – other 800.000 tons produced are consumed in the internal market. It is estimated that biofuels account for 37,2% of land areas acquired in the world during the 2001-2010 period (Cotula, 2012).

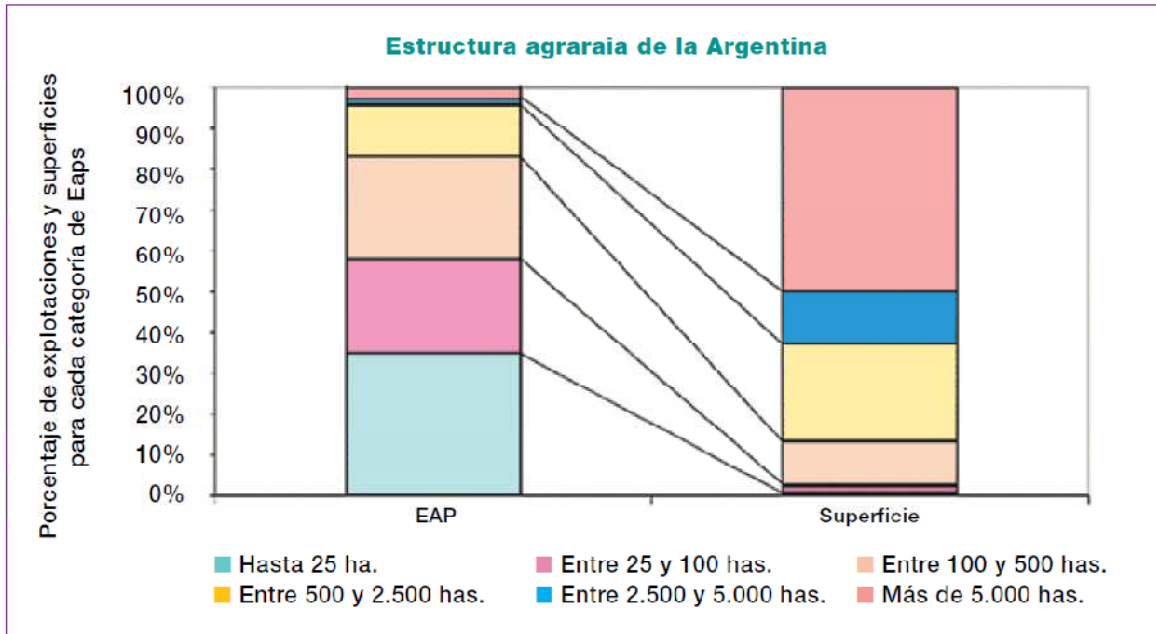
Furthermore, climate change constitutes another issue which appears to have stimulated soybean expansion, mostly in the Chaco region where in the last decade there has been a humid period as precipitation levels have increased (Manuel-Navarrete et al. 2005). As a consequence, areas which used to be too arid for cultivation have become suitable for this.

Moreover, it is assumed that Argentina's striking increase in soybean production has not been possible without certain agricultural technologies. The success of the "modelo sojero" (soya agricultural model) promoted by Monsanto and other multinational companies, together with international organizations with the support of the Argentinean government and rural organizations, is based in part to the use of a technological package composed of 3 main components: (1) No-tillage, (2) GMO seeds, and (3) use of glyphosate herbicide. This technology results in high return rates for most of the actors in the agribusiness sector as costs are considerably lowered (Teubal, 2011), even though the use of this technology doesn't result in an increase in yields compared to traditional soybeans as the food security concept promotes (Rodriguez, 2009).

The transgenic allows the producer to adopt zero-tillage technology. As weeds are not killed during the tillage process, glyphosate is used to eliminate them. The only thing left in the field after the use of glyphosate is the seed/plant. No-tillage technology requires less time, less labor and less heavy equipment compared to conventional tillage systems, and allows for cultivation in water-strained areas. This represents an extensive reduction in the costs for the farmers (Rodriguez, 2009). In addition, this technology reduces soil erosion and CO₂ emissions (Burachik, 2010).

The dependence on glyphosate as the only possible pesticide for GMO seeds results in higher levels of pests every year, as pests get stronger and resistant. Therefore the use of glyphosate per hectare of GMO soya has increased every year since its introduction. From 1,14kg/hectare used in the 1996-1999 period, its use increased in almost 15% up to 1,3kg/hectare in the 2003-2004 period (Rodriguez, 2009).

This technological package described has helped towards a concentration of land in fewer hands. In the last decades Argentinean agriculture was apace transformed in agriculture without farmers (Teubal, 2011). In the neoliberal era of the 90's, 87,000 farms disappeared, mostly farms with less than 200 hectares. In contrast, farms over 500 hectares increased in quantity, particularly the stratum of between 1000-2500 has (Teubal, 2011) (See Fig. 14). Producers who have managed to survive and stay in the area are more than ever subject to guidelines prescribed by TNC who provide not only the seed, but also the technology package involved in the model. Therefore what, how and with what technologies, production should be guided is increasingly dictated by these companies.



V - Percentage distribution of farms size and the area (Gigena et al., 2013)

The composition of Argentinean socio-demographic rural organization is a factor that seems to have influence the success of this technological package. With only 3% of the land occupy by peasant groups, capitalistic forms of organizing agricultural production have always been in the foundation of Argentinean rural history (Barsky & Gelman, 2009); “chacareros” (small and middle rural family size – farmer style) and large “latifundistas” composed the rural landscape of the Pampa region. It is believed that conditioning the conduct of fewer farmers in Argentina has accelerated the penetration of the promoted technological package, as other Latin American or Asian countries like China - with a larger amount of peasant farmers- present a more difficult “public to convince” (Bravo et al., 2010).

Besides the already mentioned technical, climate and market drivers, the agricultural expansion of soya has been consciously stimulated by governmental and industrial actors and institutions in line with particular economic and political interests. Roundup Ready soybeans were actively promoted in Argentina by agribusinesses (particularly its producer Monsanto), politicians and government. As such, its high adoption rate should not only be attributed to its technical and economic merits, but also be seen in the light of promotion and incentive strategies. In 1996 Argentina was the first country in Latin America to approve the use of RRS (Teubal, 2011). These measures have been supported and lobbied for by both domestic and foreign representatives of the powerful soy industry. With soybeans constituting an important export product of Argentina, and the soybean sector growing progressively since the mid-1990s while most other economic sectors have been troubled by market developments, soybean exports have proven to be a significant and steady source of government income. As such, it is not surprising that soybean production is highly valued and stimulated by political leaders and public institutions.

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