CIRAS Discussion Paper No.90

Lifetime of Urban, Regional and Natural Systems: examining examples from Brazil and Japan

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Photo Cover: Ricardo Fraga. Rock painting in the “Abrigo Santa Marta” (Iraquara / Bahia)

Note: Japanese names are given in the traditional order of family name followed by given name(s)

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March 2019

Contents

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Preface

This volume compiles the contributions of participants in the 3rd Brazil-Japan Seminar on Cultural Environments: LIFETIME OF URBAN, REGIONAL AND NATURAL SYSTEMS, held between 13-15 March 2018, at the Inamori Foundation Memorial Building, Kyoto University. The "Brazil-Japan Seminar on Cultural Environments" was created with the objective of promoting the encounter of scholars interested in the debate about the processes of making, interpreting and interacting with cultural environments. This seminar serves as an interdisciplinary platform that aims at promoting the exchange and collaboration between Brazilian and Japanese scholars; between scholars engaged in research about Brazil and Japan; and between scholars interested in studies of a global scope that include Brazil and Japan as case studies.

Seminar's Rationale: the relevance of "Cultural Environments"

Among the earliest records where the use of the expression "cultural environment " was employed it is worth to cite the book "The geographic basis of society (1933)", written by the American geographers Charles Clifford Huntington and Fred Albert Carlson. In that book, the geographers discussed how man interacts with the habitat from a point of view that was quite innovative at that time. They argued that man and his habitat appear to be the product of each other in a 'dynamic' process of change and interaction. In Japan, one of the first scholars to use the expression '*bunka kankyō*' was the geographer Kojima Eiji in 1938. Although this is an example that demonstrates the early appearance of this expression within scholarly writings, it is rare to find it in other writings of the Prewar period in Japan. This expression began to be largely used and gained attention during the Postwar period, at first in the writings of scholars from education related fields interested in the debate of how the living environment of children affected learning. It was especially after the 1960s period that the expression 'cultural environment *bunka kankyō*' was definitively incorporated into the debate about the dynamic and interactive relations established between man and environment. The scope of the definition and amplitude of the use of the expression was then enlarged and influenced the apparition of original writings that included the article 'Man's physical characteristics and environment', published in 1969. In this article, the anatomist and professor of Niigata University School of Medicine, Ogata Tamotsu, investigated rather the climatic and geologic alterations of the Jomon period were a cause of change in human daily life activities, that subsequently changed the physical characteristics of human bodies, a hypothesis which he tried to confirm through the study of skeletons.

Nowadays, the expression is largely used, with disparate definitions, in writings produced by researchers from varied disciplines, such as, social sciences, environmental studies, architecture and planning, anthropology, among others. The broad, integrative and inclusive range of use of this expression allows the breeding of a debate of great actuality and relevance to our global society. In an effort to understand better the causes and effects of environmental change and its relation to human living this seminar will generate an academic debate that overcomes disciplinary limitations through an integrative approach to knowledge production. Participants in this seminar are invited to think about how humans live and interact with their surrounding environments, with a debate that will support to overcome the long-standing separation between nature and culture.

DESCRIPTION of COMPILED MANUSCRIPTS: *Socio-technical transitions under a systemic approach*						
keywords: social systems, natural systems, socio-technical transitions, longevity, Earth, forest, ancient communities, terraced paddy fields, cities and regions						
	Natural System (Earth)	**Natural System (Forest)**	**Regional System**	**Regional System**	**Urban System**	**Urban System**
Title	***Geodiversity and the interactions of socio-natural systems in an Anthropocene perspective***	***Brazilian Atlantic Forest: occupation, death and protection of forest remnants and biodiversity***	***Lifetime of human occupations in Amazonia: rethinking human presence and landscape transformation***	***The spatial distribution of cities, landscape change and traditional agriculture in the Tokushima region***	***Life cycle of Brazilian cities***	***The urban system, centralities and the use of urban space in middle cities***
Synopsis	Humans as agents of intense transformation of geological systems. The text discusses the sociotechnical transitions that affected the Earth System, and focus on the transitions taking place in a case study in Brazil since mining extraction began in the 16th century. The author suggests Geoparks as a way for expanding the Earth system's longevity.	Humans as agents of intense transformation of forest systems. The text treats the sociotechnical transitions affecting forest systems, with a particular focus on the transitions taking place in a case study in Brazil. The author suggests that Private Reserves of Natural Assets (RPPN) would reinforce the possibility to enlarge the lifespan of the Atlantic Forest Biome.	Ancient management systems supported a balanced human-environment construction of ecological niches. The text treats the sociotechnical transitions that affected the maintenance of ancient communities before modernization in the Amazonian region. Colonial conquest + modern nation states as major agents for system decadence. Authors argue that the maintenance of traditional management systems is valuable for the future sustainability of the Amazonia.	Regional systems are structured after socio-spatial relationships between cities, villages and rural areas, and the technical adaptations to the local needs and available resources. The text treats the sociotechnical transitions that affect terraced paddy fields and stone walls landscapes in Tokushima Prefecture. The author asserts that the promotion of collaborative initiatives and heritage making support the maintenance of landscapes shaped during a long-term.	Varied urban systems developed in close connection to economic and political cycles, geographical locations and access to resources since the 16th century. The text contrasts the major transitions that landmarked the dynamic birth and growth of seven cities in Brazil, with examples of decaying and non-decaying cities. Heritage making and tourism as alternative for the maintenance of declining cities founded in the colonial period.	Urban systems are formed by both spatial structures and processes. The complex interaction of form and processes in cities is closely linked to the formation of spatial centers and sub-centers, and the emergence of centralities in the use of space. In this coupled interaction between spatial structures and processual centrality, urban systems are maintained. The text clarifies the spatial articulation of the system: Brazilian Urban system, middle-sized cities, cities's centers, and centralities

Major Headings	1. Introduction 2. Geodiversity: elements, values and services 3. Humans, geodiversity and geosocial moments 4. Geological time and the Anthropocene 5. Geodiversity uses and anthropogenic transformations in Chapada Diamantina, Brazil 6. Our future common with the planet: reflections and alternatives to expand the lifetime of systems	1. Introduction 2. The historical process of occupation of the Atlantic Forest 3. The first half of the 20th century and the Mata Atlantica biome: height and decay 4. The disappearance of the Atlantic forest: industries and metropolization 5. Protected remnants: the Biosphere Reserves in the Atlantic Forest and priority areas for biodiversity conservation 6. Conclusions: End or start of a new cycle?	1. Introduction 2. The first archaeological attempts to explain the human presence in the Amazon 3. First humans and the pristine nature 4. Village life 5. The recent past and present in Amazonia 6. Conclusions: The future of Amazonia	1. Introduction 2. Spatial distribution of cities in Tokushima prefecture 3. Traditional agricultural landscape and its change 4. Steep slope land agriculture system in Nishi-Awa 5. Conclusions	1.Introduction 2. Birth of pioneer cities 3. Decline and rebirth of former pioneer cities 4. New Capitals 5. Conclusions	1.Introduction 2. First level: The Brazilian urban system and the role of middle-sized cities 3. Second level: The city and social differentiation as a starting point 4. Third level: case studies 5. Conclusions

Rethinking systems: enlarged temporal and spatial scale of socio-natural interactions

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A cultural environment focus allows to broaden the actual discussion about human-nature interactions outside current paradigmatic mainstream frameworks. This is the case, for instance, related to the whole discussion about sustainability and the emergence of sustainability sciences. It is worth to mention that sustainability sciences tend to be positivist and future oriented, neglecting the study of the past and interrogations about the meaning of failure. The latter instigates a reflection about the following questions: what is unsustainability? If we consider that in the long history of planet earth large scale massive extinctions or large-scale transformations in ecosystems have occurred, is it possible to think that unsustainable paths exist within nature away from humans? It is evident that the notion of sustainability as articulated, for instance, in Agenda 2030 and the Sustainable Development Goals adopts a human centered conception of the world. In this light the notion gains relevance of sustaining the environmental balance of the planet for the benefit of preserving the human species from a potential extinction.

It is worth to mention that the human centered environmental debate has a long history, possibly earlier than the 1950s, much before sustainability as a concept gained notoriety. Among the notorious attempts it is worth to mention the international symposium on "Man's Role in Changing the Face of the Earth", funded by the Wenner-Gren Foundation for Anthropological Research, held in 1955 in Princeton. This symposium, which had been planned since the fall of 1952, engaged during its six days of discussions more than 140 scholars who collaborated as participants, contributing authors, chairs and co-chairs, and who were coming from varied disciplines of earth sciences, biological sciences, social sciences, humanities and applied fields, such as, administration and city planning. The theme, framed after discussions with the geographer Carl O. Sauer, placed man as the dominant ecological agent on the planet and aimed at linking together a discussion about earth's resources, the numerical pressure of population upon resources and man's differing cultures, or ways of life. In these discussions, the past had a precise starting point: marked by the development of the modern scientific and technological advancements that allowed humans to intervene in most of the planet's natural cycles.

When debating sustainability, it is important to clarify the relational framework in which it is embedded and the importance of dislocating the center of the viewpoints involved in that discussion. Among others, what lacks in the debate about sustainability for a more inclusive and relational sensibility is to enlarge the scale of the spatiality and temporality that are addressed. Several authors have already mentioned the importance of the enlarged spatio-temporal scale. The spatial awareness of interactions occurring at long-distances (telecoupling), or the cumulative effects of long-term interactions (Hull and Liu 2018; Tonini and Liu 2017). The study of the past not only supports the identification of cumulative processes in long-term interactions, but can also be useful to support the choices addressing potential futures. Based on a teleological approach, the definition of effective future orientations requires a deep understanding of a system's potential to support the desired change. This has been discussed, for example, by researchers interested in observing the past patterns of rivers, in order to define the future approach of the management of a hydric system (Beller et. al 2016). The study of the past is also useful for understanding patterns of lock-in and path-dependence. Some authors have noted that the sustainability transition greatest challenges are intimately related to overcoming lock-in patterns (patterns of stability/change) and path-dependence (Wieczorek 2018).

In order to deepen the understanding of the cumulative effects of enlarged temporal/spatial interactions between human societies and local environments, new research programs have been created

* See Note

such as historical ecology, which focuses on landscapes as a "multidimensional physical entity that has both spatial and temporal characteristics" (Balee 2006). This effort towards comprehending cumulative effects and change at varied spatial scales, which are on the basis of sustainable transitions, may well be also complemented by other different viewpoints that extend the concept of life to the description of complex adaptive systems, for example in the attempt of defining the characteristics of "living things" (i.e. rivers, cities, markets…) (Le Fur 2013). Both historical ecology and complex systems theory take into consideration over an extended time frame the ability of a system to regulate its internal and external features towards continuity. However, historical ecology criticizes the systemic approach for its idealized reference based on an ideal balanced system. While the systemic view might have its shortcomings, it offers a valid framework for reflecting about the enlarged spatial and temporal aspects of socio-natural interactions.

Following recent interdisciplinary developments, it becomes relevant to discuss further which and how socio-technical transitions affect different types of complex systems (planet earth, ancient communities, forest landscapes, cities). The topic has been discussed within disciplinary boundaries, for example, in the treatment of forests as "complex adaptive system" (Filotas et al. 2014), an approach that allows to envisage alternatives for the maintenance of existing systems.

In considering the question of maintenance of systems, it is relevant to assess the main transitions affecting the continuity and decay of urban, rural and natural systems. It is known that the longevity of varied systems has depended upon dynamic interactions occurring at variable levels. In planning theory, theoretical streams linked evolutionary metaphors to the livability of cities, towns and villages: human settlements existed through vital forces and energy flows (vitalism), from a holistic-organic perspective (organicism) or from a viewpoint of urban dynamics based on natural evolutionary theories (Mehmood 2010). Looking from an urban studies viewpoint, theoreticians of cities wrote about the lifetime of human settlements, about urban expansion and retraction, and eventually, some interpreted the lifetime of human settlements with analogies to ecological cycles and evolutionary models. One of the earliest was the biologist Patrick Geddes, who developed theories linking the livability of cities with their surrounding regions. Geddes broke apart with disciplinary boundaries, tried to integrate biological notions to social theories, and became a great advocate of "regional survey". Following his steps, other figures worth to mention include the American journalist, Jane Jacobs who wrote about the death and life of American cities; the historian Lewis Mumford, who wrote about the natural history of urbanization, and the mathematician Christopher Alexander who wrote about the nature of order in an acclaimed statement about cities' existence through networks. In Japan, one of the earliest to link together a theory of life to the formation of cities was the sociologist Okui Fukutaro since the prewar period. Nowadays, an accumulated knowledge towards making cities comfortable has led cities to reach high-levels of livability, able to respond to the needs of many people. Urban concentration has steadily increased, in parallel to an increment in environmental problems, depopulation of rural areas and the emergence of other issues. It becomes urgent to discuss that urbanization is an inevitable outcome of human evolution as a species and how this affects several other systems. If we consider as a fundamental characteristic of the human nature to incessantly accumulate knowledge and create technology oriented towards the well-living of humans, probably people will continue to concentrate in cities. A deep interdisciplinary reflection about the consequences and the potential alternatives to this trend is needed.

Finally, the benefit of taking an interdisciplinary approach to the discussion of the longevity of social and natural systems is that it allows to link together phenomena that would usually be treated separately. Brazil and Japan have plenty of examples of unique experiences that discussed in parallel will open new scientific paths towards closing the earth's loop at both ends of the planet. That the centrality of a city is shaped after retail and mobility is a common analysed phenomena in geography. That this could be linked to geo-social moments of the petroleum era extends temporally and geographically the possibilities of the analysis. Focusing on a systemic view of the varied components of the culture-nature coupled environments allows to illuminate a relational construction of the world and ultimately of living.

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Note

* We would like to express our gratitude to the support from the Kyoto University, Research Unit for Development of Global Sustainability (RUDGS)

Geodiversity and the interactions of socio-natural systems in an Anthropocene perspective

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Abstract

Earth Sciences´ investigations allow us to know that the planet Earth has an age of 4,6 billion years. During this elapsed time many processes changed radically some aspects of the planet. In the first four billions of Earth´s history, life was in its initial stages and was restricted to the ocean bodies. In the other remaining 500 millions of years, living organisms became more diversified, occupied the continental lands and the human society started to participate in the Earth System at about 12.000 years ago, although our species were already present at the planet for at about 200 thousand years. This means that human's presence in the planet is just a small fraction of the Earth´s history. But, on the other hand, human's modern lifestyle caused critical changes in this system, what led some scientific currents to say that we are responsible for the global warming. Beside this, the International Commission on Stratigraphy - ICS, which is the scientific body that sets the global standard for the time scale that expresses the history of the Earth, has a working group that is nowadays discussing the establishment of a new geological epoch known as Anthropocene. This new geological epoch is marked by substantial changes, in part irreversible, to the Earth System that are comparable to or greater in magnitude to other natural phenomena or processes that occurred previously in the planet, such as glaciers and volcanic activity. Will be discussed here the interactions between human societies and the geodiversity elements, which includes minerals, rocks, soils and reliefs, throughout the human history, focusing on the needs of resources to sustain the modern urban life and the myriad of limits, values and services of natural systems and their abiotic elements. Some examples will be presented, including the reality and conflicts of the geodiversity use in Chapada Diamantina, an ancient diamond mining region in the Northeast of Brazil.

1. Introduction

The history of the Earth is a subject that is in the scope of Geology. All the knowledge accumulated until the present let us believe that the planet has 4,6 billion years. We also know that most of the chemical elements are combined in the solid state as minerals, which in turn are the constituents of rocks, and both together are the basis of the Earth´s crust and of its geodiversity.

In this long-term history, the planet was submitted to many changes, such as the heat decay in its interior, crustal thickening, changes in the atmosphere composition and climate. Many questions still remain without a convincing answer, such as the origin of life. But, for instance, it is known that when the first living creatures started to make photosynthesis, they were responsible for significant changes in the atmosphere composition, that was enriched in Oxygen and caused the extinction of the primary forms of life.

The Geological time scale, defined by the International Commission on Stratigraphy – ICS (www.stratigraphy.org), establish all the subdivisions that express the global standards for the Earth history. The diversification and spread of life in the planet marks an important transition, separating the Phanerozoic Eon, that initiated at about 541 millions of years ago, from the Precambrian Eons known as: Proterozoic, Archean and Hadean, when the Earth inhabitants were not so complex and lived just in the oceans (Figure 1).

Nowadays the ICS is debating a new subdivision of the Quaternary period, which was initiated at about 2,5 millions of years ago and is marked by climate and sea level changes, in a new epoch named as the "Anthropocene". The Anthropocene Working Group - AWG advocates that the changes made by the humans in the planet are in a global scale and are comparable with natural processes that operates at the Earth´s system (Zalasiewicz *et al.*, 2017). Although the presence of our society in the planet is a brief event, the changes that we caused on its surface are notable at different scales and subject to many scientific debate, which also includes the debate about the climate changes (IPCC, 2014).

Human societies are dependent on geodiversity elements and services. In the beginning we used

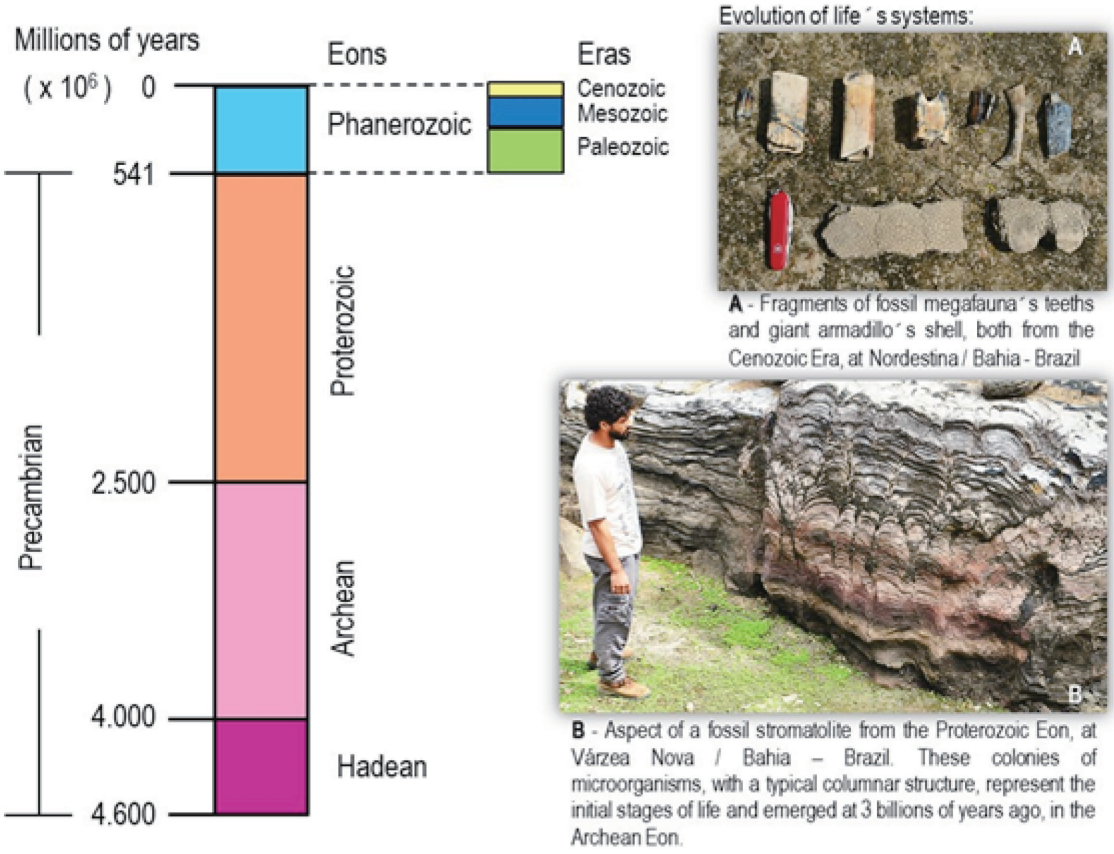

Figure 1: Summary of the Geological Time Scale, pointing the major divisions proposed by Cohen *et al*. (2013) and examples of the evolution of the life´s systems, showing fossils of microbialites, representing the initial stages of life in the planet, and fragments of fossils from the extinguished megafauna from the Cenozoic. It illustrates the advances of life forms, from micro-organisms to the megafauna, that can be found throughout the geological record.

stones to make tools, which allowed humans to hunt other species. Later, humans gained the ability to use metals to make weapons and dominate territories or use fossil fuels to make possible our mobility around the world. The use of the nature´s abiotic elements is in the basis of human history and evolution. But, despite this, for a long time the efforts towards nature´s conservancy were focused on the biodiversity elements, regarding the abiotic elements with a minor role. Looking at the future, it becomes necessary to develop a holistic and responsible view towards human ways of living, for example in cities, and nature´s conservancy. Human survival and the maintenance of human life quality depends on the ecosystem services, provided by the natural elements, and humans' ability to impact the Earth´s Systems in a planet scale.

2. Geodiversity and the interactions of socio-natural systems

Geodiversity elements includes the natural materials of the Earth Crust (ex.: minerals - Fig. 2A, rocks – Fig. 2B, soil and sediments), the processes that occur in the interior of the planet (ex.: convection currents, magmatism – Fig. 2C and metamorphism) and at its surface (ex.: weathering, erosion – Fig. 2D, hydrological cycle) resulting in the substrate, features and environments that people daily see, use and deal with. One must also point out that through this long-term history, the planet's evolution has produced environments far different from the ones known nowadays, resulting in some unique ancient products and materials.

Gray (2017) states that the word and concept of 'geodiversity' were first introduced in 1993, shortly after the Convention on Biological Diversity was agreed at the Rio Earth Summit in 1992. This author also defines it as 'the natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (landforms, topography, physical processes), soil and hydrological features. It includes their assemblages, structures, systems and contributions to landscapes'.

This means that the geodiversity elements comprise not only the natural raw materials used in the daily life around the world, but also the space where human activities take place. If so, it is possible to say that these elements possess varied types of values, much beyond the economic value, which can include cultural, functional, aesthetical, scientific,

Figure 2- A: Stalactites formed by the precipitation of Calcium Carbonate, as cave minerals at Toca da Boa Vista Cave - Campo Formoso / Bahia – Brazil, the longest cave at South America. B: Sedimentary rocks, from the Paleozoic Era (from 252 to 541 million years before the present) at the Serra da Capivara National Park, Piauí/Brazil. C: Laguna Colorada, formed by hydrothermal volcanic activity at the Eduardo Avaroa Reserve – Uyuni / Potosi - Bolivia. D: Cliffs formed by natural coastal erosion processes at the Tambaba beach - Conde / Paraíba – Brazil.

ecological and even intrinsic values. Some of these values can be exemplified in other relief features, names of cities related with geographical aspects and protected areas due to its ecological relevance. Sharples (2002) adverts that the direct values of geological, landform and soil systems to humans are the reasons most frequently cited to justify the conservation of part of the geodiversity elements, albeit not the only reasons to it, as they play many other important roles in natural environments.

Sharples (2002) also points that there is a widespread misconception, which still prevails amongst some land managers, that rocks and landforms are mostly robust, so that any special management of their values is unnecessary. Whilst this is true for some elements or features, there are many aspects of geodiversity which are highly sensitive to disturbance. For example, taking into consideration the hydrological cycle and the installation of cities in a territory, it is possible to realize how critical this misconception is and how the hydrological crisis is a reality in many places around the world (Sivakumar, 2011).

Considering the 'Ecosystem Services' approach, which include the services of: Provisioning, Regulation & Maintenance, and Cultural (Haines-Young & Potschin, 2013), it also would be possible to extend these services concept to the geodiversity elements. Taking this into consideration, Gray (2017) refers to the 'abiotic ecosystem services' or 'geosystem services' and proposes the services discussed below for the geodiversity elements:

- ✓ Regulating services - include many terrestrial cycles (Figure 3A) including the carbon, nitrogen, phosphorus and sulphur cycles as well as the rock and hydrological cycles. Also included here are geomorphological processes, that help us to understand and mitigate the natural hazards facing society and which act to regulate environmental systems.
- ✓ Supporting services - include soil-forming processes, habitat provision (Figure 3B), the land as a platform for human activities, for human burial and disposal of waste, for storage of resources including water, oil and gas and for the potential of Carbon capture and storage.
- ✓ Provisioning services - involve freshwater, mineral and renewable energy sources (Figure 3C), a wide range of construction materials, as well as industrial and metallic minerals including gold and silver. It is no exaggera-

tion to say that modern society could not exist without these geological resources.

- ✓ Cultural services - include the mental and physical benefits of being in natural environments, geotourism and leisure pursuits, historical and spiritual associations (Figure 3D) related to geological environments and artistic inspiration.
- ✓ Knowledge services - include the ability to reconstruct past environments and the evolution of life using geological evidence, environmental monitoring, education (Figure 3E) and geoforensics based on the potential to use the diverse characteristics of soils and sediments to link suspects to crime scenes.

3. Socio-technical transitions: geodiversity and geosocial moments

Velho (2006) discusses about the relations between humans and the geodiversity´s raw materials, separating the evolution of the human civilization in five geo-social moments, when the use of new Earth materials caused significant impacts in the way of living and in the establishment of future so-

Figure 3- A: Soil formatting processes involve many different cycles, such as the Carbon, Nitrogen and Phosphorus cycles as well as the rock and the geomorphological cycle (Mucugê/BA – Brazil). B: The land as a platform for human activities, including the habitat provision, is a relevant role of the geodiversity (Rio de Janeiro/RJ – Brazil). C: The provisioning of freshwater and renewable energy are important assets of nature´s abiotic elements to our societies (Sobradinho/BA – Brazil). D: Many relief features have cultural and spiritual relevance for different societies around the world (Bom Jesus da Lapa/BA – Brazil). E: The knowledge contained in outcrops and other Earth features can enable present and future societies to understand Earth history and the discovering of new mineral resources (alluvial fan outcrop in Conde/BA – Brazil).

cieties. Taking this into consideration, this author separated the evolution of civilizations as pointed below:

- ✓ First geo-social moment – with the control and use of fire, at about 1,5 million years ago, the hominids were able to improve their life quality, due to the creation of new materials such as the ceramics (9.000 B.C.) and metal alloys (6.000 B.C.). Velho (2006) says that at 11.000 years ago, at the end of the last glacial period, humans had already occupied the entire planet and were at the same technological stone age. After this period the differences had arisen at different continents and the domination of the metal alloys and weapons allowed for a supremacy of some populations above others.
- ✓ Second geo-social moment – the use of gold as currency marks another important change in the evolution of human´s civilizations. According to Velho (2006) this use was initiated at about 700 B.C. at Sarts, the capital of Lydia and located at the Anatolia Region (Asia Minor).
- ✓ Third geo-social moment – the population growth and the technological improvement registered at 18th century marks the birth of industrial cities, with the increasing use of energy and raw material consumptions, demanding the use of coal as the basis for industrial societies.
- ✓ Fourth geo-social moment – the commercial use of petroleum as an energetic resource and in the material industry marks a relevant shift in human's society, as it allowed a technological revolution and supported the emergence of a society marked by high consumption habits, supported by a variety of products obtained from this element of the geodiversity. Velho (2006) states that this industry started at August 1859, when was demonstrated, at the state of Pennsylvania in the United State of America – U.S.A., that petroleum could be obtained with drilling wells.
- ✓ Fifth geo-social moment – marked by the use of Uranium as a nuclear energetic source, which took place at the 20th century. Nowadays, Uranium represents an increasingly relevant energy source in several parts of the world, as an alternative for the oil and gas exploration.

In the hyper-connected contemporary society, the wide range of use of computational systems, made of silicon components, to control many aspects and activities of our lives could be considered as a new geo-social moment, as these have greatly interfered in our daily life in a global scale, and is based in a mineral substance that, by the way, is the most abundant component of the Earth´s crust.

Although, Velho (2006) states that the next geo-social moment will also be related with the energetic sources and believes that the use of renewable sources, such as winds, solar heat and /or tides will play an important role at a local scale. In a global scale this author believes that the controlled use of Hydrogen will provide an important shift. The author also mentions that this next geo-social moment will be related with the industrial rocks and minerals, as its consumption increases in an exponential scale and demands high quality materials.

This increased consumption of Earth´s material and services, beside the changes that humans are promoting in the planet´s natural processes are the basis for the new debate in the Earth Sciences advocating the dawn of a new epoch of Earth´s history which is known as Anthropocene, when a new stewardship of geodiversity elements will become necessary (Steffen *et al*., 2011).

4. Geosystemic transformations and the anthropocene

The geological time scale (Figure 4) encompasses a time span of 4,6 billion years. If we consider that a human being can live for a maximum of 100 years, it is possible to observe that the span of a human life is insignificant compared to the time represented in this scale. But it is also possible to consider the existence of the human species, in particular the *Homo sapiens*, that inhabited Africa since about 200.000 years ago (Harari, 2012). Even at the human species timescale, the human presence in this planet is numerically insignificant in a time range. In both cases, this explains why it is usually difficult to visualize or get acquainted to many of the geological processes that take place slowly and continuously at the Earth´s surface.

Sometimes, this lack of awareness in some projects around the world is one of the reasons that explains why governments, decision makers or stakeholders tend to ignore the variability of the time span, caractheristic of some natural geological processes, when dealing with the Earth Systems. An example of this misconception is illustrated by

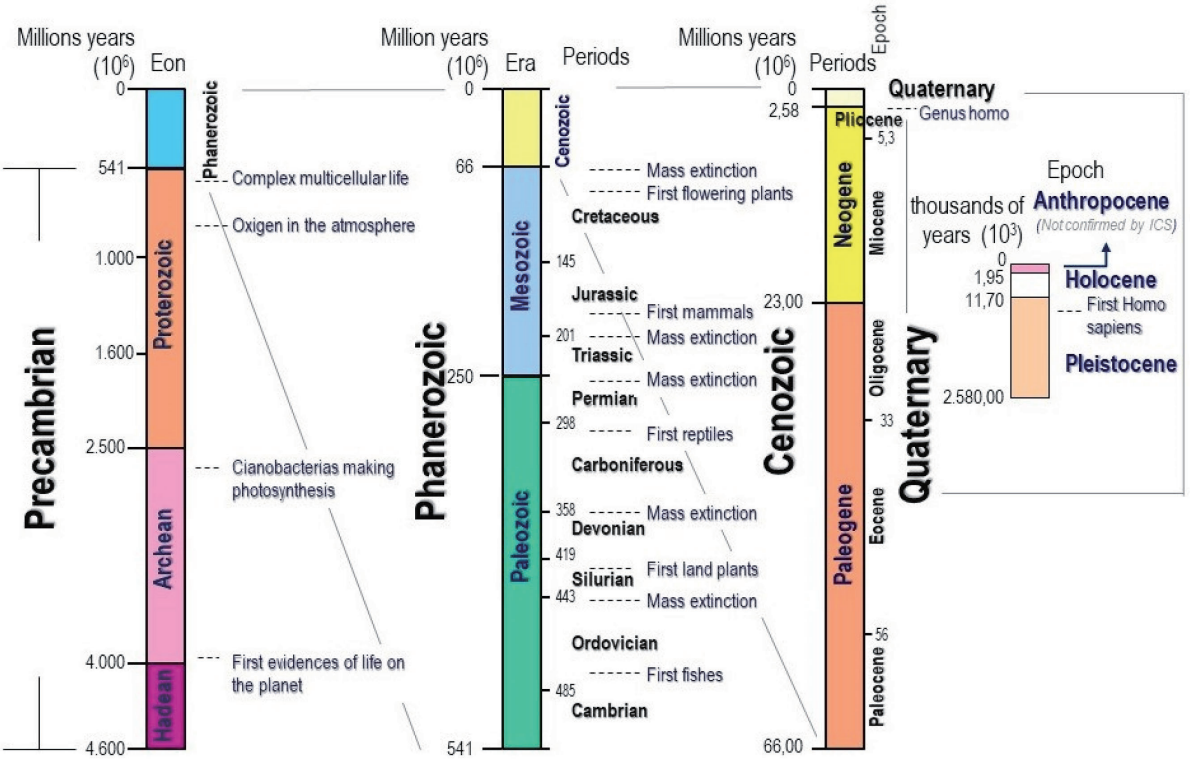

Figure 4: Geological Time Scale assuming the Anthropocene Epoch, as proposed by Zalasiewicz *et al*. (2017). The dates considered on the figure were based on the ages proposed by Cohen *et al*. (2013) and the listed events based on Teixeira *et al*. (2009).

the water crisis that took place, during the years of 2014 and 2015, in the Metropolitan Region of São Paulo - MRSP, the major city of Brazil, which detains one of the largest Water Production Systems in the world, covering 12 municipalities and producing about 33.000 liters of water per second (Soriano *et al.*, 2015).

As discussed by Soriano *et al.* (2015) the historic drought in southeastern Brazil in 2014-2015, began in São Paulo in October 2013. The consequences of this lack of rainfall, coupled with poor planning and irregular human occupation of the springs have resulted in a severe reduction of the service capacity of the main water supply system. This system counts with a minimum amount of precipitation, that greatly depends on the occurrence of a natural process. This is also part of the geodiversity and relates to the hydrological cycle, with uncertain rainfall frequency and volumes, for specific periods. Considering the historical average rainfall, the monthly measurements represent an average of a certain period, that usually is of thirty years. Thus, it is possible to foresee some expected rainfall values, but there is no guarantee neither for rain occurrence, nor for the certainty of specific values, or determined period. In the case of Sao Paulo's drought, authorities neglected the natural variations of the rainfall, along time, and the possibility of the occurrence of a drought, beside the lack of attention to changes in patterns of soil use, including disorderly occupation.

Steffen *et al.* (2011) says that, in the 21st century, there is a scarcity in critical resources, degradation of ecosystem services and the erosion of the planet's capability to absorb human waste. These authors call the attention for the speed and scale of this situation, which is fast and reaches a global scale, threatening the resilience of the Earth System. Because of this, the advent of the Anthropence -- the time interval in which human activities have reached an impact in terms of the global geological phenomena -- suggests the need to fundamentally alter the relationship between humans and the planet we inhabit. This becomes even more relevant as the evidences have emerged to show the uncertain capacity of the planet to provide the same accommodating environment that has facilitated human development, over the past 10.000 years.

The abovementioned authors place the evolution of the human enterprise in the context of a much longer Earth history and advocate for a human-inclusive Earth System, which implies that the global scale social and economic processes are now becoming significant features in the functioning of the System, of similar relevance of, e.g., atmospheric and oceanic circulation. Taking this into account, it

is possible to say that humans are part of a system that is apart of the natural ones. This is in accordance with what was stated by Claude Lévi Strauss (1976), when he says that since hominids were able to transmit rituals and culture for the next generations, a social system was created. These hominids became not only a biological being, submitted to natural systems, but also social individuals. For this author, when it became culturally established that humans should not reproduce with each ones parents or relatives, an artificial condition has been created as a shifting point of relation to nature and the human submission to natural processes.

Harari (2012) points that the first hominids appeared at the Earth System at 2,5 million years ago. At this time our ancestors, wich formed the genus homo, were already able to make tools, using stones and / or bones. The genus originated different species, which shared or disputed space at the planet, during a timespan of between 2 million and 10 thousand years ago. Although the *homo sapiens* appeared before, it is believed that they left the african continent at about 70 thousand years ago and became the only *homo* species living on the planet in the last 10 thousand years. But, since 12 thousand years ago the *homo sapiens* started to live in societies and promote changes in a wide scale. As an example, Diamond (1997) shows evidences that the extinction of the mega-fauna of the American continent, at 11 thousand years ago, was due to hunting by the ancient inhabitants of America.

If we assume that human actions on Earth´s surface is truly resulting in long-term and wide scale changes of the dynamics and processes in course on Earth System, it becomes valid to point out when these changes started to be significant and reached a global scale. Zalasiewicz *et al.* (2017) present a dataset that provide robust evidences for the establishment of the onset for the Anthropocene at mid-20th century. Such data includes the increase in anthropogenic halocarbons and radionuclides (239+240Pu), also observed in the abundance of greenhouse gases at the atmosphere. About the Radionuclides, these authors highlight that they were derived primarily from nuclear weapons tests, showing an increase after 1950, that was followed by a marked decrease during the decades of 1960s and 1970s. They also point that the presence of microplastics in samples from the distal or slowly-accumulating deep marine oozes, is an imprint and recognizable stratigraphical evidence of the Anthropocene.

Therefore, it is possible to believe that in the same way that humans create new social rules, humans have also been able to create new kinds of environments, that are related to artificial processes, such as: industries (Figure 5A), mines (Figure 5B), pasture (Figure 5C) and cities (Figure 5D). These could be named as anthropocenic environments and in such places a huge amount of materials is processed in a short time span, overwhelming the capacity of the Earth natural systems to reach a natural balance. In each of these environments we will face situations that must be managed -- such as wastes and effluents to be treated, discarded or reused; or floods and / or erosion -- that must count with an adequate infrastructure to be avoided, including measures against the risk of desertification, due to deforestation and episodic rainfall that can remove the organic soil. These places create artificial conditions to support an increased amount of population, which will demand an increase of the 'Ecosystem Services' from the geodiversity, that sometimes cannot be supported in a natural scale, reaching a limit for the artificial - urban or regional - system or even for the natural system.

As dynamic systems, the Earth Systems are submitted to many changes. Since the emergence of life in the Archean Eon (between 3.850 to 2.500 million years before the present - Figure 4), most of the processes that take place above the crust and the environmental conditions have been modified. As these organisms were photosynthesizers, the composition of the atmosphere became enriched in Oxygen, what caused the deposition of iron ores in the oceans (Teixeira *et al*., 2009). Nowadays, as humans promote changes in the natural mass balance of the Earth, a new equilibrium must be reached. The Anthropocene just testifies that the humankind is a new geological agent. When we recognize that we are able of changes in the scale of the Earth System, we will be able to investigate the environmental conditions that future generations will need to deal with.

5. Anthropogenic changes and geodiversity in the landscape of Chapada Diamantina - Brazil

Chapada Diamantina is a region located in the central part of the Bahia state (Figure 6), in the northeast region of Brazil, that comprises highlands sculpted in sedimentary rocks from the Proterozoic Eon and occupies an area of about 65.000 km^2. Its history is marked by the ancient mining activity of

Figure 5- A: Petrochemical complex in Camaçari / Bahia – Brazil, one of the biggest at South America. B: Silver mine of Potosí / Bolivia, which was the main silver production area in the Spanish colonies and operates since the 16th century. C: Pasture in the countryside of the State of Bahia / Brazil. Nowadays the country holds one of the main positions in the meat production in the world. D: The city of Salvador, capital of the state of Bahia, was the main harbor of the southern hemisphere until the 18th century. Nowadays, with almost 3 million inhabitants, it is the fourth largest city in population numbers in the brazilian scenario.

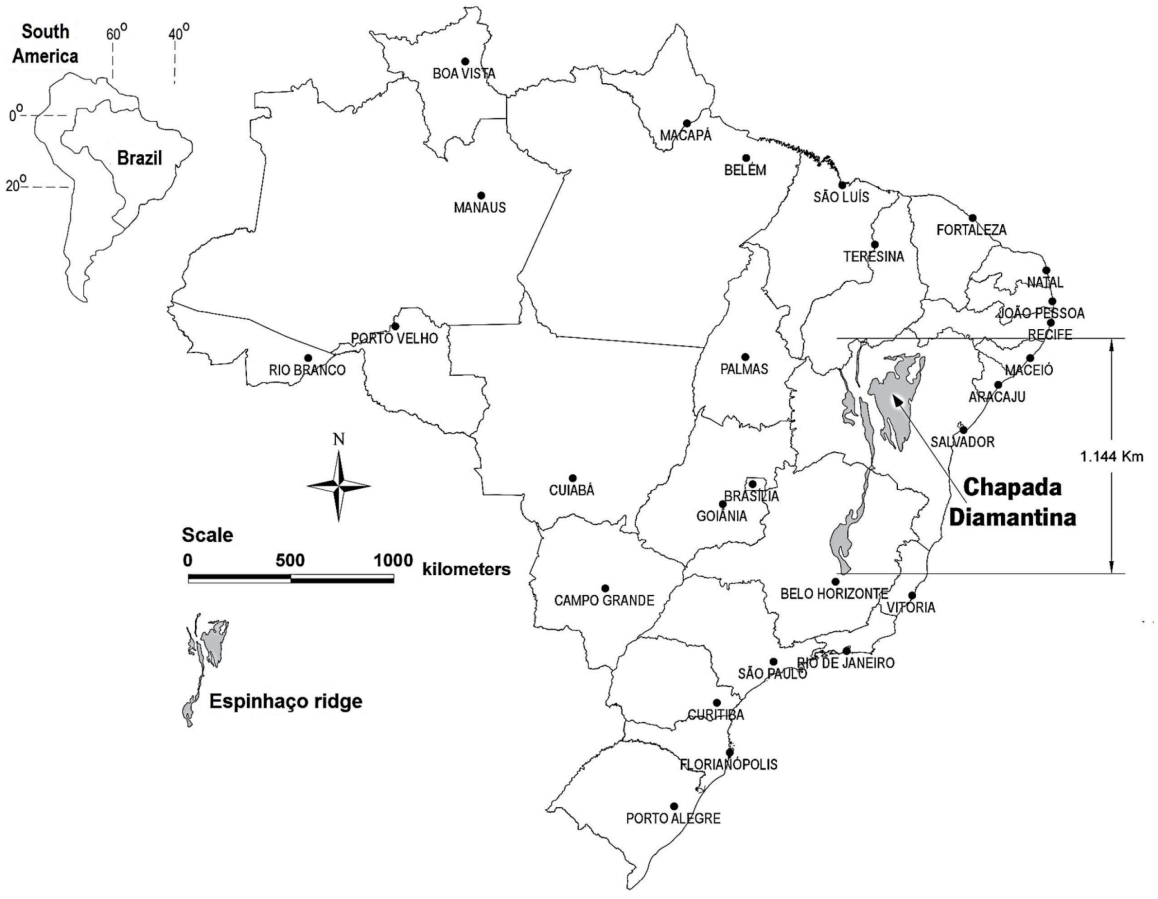

Figure 6: Location of the Chapada Diamantina region in the Brazilian context. It represents the northernmost part of the Espinhaço ridge, which extends in the North/South direction, for about 1.200 kilometers, at the oriental portion of the country.

gold and diamonds that drove its initial colonization during the 19th century, during the Brazilian colonial times.

Its mining potential was initially pointed out by the naturalists Spix & Martius, during their trip in Brazil between 1817 and 1820 (Spix & Martius, 1976). According to Teixeira *et al.* (2005) Diamonds were found at this region in 1844, at the place where nowadays is located the city of Mucugê. This discovery intensified the migration for that region and was responsible for the establishment of the main settlements existing at Chapada Diamantina. At 1867, when diamonds ores were found at South Africa, the price of this mineral fell and Brazil lost the international hegemony in the trade of diamonds, what caused the decay of the mining activity and the decadence of most cities at this region.

With the building of London´s subway and the Panama Canal, at the end of the 19th century, there was an international demand for abrasive materials. At this time, the black Diamond locally called as *carbonado* and without value as a gem, started to be used in the drills, resulting in another stimulus for the mining activity, that lasted until the first decade of the 20th century. Based on this, one can notice that this mining cycle spanned for about 60 years, when many cities thrived at the region (Teixeira *et al*., 1998). But, with the Diamonds shortage, when its extraction was not available by employing the traditional methods, most of the population moved away, cities declined and just traces of the ancient prosperity were left on the territory. Nolasco (2002) estimated the populational variations for a group of main cities in the region, which is summarized in Figure 7.

The decline of the region lasted until the 1940s decade of the 20th century, when the second world war led to a rise in the demand of *carbonados* from the region, these were used in rock drillings and in the ignition of airplanes and submarines. After this cycle a new decline is registered and the recovery lasted until the 1970s decade, when new technologies began to be used in the mining of Diamonds, but at this time another cycle was about to begin in the region.

During the 1970s decade of the 20th century mechanical methods began to be applied on river channels and the mining activities started again. But at mid-80s the mining activity was forbidden by federal legislation, as the environmental awareness started to call attention and nature´s conservancy concerns started to be an important issue at the region, culminating in the creation of protected areas, including a national conservation park. Chapada Diamantina houses the springs of the major rivers of the state of Bahia, including the Paraguaçu river, which responds for almost 60% of the water supply for the metropolitan region of Salvador, the capital of the state.

With the creation of the protected areas a new economic cycle, based on tourism, started at Chapada Diamantina. The region represents today one of the main natural destinations for tourism in Brazil (Brito, 2005), receiving tourists from all over the world, that travel there to visit mainly sites related to its geodiversity, such as caves, waterfalls, hills and ruins of ancient mining activities (Figure 8). Although the visitors travel there due to its natural aspects, most of the landscape has been modified by the mining activity and the evidences of these activities can be found everywhere as tailings piles, dams, water channels and ruins. Nolasco (2002) describes the anthropogenic deposits and classify them as anthropocenic evidences of that territory.

Nowadays the region of Chapada Diamantina has a strong mining identity and counts with other economic activities, but the tourism plays an important role in the cities of Andaraí, Mucugê, Lençóis and Palmeiras, that were previously dedicated to the mining and trade of diamonds. In Mucugê, agriculture also represents an important income to the municipality. Mining activities took diamonds from the region and left poverty and significant environmental transformations, including deforestation, erosion and silting of rivers and springs. The geodiversity of Chapada Diamantina was the main asset that led to its occupation in the past, and is still the main aspect that enables touristic activities in the present.

6. Our future in common with the planet: reflections and alternatives to expand the lifespan of systems

Predict the lifespan of urban, regional and natural systems is such a great challenge, of similar scale to that of predicting the humankind extinction. Episodes of mass extinctions are part of the geological record since the beginning of the planet (Figure 4). Some of them are well explained, but some remain without convincing explanations. Looking at a dynamic system like the Earth System, sciences cannot ensure exactly how the future will be, but there is a possibility to build reasonable

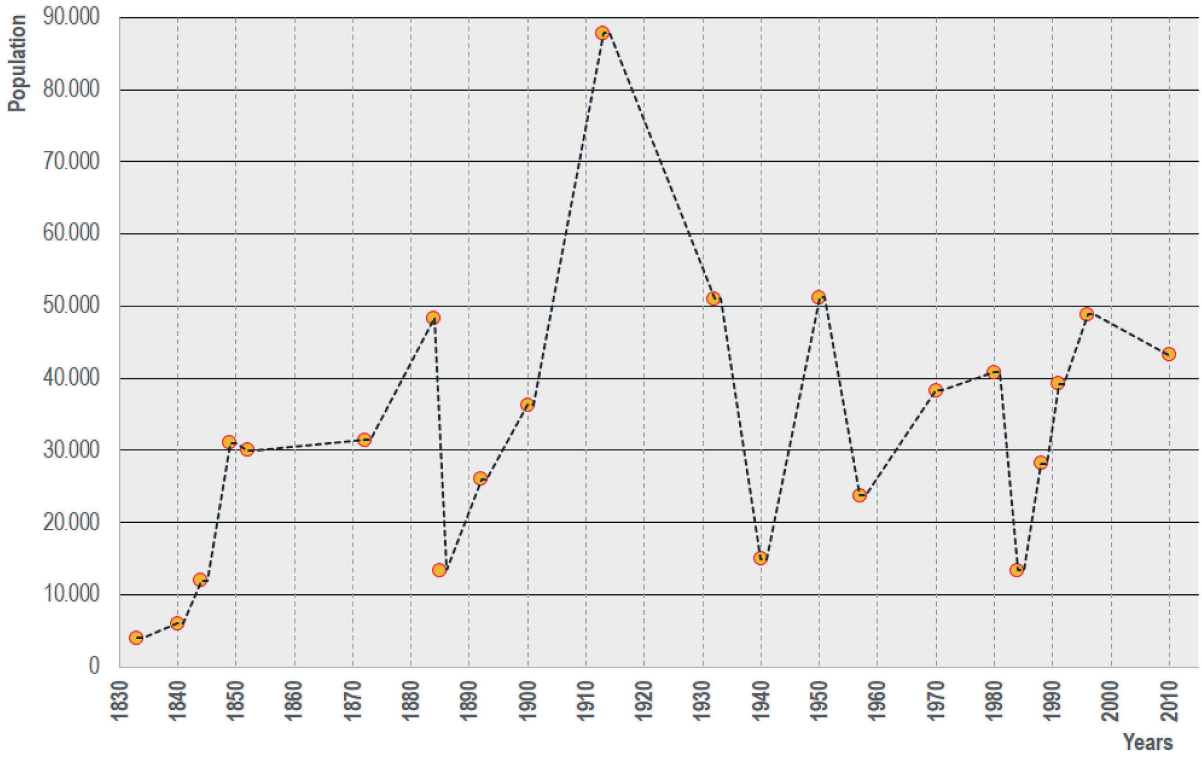

Figure 7: Historical estimated evolution of population in Chapada Diamantina, considering the data presented by Nolasco (2002) and the population for the major mining cities, namely: Andaraí, Mucugê, Lençóis e Palmeiras.

Figure 8: Ruins of houses at Xique Xique de Igatu, a district of the city of Andaraí that was an important mining village at the past, with about 4.000 inhabitants. Nowadays its population counts less than 500 inhabitants. The ruins, that are found eveywhere at that district, testify the opulence of the past history. The white sandy river plain, in the back of the ruins, is a result of this ancient activity, when the sediments were washed to find the diamonds, resulting in the silting of most rivers.

scenarios and manage the social and economical processes needed to reach the best modeled ones.

Meadows *et al.* (1972) made a formal world model, attempting to bring together the large body of knowledge that was available until the 70th decade of the 20th century. This model considered the parameters of food, nonrenewable resources and pollution absorption, as well as, the growth and maintenance of population and industry, in the time span from the year 1900 to 2100. It also considered the cause-and-effect relationships among the five listed factors and analyzed how a change in one variable might ultimately affect each of the others.

At that time, the abovementioned authors con-

cluded that the shortage in the doubling time of many of man's activities would bring the human society close to the limits of its growth surprisingly soon. Although they wanted to emphasize that the model just pointed general behaviors and not the numerical values, which were only approximately known, the curve for the population growth reaches its peak at the year of 2050, starting to decrease after it, mostly due to nonrenewable resource depletion. Nowadays, it is possible to consider that the present technological scenario is much different from previous ones, and many new materials and industrial processes have been created and used at the present, inputting new perspectives to this model and expanding the lifespan of urban and regional systems.

Almost 15 years later, the concept of sustainable development entered the global agenda. It was first ennounced in the UNESCO (1986) report, also entitled as "Our Common Future", which defined the sustainable development as the kind of development that meets the needs of the present human societies, without compromising the ability of future generations to meet their own needs. As is clear in this statement, this is an anthropocentric concept, relegating to the natural systems a minor role, neglecting Earth System´s intrinsical value, that is far relevant in a geological time perspective and more remarkable than solely being treated as a source of resources for our societiy´s needs.

The UNESCO´s (1986) report already considered that, by the turn of the 20th century, almost half of the world would live in urban areas – moving from small towns to huge megacities, and also that the economic growth would lead to improvements in living standards. This has also sometimes been achieved in ways that are globally damaging in the longer term, leading to unforeseen effects on the environment. The report also assumed that, at that time, the pressures on the planet were already unprecedented and were accelerating at rates and scales that were new to the human experience. In the other hand, the report believed that the new technologies and the potentially unlimited access to information constituted great promises. Based in such assumptions they concluded that our societies´ challenge to the future would lead to the shifting of the focus of attention to environmental policies in a world basis.

This global agenda is considering the cause-and-effect relationships -- that are intrinsic to Earth, as much as to urban and regional systems. It recommends the achievement of common and mutually supportive objectives, with aspirational goals for the world community that takes into account the interrelationships between people, resources and development, and is concerned with a long-term environmental perspective. This agenda can be considered a fortunate pact that resulted from the sustainable development concept, with positive impacts over geodiversity assets.

In an Anthropocene perspective we must recall the land ethics paradigm (Leopold, 1949) which considers the Earth System as a community to which we belong, and expands the definition of "community" to include not only humans, but all the other parts of this system, as well: soils, waters, plants, and animals, that this author called as "the land". We must also understand the sustainable development in its broadest sense, glimpsing that its strategy aims to promote harmony among human beings and between humanity and nature.

This broad view drives us to the geoparks strategy as one alternative -- among others in this Anthropocene perspective -- to foster local initiatives that can expand regional and natural systems´ lifespan, and which can be implemented in cities and / or territories that hold a geological heritage with regional or international relevance. UNESCO (2016) defines Geoparks as single geographical areas, where sites and landscapes of international geological significance are managed under a holistic concept, that merges protection, education and sustainable development. It uses its geological heritage, in connection with all other aspects of the area's natural and cultural heritage, to enhance awareness and understanding of key issues facing society.

Henriques & Brilha (2017) point that the implementation of targeted local projects with a global reach is a challenging task, but the mechanisms and actors usually involved in the creation of a geopark can be of great usefulness to conceive other action plans, fostering global understanding as a tool to achieve sustainable development goals.

In a global perspective, the Global Geopark Network -GGN is a legally constituted not-for-profit organization founded in 2004. It is a dynamic network where members are committed to work together, exchange ideas of best practice, and join in common projects to raise the quality standards of all products and practices of a UNESCO Global Geopark (http://www.globalgeopark.org/index.htm). Until May 2017, this network counted with 127 Geoparks in 35 Member States (Figure 9). If in

one hand the Geoparks are an increasingly applied strategy in Europe and in the Asia – Pacific Region, in the other hand its growth in the Americas faces a rather slow rate.

The Japanese Geopark Network - JGN (http://geopark.jp/en/) comprehends a geopark as a single and unified geographical area, where people conserve important geological heritage and landscape, as well as utilize this Earth heritage for education, disaster mitigation activities and geotourism, all with the aim of reaching a sustainable development for local communities. This network is a specified non-profit organization which provides support and a networking platform for Japanese Geoparks and aspiring geoparks. The JGN consists of 8 UNESCO Global Geoparks, 35 National Geoparks and 14 aspiring geoparks listed as associate members. The network also has supporting members, both individuals and private companies that want to support geoparks.

Brazil counts with just one Geopark, namely Araripe Geopark (http://geoparkararipe.org.br/), which was the first geopark of the American continent and, since the year of 2006, represents the only case of successful geopark implementation in the country. As geoparks must be based on bottom up approaches, linked with local identities, this may be one of the reasons that the geopark projects spread in the country in such a slow rate. As pointed by many authors (Fausto, 2012; Schwarcz & Starling, 2015; Holanda, 1976), since colonial times the local and regional identities have not been encouraged in the country and national governments always chased all the initiatives that tried to foster local commitments. These authors also highlight that the building of a continental country is historically the focus of national policies in Brazil, at the expense of strengthening local identities.

Although the country has yet to develop a national geopark network, some local proposals are in course, driven by different kinds of initiatives. These can be promising emerging alternatives for the future of the Brazilian regional and natural systems, or even for some urban systems, fostering the citizenship and a holistic nature conservation policy, based in a land ethic perspective and more sustainable basis. As an example, it is worth to point the proposals for the creation of three geoparks lo-

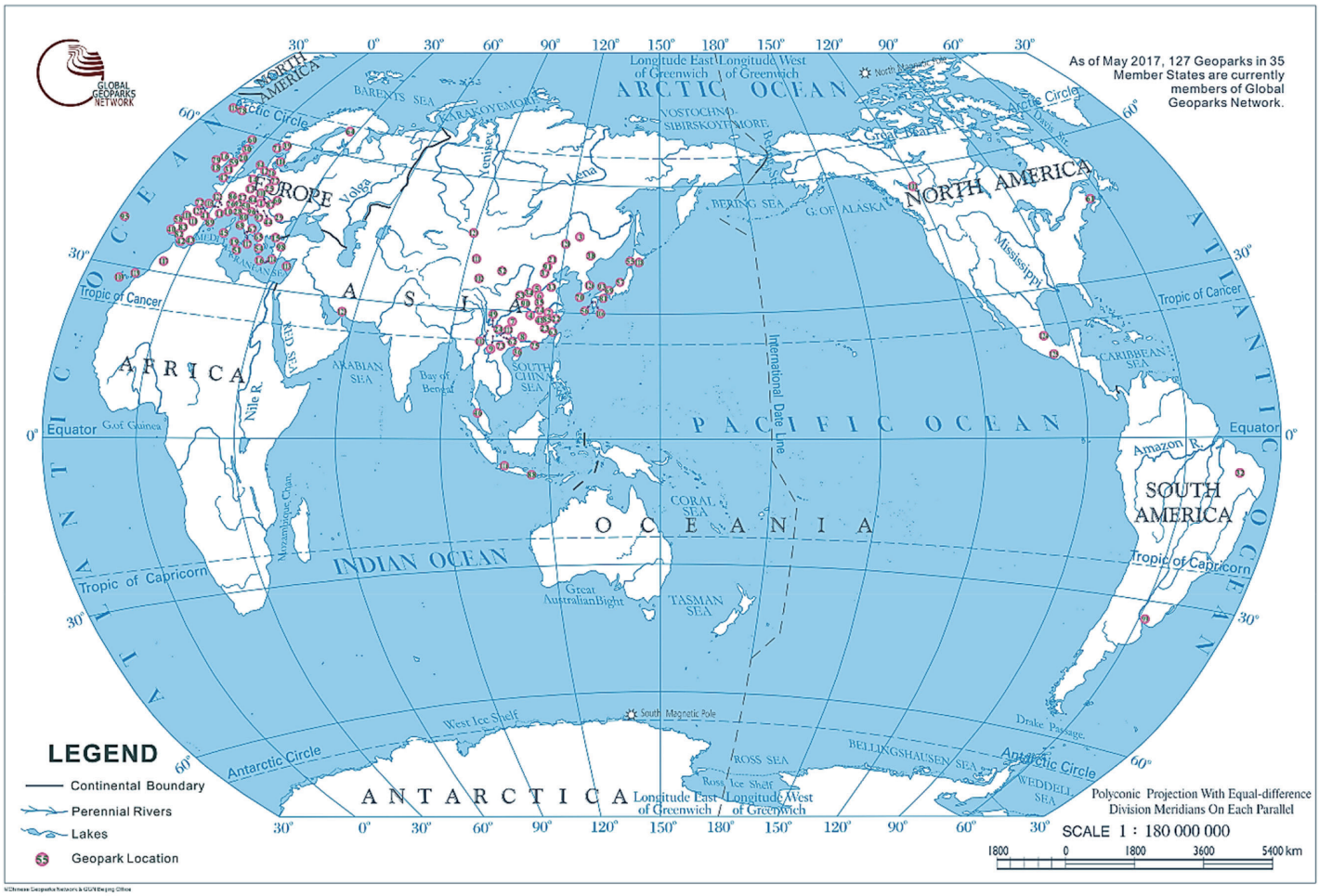

Figure 9: Distribution of Global Geoparks Network members. http://www.globalgeopark.org/homepageaux/tupai/6513.htm

cated at the region of Chapada Diamantina (Rocha & Pedreira, 2014; Pereira *et al.,* 2017, Martins *et al.,* 2017), which counts with relevant geodiversity assets and a historical unsustainable process of mineral exploitation, that took off valuable resources and left a poverty trail and / or demise in face of most of the urban systems at that region.

The socio-natural systems in Chapada Diamantina are marked and linked by a strong mining identity, due to its history, although this is not the main economical activity at most of the cities at that region nowadys. Tourism raise as a sustainable alternative, in cities that were the main urban systems during the ancient mining period. The legacy of this activity, alied with some geodiversity elements, are the touristic assets for localities that are marked by Anthropocene transformations of local natural systems. This cultural and geological heritage are the assets that motivated the local geoparks projects, and can be used in educational and geotourism activities, fostering locally the understanding of global dynamics in the Earth´s system, and globally testimoning the ability of social systems to fastly trasnform the natural systems, besides the need for long term planning to achieve the sustainability of urban and regional systems.

Geoscicences provide important informatons, tools and alternatives for a sustainable future, when a new stewardship of geodiversity elements will be critical to support and expand the lifespan of urban and regional systems. Geopark projects are one of these possible tools, which can be applied in local scale, but facing global challenges. Humans´history shows that transformations in the management and use of geodiversity assets are the paramount trigger for the shiftenning of geo-social moments, marked by technological advances and prosperity of human societies. Assume the Anthropocene epoch and the global scale transformations of Earth System by human societies, is an alternative paradigm that must be adopted by policy makers and consumers, to ensure better practices for our future in common with natural systems, reinforcing the role of Earth Sciences in the implementation of the Sustainable Development Goals, as a planetary agreement for social development in harmony with nature´s dynamic systems.

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The Brazilian Atlantic Forest: occupation, death and protection of forest remnants and biodiversity

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Abstract

Metropolitan dynamics totally remodel natural systems. Is it an inevitable process of destruction of the latter, or are there possibilities of socio-cultural and political co-existence? The Atlantic forest biome, formed by diverse forest ecosystems, is a long coastal area extending from south to northeast of Brazil, presenting a variable depth, reduced to a narrow coastal strip in the North and Northeast from the state of Amapá (AP) to the city of Salvador (BA), but entirely covering the States of Espirito Santo and Rio de Janeiro, and wide stretches of the southernmost states. It is the most anthropized biome in the country.

These coastal regions were the first occupied by the Portuguese colonization and are the areas where much of the economic cycles of the Brazilian history were developed and where, for that reason, the destruction of the nature has been more profound. Geographical factors such as the location and availability of natural resources, such as abundant wood, were favorable to the installation of the political and economic power centres, and these coastal areas became the site of construction of two of the former Brazilian capitals, the cities of Salvador and Rio de Janeiro.

In the first half of the twentieth century this untouched ecosystem still covered the center-west of São Paulo State? and the north of Paraná State?. But historical, socio, cultural, and political factors contributed to its decay: the colonization and occupation of the coast and the progression of a pioneer front base on the development of agriculture, especially coffee plantations, caused the destruction of this dense vegetation. The logging activity, in particular, led to the conversion of the forest into an agricultural domain, where maize and wheat were first produced, and then soybeans. The use of timber? for construction, transported on railroads which later, served as a base for the industry of São Paulo, led to the near disappearance of this biome. It was also during this century that the installation of industry, concentrated in the areas near the city of Cubatão in Sao Paulo State, and the emission of polluting chemical substances in the air, constituted important factors for the destruction of the forest itself.

Currently, there are only remnants of this biome usually on riverbanks or in hard-to-reach areas, and it covers less than 7% of its initial extension. Since the late 1970s, the notion of environmental protection gained global relevance and began to guide public policies around the world. This notion has also made promising advances in the national context because it has gained voice through the pressure from nongovernmental organizations such as SOS Mata Atlântica, ISA, WWF, Greenpeace. As a result, these remnants were declared a Biosphere Reserve by the United Nations Educational, Scientific and Cultural Organization (Unesco). Its conservation can nowadays rely on specific environmental legislation and biodiversity conservation policies that contribute to the fulfillment of the country's international commitment towards multilateral institutions.

However, this coastal area simultaneously shelters, between the cities of São Paulo and Rio de Janeiro, a region of intense urban-metropolitan dynamism which provokes conflicts of use of the territory. Are these reserves, and the group of protected areas of this biome, able to resist to the situation or would these fail to do so, which would lead to the final demise of these natural systems? Or would public actions articulated with those of society, allow the beginning of a new cycle?

1. Introduction

Metropolitan dynamics totally remodel natural systems. Is it an inevitable process of destruction of the latter, or are there possibilities of socio-cultural and political co-existence with them? Before the industrialization period, the Atlantic forest biome, formed by diverse forest ecosystems, was a long coastal area extending from south to northeast of Brazil, presenting a variable width. Reduced to a narrow coastal strip in the North and Northeast from the state of Rio Grande do Norte (RN) to the city of Salvador (BA), it covered entirely the states of Espírito Santo and Rio de Janeiro, and wide stretches of the southernmost states. Having lost 93% of its original vegetation it is nowadays the most anthropized biome in the country, as shown in figures 1, 2 and 3.

These coastal regions were the first occupied by the Portuguese colonization and are the areas where much of the economic cycles of the Brazilian history were developed and where, therefore, the destruction of the nature has been more profound. Geographical factors such as the location and availability of natural resources, such as abundant wood, were favorable to the installation of the political and economic power centers, and this coastal area became the site of construction of two of the former Brazilian capitals, the cities of Salvador and Rio de Janeiro.

In the first half of the twentieth century, this ecosystem, little modified, still covered the center-west of São Paulo State and the north of Paraná State. However, historical, socio-cultural and political factors contributed to its decay: the coloniza-

tion and occupation of the coast and the progression of the agricultural pioneer front, especially coffee plantations, caused the destruction of this dense vegetation. The logging activity, in particular, led to the conversion of the forest into an agricultural domain, producing maize and wheat, and then soybeans. The use of timber for construction and as fuel for railway locomotives, which served as a base for the industrial development of São Paulo, led to the near disappearance of this biome. Later in this century the installation of industries, concentrated in the areas near the cities of Cubatão (SP) and São Paulo (in São Paulo State) and the emission of chemical substances in the air constituted important factors for the destruction of the forest itself.

Currently, there are only remnants of this biome, usually on riverbanks or in hard-to-reach areas, such as mountainous areas covering less than 7% of the initial total forest extension. Since the late 1970s, the notion of environmental protection has gained global relevance and began to guide public policies around the world. This notion has also made promising advances nationwide because it has gained voice through the pressure from nongovernmental organizations such as SOS Mata Atlântica, Instituto SocioAmbiental (ISA), World Wide Fund for Nature (WWF), Greenpeace. As a result, these remnants were declared a Biosphere Reserve by the United Nations Educational, Scientific and Cultural Organization (Unesco). Its conservation can nowadays count on specific environmental legislation and biodiversity conservation policies that contribute to the fulfillment of the country's international commitment towards multilateral institutions.

However, this coastal area also shelters many cities along this strip between São Paulo and Rio de Janeiro, a region of intense urban-metropolitan dynamism, thus provoking conflicts of use of the territory. Are these reserves, and the group of protected areas of this biome, able to endure given the situation, or will it reach the final demise of these natural systems? Would public actions, articulated with those of the society, be enough to allow the beginning of a new cycle?

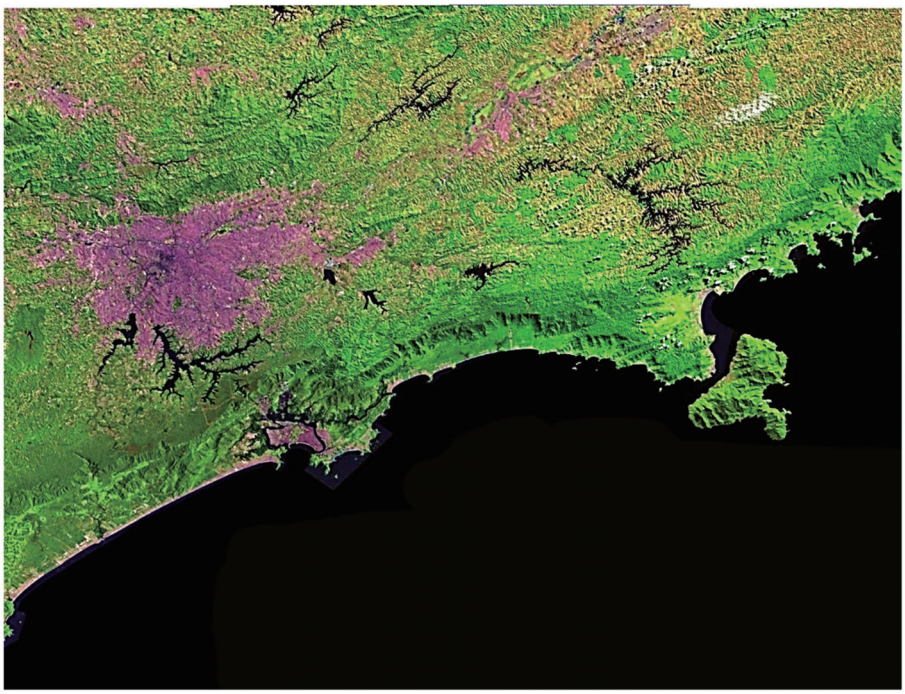
There is a lack of consensus on the total surface originally covered by this biome. The figures vary depending on each institution dealing with the ecosystems of the Atlantic Forest, but all agree on the fact that currently only fragments remain. Following the legal definition of the Mata Atlântica (law 11.428. Brasil, 2006), this study adopted the value of 1,309,736 km^2 of a Brazilian territory that shelters more than 72% of the Brazilian population.

In order to understand the dynamic transformations of present time it is irrelevant to look back as far as the arrival of the Portuguese, but the structuring of spaces resulting from the occupation process, and the mechanisms created to facilitate it, resulted in the reduction of the remnants that can be found today. Many of the Brazilian economic cycles occurred in the Atlantic Forest region, causing the exploitation of natural resources that prevail in the area. In this area are located the São Paulo and Rio de Janeiro metropolises, interconnected by the Paraíba do Sul Valley, as well as 13 out of the 27 Brazilian capital cities and about 75% of the Brazilian GDP is concentrated there. On the other hand, it is a biodiverse region of great importance for national conservation policies.

2. The historical process of occupation of the Atlantic Forest

It is worth to share some ideas and findings from Warren Dean's book "With Broadaxe and Firebrand" (1996) that became a classic in environmental history for anyone studying the Atlantic Rainforest as he analyzes the entire process of its destruction, although he was not the only one to highlight this fact. The destruction of this ecosystem had in land appropriation, one of its strongest inducers. From the nineteenth century the states controlled the land public patrimony and the land law (Lei de Terras), passed in 1850 was its mainstay guaranteeing the regularization of illegal occupied lands. Initially under the responsibility of the federal government, in 1891 they were transferred to the States and in 1895, the State of São Paulo placed the public lands for sale. Some criteria were established. For example, no buyer could claim more than 500 hectares of forests; and this measure extended up to 1.000 hectares of land forests when they were already occupied. However, land registration was not done, disputes marked political arenas and power groups within the state, *local people* failed to transform their rights as occupants into property titles and switch to commercial production. This process has brought about the acceleration of the destruction of the Atlantic Forests and this process has been now repeated in the Amazon pioneer frontiers (Mello-Théry, 2011).

The economic occupation of the forests in the country began in the 1790s, starting from the southeast (from Paraíba Valley to Campinas in the years



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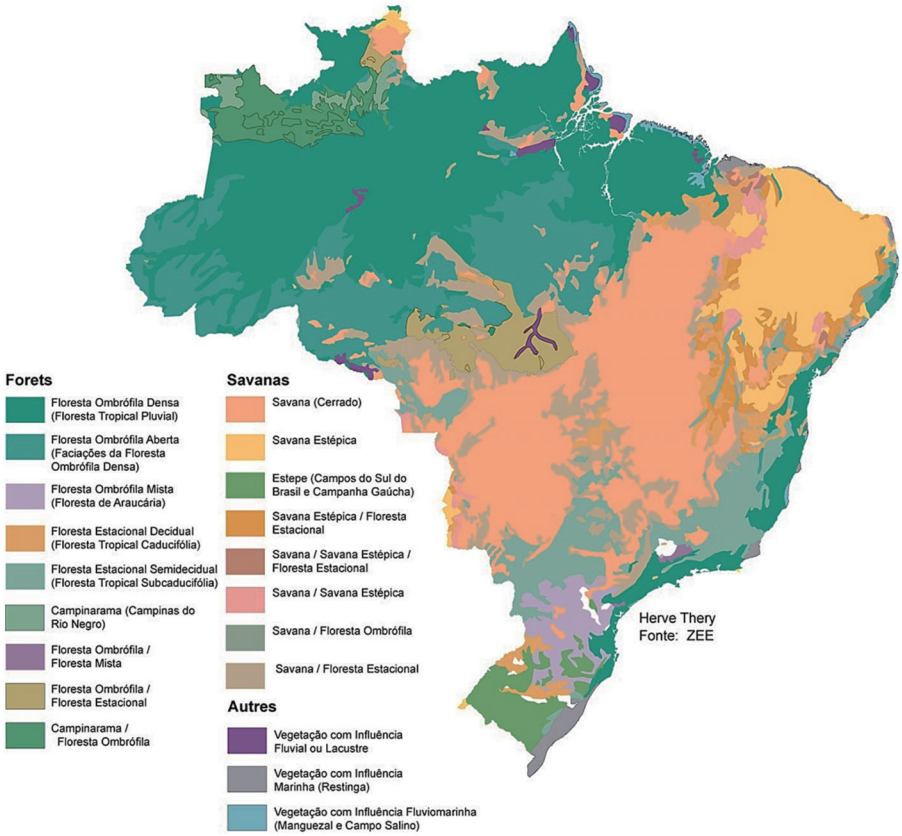
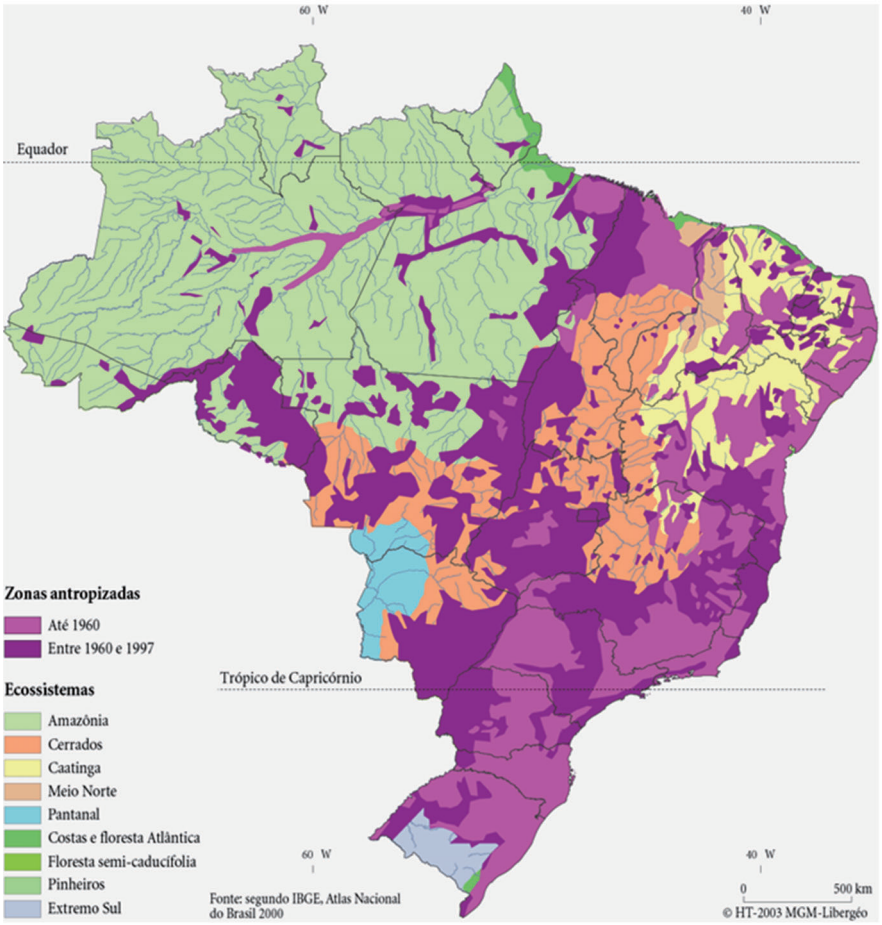
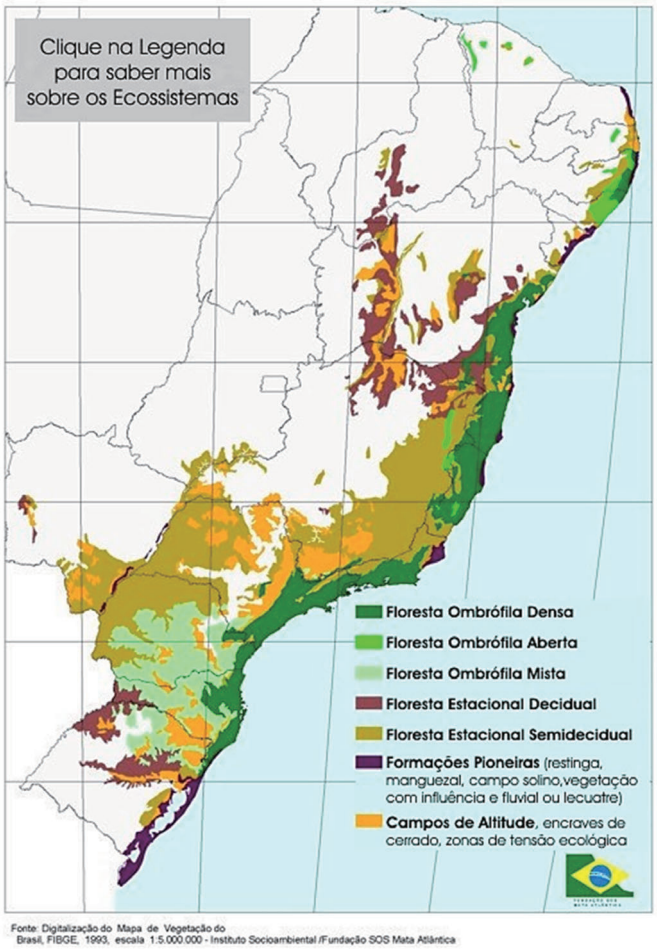


1817) and spreading to the east (1870 in Espírito Santo). Ten thousand square kilometers of forests were depleted during the first century by this type of occupation, with the slopes being the first to be destroyed. The forests of the high, rugged and relatively barren regions were overthrown and cultivated by Germans and Italians. In 1890, the railway companies consumed half a million cubic meters of firewood. The three maps below show the different types of vegetation in the Mata Atlântica domain and its process of anthropization.





Fonte: Digitalização do Mapa de Vegetação do Brasil, FIBGE, 1993, escala 1:5.000.000 - Instituto Socioambiental /Fundação SOS Mata Atlântica

Such economic dynamics caused the price of lands planted with coffee to increase making it a reason for speculation. Such lands' prices were higher than any other crop (in relation to rice it reached as much as 7 times), leading to the replacement of areas planted with sugar cane, cotton and subsistence by coffee plantations.

Well known in the country are the antagonisms of the Brazilian public actions, and in that historical period it was no different. Coexisting with the economic dynamics, with the risks of plantation agriculture and with eroded and arid slopes, gullies and exposed rock, abandonment of coffee plantations in rural areas, the first attempts of conservation took place: i) in 1862, governmental funding of reforestation in the springs; ii) in 1817: prohibited clearing of trees; iii) in 1856, the government acquires a few farms in Tijuca and in the Paineiras mountain to transform into conservation areas; iv) and from 1862 to 1892, with an order and authorization to replant the vegetation cover in Forest of Tijuca, but without restrictions to exotic and ornamental plants. During this period, 127,000 trees were planted.

At the end of that century, several governmental agencies were created, with specific responsibility for the management of natural resources, among which the Botanical Garden of Rio de Janeiro stands out. In 1896, the botanical section of the Geological and Geographical Commission (later the Brazilian Forest Service, 1899) highlighted the function of the Cantareira mountain: to protect river basins from the streams and to channel their water to the reservoirs of the city. In 1902, the botanist Albert Löfgren, created the "empty" frontier concept (i.e. exhausted and unproductive land) and proposed the establishment of the Arbor Day.

After this, the first conflict between landowners and public officials began. Landowners dominated the government and created barriers to the implementation of policies. This process continued to occur throughout the 20th century, with greater intensity. Degradation continued, while state capitals concentrated urban growth. In this century the Brazil's population grew from about 10 to almost 200 million people, new states (from 20 in 1872 to 26, with addition of the national capital, the Distrito Federal) and hundreds of new cities were created in this biome. The rural environment was transformed. Industries were installed in the Southeast region between São Paulo, Belo Horizonte and Rio de Janeiro. The concentration of industries in Cubatão resulted in acid rain and consequent destruction of many Atlantic Forest slopes. A natural system was striding towards its death.

Nevertheless, the twentieth century was a century when a raise of awareness of the environmental dimension and of great transformation of concepts, principles, and the creation of legal mechanisms to protect this biome. Society and governments developed public actions that could conserve what remains of the Atlantic Forest. Non-governmental organizations raised their voices and the Mata Atlântica was registered in the Federal Constitution as a national patrimony.

Governments reacted by creating conservation areas and implementing public actions and many of these areas were defined as conservation units, becoming areas of extreme importance for the conservation of biodiversity. At the end of the century, it was possible to say that the efforts that were and are being made contribute to protecting the remnants of this biome, although they are still considered as marginal activities, given the predominance of degrading activities.

The twentieth first century was also marked by actions from society, no longer in the form of large mobilizations on the international scale, but of daily actions[1] with a great deal of society involvement, with the clear perception that the protection of that natural system and its biodiversity depends on the local development. There has been a better understanding that people´s actions can therefore contribute in an incisive way, so that the remnants can be the starting point for a new cycle.

3. The first half of the 20th century and the *Mata Atlântica* biome: height and decay

From 1900 to 1950, the Brazilian population grew three times and the population of São Paulo four times. The process of industrialization of São Paulo State required a lot of energy for industrial, residential and transportation uses, which was obtained through cutting the Atlantic forest.

From the economic point of view, the first half of the twentieth century is marked by the so-called coffee cycle, which was responsible for 75% of the budget of São Paulo State and the basis for the country's trade balance.

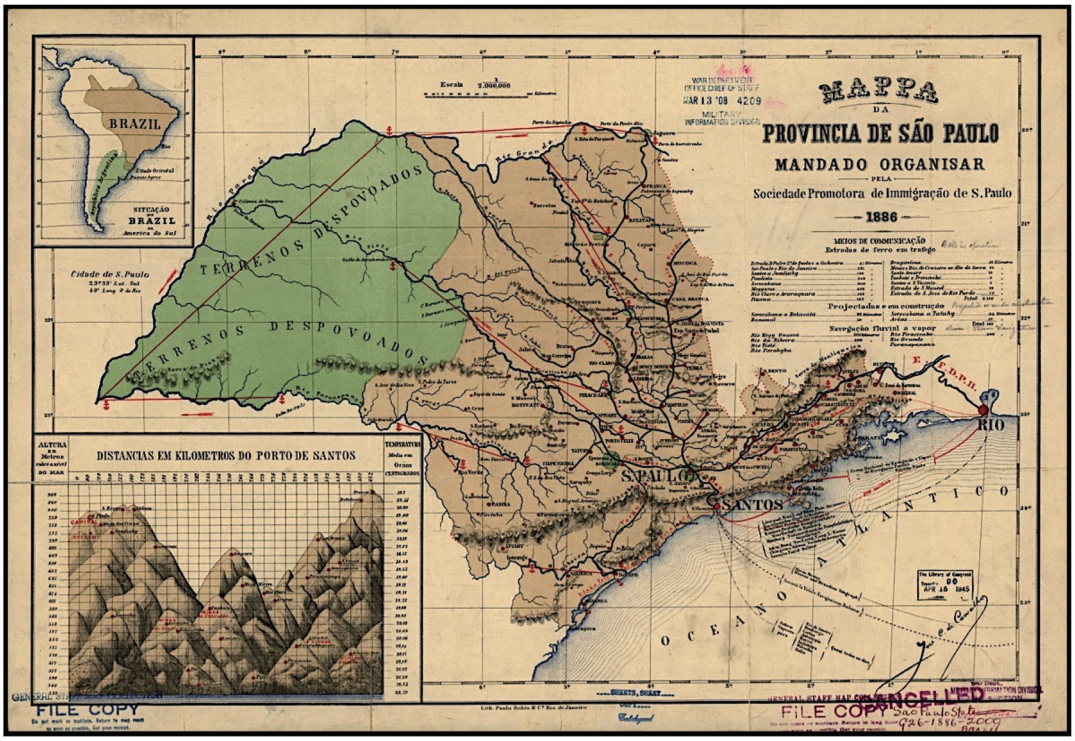
1. Experiences of local and urban gardens, reforestation with native vegetation of degraded areas by illegal occupations near cities, development of a green economy based on originating products of the biome such as de Cambuci's fruit among others. In the project "Experimental networks of sustainability (ENESUS)" the research developed in Biosphere reserves, of which 122 of these initiatives were identified in the area of the Biosphere Reserve of the Green Belt of São Paulo.

In a different political context from the previous ones, those new times stimulated the arrival of European immigrants, as slavery had been abolished in 1888. More than 1 million European immigrants (Italian, Spanish, Portuguese, Japanese and others) arrived in the country between 1888 and 1914. This labor force, which allowed the expansion of plantations, caused intense deforestation, gave rise to new cities, focusing on the development of the railways, which linked these new producing regions to the port of the city of Santos. The French geographer Monbeig chose it as an object of study, analyzing in his book "Pioneers and farmers in São Paulo" (1986) the three conditions for the advance of this pioneer front from the west of São Paulo to the north of Paraná. First, the availability and the quality of the land (i.e. the red earth originating from the decomposition of basalt, known as *terra roxa*, the purple earth). Secondly the State actions and finally the willingness of society to move forward.

The dominant mentality was to generate wealth for the country, valuing the strategies used to guarantee production cycles. Activities based on the use of wood, associated with building industry, railway transportation and the supply of firewood to the cities contributed to speed up the Atlantic Forest destruction. The evolution of the process was marked by speculation on land prices and successive cycles of occupation. Slashing and burning of large tracts of primary forest increased soil fertility and the possibility of crop development, but for a limited time, because in the short run the land became sterile. The disappearance of animals caused the spreading of pests which attacked the production of coffee in the Paraiba valley. As coffee farms lost productivity in these now very poor soils, such farms were usually converted to pasture fields for cattle.

The construction of the railway system also created a strong demand for the use of natural resources, and in 1910 it consumed 80 km² of primary forest (i.e. 2.4 million m³ of wood) to put the 1.500 railpads of railways' tracks per km, and additional 20 km² of forests only for the maintenance of the railway.

The Portuguese agronomist Edmundo Navarro de Andrade carried out a research on forest species. He set up 18 experimental garden stations in Jundiaí, Campinas and Rio Claro and planted 95 forest species before deciding on the eucalyptus as the best one. Andrade considered that "that ugly, low, unequal and unhealthy forest" should be replaced, valuing the advantages of the absorption of water and the production of aromatic oils with disinfectant and curative qualities of eucalyptus. Based on this research, the Sao Paulo railway company began to promote the advantages of eucalyptus by developing a project to create forest gardens along the railways, considering that the eucalyptus rapid



Source: *Mappa da Provincia de São Paulo mandada organizar pela Sociedade Promotora de Immigração de São Paulo*. Rio de Janeiro: Lith. Paulo Robin & Cia, 1886. 1 mapa color.; 38 x 58 cm. Arquivo Público do Estado de São Paulo.

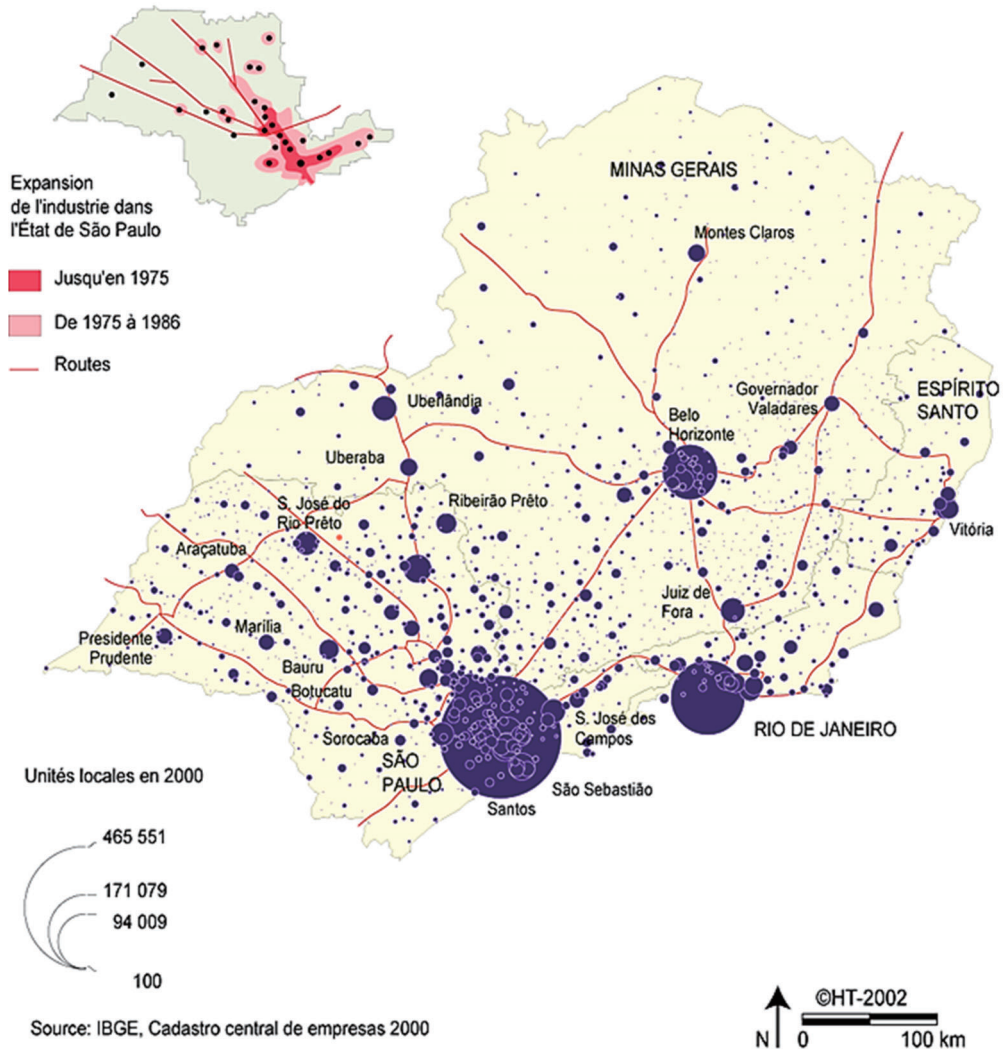
growth would allow both reforestation and maintenance of the railways.

Together with this dominant process, there were also conservationist arguments synthesized in two streams of thought: one of these, on the impacts of forest clearing, was defended by Álvaro da Silveira, a botanist, while counter-arguments about the value of the Botanical Gardens were presented by João Barbosa Rodrigues. In 1913, Alberto Torres proposed the inclusion in the Brazilian Constitution of a clause in defense of the natural resources, since there was a need for protection of springs, reforestation and irrigation more than for roads and railways. He argued that repairing ruined areas, establishing populations in areas open to cultivation, educating men to use them should be part of government decisions and policies.

4. The disappearance of the Atlantic Forest: industries and metropolization

The mid-twentieth century is marked, therefore, with public actions involving conservation and development. According to Gonzaga de Campos, from the Ministry of Agriculture, the states of São Paulo, Rio de Janeiro, Minas Gerais and Espírito Santo still contained about 500 thousand km² of secondary forest and *cerrados* (a kind of Brazilian savanna), being the remaining reserve stock of the Atlantic Forest of approximately 390 thousand km². However, the loss in the four States was probably of 50% between 1910 and 1947. At the same time, a decree law (number 25) was considered an instrument of forest assets protection.

The surveys carried out to diagnose the forest situation in Sao Paulo showed only 41,640 km² of primary forest in 1905, which were concentrated in the State public lands, showing that for the farmers the most important, of course, was not the conservation of the forest. Between the 1920s and 1950s, the area of private forested land was still diminishing and by the end of 1950 there were only about 27,700 km² left. The annual destruction was of more than 3 thousand km ² per year, between 1920 and 1934 (Dean, 1996).



Government decision in the 1950s (during President Juscelino Kubitschek's government) stimulated the accelerated development of the Brazilian industrialization, whose nascent process had occurred in the period of World War II, with the strategy of so called Import Substitution. The core area for industrialization was the southeast region, between São Paulo-Rio de Janeiro-Belo Horizonte, spreading along the Paraiba do Sul River Valley and near the port of Santos. In the 1960s, there were 18 major industries (refinery, steel, fertilizers and chemical products) in the municipality of Cubatão, whose exports of these products gave to the municipality 2% of the country's exports. This caused not only the degradation of the Atlantic Forest but also deep health problems and birth of children with neurological deficiencies and anencephaly, causing the valley to be nicknamed "Death Valley".

Decentralization of the industry from the late 1970s to the interior of the São Paulo state led to the creation of new cities or to the growth of existing ones in both regions of Santos (because of the port) - Campinas and of the Paraíba do Sul Valley, expanding alongside the old railways.

At the beginning of the 2000's the industry had spread through São Paulo, Minas Gerais, Rio de Janeiro and Espírito Santo States. Such aspects are highlighted in the map below.

The Death Valley situation began to be modified only after the creation of the Pollution Control Law in the State of São Paulo (1976), when it became mandatory, due to pressures from the UN and from national and international environmentalists, to install filters or replace old machinery in the industries. Government, industrialists and population were able within a period of six years, with the implementation of the environmental recovery plan, to control the 320 polluting sources that existed at the time.

An important environmental recovery plan with reforestation was carried out in the Atlantic Forest: in addition to mobilizing public agencies responsible for environmental control, non-governmental initiatives were part of the actions, including as a main strategy the dispersal of seeds by airplanes, having this reached good results.

5. Protected remnants: the biosphere reserves in the atlantic forest and priority areas for biodiversity conservation

The Atlantic Forest is considered a "hotspot" of the world's biodiversity, having been reduced to 3% of its original area in the northeast region, while 20% of the remnants are in the Ribeira de Iguape river valley, in the southeast region (border between São Paulo and Paraná). Even today, there is strong pressure on the remnants, but private foundations, states and federal governments take different actions to conserve them. We can take the case of the ecological corridors to illustrate this situation: supported by international (PPG-7) and national resources: its strategy was conservation in public and private areas, in a participatory management model. The central corridor of the Atlantic Forest (CCMA) focused on the protection of forest remnants, through the revegetation and sustainable production activities. In the Mata Atlântica biome there are 92 federal conservation units, which protect more than 38.400 square kilometers (ICMBbio, 2017). Alternatives have been established since the 1930's for extending the lifetime of this forest system through the maintenance of remaining forest areas and the expansion of new forest areas. The map below shows the remnants of the Mata Atlântica in 2015-2016:

However, one other aspect, the lack of articulation among the different environmental laws, such as the Forestry Code and the national system of protected areas (SNUC) a mix of misleading terms and lack of technical basis leads to a confusion that can be disastrous to the conservation of the biome, which brings its effectiveness to be questioned, as did Scárdua and Leuzinger (2011). They analyze the legal instruments inserted in the Law of the Atlantic Forest and conclude that it is excessively permissive for local people and small farmers, when it comes to the use of forest resources. On the other hand, it is extremely strict when it comes to the use by other segments of society, with some flexibility for some sectors that are more representative, such as cocoa producers. This legislation also created new forms of environmental compensation, which end up generating cumulative obligations for the entrepreneur, since they do not exclude similar situations already regulated by other norms.

Brazil joined the MAB program[2] and created its National Committee (Cobramab) in 1974. In 1991 approved the creation of the first reserve, the Mata

2. Man and the Biosphere Programme (MAB) is an Intergovernmental Scientific Programme that combines the natural and social sciences, economics and education to improve human livelihoods and the equitable sharing of benefits, and to safeguard natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate, and environmentally sustainable. http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/

Source: http://www.sosma.org.br/en/wp-content/uploads/2015/06/atlas.jpg

Atlântica Biosphere Reserve. At the same time, actions from non-governmental organizations have gained great repercussion. The SOS Mata Atlântica Foundation, with works aiming at knowledge generation and at mobilization for its conservation since 1990 is a good example of this

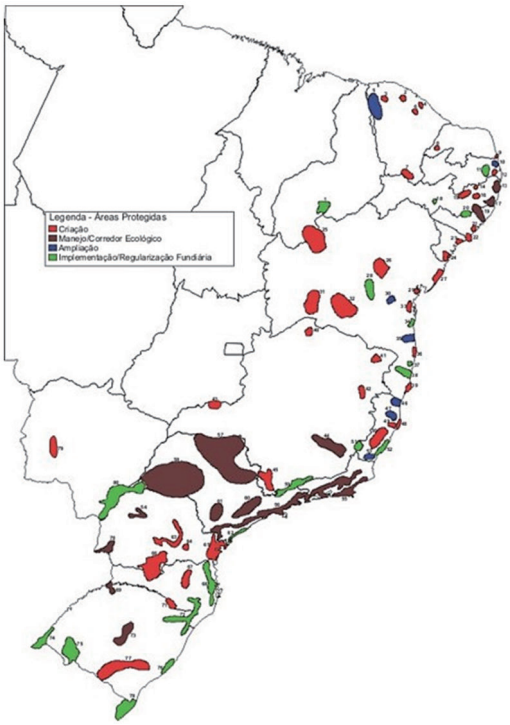
The Mata Atlântica Biosphere Reserve form an ecological corridor of 35 million hectares distributed in 17 Brazilian states, which is considered a cultural and natural heritage of the country. Among them we highlight the Discovery Coast (*Costa do Descobrimento*) and the Southeast Atlantic Forest (*Reservas da Mata Atlântica do Sudeste*) Reserves. Since the country adopted the concept of Biosphere Reserve and added it to the law of the National System of Conservation Units, the public actions follow the evolution of this notion, aiming for the future use at the scenic beauty preservation or at the development of natural processes related to the reproduction of microorganisms which form the base of the food chain and genetic information in the protected areas.

As usual, it is possible to perceive the emergence of contradictory visions. Many scientists consider that after the Biodiversity Convention was signed there is a predominance of an "utilitarian mentality" since what is important is to explore the traditional knowledge of the locals about conservation and sustainable use of the biodiversity.

The map below shows the priority areas for actions in existing conservation units. The red color means creation and management of new areas or ecological corridors; brown means enlargement of the areas; blue means implementation of the protected areas and green is the land regularization of these areas.

In terms of regional planning, two ecological corridors formed by the association of two areas, one from southern São Paulo to Rio de Janeiro and another from Espírito Santo to southern Bahia were prioritized.

Public actions alone will not be able to stop the ecosystem degradation process. It is necessary to count on the increase of the awareness of the society on the conservation of the biodiversity. In this regard, these concerns are part of the joint actions



Fonte: http://www.rbma.org.br/anuariomataatlantica/index.php

Portraits of Brazilian society: knowledge of the population about the environment and environmental problems		
Climate change: caused by	Problems related to human actions	79%
	Natural process	16%
Environmental Preservation and Economic Growth	Environmental preservation should be a priority over economic growth	44%
	It is possible to reconcile the two	40%
Environmental preservation and awareness: the most important issues	Deforestation	53%
	Water pollution	44%
	Climate changes	30%
	Initiatives to preserve the environment have remained unchanged in recent years	40%
	Prevent water waste	71%
	Saving energy	58%
	Willing to pay more for correct environmental products	52%
	Prioritize “green” products or recyclable packaging	18%
	Do garbage separation	59%
	Brazilians consider recycling very important	67%
	Do not have access to selective garbage collection	48%

Source: CNI/Ibope, 2012.

to address the root causes of biodiversity loss, according to the decisions of Aichi (COP10, Japan, 2010) and the Strategic Biodiversity Plan. Thus, it is important to understand the levels of environmental awareness of the Brazilian society regarding such subjects identified in the CNI / Ibope survey:

6. Conclusions: end or start of a new cycle?

For sure, the day this biome will disappear is close. If overlooked the environmental value and the services this biome can provide, it will be hard to give priority actions in favor of nature. According to recent studies of regional specificities, the Atlantic Forest is currently drastically reduced of its original area, but we can still find larger frag-

ments, which allowed the adoption of the ecological corridor strategy.

Much work has been done, involving non-governmental organizations, states and private owners, which allowed for the creation of the Private Reserves of Natural Assets (RPPN), of which 360 were created from 1990 to 2017. These efforts have allowed the increase of protected areas and the evolution of its remnants. But even so, the Atlantic Forest is still one of the most endangered tropical forests in the world. The beginning of a new cycle will only be possible if authorities, managers and population are agile in the implementation of concrete actions of protection.

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Lifetimes of human occupations in Amazonia: rethinking the human presence and landscape transformations

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Abstract

Following the approach of Historical Ecologists this presentation will use data from different collaborative projects in order to demonstrate that today's Amazon forest, considered by many as one of the few pristine and unchanged wild environments of the planet, is in fact the result of a long term human management of positive impacts. This assumption is extremely important to rethink the role of traditional populations for the preservation of the Amazon.

Scientific standard view presents Amazonia as a place where local societies were unable to reach a fully developed stage as a result of a supposed shortage of resources and an oppressive environment. In this perspective, humans would not have been able to domesticate animals and plants of significant importance to their daily diet. Therefore, forest groups would have lived in continuous dependency and limited by the availability of wild game and plant resources in nature.

With the better understanding and accumulation of data provided by Amazonian archaeological sites and remains, nowadays it is possible to offer an alternative viewpoint to understand the long relationship thread between humans and their environment. Different from the first assumptions presented in archaeological studies from the 1950´s to the 1990´s, we suggest that Amazonian people developed mechanisms of manipulation and interaction with the environment that allowed animals and plants to be managed or semi-domesticated in different ways and that these choices acquired, throughout time, more importance in the manner they obtained food from the forest.

Dealing with some undomesticated plants has freed humans from laborious agricultural work and from the need to choose more fertile soils as the only settlement possibility for home and production sites. We understand that this process was not an imposition from the environment, but rather, it was a cultural choice. The evidence that several plants were fully domesticated in archaeological sites shows that ancient societies knew how to cultivate, but nonetheless, gave a secondary importance to these plants, choosing a more flexible approach.

This presentation will focus on four main moments of the human occupation history in Amazon: first, the arrival of the earliest comers, around 12 thousand years ago and how they interacted with a "pristine environment", we will mention evidence that these new comers initiated a process of environment manipulation following distinct strategies; second, a few millennia later, this process culminated in large occupations and populous societies in distant parts of the Amazon around the year 1000 A.D., which created a large network of exchanges (social, economic, political, material, etc.); third, we will mention how these large societies entered a moment of intense disputes in some parts of the Amazon, and subsequently experienced a population decline. When these populations apparently started to regain stability, the European contact drastically changed Amazonian societies forever with the arrival of new foreign populations. At the same time, many bias and harmful concepts emerged. Finally, we will focus on nowadays occupants, who still have a traditional life style and that were influenced by ancient indigenous societies. By dealing with these four moments of occupation, we will revisit a few key concepts like: environment, human-nature interaction, urbanism, human ecology, sustainability, negative and positive human impacts.

1. Introduction

Many people believe that there are places on the Earth´s surface that are still completely natural, in other words, places where humans[1] have not caused

1. The matter of humanity as part of nature is a heated debate. The limits between natural and cultural are frequently questioned, and an enormous number of proposals exist.

any kind of impact, positive or negative. Amazonia is believed to be one of those places (Meggers, 1971; Barlow et al., 2012).

Concerns about the rapid changes taking place in the planet's climate and vegetation cover, have resonated with environmentalists and development agencies and have real life repercussions. The results of this controversial debate served as basis for politicians and policy makers to make decisions and implement public policies, towards preservation and/or economic exploitation of natural resources in areas assumed to be "human free". As an example of how these different types of approaches have always been prejudicial for traditional populations, in 1971, in the Tapajós River Basin the Brazilian Government suggested that 1 million ha, for environmental reasons, became the PARNA (Parque Nacional da Amazônia – Amazonia National Parc). In this type of conservation unity all human beings are to be left out, therefor hundreds of riverine and forest dependent populations were thrown out of their own homes and lands and sent to the other margin of the same river, this was all in the name of preservation (Camargo and Torres, 2016). Sadly, in 2012, the parcs limits were reviewed and reduced, this time for economic reasons, a new hydroelectric dam was being considered in the Tapajós River (Camargo and Torres, 2016). Once again, the government response was to remove the already displaced populations. Fortunately, the dam was not yet built, but there are still those who are seeking to go on with the project.

The human-nature interaction through hundreds even thousands of years is a phenomenon that interests many archaeologists, because, in order to understand the human's trajectory, since the appearance of our species, it is necessary to comprehend the relation that "we", as a species, have established with the different environments that "we" came in contact with, as well as "our" relation to other animals and plants in each of the regions occupied.

Although we have increasingly moved away from the theoretical perspectives of the "Environmental Determinism", our present understanding is that it is not possible to disregard the environment when studying human cultures.

Our History is quite old, considering the available data, we are talking about at least 200,000 years or, if one takes into account the new findings, maybe up to 300,000 years (Hublin et al., 2017).

Nonetheless, even if one accepts only the most conservative hypotheses, we have no difficulty demonstrating that the History of human colonization of the Earth was a slow process. The Americas, for example, would have been one of the last chapters of this story. While the dates for human occupation of the Americas is another topic of heated debate, it is a recent event compared to the date of our species' emergence.

In this paper the discussion of human occupation in Amazonia will be the primary focus, which is one of the most singular places in South America, and site of both intellectual and economical disputes between conservative and developmental points of view. Our perspective is to present human knowledge production systems as a cumulative trajectory. The archaeological data indicates that human occupations diverged significantly from following an "evolutionary linearity" and, as such, it makes more sense to think of the coexistence of different social, economic, and political systems and sets of cultural choices rather than to propose a linear succession of different societies.

Despite the importance of Amazonia, on a planetary scale, with its 7 million km^2 dispersed in nine different countries, politically it only occupies a peripheral position in relation to the centers of power of these same countries. This is a historical process related to how these countries were colonized and which regions were valued, for instance in Brazil all the coastal region were initially sought, the Amazon was only considered in very particular circumstances (example: rubber boom, slave trade, extraction of natural resources).

In Brazil, the area of the Amazon where we have been working for the last fifteen years, is the stage for a "crusade" of territorial occupation similar to what was known in the United States of America as the "march to the West". This movement advances over the Amazon, alleging that the lands they are occupying are empty and untouched, just waiting for settlers to promote national economic development and prosperity. In many moments of Brazilian History this march towards the north was promoted and driven by the government. As such, in the 1960s and 1970s, the Brazilian government promoted migration using the slogan that "the Amazon was a land without people for landless people" and that it was fundamental for national sovereignty that this condition be changed through colonization (Torres, 2005). This program was responsible for the opening of roads, the establishment of new urban centers, and the rise of enterprises focused on industrial scale exploitation of natural resources,

such as iron, aluminum, cassiterite, gold, and petroleum. To meet the demands of these projects and urban centers in the southern portion of the country, large hydroelectric dams were designed, several of which have already been built.

The speed by which this project was expected to implement changes, coupled with a lack of knowledge about Amazonian particularities among its architects, turned this governmental program into an unfinished and extremely conflicting enterprise whose impacts are blatantly evident to the present day. The land without people, advertised by the colonizing enterprise of the 1960's, was based on the common-sense notion that the Amazon rainforest and the fragmented native populations that inhabit it today are part of what is still wild and untouched on the planet. Even though this event happened almost 5 centuries after the European colonization, the mechanisms used by the Brazilian government were hardly different from the strategies of the sixteenth century. They followed the premise that both the environment and the native populations lacked "domestication" (Image 1). And, for the traditional populations this "domestication" usually meant extermination. Evidences of these types of reasoning are extremely well documented and can be easily found in international news mentioning how the government is willing to trample civil rights, mainly poor and traditional communities, for economic reasons. Belo Monte´s Dam in the Xingu River or the Santo Antônio and Jirau Dam´s in the Madeira River are examples that were widely reported and had high environmental and social impact. Less known are local (State and Municipal) political changes that have been legalizing large scale farming and mining in areas occupied by traditional populations.

With this brief outline established let us see what the archaeological data presents about the presence and permanence of humans in the Amazon. Also, we will try to demonstrate the necessity of respecting traditional ways of life, as matter of ethical behaviour, but also because if we want to preserve the forest we will need them to help maintain what was created through thousands of years of interaction.

2. The first archaeological attempts to explain the human presence in the Amazon

The beginning of what archaeologists can call "professional archaeology" in the Amazon region came in the late 1940s with the works of Betty Meggers and Clifford Evans (1957). However, other researchers, amateurs or naturalists, had earlier passed through the region and left abundant descriptions of their findings.

These early professional archaeologists made a lasting mark on the archaeology and anthropol-

Image 1: Picture taken from an airplane showing the floodplains near the city of Santarém, Brazil. Observe the small houses, what initially looks like just large masses of land and water, are actually traditionally occupied territories. Photo: C. Moraes.

ogy of the region. To a large extent, Meggers and Evans were responsible for the spread of what became known as "Environmental Determinism". This theoretical postulation affirmed that the social, cultural, political, and economic development of a population was subordinated to the environment it inhabited. Thus, "civilizations" would only emerge in fertile settings, where diverse ecological niches were easily exploitable. These ideas largely drew on the assumptions of the naturalist and botanist Carl Friedrich Philipp von Martius, who set about trying to explain the native humans of the Amazon. He proposed that the natives of the Amazon represented one of the most advanced stages of the "degeneration" of any civilization (von Martius, [1832] 1982) and, more importantly, that this was a natural process. The Amazonian environment, according to his interpretation, would lead the people who inhabited it to become more and more "primitive", to the point of ceasing to exist as social beings, that is he was only admitting them as a "savage" form.

In this context, the Amazon was evaluated as a large mass of tropical rainforest on top of poor and infertile soils. These limitations associated with what Betty Meggers (1971) termed a permanent "climatic instability" (for example: disparity of flood periods, El ñino events, etc.) would have made the entire region unsuitable for the rise of long-lasting, socially complex, large human settlements. Any archaeological remains that pointed to substantial occupations (as in the finds from the island of Marajó and Santarém county) were interpreted as external invasions of more "civilized" societies (like the Andean civilizations or the societies found in the Caribbean area). Nonetheless, they too would have had a short "life-span" within the region since they would suffer from the "hostile" environment and quickly degenerate.

Science had to wait until 1970 to see researchers from the humanities beginning to review and revise the environmental perspective, changing it completely and arguing that the Amazon was indeed a paradise (Lathrap, 1970). Within this new perspective the floodplain areas were reconsidered and interpreted as extremely suitable locations for large-scale agriculture. But most of these proposals were not based on archaeological data, they rather considered that the intertwined hydrographic network of the Amazonian rivers would bring large benefits. Anna Roosevelt (Roosevelt, 1980, 1987, 1991) in the late 1970's and during the 1980's and 1990's would return to a number of the archaeological sites identified by earlier researchers and amateur naturalists, such as Charles Hartt and Curt Nimuendajú, and confirm their observations about: the presence of large villages (under the city of Santarém and on the island of Marajó); and extremely ancient occupations (such as the site Caverna da Pedra Pintada in the county of Monte Alegre (Roosevelt et al., 1996) and the shell mound of Taperinha in Santarém county) (Roosevelt et al., 1991). However, the mechanisms of occupation, the access to resources, and the human-nature relationship were still not well understood.

The research developed in the field of Historical Ecology[2] from the end of the 1990's provided the basis for new perspectives and for studies to be conducted in association with large interdisciplinary projects[3]. The initial large projects are now dismembering into more localized ones.

Although gigantic gaps still exist, archaeologists have begun to have more data to be able to discuss human occupation without falling into the stereotypes of the past that associated the Amazon sometimes with heaven and sometimes with hell.

As more controlled archaeological data emerged the idea of local Amazonian cultural development becomes increasingly plausible. Today we can say that humans have been present in the Amazon for at least 12,000 years. During this time, what the archaeological data presents are not rapid and doomed events of attempted colonisations, but rather a long process of the cultural construction of ecological niches and the flowering of various cultures. A few millennia later, this process culminated, around the year 1000 A.D., in large occupations and populous societies in distant parts of the Amazon and the establishment of a large network of exchanges (social, economic, political, material, etc.). Later, in some parts of the Amazon, these large societies entered a moment of intense disputes and subsequent

2. As William Balée states, Historical Ecology is believed to be both a theoretical proposal and a methodological proposal. The books of Balée (2002) and Balée and Erickson (2006) are references to the discussion of how human societies interact with the environment. They proposed (along with the different authors of their books) that anthropogenic processes can have both positive and negative impacts on the environment (Erickson, 2006: 245-246).

3. As examples of these large projects we have the Central Amazon Project created in 1995 by Eduardo Neves, James Petersen and Michael Heckenberger. Denise Schaan and her team acted in extremely different areas of the Amazon (from Acre to Pará State) from the beginning of the year 2000. Heiko Prumers and Clark Erickson, independently, structured large projects in the Bolivian Amazon. Stéphen Rostain has spent the last 30 years making large surveys in the Guianas and Ecuadorian Amazon. Michael Heckenberger and his colleagues completely reviewed the Indigenous history in the Xingu River working with the Indigenous population known as the Kuikuro.

population decline. When these populations apparently started to regain stability, European contact drastically changed Amazonian societies forever with the arrival of new foreign populations.

Departing from this last moment we want to rethink "what are the cities in the Amazon" and the difference between occupations of negative and positive impact (Balée, 2002) using archaeological data and personal experiences.

3. First humans and the pristine environment

Very little is known about Amazonia´s first occupants. But the data uncovered thus far shows that the Amazonian region has some of the oldest dates for human occupations in the Americas, starting at least 12 thousand years ago (for example: Abrigo do Sol in the state of Rondônia/Brazil, Caverna da Pedra Pintada in the state of Pará/Brazil). Very few sites are known for this period and the one that has been the most studied is Caverna da Pedra Pintada, with dates going back to 12,000 years before the present (Roosevelt et al., 1996; Pereira et al., 2016). In the 2010´s, Edithe Pereira (Museu Paraense Emílio Goeldi) and collaborators have returned to the same cave and confirmed the dates.

The excavations in this site have demonstrated that humans were not passive to their environment, on the contrary, for instance they had noticed the high potential of palm trees and were using them intensively (Roosevelt et al, 1996; Pereira et al., 2016; Myrtle Shock pers. Comm.). These trees are still found in the area surrounding the cave and continue today to be an important part of the diet of people living in the Amazon. The sparse remains of faunal bone express a diversity of fish that are not present anywhere near the cave (Roosevelt et al, 1996; Pereira et al., 2016), the rivers are a few kilometres from the cave.

The data show that the early Amazonians were not mere hunter-gatherers passing through the Amazon in search of more attractive places. They are an evidence that socio-technical transitions occurred in order to allow the early Amazonians to adapt to that natural environment. In the site Caverna da Pedra Pintada, and in more than 40 sites already identified in the region, we see enduring occupations with permanent positive impacts on the transformation of the environment. One can propose that these places are what Schlanger (1992) and Zedeño (1997) defined as persistent places. Besides that, the cultural sequence observed in the archaeological record of earlier sites indicates that the new occupants always took advantage of the environments managed by the previous occupants. There was an efficient process of accumulated socio-technical adaptation concentrated in certain locations. Two currently commercially important plants are good examples of this. Brazil nuts (*Bertholletia excelsa*) and açaí (*Euterpe oleracea*) are undomesticated plants, but the management of which is important for the local economy and they also occupy an important role in exports nowadays. Evidence of these plants is present in the oldest levels of Amazonian archaeological sites (Morcote-Rios et al., 1998; Pereira et al., 2016; Shock and Moraes *in press*). A recent botanical survey (Ter Steege et al., 2013) pointed out the açaí palm tree as the most abundant species distributed across the Amazon. Could we consider this hyperdominance as a natural process? It seems more logical to consider that this is the result of a management started several millennia earlier, in other words, it was a long process of building ecological niches with greater taxonomic diversity and selecting edible plants.

Thus, it is possible to affirm that an Amazonian way of life emerged after a complex adaptative human-nature interaction system from the earliest human presence. It is not simply a human adaptation to the Amazon, but an adaptive mutualism where both sides begun changing.

Around 7000 B.P.[4] systems of human settlement emerged, one of them shows evidence of an increased use of managed plants, while another is associated with more intensive exploitation of aquatic resources (fish, molluscs, mammals, and chelonians), both providing resources for longer periods of settlement. Humans started to manipulate and, through selection, domesticated several plants including manioc/cassava and peach palm (*Bactris gasipaes*, known as *pupunha* in Portuguese or *chontaduro* in Spanish), that like those previously mentioned, are plants that remain of great importance to Amazonians' diet[5] (Clement et al., 2009). In other parts of the America´s during the same period corn, potatoes, and some types of peppers were also managed to the point of complete domestication[6]. It is necessary to understand these first interventions on the local flora if one wants to comprehend how later societies developed, or even

4. B.P. refers to a time Before Present.
5. One could argue of their importance in the world, since great part of Africa is now producing Manioc.
6. Domestication is a process of selection leading to complete human dependency, of a plant or animal.

the importance of these resources for the first Europeans to arrive in the continent.

Still around 7,000 years ago, some of the human populations in the region decided to build large mounds with shells that were used and occupied for thousands of years (known in Brazil as *Sambaquis*). These shell mounds seem to have served both as dwelling places and as funerary monuments (Roosevelt et al., 1991; Imazio da Silveira and Schaan, 2010; Pugliese et al., 2018). It is important to note that these changes did not mean the end of the prior lifeway and were not a transition to a new system. Archaeological sites in natural shelters and near waterfalls continue to appear as contemporary sites, demonstrating that hunting for terrestrial animals, fishing, and collecting and managing plants persisted as a very successful strategy.

Evidence of the oldest ceramics in South America, dating back to about 8,000 years, perhaps even more, are found in some of these shell mounds. They are probably the oldest pottery made on the entire American continent (Roosevelt et al., 1991), but again this did not mean that from this moment on the Amazonian populations all became potters. On the contrary, this innovation will remain quite rare as, between 8 and 3 thousand years before the present, the traces of ceramics in archaeological sites are sparse.

In some sites located close to waterfalls, one can see an intensification in fishing activities, with dates also around 7,000 years ago. In these places, fish were very easy to catch (Mongeló, 2015), and the abundant human actions had a permanent impact on the chemical and physical properties of the occupied soil (Miller, 2009; Neves, 2012), they are the oldest known "Terra Preta de Índio" (TPI) or "Anthropogenic Dark Earth" (ADE). These soils, when compared to the natural soils of the Amazon, have a high fertility index and greater power of nutrient retention, characteristics that persist for extremely long periods (Teixeira et al., 2009). Some of the managed plants, and in some cases domesticated plants, probably began to find in these modified soils interesting niches for propagation. Once more this does not mean that from this moment on all these populations became farmers. What the archaeological remains show is that they could have made this choice, but chose not to.

4. Village life

Around 3,000 years ago several domesticated plants including manioc, peach palm (Clement et al., 2009), corn (Roosevelt, 1980), rice (Hilbert et al., 2017) were widely available in the Amazon. At this point human populations probably understood that the disposal of organic matter associated with the controlled use of fire could transform the soil into TPI or TPI like. Yet, it is important to notice that most TPIs are found in residential areas. During this period the archaeological record shows an intensification of the production of ceramic vessels. This "technological package" seems to have led to the emergence of yet a new way of village life in the Amazon. The archaeological evidence from these sites (botanical and faunal remains) suggests, however, that this was not a new autonomous system in relation to the previous ways of life.

These populations were experiencing more sedentary lifeways and, in some cases, benefiting from long distances networks that provided resources from very diverse niches across the Amazon. Technological similarities in the ways of producing and decorating ceramic vessels appear to be good markers of long-distance relationships. Ceramics of a style classified by archaeologists as Pocó appear with similar dates in areas located thousands of kilometres from each other (Neves et al., 2014). These settlements had higher population numbers and demonstrated more capacity to exploit resources over the following millennia.

The archaeological sites dated from around the year 1,000 A.D. in almost all of Amazonia demonstrate evidence of large occupations. The size of these sites associated with the density of material can be interpreted as the populational apex of the region before the 19th Century (Moraes and Neves, 2012; Moraes, 2015). The process that led to this situation started a few hundred years before the Christian era, when large populations started to enhance their trading networks, this probably also led to a higher number of migrations and the expansion of territories that were occupied.

Simultaneously another phenomenon reappears with great intensity, the locations that these large populations inhabited underwent transformations in the structure of the Amazonian soil. Archaeological sites from this period sometimes contain hundreds of hectares of TPI. We also have sufficient evidence to believe that these populations had intensified their agricultural production possibilities, but not necessarily in the TPI. In fact, some archaeological sites from this period in Suriname (Rostain, 2008) and in the Bolivian Llanos de Mojos (Erickson, 2008) indicate the presence of extensive areas of

artificial raised field associated with management of soil, water and aquatic fauna.

On the Marajó Island, in the mouth of the Amazon river, there is evidence that large contemporary mounds were built for reasons of water management and settlement. These mounds, known as the *Marajoara Tesos* were used as housing and ceremonial platforms (Meggers, 1957; Roosevelt, 1991), and the local economy relied mainly on the exploitation and management of the aquatic fauna (Schaan, 2008).

In the Central Amazon, near where today is the city of Manaus, were uncovered some of the largest TPI sites known in the Amazon. In these places evidence of several domesticated plants being used were found (Cascon, 2010; Silva et al., 2016). However, the importance of using (millennially managed) wild plants, aquatic and terrestrial fauna (Prestes Carneiro et al., 2015) still seems extremely important (Moraes, 2015).

These populations seemed to be taking advantage of ecological niches and connecting routes amongst these niches were built to compose increasingly complex and efficient systems for the maintenance of large populations.

The symbolic and probably political importance of controlling these niches led to the appearance of noticeable evidence of conflicts in some areas of the Amazon (Moraes and Neves, 2012). Different ways of occupying space, building villages, exploiting resources, making pottery begin to overlap at the same large sites of anthropogenic dark earth (Heckenberger et al., 1999; Lima, 2008; Moraes, 2013). In some of these sites, evidence of ditch construction and defensive palisades appears (Neves, 2009; Moraes and Neves, 2012).

At this same period some archaeologists suggest that human settlements in the Amazon can be considered as a type of urbanism (Heckenberger et al., 2008). An urbanism different from that of other parts of the world, a kind of "garden city" (Heckenberger et al., 2008). This type of urbanism was defined by Michael Heckenberger (2005) in the Upper Xingu region and takes into account a number of elements such as: continuity and size, although the format of the villages remained the same over 1000 years, the size of the villages around the year 1000 A.D. were more than 10 times the size of the present day villages; the presence of large networks, in this region great roads are still built and cared for, they connect different villages, these routes, besides being more numerous in the past, could reach more than 10m wide; the estimated population density was higher than the estimates for the Greek city-states, which are held as the cities that defined urban planning patterns for European civilizations.

There is not enough archaeological data to clearly address the consequences of these events (urbanism and conflict) but the fact is that the archaeological record shows a decrease in population in some parts of the Amazon in the period right after the year 1000 A.D. (Moraes, 2013, 2015).

Even though the villages encountered by Europeans in the 16th, 17th and 18th centuries were not as large as the ones around the 10th century, they were large enough to be called "cities" by the first explorers.

Once again, this new, more sedentary way of life did not become the only Amazonian way of life.

5. The recent past and the present in Amazonia

For a great number of historians and other social scientists[7] the arrival of Europeans in the sixteenth century would mark the end of this millennial systems of human development in the Amazon. Some archaeologists, historical ecologists and anthropologists differ from this perspective quite drastically. No one disregards the dramatic impacts this event has caused and still causing in and for native populations.

It is important to remember that a few internal events had somehow disrupted some ways of life of some of the Amazonian populations before the 16th century. When Europeans arrived, the archaeological record presents evidence that the Amazonian populations, especially those closest to the main channel of the Amazon River, were resuming their growth curve, but they were not as large as the ones in the year one 1000 A.D.. Europeans quickly brought mayhem and ended the possibilities for integrated exploitation of different ecological niches and the use of networks of long-distance relationships were weakened by violence and disease. The maintenance of most of the major human settlements was then compromised, some estimates say that indigenous societies that came into direct contact with Europeans had a mortality rate close to 90%, that is, new forms of survival had to emerge.

Here it is important to return to the idea of coexistence of several Amazonian human settlements

7. As an example of this situation, even though Laws in Brazil demand that Indigenous History be taught in schools, most books start "History" in the year 1500, when Brazil was allegedly "discovered". Indigenous populations are still being presented as "second class" citizens who have been living in the "past".

systems, to understand that even with the disintegration caused by colonialism, this did not end of the Amazonian way of life.

As has been presented by many historical ecologist (such as Balée, 2002), the Amazonian human exploitation system has not favored the domestication of plants and animals. Despite having domesticated important species in the Amazon system, the strategy was the domestication of the entire environment, the creation of managed ecological niches involving animals and plants. This strategy led human beings to be less dependent and at the same time the imposition of maintenance of these plants and animals was less time consuming, but this did not necessarily lower the productivity (Image 2).

Throughout the 12 thousand years of history of human interaction with the Amazon we have learned that the oldest strategies were never abandoned in order to favor the technological innovations that were emerging. This means that, faced with external and internal pressures, these populations were much more flexible and likely to continue existing.

In this story of coexistences, the occupations in the past and the impact of European colonization had a direct influence on how Amazonia is occupied nowadays. For instance, all large Amazonian cities are in fact continuities of large indigenous villages, religious Catholic missions were created in these large centers in order to "recruit" more souls. Later on, these missions were transformed in villages and then cities.

Another impact that is quite hard to be measured is how the TPI affects traditional villages today. The characteristics of the TPI make it a fertile land and those dependent of small farming plots seek it to plant corn, watermelon, cacao trees, etc. These productions are for family use and sale purposes and have small impact on the archaeological site itself.

Nowadays, there are still some native populations that continue to deny the need to contact the different national Amazonian societies (Brazil, Peru, Bolivia, etc.). Choosing a strategy based on hunting and gathering remains a possible and successful alternative for the maintenance of an Amazonian life. This is not to say that these populations are degenerate remnants of the ancient Amazon "civilizations" of the past as von Martius (1982) asserted, or that they are primitive hunter-gatherers like those first comers of twelve thousand years ago. On the contrary, it means that the cumulative and millenarian Amazonian management system remains efficient for these populations.

Along with European populations came an enormous number of Africans, who were brought by force and against their will, but who nowadays represent a large part of the Brazilian population. In some areas, they struggle to have their communities recognized as "maroon communities" (O´Dwyer, 2010). In many cases, these communities came to existence as an effort from African descendants and indigenous populations to resist and flee from slavery. In Amazonia the maroon communities inherited knowledge from Amazonian indigenous communities about how to live in the region and benefit from this long history of forest domestication.

Image 2: This large Samauma was photographed in the Aripuanã River (Brazil), it is on top of a large archaeological site (with abundant Terra Preta and ceramic sherds). It is a good example of the forest´s resilience in previously traditionally occupied area. Photo: C. Moraes.

6. Conclusion: the future of Amazonia

Contemporaneity gives signs that we may be nearing the end of this human-environment/ or human-nature coupled Amazonian system, not because of its internal capacity for maintaining itself, but because of the increasingly overwhelming external pressures that the Amazon is suffering. As we have rapidly tried to demonstrate in the human-environment system is a self-sustained system that has had a long lifetime and it would be even longer if not for the external pressure. In this scenario, allies are ever more difficult. On one hand, global capitalism, which is increasingly prone to natural resources, advances over the Amazon with the justification that it is necessary to bring "modernity and civilization" to a vast wild and unproductive environment. International capitalism is increasingly empowered to make decisions about future policies for the Amazon. Large-scale farms are not concerned, most of the time, with TPI they usually look for chemical fertilizers to enhance productivity in any type of soil. But as time passes the land becomes completely sterile and they end up buying or just taking new lands, in the end this repeated action is resulting in traditional populations being expelled from their own land.

On the other hand, a large part of the environmentalists diverges from the perspective of exploitation of natural resources, but not from the perspective of the Amazon being a wild environment. The traditional populations of the Amazon are little heard by both sides of this power struggle. There is every reason to believe that many are giving up considering to understand a system that has been operating for at least 12,000 years and that had far more positive than negative impacts, for the establishment of human systems as well as the conservation and promotion of the environment.

In order to understand the Amazon, it is necessary to think about human ecology (Moran, 1993) and not the dichotomy between nature and culture that predominates in Western conceptions. And actions towards changing the value systems predominant nowadays must be put to practice with urgency.

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The spatial distribution of cities, landscape change and traditional agriculture in the Tokushima region

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Abstract

Tokushima Prefecture is located on the eastern side of Shikoku Island, and 80% of its area is mountainous with 75% of the soil surface covered with trees. In the 1950's period, the local population in such rural mountainous areas reached its peak. In Tokushima and across Japan, people needed to develop agricultural fields even on the steep slopes, and tried to grow rice by making terraced paddy fields, by piling stones vertically. Since the Rapid Economic Growth period, which began in the middle of 1950's, people started to leave their home villages and move to urban areas for work. When they left their agricultural fields, they planted cedar trees, because cedar wood was sold at a high price at that time. Decades later, however, the cedar lumber price dropped due to the increase in the importation of cheaper woods. Abandoned cedar trees continued to grow covering the former agricultural fields.

Today, many villages in mountainous areas of Tokushima are at risk of extinction due to the falling population and aging (genkai shūraku). Many agricultural fields are left abandoned. In the context of re-vitalization of the diminishing rural communities, traditional landscape is being reappraised as a local treasure. Consequently, the UN Food and Agriculture Organization (FAO) founded the World Agricultural Heritage Systems in 2002, and 45 regions in 19 countries were registered by the end of 2017, of which 9 regions are located in Japan. The traditional farming systems on the steep slopes in mountainous areas of Tokushima are among the candidates for registration. The top 100 Terraced Paddy Fields in Japan were selected by the Ministry of Agriculture, Forestry and Fisheries in 1999, and two of them are located in Tokushima Prefecture.

Stone walls (ishigaki), built to make flat land on a steep slope, are constructions that use a traditional type of architectural technique, and recently it has been reappraised from an ecological viewpoint in comparison with contemporary concrete constructions. Generally, the earths and soil slide down the steep slopes due to gravity, so it is necessary to bring these back upward from time to time. On the steep slopes people try to keep earth and soil in its present position by mixing thatch with earth and soil. If local people abandon their agricultural activities and discontinue the maintenance works, this kind of traditional landscape on the steep slopes will deteriorate soon. The speaker will discuss about steep slope agricultural systems, terraced paddy fields (tanada), and a village rich in stone walls in Tokushima.

Keywords: The Urban system of Tokushima prefecture, Tanada (terraced paddy fields), Ishigaki or Ishizumi (stone walls, masonry), Kyukeishachi-nouhou (agricultural system on steep slopes), and Kyoudou (collaboration, working together with others)

1. Introduction

Tokushima Prefecture is located on the eastern side of Shikoku Island, and 80% of its area is mountainous with 75% of the soil surface covered with trees. In the 1950s, the local population in such rural mountainous areas reached its peak. In densely populated rural mountainous areas, people needed to develop agricultural fields even on the steep slopes, and tried to grow rice by making terraced paddy fields (*tanada*), by piling stones vertically.

Since the Rapid Economic Growth period, which began in the middle of the 1950s, people started to leave their home villages in rural areas and move to urban areas in search of work. When they left their agricultural fields, they planted cedar trees, because cedar wood was sold at a high price at that time. Decades later, however, the cedar lumber price dropped due to the increase in the importation of cheaper timber.

Today, cutting down a cedar tree results in 1,000 yen deficit. So, abandoned cedar trees continue to grow, covering the former agricultural fields.

2. Spatial distribution of cities in Tokushima Prefecture

Figure 1: Geomorphology of Shikoku Island
出典）国土交通省四国地方整備局

This satellite image shows the geomorphology, or land features, of Shikoku Island.

Geological layers run in an east to west direction in the northern part of Shikoku.

Figure 2: Landsat image of Shikoku Island taken from an east to west direction.

The Yoshino River forms an important alluvial plain in the island and Tokushima City is located around the mouth of the Yoshino River.

Curiously, it is possible to perceive some similarities between Brazil and Tokushima prefecture.

The first point is the shape of Brazil and Tokushima Prefecture. And the second similarity is that a big river runs in the north, from west to east.

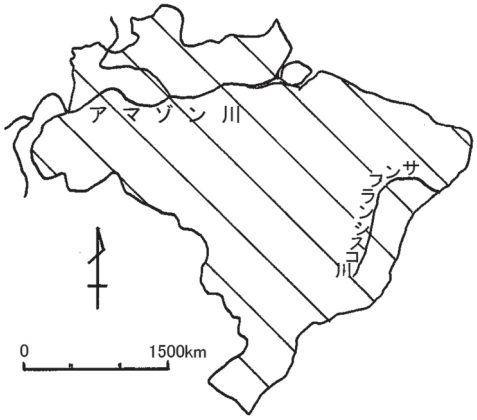

Figure 3: Brazil

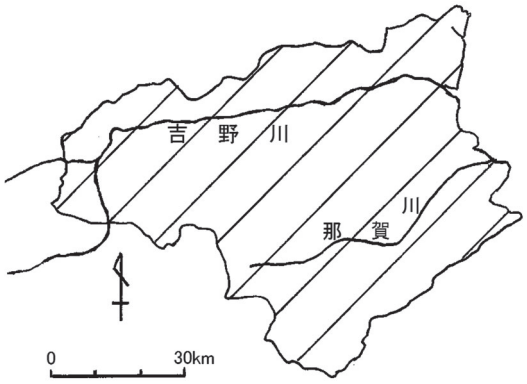

Figure 4: Tokushima Prefecture

The Amazon River runs in the north of the country, from west to east. And the Yoshino River runs in the north of Tokushima Prefecture, from west to east.

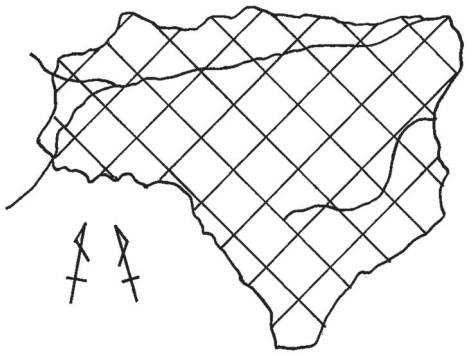

Figure 5: Combined shape of Brazil and Tokushima Prefecture

If we combine the two areas on top of each other, this is the shape that would come out. Another interesting fact is that São Paulo State and Tokushima Prefecture have been friendship partners since 1984, and the shape of São Paulo State and Tokushima Prefecture are also similar.

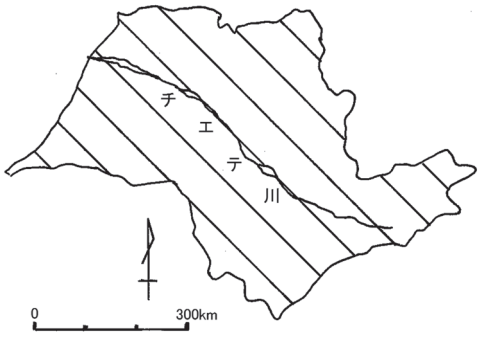

Figure 6: São Paulo State

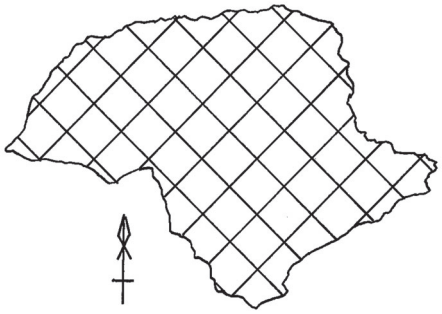

Figure 7: Combined shape of São Paulo State and Tokushima Prefecture

Figure 6 shows São Paulo State and the Tiete River that runs from east to west. If we combine the two areas on top of each other, it is possible to see the shape of figure 7.

Table 1: Changes in Population of Tokushima Prefecture, Tokushima City and Kamikatsu Town in about 100 years.

year	Tokushima **Prefecture**	Tokushima **City**	Kamikatsu **Town**
1920	670,212	68,457	5,172
1925	689,814	74,545	5,298
1930	716,544	90,454	5,139
1935	728,748	97,022	5,180
1940	718,717	119,581	5,276
1947	854,811	102,672	6,005
1950	***878,511***	121,416	***6,356***
1955	878,109	171,419	6,265
1960	847,274	182,782	5,915
1965	815,115	193,233	5,003
1970	791,111	223,451	4,057
1975	805,166	239,281	3,587
1980	825,261	249,343	2,918
1985	834,889	257,884	2,712
1990	831,598	263,356	2,450
1995	832,427	***268,706***	2,318
2000	824,108	268,218	2,124
2005	809,950	267,833	1,955
2010	785,491	264,548	1,783
2015	755,733	258,554	1,545

This table shows changes in population of Tokushima Prefecture, Tokushima City (capital city) and Kamikatsu Town (rural villages' area) in about 100 years. Kamikatsu received the category of town when its population reached more than 5,000 people. The peak of the population of Tokushima Prefecture and Kamikatsu Town was in 1950. And the peak of the population of Tokushima City came later, in 1995.

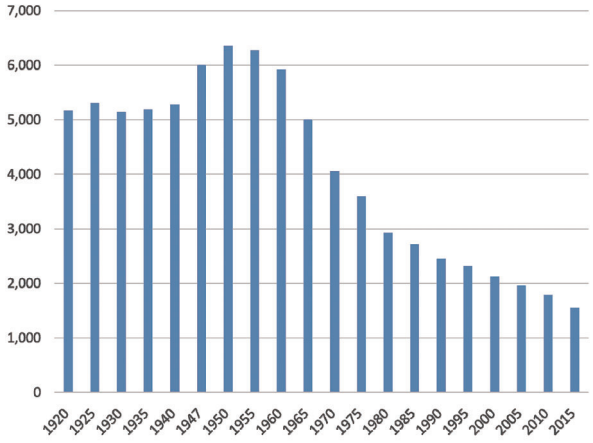

Figure 8: Population changes of Kamikatsu Town

Figure 8 shows population changes of Kamikatsu Town. The peak of the population of Kamikatsu Town came 5 years after the end of WWII.

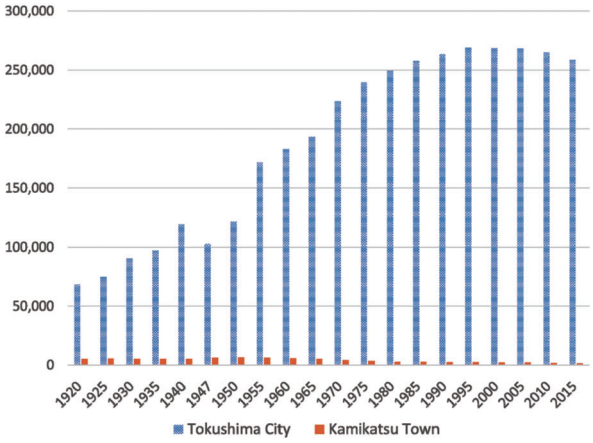

Figure 9: Population changes of Tokushima City.

Figure 9 shows population changes of Tokushima City. The population of Tokushima City continued to grow until 1995, and it started to decrease.

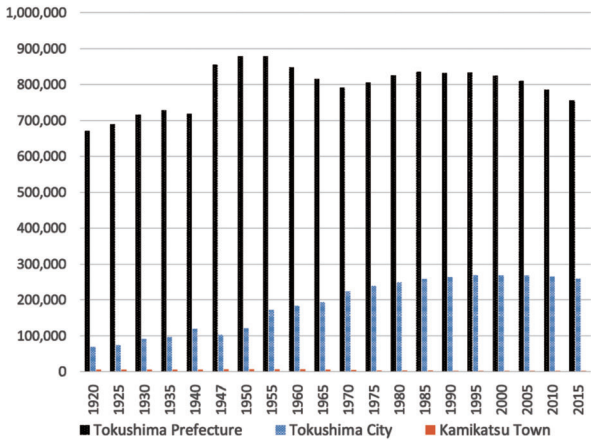

Figure 10: Population changes of Tokushima prefecture, Tokushima City and Kamikatsu Town

Figure 11: Administrative division of Tokushima Prefecture

Figure 10 shows population changes of Tokushima prefecture, Tokushima City and Kamikatsu Town. The population of Tokushima Prefecture started to decrease once in 1950, and started to decrease again in1995.

Table 2: Basic numbers of the four prefectures of the Shikoku Region

	Ehime Pref.	Kagawa Pref.
Area	5,676㎢	1,877㎢
population	1,400,000	980.000
Capital	Matsuyama (520,000)	Takamatsu (420,000)
	Kochi Pref.	**Tokushima Pref.**
Area	7,115㎢	4,147㎢
population	740,000	760,000
Capital	Kochi (340,000)	Tokushima (260,000)

Total Area of Shikoku : 18,804㎢ population : 3,880,000

＊Data: April 2015

Table 2 shows that Kochi is the largest and Kagawa is the smallest prefecture in area, and Ehime is the biggest and Kochi is the least prefecture in population of the Shikoku Region. This table also shows that Matsuyama is the largest and Tokushima is the smallest capital city in terms of population in the Shikoku Region.

Tokushima Prefecture is composed of 8 cities, 15 towns and 1 village, totaling 24 municipalities.

Table 3: Ranking of the cities and towns of Tokushima Prefecture, according to population size and population density.

	自治体	Administrative Division	Population	Area(㎢)	Density (人/㎢)
	徳島県	Tokushima Prefecture	755,733	4,146.80	179.26
1	徳島市	Tokushima City	258,554	191.39	1,345.75
2	阿南市	Anan City	73,019	279.25	256.63
3	鳴門市	Naruto City	59,101	135.66	425.01
4	吉野川市	Yoshinogawa City	41,466	144.14	280.08
5	小松島市	Komatsushima City	38,755	45.37	830.44
6	阿波市	Awa City	37,202	191.11	189.65
7	藍住町	Aizumi Town	34,626	16.27	2,150.65
8	美馬市	Mima City	30,501	367.14	80.44
9	三好市	Miyoshi City	26,836	721.42	35.42
10	石井町	Ishii Town	25,590	28.85	878.93
11	北島町	Kitajima Town	22,446	8.74	2,580.66
12	松茂町	Matsushige Town	15,204	14.24	1,052.53

(Census 2015)

Table 3 shows the ranking of cities and towns of Tokushima Prefecture, according to population size and population density. The 5 biggest cities in population size are Tokushima City, Anan City, Naruto City, Yoshinogawa City, and Komatsushima City. The 5 top cities and towns in population density are Kitajima Town, Aizumi Town, Tokushima City, Matsushige Town, and Komatsushima City. These top cities and towns in population size and density are located in a T-shaped area that concentrates the population of Tokushima Prefecture.

Figure 12: T-shaped population concentration area of Tokushima Prefecture.

The main cities of Tokushima prefecture are located along the coast line and the Yoshino River, where the land is flat or less inclined. They form the T-shaped population concentration area of Tokushima Prefecture.

It is said that not only the physical geomorphology but also historically developed human interactions and interests are facing to the east direction, which is the direction where the large cities of the Kansai Region are located. Tokushima, in comparison with other prefectures of Shikoku, has the strongest socio-economic connection with the Kansai Region. Taking into consideration the geographical features of population distribution and the formation of the urban system in Shikoku, it is worth now to look at some specific case studies of the types of traditional agricultural landscapes and their transformation.

3.Traditional agricultural landscapes and their change

Figure 13: Tikagawa, Kitou, Naka Town

The first case study is a yuzu citrus farm on a steep slope in the Kikagawa area, Kitou district, Naka Town.

Figure 14: Yuzu citrus and its farm on a steep slope in Tikagawa

This image shows a terraced yuzu citrus farm on a steep slope. The yuzu trees are planted in narrow flat belts on terraces of steep slopes. Yuzu trees are planted on flat land, so that the harvest work becomes easier using special length adjustable cutting tools. The Kitou area is known for its yuzu production of excellent quality. Effort to add even more value to the Kitou brand has been encouraged in recent years and the export of Kitou yuzu to Europe has started.

Figure 15: Nishiiya, Miyoshi City

The second case is a potato farm field in Nishiiya district, Miyoshi City. Miyoshi City was founded in 2006, by incorporating 4 towns and 2 villages, in order to become a city with a larger area. But the total population is less than 30,000, and the population density is very low. How is this area changing?

Figure 16: Potato field and stone walls in Nishiiya

Nishiiya is an area where the population occupied flat lands inside a mountainous region. Flat lands can be found even in high lands, and stone walls are very high in some places. Figure 16 shows the students of Shikoku University and employees of Livedo Corporation, an adult diaper manufacturer, who are working together in a potato field in the scheme called Tokushima Ouen Shitai (Let us support Tokushima). But after the last collaboration which was in July 2017, the people of the local community have decided not to ask for others' support anymore, and to continue just by themselves as long as possible.

Figure 17: Shimokage, Ikawa, Miyoshi City

The third case study are terraced paddy fields in Shimokage, Ikawa, Miyoshi City.

The Japanese Ministry of Agriculture, Forestry and Fisheries selected the top 100 Terraced Paddy Fields in Japan in 1999, and two of them are located in Tokushima Prefecture. One of them is Shimokage located in the Tokushima Prefecture. When Shimokage was recognized as one of the top 100 stepped paddy fields of Japan in 1999, its paddy fields were kept in good condition.

Figure 17: Partly deteriorated paddy fields and electric fence in Shimokage

Figure 17 shows that some paddy fields on the right side have deteriorated and an electric fence was erected to keep unwanted animals such as wild boars, deers and monkeys away. Electric shock, is especially effective against monkeys which can clear the fence easily.

Figure 18: The certification plate as one of the top 100 stepped paddy fields of Japan and old stone walls in Shimokage

Figure 18 shows the certification plate that Shimokage was selected as one of the top 100 stepped paddy fields of Japan in 1999. The certification plate is placed against old stone walls which are remains of former stepped paddy fields. Farmers planted cedar trees, when they left the land several decades ago the former paddy fields left behind have deteriorated and the landscape of the area has greatly changed after the cedar trees grew.

Figure 19: Hoichi, Higashimiyoshi Town

The fourth case study is a vegetable farm field in the Hoichi area, Higashimiyoshi Town.

Figure 20: Vegetable farm by furrows on a slope in Hoichi

Figure 20 shows that vegetables are planted in lines of furrows on a slope. The earth and soil slide down the steep slopes due to gravity, so it is necessary to bring these back upward from time to time. If local people abandon their agricultural activities and discontinue maintenance work, this kind of traditional landscape on the steep slopes will deteriorate fastly.

Figure 21: Oogami, Misato, Yoshinogawa City

The fifth area is Oogami, Misato, Yoshinogawa City. This area is known as Takagai Masonry village. This area is located on high lands and on very steep slopes, so this landscape reminds us of Machupichu in Peru.

Figure 22: Masonry village of Takagai in Oogami

Stone walls were built very high in order to get very limited flat belts in Oogami. The masonry village of Takagai is well known today thanks to its excellent landscape. So, residents prefer planting moss phlox widely, which flourish in spring and attract visitors.

Figure 23: Kashihara, Kamikatsu Town

The sixth area are terraced paddy fields in Kashihara, Kamikatsu Town. Kashihara is one of the two of the Top 100 Terraced Paddy Fields in Japan which are located in Tokushima.

Figure 24: Pit of a drainage well to prevent landslides in Kashihara

Figure 24 shows a pit of a drainage well to prevent landslides in the Kashihara terraced paddy fields area. After this drainage well was constructed, landslides occur with much less frequency than before.

Figure 25: Piling stones and mounding edge of paddy fields with viscous soil

Figure 25 shows men piling stones and mounding edge of a terraced paddy field with viscous soil.

Figure 26: Irodoriyama, Kamikatsu Town

The seventh area is Irodoriyama, Kamikatsu Town. Irodoriyama used to be a cedar forest on abandoned terraced fields, but this place started to be developed with agroforestry since 2017.

Figure 27: Cedar trees and *Hawasabi* (Leaf wasabi) planted on former terraced paddy fields

Figure 27 shows cedar trees which were planted near the edge of terraces in order to open the pathway on the flat belt of terraces. Some cedar trees were cut down in order to provide space for cultivating different plants. Here, *Hawasabi* (leaf wasabi) was planted between cedar trees. This is a kind of agroforestry. Leaves of the wasabi plant are edible, and they taste like wasabi. Hamburgers with wasabi leaves are very tasty and the local producers believe that there is a potential market for the production of leaf wasabi.

These cases studies are included in the project Tokushima *Furusato Ouen Shitai,* which emphasizes *kyoudou* (collaboration, the act of working together with others). The expression *Ouen Shitai* has a double meaning that expresses the desire to support someone and the creation of a supporting unit or detachment workforce unit. In this scheme, local leaders of rural areas ask for help and other social sectors as companies, educational institutions, professional sports teams etc. offer their labor forces. The prefectural government intermediate in the process of matching up the different sectors. Apart from the case studies of agriculture on steep slopes supported by the project *Tokushima Furusato Ouen Shitai*, it is also worth to mention other types of projects of revitalization of traditional agricultural practices, which are considered to be a local heritage. This is the case of Nishi-Awa

4. Steep slope land agriculture system in Nishi-Awa

The “Nishi-Awa” Region is located in western Tokushima Prefecture. In the mountainous region of Nishi-Awa, depending on the location, the land sits at an inclined slope as steep as 40 degrees. Within that, the farm work takes place not on a flat field, but on the inclined superficie of the slope as they have been originally shaped. Slopes are excessively steep to make terraced flat belts. On the steep slopes people try to keep earth and soil in its present position by mixing cut hay with earth and soil. The runoff of soil from these steep inclines due to wind and rain are controlled as the fields are covered with cut hay.

Yearly production of an assortment of *soba* (buckwheat) and other grains, edible wild plants, vegetables, fruits, and other types of crops have been produced and amassed with a farming system suitable for this type of mountainous environment. Through over 400 years, this farming system has been passed down to several generations of local farmers and, as a result of this human-natural management of landscapes, various plants and animals have had the opportunity to thrive. This type of mountainous agricultural practice include the Slash-and-Burn farming method which encompasses a deep sense of Japanese nostalgia. The traditional food culture of preserve fruit and vegetables (pickle), the annual promotion of traditional events, and the vast nature of the region have all been maintained by very hands of people in close relationship with the natural environment of the region.

As a result of this long-term socio-natural interactive process, Tokushima Tsurugisan Council for the Promotion of World Agricultural Heritage Systems was founded in 2014 by the four related local governments in the Nishi-Awa Region. Moreover, on March 9th of 2018, the Steep Slope Agriculture System in Nishi-Awa was registered as one of the World Agricultural Heritage Systems by the Food and Agricultural International Organization (FAO).

5. Conclusion

This paper has mentioned the several types of local agricultural techniques developed in Tokushima Prefecture: steep slope agricultural systems (*Kyukeishachi-nouhou*), terraced paddy fields (*tanada*), and villages rich in stone walls in mountainous areas. Along the history, people were obliged to develop agricultural fields even on steep slopes of densely populated rural areas, developing these particular types of local agricultural techniques that counted with the support of specific architectural techniques. Stone walls (*ishigaki*) and masonry (*ishizumi*), built to make flat land on a steep slope, are constructions that use a traditional type of architectural technique, and they have been recently reappraised from an ecological viewpoint in comparison with contemporary concrete constructions, especially after a series of natural disasters occurred in Japan. If local people abandon their agricultural activities and discontinue the maintenance work of stone walls, this kind of traditional landscape on steep slopes will not be maintained as it is in its present condition. The reassessment of the long term processes that supported the shaping of these landscapes, and the collaborative work and exchange with people from different sectors (*kyoudou*) has the potential to make rural communities more active and allow for the maintenance of these landscapes for a longer time.

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Life cycle of Brazilian cities

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Abstract

One of the remarkable features of Brazil is that it is possible to observe there the complete cycle of birth, growth, decline - and sometimes disappearance - of cities in short time spans, often less than a century. This is particularly the case of cities that were created on the pioneer fronts, such as the coffee front, during the first half of the 20th century in the States of São Paulo and Paraná, or on the soybean front since the 1970s in Mato Grosso. Earlier cases from the colonial and imperial period allow to follow the cycle up until their final decline, such as the gold towns of Minas Gerais, which reached their economic and demographic peak in the 18th century, suffered a sharp decline in the 19th century and sometimes have witnessed a recent renaissance due to the increase of touristic activities. In addition, the country has, in several occasions, created ex-nihilo new cities to become capitals of federal states or, in two occasions, to become the capital city of the entire country, on dates that span between the end of the 19th century and the end of the 20th century.

We will therefore analyze these three cases, focusing at first on the examples of the city of Londrina (Paraná), founded in 1929, then in a second moment on that of Sinop (Mato Grosso), founded in 1974, and finally in a third moment on those of Ouro Preto (Minas Gerais), founded in 1711, and Paraty (Rio de Janeiro), founded in 1597. Among the creation of federal states capitals, we chose the examples of Belo Horizonte (1897) and Palmas (1989) and at the national level the case of Brasília (Federal District), founded in 1960, which reached in 2017 the three million inhabitants mark.

In each case, we will analyze the reasons for the founding of the city, generally related to an economic cycle of production, for export, of ores or agricultural commodities. Then the modalities of its growth and its positioning in the pre-existing urban and transport networks, already existing or created for a specific occasion (e.g. “royal route” for the gold export, coffee railways, trans-Amazonian roads). Special attention will be paid to cities that for a certain period played the role of boca do sertão, gateways to frontier zones, which lasted only until competitors supplanted them when the pioneer front advanced a step further.

Then we will focus on the ulterior destiny of those cities after the end of the peak of the economic cycle that gave birth to them: either growth stabilized on different bases, or a more or less pronounced decline, followed or not by a recovery in another situation. In the case of voluntarily created capitals, it will be examined whether this initiative has had the expected success in giving the new city a real command role and rebalancing the territory in their area of influence.

The extraordinary dynamism of the Brazilian urban network thus offers many examples, observable until today, of the lifetime of urban systems, much more than in the countries of Europe or Asia, where the origins of the cities are so remote and their history so long and complex that it is difficult to reconstruct their life trajectory.

1. Introduction

One remarkable feature of the Brazilian urban history? Of cities’ development? Of the urban system? is that it is possible to observe the complete cycle of birth, growth, decline - and sometimes disappearance or recovery- of cities in short time spans, often less than a century.

This is particularly evident in the case of cities established at agricultural? pioneer fronts, such as the coffee front, that developed during the first half of the 20th century in the States of São Paulo and Paraná, or nowadays on the soybean front in the State of Mato Grosso. Earlier cases of establishment of cities during the colonial and imperial periods offer also examples that allow to perceive the entire life cycle of cities up until their final decline. This is the case of the gold towns in the State of Minas Gerais, which reached their economic and demographic peak in the 18th century, suffered a sharp decline in the 19th century and sometimes have witnessed a recent renaissance due to the increase of touristic activities. In addition, the country has in several occasions created *ex-nihilo* new cities to become capitals of federal States or, in two occasions, cities were created with the aim to become the capital city of the entire country, on dates that span between the end of the 19th century and the end of the 20th century.

The following article therefore analyses examples of cities that illustrate these three situations, focusing at first on the city of Londrina (Paraná), founded in 1929, then on Sinop (Mato Grosso), founded in 1974, as agricultural frontier cities; and Ouro Preto (Minas Gerais), founded in 1711, and Paraty (Rio de Janeiro), founded in 1597, as cities established during the colonial and imperial period. Among the creation of State’s capitals, are worth to cite the examples of Belo Horizonte (1897) and Palmas (1989) and at the national level the case of Brasília (Federal District), founded in 1960, which reached in 2017 the three million inhabitants mark.

In each case, will be examined the reasons for the founding of the city, generally related to an economic cycle of production, for export, of ores or agricultural commodities. Then the modalities of its growth and its positioning in the pre-exist-

ing urban and transport networks, including the already existing transport networks or those created in a specific occasion (e.g. the "royal route" for the gold export, or the creation of coffee railways and the trans-Amazonian roads). Special attention will be paid to cities that for a certain period played the role of *boca do sertão* (literally meaning "the hinterland mouth", it is an expression used to refer to the gateways to frontier zones), which lasted only until other competing cities supplanted them in the moment when the pioneer front advanced a step further inside the hinterlands.

Finally, the article will also include an analysis of the ulterior destiny of those cities after the end of the peak of the economic cycle that gave birth to them. This would include situations where either economic? Population? Land occupation? growth stabilized on different economic? bases, or a more or less pronounced economic? Socio-Political? decline, followed or not by a recovery in another situation. In the case of voluntarily created capitals, it is valid to assess whether this initiative has had the expected success in giving the new city a real administrative command role and how these cities function in terms of reorganizing the territory under their area of influence.

Can you please add a commentary on how you think it is interesting/relevant to analyse in parallel the life cycle of cities emerging from different necessities and historical moments? Do you have any comments on how this type of economic or administrative (political) origins in the basis of the establishment of new cities may serve to understand the potential capacity of a city to survive long periods? Or do you see in the lifecycles of Brazilian cities, some features which are particular to Brazil? How about other cities that were built at agricultural fronts/ or as administrative capitals in the rest of the world?

Could you please add a comment on how the tables and graphics above relate to the lifetime of

Table 1 Summary of the seven cities

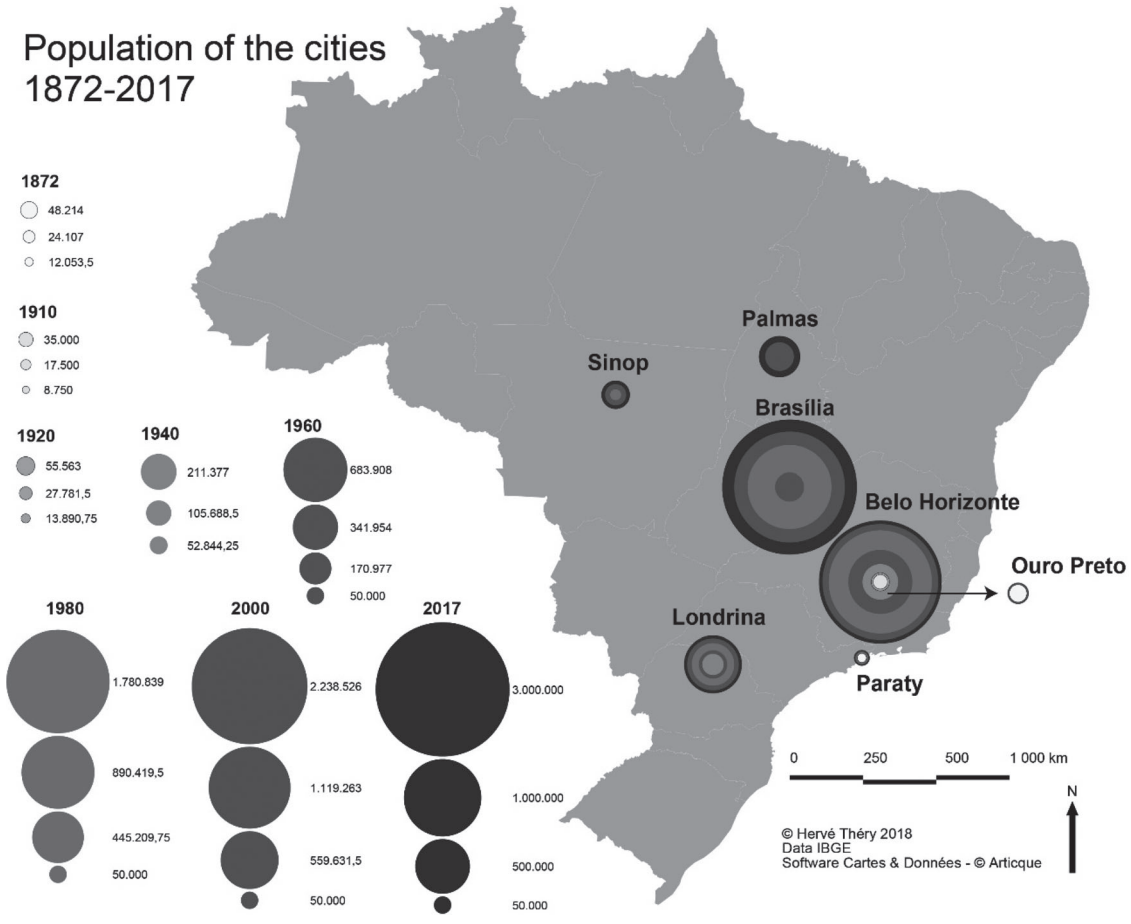
	Creation		
	Date of foundation	**Reasons of foundation**	**Economic cycle**
Londrina	1929	Pioneer front	Coffee
Sinop	1974	Pioneer front	Soybean
Paraty	1597-1606	Pioneer front	Gold
Ouro Preto	1711	Pioneer front	Gold
Belo Horizonte	1897	State Capital	Political
Palmas	1989	State Capital	Political
Brasília	1960	National Capital	Political

	Growth		
	Peak	**Transport**	**Gateways to frontier zones**
Londrina	1940-2017	Railway	Yes
Sinop	1974-2017	Roads	Yes
Paraty	1700-1763	Trail	No
Ouro Preto	1700-1897	Trail	No
Belo Horizonte	1900-2017	Railways	No
Palmas	1989-2017	Roads	No
Brasília	1960-2017	Roads	No

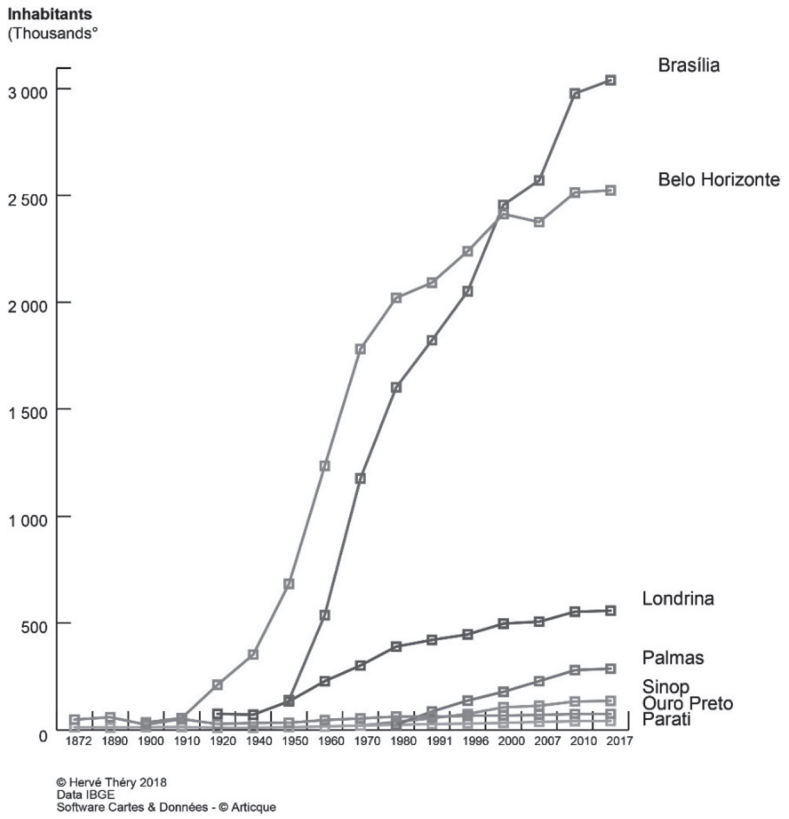
	Ulterior destiny		
	Stabilized growth	Decline	Recovery
Londrina	Yes	No	No
Sinop	No	No	No
Paraty	Yes	Yes	Yes
Ouro Preto	Yes	Yes	Yes
Belo Horizonte	No	No	No
Palmas	No	No	No
Brasília	No	No	No

	Area of influence		
	Command role	Rebalancing the territory	2017 Population
Londrina	Local	Yes	558.439
Sinop	Local	Yes	135.874
Paraty	No	No	41.454
Ouro Preto	Local	No	74.659
Belo Horizonte	Regional	No	2.523.794
Palmas	Regional	Yes	286.787
Brasília	National	Yes	3.039.444

Map 1 Demographic growth of the seven cities



Graph 1 Demographic growth of the seven cities



cities discussion? Why did you choose these seven cities, and their role in the national urban system?

2. Birth of pioneer cities

Creations *ex nihilo* of cities still happen in Brazil today, because its territory is still in formation and some regions are still nowadays being occupied and made to produce mineral and agricultural commodities - not without damages for an environment until then preserved and for the people who used to live there. These pioneering conquests occurred, in the first half of the twentieth century, in the South and Southeast regions, today in the Central West and the Amazonian North: Londrina and Sinop are, respectively, good examples of these two periods.

Londrina

The reason of Londrina's foundation in 1929 is the expansion of the coffee pioneer front. A little less than ninety years later, the regional capital

Photo 1 Londrina in 1934

Source: IPPUL-Instituto de Pesquisa e Planejamento Urbano de Londrina

of Northern Paraná had a population of over half a million inhabitants, went through all the stages of growth and must now face all the problems of urban maturity: heavy traffic, segregation, degradation of the environment. Both successes and problems make Londrina an exemplary case amongst Brazilian cities, as it has run in less than a century the complete cycle from birth to maturity.

Date of foundation:
1929

Reasons for the founding

Londrina was founded by the *Companhia de Terras Norte do Paraná* settlement company, with British capital (hence its name, meaning in Portuguese "Londoner"). Its aim was to create a new base for the development of coffee culture, which after having traveled all the State of São Paulo from East to West was then advancing in the north of Paraná. Does this link to the geographical/ climatic features of the region?

Modalities of growth

The city has experienced continuous population growth since its foundation, first based on the export of coffee by rail and then by road, as the gateway to a pioneering region (*boca do sertão*).

Ulterior destiny

When coffee production fell sharply with the 1975 frosts, the region was able to convert into soybean production and gradually developed agro-industrial and service activities that allowed it to continue growing.

Area of influence

Londrina is today, in competition with its neighbor Maringá, the regional capital of Northern Paraná but is a little larger than its rival is, with 558 439 inhabitants (Maringá has 406 693).

Sinop

The city of Sinop is the result of the occupation policy of the Brazilian Amazon led by the federal government in the 1970s. Its name comes from the initials of the settlement company, the North-West Company of Paraná (*Sociedade imobiliária do Noroeste do Paraná*), which founded the city, after having carried out actions of the same kind in this southern State (like the one which gave birth to Londrina).

Photo 2 Sinop today

Source: http://www.sinop.mt.gov.br/sic/

Date of foundation:
1974

Reasons for the founding

The pioneers of Sinop came mainly from Paraná, and began arriving in 1972 and 1973. When the project launched, 400 men and machines crossed the Rio Verde river and founded, besides Sinop, three other smaller cities (Vera, Santa Carmem and Cláudia), and opened 1,400 kilometers of roads.

Modalities of growth

Sinop's real economic take-off dates from the arrival, in the 1990s, of the pioneer soybean front (and its associated products, maize and cotton). The city is located on the BR-163 road, the main exit route for those products: this has led to the development of a transport logistics function and the deployment of new businesses focused on exporting and processing raw materials. In the last ten years, the number of companies has increased by about 150%, between 2010 and 2016 9,062 companies in the industry and trade sectors have established themselves in Sinop.

Ulterior destiny

The city has been growing steadily since its foundation and, although recent, it is one of the municipalities with the highest indices of development and quality of life in Brazil. In addition to its function of sending agricultural products to the South, its location makes now also Sinop the main point of support on the road to the Amazonian port of Santarém, in the state of Para, located "only" 1400 kilometers away in a northern direction.

Area of influence

Currently, the growth of Sinop continues, it had in 2017 135 874 inhabitants. The city is now one of the main urban centers of the north of Mato Grosso (in competition with Lucas do Rio Verde, Sorriso and Alta Floresta) with regard to the medical and hospital, educational, industrial, commercial and leisure aspects.

3. Decline and rebirth of former pioneer cities

To better understand the "life cycle of Brazilian cities" and fit it into the general theme of the "lifetime of urban, regional and natural systems" we can, to benefit from the perspective given by history, look at past cases. Some cities once knew pioneering conquests comparable to the present ones, but had then time to know stagnation, decline and - sometimes - rebirth on other bases. This is the case of cities that experienced gold rushes in the eighteenth century, such as Ouro Preto, or were used for the export of precious metal, such as Paraty.

Paraty

The city of Paraty, in the state of Rio de Janeiro, is one of the busiest tourist spots in Brazil; it is now one of the top twenty destinations in the country (and one of the top five for French and English visitors). However, tourism has only developed in the last fifty years, the main factors of its recent growth being its exceptional location and the new roads that have allowed the rediscovery and enhancement of its historical heritage, dating back to the time when the city was the outlet of the "gold route", well preserved by a long period of isolation.

Date of foundation:

The date of foundation of the city is not firmly established: according to some, a small settlement dedicated to San Roque already existed in 1560; others trace its origin to 1597, when Martim Correa de Sá undertook an expedition against the Guaianá Indians in the Paraíba Valley. Others prefer 1606, when the first settlers arrived. In any case, in 1660 the situation was good enough for its inhabitants to demand their separation from Angra dos Reis and their rise to the rank of *vila*, obtained in 1667 under the name of Villa de Nossa Senhora dos Remedios de Paratii.

Reasons for the founding

Paraty has become a prosperous trading post because of its strategic position on the shore of Ilha Grande Bay. It was here that the trail coming from the Minas Gerais region (literally "the general mines" (where enormous gold deposits were discovered at the end of the 17th century) reached the sea: thanks to this "gold path" its port had then become the second of the country.

Modalities of growth

In 1702 the governor of Rio de Janeiro had promulgated the "Mining Regulations" which provided that only cattle could be brought from Bahia, and that all other products should pass through Rio de Janeiro (then a very small town), then from there "take the direction of Paraty". In 1703 the Royal Letter of May 9 ordered the establishment of a

Photo 3 Playing slavery in Paraty

©Hervé Théry 2009

Casa de Quintar (literally a house where to take the 20% share of the gold for the Crown) to control the flow of gold from mines to Rio de Janeiro, and men and goods in the opposite direction.

Unfortunately for Paraty, from 1710-1711 was underway the opening of another path leading straight from Rio de Janeiro to Minas by way of the Serra dos Orgãos, reducing the travel time by half. In 1767, the development work of the *caminho novo*, the "new path", was complete, that of Paraty becoming the *caminho velho*, the "old path".

Ulterior destiny

With the fall of the gold trade, Paraty turned to the production of *cachaça* (the Brazilian version of rum), used as barter money to buy African slaves. The former gold road became more and more the way to get them to the coffee plantations of the Paraíba Valley, and to get the coffee bags out. On the way in also came the luxury goods imported from Europe by the "coffee barons", who provided the country with its main wealth, and the government - via the export tax - its main tax resource.

In 1850 Emperor Dom Pedro II passed a law prohibiting the slave trade. However, it continued in the form of contraband, which passed through Paraty because the slavers found in Ilha Grande Bay many places less controlled than the port of Rio de Janeiro, where they could anchor, and islands where to rest, under good guard, the slaves exhausted by the Atlantic crossing.

Decline began in 1864, when the railway reached the Paraíba Valley at Barra do Piraí and the whole valley began to use it to sell its produces, causing the final decadence of Paraty and of the old gold path. The *coup de grace* was the abolition of slavery in 1888, which provoked such an exodus that, while the city had 16,000 inhabitants in 1851, it had only at the end of the nineteenth century, according to a traveler of the time, "600 old men, women and children".

The city then remained virtually isolated for decades, which preserved it as it was at the end of the coffee cycle and in the mid-twentieth century it had about the same extent and appearance as then. Both Paraty and its heritage were rediscovered in 1954, with the reopening of the Paraty-Cunha road linking it to the state of São Paulo. The movement then intensified with the construction of the Rio-Santos road (BR-101) in 1973, connecting it, along the coast, to the two metropolises. Initially "discovered" by intellectuals and artists, who found there beautiful houses at very low prices, the city gradually became a popular destination thanks to its heritage, but especially to its landscapes, which allowed him to combine cultural, ecological and

seaside tourism.

Paraty became "State patrimony" in 1945, has been registered in the inventory of the *Instituto do Patrimônio Histórico and Artístico Nacional* in 1958 and classified "national monument" in 1966. It officially has 88 cultural attractions, including the Festival da Pinga (*cachaça*) and the Paraty International Literary Festival (FLIP), which attracts every year writers from around the world.

Area of influence

The situation of Paraty favors its new tourist role: it is located halfway between the two biggest cities of Brazil, 248 km from Rio de Janeiro and 330 km from São Paulo. This is obviously a major asset since the first has more than 12 million and the second more than 20 million inhabitants, among which the largest concentration of high-income families in the country. It can therefore count on an large pool of well-to-do customers, to which it is well connected by the coastal road and, by the highways that connect the two metropolises with each other (further west, in the Paraíba valley) and from which several perpendiculars allow to go down the Serra do Mar and join the coast. It had a permanent population of 41,454 inhabitants in 2017, but it welcomed the same year nearly 36,000 people during the New Year holidays, and during the Carnival the number of tourists exceeded 22,000 people in six days.

Ouro Preto

Ouro Preto is located in one of the main areas shaped by the gold cycle of the XVIII century, one of the greatest "gold rushes" in history. Officially, 800 tons of gold were shipped to Portugal, not to mention what was circulated in an illegal manner, nor what remained in the colony, such as gold used in the ornamentation of the churches. The city became the most populous in Latin America, counting around 40 thousand people in 1730 and, a few decades later, 80 thousand. At that time, the population of New York was less than half of that number and the population of São Paulo did not reach eight thousand.

Date of foundation:

1711

The origin of Ouro Preto is the "Arraial do Padre Faria" (Father's Faria camp), founded by the bandeirante Antônio Dias de Oliveira and by Father João de Faria, around 1698. Joining these various camps, it was elevated to the category of *vila* in 1711 with the name of Vila Rica. In 1720, it became capital of the new captaincy of Minas Gerais, in 1823, after the Independence of Brazil, it received the title of Imperial City, confirmed as capital of the province and, later, of the State, until 1897.

Reasons for the founding

The city had its heyday during the last decade of the seventeenth century and the beginning of the eighteenth century, the climax of the explorations by miners coming from São Paulo. They had found the "black gold" ("*ouro preto* in Portuguese") from which the city derives its name: as it has a high content of iron oxide gold found there did not have its usual golden color, but a rather darker hue.

Modalities of growth

Striking episodes from the history of Ouro Preto were, from 1708 onwards, the "Emboabas War", between Paulistas and "outsiders" from other parts of Brazil or Portugal. In 1720 the Revolt led by Filipe dos Santos against the 20% tax on gold taken by the Portuguese crown, and in 1789 the "Inconfidência Mineira", a conspiracy led by rich miners to make Minas free of the Portuguese yoke. The apogee of Ouro Preto lasted until the end of the 18th century, when the deposits were exhausted and the gold cycle gave way to livestock and agriculture.

Ulterior destiny

With the proclamation of the Brazilian republic in 1889, Ouro Preto came to be seen as an obstacle to the development of the modern State of Minas Gerais, which replaced the province of Minas Gerais. Its leaders decided, then, to transfer of the State capital to a new planned city, the present Belo Horizonte, inaugurated in 1897.

Ouro Preto remained then stagnant for decades, and only much later, in the second part of the twentieth century, did it experience a renaissance, thanks to the tourist valorization of its historical patrimony. The city was the first Brazilian site considered World Heritage by Unesco, title it received in 1980. Before that, it had been classified as State patrimony in 1933 and national monument in 1938. Today's greatest concern is to conserve this patrimony, considering the large number of tourists who visit the city (15 to 25 thousand per month).

Although currently the economy of Ouro Preto depends heavily on tourism, there are also important metallurgical and mining industries in its

Photo 4 Ouro Preto today

©Hervé Théry 2009

region. Another resource for the municipality is the presence of the students of the Federal University of Ouro Preto.

Area of influence

Ouro Preto has a purely local influence, included in the area of attraction of Belo Horizonte, its population was in 2017 of 76 659 inhabitants.

4. New capitals

Another cause of cities creation is the decision to build *ex nihilo* a new capital, either to break with the past, or to benefit from more favorable conditions for urban development, or to rebalance the territory by installing the new capital in a more central and more accessible position. The history of Brazil is rich of this kind of initiative, since the foundation of Teresina, new capital of the State of Piauí (1852): Belo Horizonte (Minas Gerais) in 1897, Goiânia (Goiás) in 1932, the new federal capital, Brasília, in 1960 and Palmas (Tocantins) in 1989. We have chosen the cases of Belo Horizonte, one of the most significant successes in demographic terms, Palmas, the most recent, and Brasilia, whose population has grown from zero to 3 million inhabitants in sixty years.

Belo Horizonte

The city was planned and built as the new political and administrative capital of Minas Gerais State. It then had an accelerated population growth, reaching more than one million inhabitants less than seventy years after its foundation, and 2.5 million today, after 120 years.

Date of foundation:
1897

Reasons for the founding

The transfer of the capital city of the State intended to replace the old colonial capital, Ouro Preto, by a brand new city, designed under the influence of the ideas of positivism, in a moment of strong appeal of republican ideology in the country

In 1893, the governor had referred the proposal for the founding of the new capital to the Minas Congress, which indicated that the capital change should occur in a place that met the ideal condi-

Photo 5 Belo Horizonte today

Source: https://prefeitura.pbh.gov.br/

tions. A technical commission suggested five localities judged to be in almost equal conditions, including Belo Horizonte, but another one, Várzea do Marçal, being preferred. The proposal returned to the Congress, which, after extensive debates, established that the capital was to be where is now Belo Horizonte. Still in 1893, it was elevated to the category of municipality and capital of Minas Gerais, under the denomination of Cidade de Minas. In 1894, it was dismembered from the municipality of Sabará and on December 12, 1897, the then president of Minas inaugurated the new capital, which already had 10,000 inhabitants. In 1901, the Cidade de Minas had its name changed to the present Belo Horizonte ("beautiful horizon"), after the name of the district.

Ulterior destiny

In its early stages, the new capital was the major problem State government: built after overcoming many obstacles, it remained relatively stagnant due to the financial crisis of the early twentieth century and its development was minimal until 1922. One of its few comparative advantages was the proclaimed virtues of its climate, and the city became attractive for the treatment of tuberculosis: hospitals, pensions and hotels multiplied. However, until 1930 the city exercised an almost strictly administrative function. In the 1930s, Belo Horizonte consolidated as a capital, at this time the municipality already had 120,000 inhabitants and was experiencing problems of occupation, and lack of public services.

Between the 1930s and 1940s, industrialization advanced, in the 1950s the population of the city doubled again from 350,000 to 700,000, and in the 1960s the city reached more than 1 million inhabitants. The installation of Fiat in 1973, the first automaker off the Rio-São Paulo axis, established a major industrial hub in the state. Today it leads the production and sales of automobiles in the domestic market, becoming the company's most important production unit outside Italy.

Area of influence

The population of Belo Horizonte (or "BH", as it is usually dubbed) is of more than 2.5 million inhabitants (2,523,794 inhabitants in 2017), making it, besides the uncontested capital of Minas Gerais, and the sixth most populous municipality in the country.

Palmas

Palmas, capital of Tocantins State, born of the dismemberment of Goiás in 1988, is the most recent State capital in Brazil, after Campo Grande, capital of Mato Grosso do Sul (dismembered of Mato Grosso in 1979). Nevertheless, the latter already existed before becoming capital while the former has been built in a region until then practically empty.

Date of foundation

The foundation of city occurred on May 20, 1989, shortly after the creation of Tocantins State. However, it was only on January 1, 1990, that Palmas became its definitive capital city.

Photo 7 Palmas today

Source : https://www.youtube.com/watch?v=hcFzRDIwX5U

Reasons for the founding

The city was to be, from the beginning, the capital of the state of Tocantins, and it is still today the Brazil's newest State capital.

Modalities of growth

Palmas is located on the highway BR-153 (also known as Belém-Brasília Highway). This location gives access to the main cities of Tocantins and other regions of the country, especially the Center-South and the other states of the Mid-North (Maranhão, Pará and Amapá).

Ulterior destiny

The growth of Palmas was very fast during the decade of 1990. In 1991 the city had a population of 24,261 inhabitants, 130,528 in 2000, 228 332 in 2010 and in 2017 its population was estimated by IBGE to be 286 787 inhabitants.

Area of influence

The development of Palmas made it a hub whose socio-economic influence extends beyond the State of Tocantins to southeastern Pará, northeast of Mato Grosso and south of Maranhão.

Brasília

A little more than half a century after its inauguration on April 21, 1960 Brasília and its "satellite cities" (as are known the parts of the city outside the Pilot Plan) have today more than three million inhabitants and are part of an agglomeration of more than four million. The monthly income *per capita* of its citizens was in 2014 (according to the Brazilian Institute of Geography and Statistics) nearly twice the national average, one and a half times that of the State of São Paulo, the richest of Brazil, and four and a half times that of Maranhão, the poorest.

Date of foundation:

1960

Reasons for the founding

Brasília has been designed to be the capital of Brazil, and as such, it must be seen in the national context and it is now in many ways its capital. However, we can wonder if it is quite true, as it seems to occupy a position apart (we do not dare say eccentric, since it stands in the center of the country) compared to the center of gravity of Brazil and to the economic flows in which it is inserted. Furthermore, in the project of the founders, Brasília should have been not only be the new capital of the country, but also be exemplary in every way, as they wanted to make it a city with perfectly logical and fluid operation, a model of brotherhood between its inhabitants, rich and poor.

Modalities of growth

On the national level, Brasília has contributed

to refocusing transport flows, but more the ones done by road than the ones done by railways, which until then had been predominant. A striking symbol of this disaffection is the redevelopment of the Brasília railways station, renamed *Rodoferroviaria* (road and railway station), which in fact became its temporary long-distance bus station. It was much needed, as Brasília's construction gave the start of major road works, a series of roads were built to connect it to the rest of the country, radials roads linking it to the major cities of Sudeste, Nordeste, Amazon and Central West. Connected to most Brazilian cities, at the crossroads of most major roads in the country, plays its full role as a hub.

In terms of air transport, Brasília airport certainly is less busy than those of São Paulo and Rio de Janeiro are, but it has experienced strong recent growth thanks to its central position, which makes it a *de facto* hub. Many region-to-region links pass through it, and bring their transit flows in addition to those of the officials on mission or politicians and solicitors "going up" to the capital.

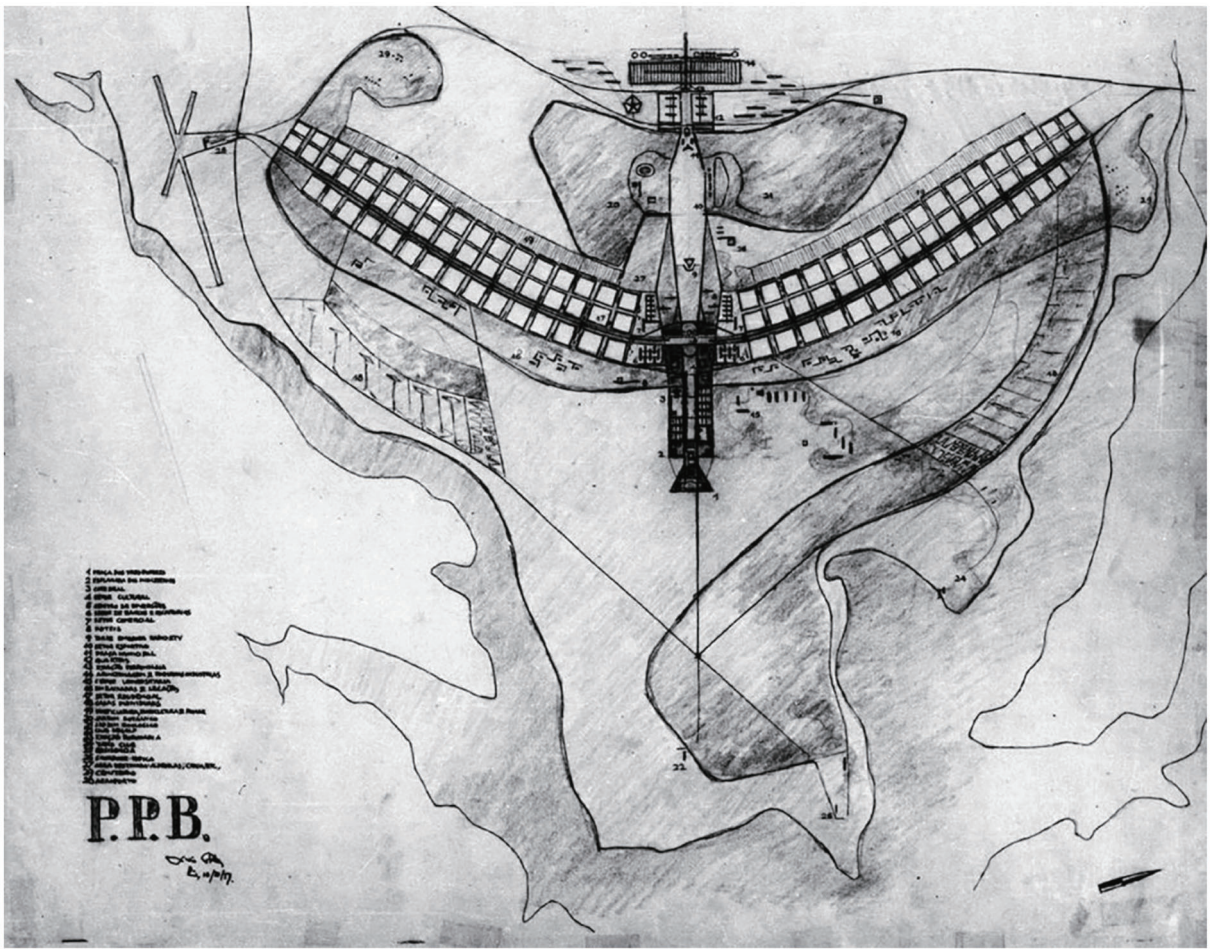
On the local level, the planned city (called "Pilot Plan") gradually filled up from 68,000 inhabitants in 1960 to just over 200,000 in 2010. The two extensions around the Paranoá Lake (North Lake and South Lake) and Cruzeiro district became administratively autonomous in the mid-1980s but, even with them, the heart of the city today hardly exceeds 300,000 inhabitants, and its growth remains slower than that of the other parts of the Federal District.

Ulterior destiny

Satellite cities have multiplied more rapidly than the planners of the Pilot Plan had anticipated. Their origins are diverse, starting with the ones created to house the construction workers who chose to remain in the city, like *Cidade Livre*, legalized in 1961 under the name of *Nucleo Bandeirante*.

These peripheral offspring of the Pilot Plan experienced an explosive growth, for instance 87% average annual growth for Recanto das Emas between 1991 and 1996. From 1960 to 1980, while the population of the Pilot Plan had quadrupled, Taguatinga multiplied eightfold (reaching 361,063

Photo 6 The winning project for the construction of Brasília



Source http://doc.brazilia.jor.br/plano-piloto-Brasilia/plano-Lucio-Costa.shtml

inhabitants in 2010). Whenever the urban fabric is consolidated, the influx of people reduces, and a certain normalization of the city occurs, as well as an incipient "gentrification" of the best-equipped areas, accompanied by a increases in real estate prices and a modification of the social composition.

Area of influence

Brasília has become the capital of Brazil, although it is not the only one. Goals defined by official projects have been achieved, in more than one way. As early as 1948, Francis Ruellan had summed up the alternative between two possible functions conditioning the choice of the site: "Finally, it is necessary to define what is expected of the new capital. Should it be exclusively a political and administrative center, enjoying all the possible amenities for itself and in its neighborhood, placed in an already densely populated area? In this case it is south of the central plateau that we will find the best sites. If, on the contrary, the capital is to be in addition a ferment, a center of colonization and irradiation towards the great *sertão*, or backwoods, of the North and the West, it is necessary to place it as some big cities are located. Beijing for example, is the political capital at the same time as a large land port and a starting point for caravans to Mongolia and Manchuria. Belo Horizonte played this role of ferment for the São Francisco *sertão*, Goiânia plays it now in the best possible way for its surroundings and further north "(Ruellan p.100).

Brasília has fulfilled both these functions at the same time: it is a "political and administrative center" and in fact enjoys "all the possible conveniences, for itself and in its neighborhood", attracting migrants fascinated by this islet of wealth. Even if it was not "placed in a zone already densely populated", the migratory movement has been responsible for creating this situation. It has also been "a ferment, colonization and irradiation center", thanks to the roads built to connect it to both populated areas and pioneering frontiers of the West and North.

Undisputed federal capital, pioneering capital, Brasília is also changing scale, like many other metropolises in the world. Its real functional space is not only the *Distrito federal* under the direct jurisdiction of the Federal State, but also its "*entorno*" ("surroundings"). Since 1998, it is officially part of the RIDE, (*Região Integrada de Desenvolvimento do Distrito Federal e Entorno*) created to "articulate the administrative action of the Union, the States of Goiás and Minas Gerais and the Federal District", much bigger: the "DF" had 3,039,444 inhabitants in 2017, and the RIDE already had 4.4 million. This *entorno* attracts more and more migratory currents, coming mainly from Goiás, the neighboring State, but also from all the country. Many small towns are in formation, such as Cidade ocidental or Valparaiso, built along the lines of communication, which explains the discontinuous nature of this periphery, modeled on the geometry of the transport network.

The emerging metropolis, unlike the planned city that was its starting point, is indeed now a fragmented territory, marked by increasingly strong oppositions between rich and poor neighborhoods, very different from what had dreamed its founding fathers.

5. Conclusion

The extraordinary dynamism of the Brazilian urban network thus offers many examples, observable until today, of the "lifetime of urban systems", much more than in the countries of Europe or Asia, where the origins of the cities are so remote and their history so long and complex that it is difficult to reconstruct the various phases of their trajectories.

Analyzing the contrasting destinies of Brazilian cities makes it possible to observe multiple cases of city creations between the sixteenth century - when the Portuguese arrived - to the present day, where foundation of new cities are still frequent. In the past, some of them were able to grow up without hindrance but for others the causes that allowed their creation no longer exist. Few have disappeared or become ghost towns, but they have sometimes experienced a significant decline if they have not been able to find other bases to continue to grow. For a few, new resources have appeared, for others the legacy of the older phases allowed them to convert to heritage enhancement activities, launching a new cycle superimposed on the old one.We therefore do hope that those examples can contribute usefully to the reflection on "lifetime of urban, regional and natural systems".

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The urban system, centralities and the use of urban space in middle cities[1]

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Abstract

The text is structured in three parts. In the first, we present a discussion about the concept of center (downtown) and its role for the retail trade. The center is understood as a place of confluence (as a dialectical and hierarchical pair in relation to the periphery) resulting from the search by the economic agents for the best locations for commercial establishments, making use of the land in the city. Next, we discuss the formation of subcenters defining new centralities in medium-sized cities to show how the city restructures in response to changes at different scales, from the broader process of globalization to the localization of commercial activities, in a geographic articulation of scales. The redefinition in the location of commercial activities in areas other than the city center allows the formation of new centers and, consequently, the projection of their roles as new centralities. Finally, the displacement of people in their consumption actions shows how mobility presents itself in urban space. Urban mobility is here explained from the choices and preferences of consumers in their search for the place of purchases articulating what we call centrality to their individual economic profile. We present, in the end, some partial conclusions of a collective research carried out in several medium-sized cities in the State of São Paulo. We have chosen, as case studies, the cities of Presidente Prudente, Ribeirão Preto and Marília, each one with their specific characteristics that condition and are the product of the new relations of people in their choices of consumption. As it deals with a collective work, some descriptions and conclusions are analyzed and explained in function of the spatial, temporal and thematic clipping presented. Although the definition of average city is taken from the position of the city in the urban network, in this study we will privilege the city in its specific restructuring, that is, in the reconfiguration of its urban design.

As partial result, we will demonstrate the following: 1) consumption is conditioned by the social class to which the individual belongs; 2) urban mobility (independent of means of transport) shapes the new centralities and modifies the role of the main center of the city; 3) the city restructures because of the locations that differ according to people's purchasing power.

From the methodological viewpoint, the information was obtained indirectly and directly through field observation, questionnaires and interviews with different groups of people. As a way of visualizing the relationship between the dimensions of the city center and the location of retail activities, the conformation of new centralities and how consumers are distributed according to their specific characteristics, we use cartographic representation.

1. Introduction

In this paper we shall present a number of partial conclusions from collective research made on middle cities from the state of São Paulo. This article uses as case studies, the cities of Presidente Prudente, Marília and Ribeirão Preto. These were the objects of study of a project titled: *Contemporary economic logics and social practices: middle cities and consumption.* This collective project was developed between 2012 and 2017 within the GAsPERR scope, as a collective labor process. Hence, a number of descriptions and conclusions are hereforth analyzed and explained according to their spatial, temporal and thematic sample size, which provided the basis for this research.

The text is structured under three levels. On the first, the article presents a discussion about 1) the Brazilian urban system, the concept of city center (downtown) and its role for the retail trade. The center is understood as being a place of confluence (as a dialectical and hierarchical pair in relation to the periphery) resulting from the search by economic agents for the best locations for commercial establishments, making use of the land in the city. It composes a dynamic and complex socio-spatial system. Second, the context of middle cities, with a focus on the state of São Paulo. Finally, the displacement of people in their consumption actions shows how mobility presents itself in urban space. Urban mobility is here explained from the choices and preferences of consumers in their search for a place for purchases, thus articulating what we call centrality to their individual economic profile. Finally, we highlight three middle-sized cities, as seen from the perspective of the location of retail activities and the mobility of consumers, as well as the concept of the city center (downtown) and its role for the retail trade. The center is seen as a place of confluence (as a dialectical and hierarchical pair in relation to the periphery) resulting from the search by the economic agents for the best locations for commercial establishments, making use of the land in the city. The center has a relevant role of articulating varied socio-economical-technical functions within na urban system.

In the end we present a few partial conclusions

1. The results presented in this article are related to the (Economic logics and contemporary spatial practices: middle-sized cities and consumption) thematic project financed by FAPESP – São Paulo State Research Support Foundation.

of a collective research carried out in several middle cities in the State of São Paulo. The chosen case studies are, the cities of Presidente Prudente, Marília and Ribeirão Preto, each one with its specific characteristics, and conditions result of the new relations of people in their choices of living and consumption.

As partial results, in an urban system transitions are mediated by socio-technical diversity and mobility as follows: 1) consumption is conditioned by the social class to which the individual belongs to; 2) urban mobility shapes the new centralities and modifies the role of the main center of the city; 3) the city is restructured because of the locations that differ according to people's purchasing power. Thus, center's dislocation is mediated by socio-technical changed related to consumption patterns.

From the methodological point of view, the information was obtained indirectly (data from sources such as IBGE and municipal governments) and directly through field observation, questionnaires and interviews with different types of people. As a way of visualizing the relationship between the dimensions of the city center and the location of retail activities, the conformation of new centralities and how consumers are distributed according to their specific characteristics, cartographic representation was primarily used. We discuss the formation of subcenters defining new centralities in medium-sized cities to show how the city restructures in response to changes at different scales, from the broader process of globalization to the localization of retail activities, in a geographic articulation of scales that allows for the maintenance of a larger urban-regional coupled system. The redefinition in the location of commercial activities in areas other than the city center allows for the formation of new centers and, consequently, the projection of their roles as new centralities.

2. First level: the Brazilian urban system and the role of middle cities

Despite the fact that the studied areas are composed of medium-sized cities from the state of São Paulo, we will however analyze the current state of the urban Brazilian system.

Back in 2015 Brazil measured 8.5 million km2 and housed 207,660,929 inhabitants, according to the estimates of the Brazilian Institute of Geography and Statistics-IBGE. Moreover, the country boasted 5,570 municipalities, whose populations varied between 11,967,825 inhabitants (São Paulo, being the most populous municipality) down to 805 inhabitants (Borá, the least populous municipality), both found in the very same State.

Considering as reference the demographic situation, the recent evolution of the Brazilian demographic framework presented a decrease in the annual population growth rate. If between 1950 and 1960 the growth rate reached 2,99% per annum, this same rate dropped to 1,17% within the last census period (2000-2010). In a country with ongoing expansion of land occupation with human activities (Urban and Rural activities), this will only mean that, due to an increase in vegetational growth, stimuli towards internal migration in a general sense also dropped. Thus, the boom of emergence of new cities and municipalities fell and a tendency towards of decline is apparent for the coming years. These statements are surely related to the spatial organization of the Brazilian urban network.

Regarding the cities themselves and the urbanization process identified in the urban mesh, it is possible to state that it has extended itself beyond the areas of cities, thus provoking the rise of new forms and dynamics, such as the formation of numerous centralities and urban-rural fringes. Another labor land division came about from the changes in the urban-industrial conditions from the Ford period which extended itself throughout the country. From the changes in the accumulation regime (also known as flexible accumulation), urbanization patterns changed towards featuring spatial characteristics which are concentrated and extensive, centralizing and disperse. For Monte-Mór (2005, p. 437), these processes articulate "local and distant public actions within competition and cooperation processes that become more and more plural and complex, just as internally as among the urban centers and urbanized regions". Another associated feature of this process is the decrease in the rural population, especially in states with greater economic dynamism.

In the last three decades, the role performed by medium and small-sized cities in Brazil's urbanization scenario have become altered. There was de-facto change, for instance, in the situation of urban concentration and territorial extension of the contemporary urban Brazil. In general terms, the part of the urban network which follows Brazil's coast on an average distance of 500 km shows density, dynamism and more intense articulations than the more consolidated part of the urban network

known as the countryside and, less intensively, on the edges of the greater Amazonian region.

Therefore it may be stated that the heterogeneity of the Brazilian urban system is in fact extreme: large and small municipalities, municipalities with a high number of inhabitants and others containing less than a thousand, 27.2% losing residents in the early 21st century and, according to the IBGE, 40% growing at a rate considered below the national average, besides the constant border expansion towards the north of the nation, followed by a steady introduction of new municipalities. This disparity in the Brazilian urban system does have a historical basis: in a short time of over 500 years the colonial land occupation began at the coastline; an economy based on the cycles sustained by a product (gold, sugar cane, coffee) supported in the expansion of occupied land; this evolved until the 1930s in parallel to a lack of transport articulation amongst the various regions of the country; followed by an industrialization propelled by a process of import substitution, incomplete and localized in specific areas of the country, and rapid population growth, especially in state capitals, combined by the interiorization of inhabitants through the rise of medium sized cities, among other factors. Furthermore, there are several factors which supported the formation of the Brazilian urban system. Let us not overstate these factors to the point of exhaustion, but merely highlight a few in order to demonstrate how land was occupied over time, and how that has intensified in the last 50 years.

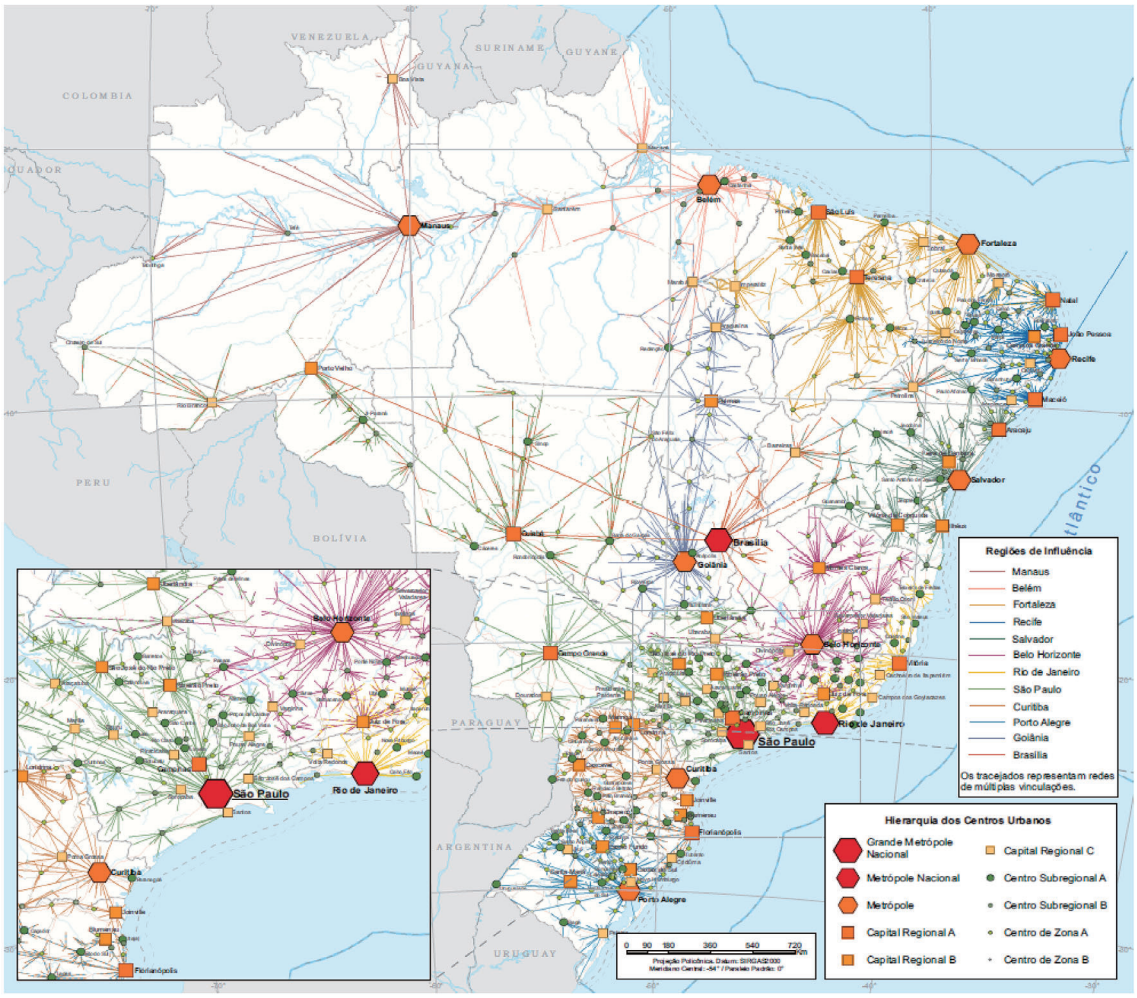
The structural changes in the economy may be attributed to uneven land occupation and their difference in population density, the manner under which the process of capital globalization brought about changes in the functions and forms of the urban system as well as the changes in territorial labor division. With that in mind, it is possible to affirm that there was a specialization of some spaces (industrial cities, the touristic coast, agrobusiness cities, etc.), through mutually influential actions of cities that generated a high level of functional complexity, thus conforming a system characterized by different types of urban centers which may be different, depending on the scale of approach (national or regional) as well as their particular historical development. This provides characteristics to geographical spaces according to their occupation as well as their regional and social resulting disparities. As per the larger urban system, cities may be classified by the concentration of their economic activities which generate inter-urban centralities (based on the REGIC [*Regions of Cities' Influences*] from IBGE) as well as the hierarchy related to this centrality or even that heterarchy (Catelan, 2013), defined by flows of capital and goods among cities from global, and not regional or national rationales, which may be studied in accordance with categories such as time, space and movement.

The importance of the study of middle cities is justified due to the redefinition of their roles in the territorial division of labor; the demographic importance of those cities; direct relations (resulting in urban hierarchy or heterarchy) with cities of other levels of importance (be they major or smaller cities) which reaffirm their own identities and fall theoretically or conceptually apart from a metropolis or smaller city bias.

In other words, since middle cities are less complex totalities than say, metropoles, they are worth to be studied, with an approach of broader high intensity context whilst respecting the existing articulations between the urban and the rural (as per the transformation of rural land into urban land, or from a regional scale, or even from its relations of urban heterarchy). That is why it is relevant to consider close and distant orders (i.e., the relations with closer cities or the impacts of globalization in the urban space). In this fashion, it is possible to articulate the scales in the composition of the urban system, observe what is new in the horizontal and cross-sectional relations between the cities themselves; amongst them in the urban system, and furthermore, the relations between cities from different urban systems (different socio-spatial formations), focusing on international scales. Finally, when the focus is on namely middle cities, one has to consider territorial continuities (structure of the polarization area of a middle city by means of population, merchandise and information displacement) as well as spatial continuities (structure of transport and communication axes and the building of fast circulation roads or the introduction of fiber optic networks).

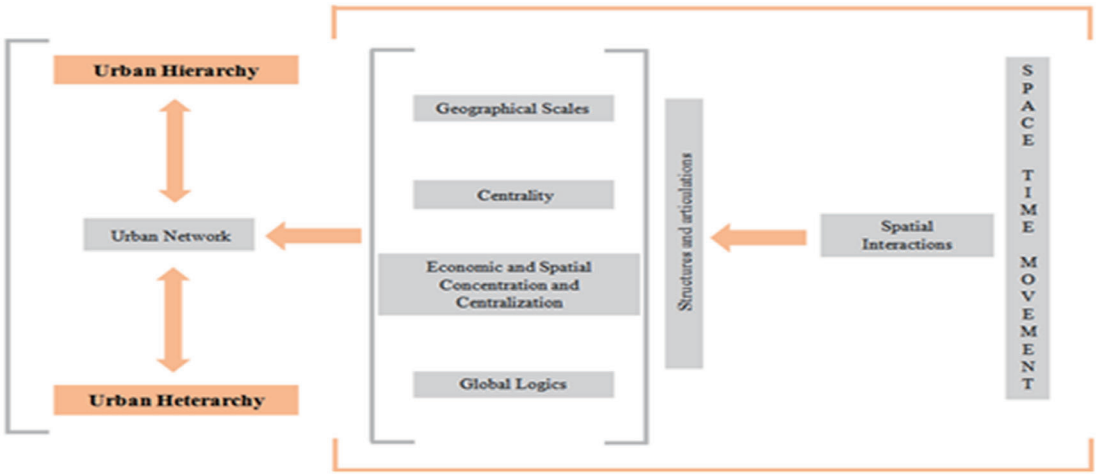
For comparative purposes, an analysis of images 1, 2, and 3 is recommended. On the first image, the Brazilian urban system is presented according to the hierarchy system defined by the relations between cities resulting from different economic and social fluxes. The layout on image 2 presents the relation between hierarchy and heterarchy from the geographical scales and global rationales.

Image 1. The Brazilian hierarchical urban system (according to cities' regions of influence).



Source: IBGE/REGIC, 2010

Image 2: Theoretical and methodological frame for a combined reading of hierarchy and heterarchy.



Source: Catelan, 2013.

3. Second level: the city and social differentiation as a starting point

In the terms proposed by this study, the network and urban system reference utilized is that which can be called of a middle city. To begin, let us make clear what we mean by middle city.

Our focus in this paper may particularly be summarized by the expression *social differentiation.* For Ascher (2000), "social differentiation touches down on all spheres of social life" (p. 54-55) and

this observation does not narrow down to any specific period, but rather infers differentiation as an inherent part of the social dynamics in a city. For this author, this also means that "globalization, when associated to different local societies under a same productive process adds to social differentiation a sort of territorial differentiation" (p. 54). Something that needs to be brought up when stating this is: it is not about replicating European dynamics (the author's empirical basis) in Latin America, but to search, upon one's conclusion, how the social differentiation movement and its manifestations (such as cause, consequence and intermediation) come to be, in the city space.

Sposito (2017), basing himself on Lefebvre, states that "spatial practices do have a dialectic relation to space, since it is what it produces, and though slowly, ends up appropriating it." Therefore, it is possible to infer that space and time are basic categories for understanding spatial practices (of people). This does confront itself, as one reiterates what was already said, through spatial rationales coming from companies, which relatively condition spatial practices. To this, it i salso possible to add offers and goods, which also are conditioning elements of spatial practices, since goods need to be reached, and in order to accommodate this need, mobility (both spatial and social) participates as a condition and a motivation for consumption.

These movements of geographical nature may be synthesized, in their development, in the following manner:

- "The spatial logic of companies is completely guided by intentionalities", while spatial practices, "despite being loaded with intentionalities, are several and conducted by a much greater number" and "diverse with social subjects";
- "Spatial practices are directly associated to daily life";
- companies' spatial logic require planning, while spatial practices are fraught with objectivity and subjectivity;
- "Rationales are more economic and practices are more social and political;
- "There are differences in the geographical scales under which these actions are performed" (Sposito, 2017, p. 638-639).

According to this same author, the city restructures itself for different reasons:

- Urban dispersion in middle cities has taken place, systematically, since 1970's;
- Dispersion is guided both by the location choices of housing programs financed by the government or through private initiatives which have been implementing urban allotments. City growth in territorial terms is mainly due to the transformation of rural land into urban land, combining conflicts and complementarities between different agents with the goal of profiting from the land. This has in fact heightened socio-spatial segregation, by increasing forms of segmentation of residential use of the urban space as well as the space-time distance of urbanites in regards to the main city centers. This urban dynamic is not unique to large-scale or major cities but may indeed be also detected in middle cities.

3.1 The city, the center and centrality

The city center, by definition, consists of a particular content made up of economic, ideological and political-institutional levels, which may be the city or urban centers within the urban network (Whitacker, 2017, p. 170-171); the area itself being a "convergence of economic, population and data fluxes" (Sposito & Lozano, 2017, p. 2), having historical mobility not only from its shape but also from a content point of view. City centers are defined by the convergence of economic fluxes, people and information, which are modified with time due to the changes in the way land is occupied. On the other hand, centrality is understood, as far as we are concerned, as a statement by Sposito (2013), not as a place in the city, but as "conditions and expressions of a center that an area is able to exert and represent" (p. 73). To further emphasize: if the city center is the denser area in terms of commercial activities and services (usually more verticalized in comparison to other areas), its negation are the periphery and sub-center areas. The relation between the center, the periphery and sub-centers may be identified as being a trait of centrality. That is why central areas are "spaces which anchor the constitution of centralities, though are not one and the same" since "there is no center unless it reveals its own centrality" (Sposito, 2013, p. 73). In summary, "if the center is revealed by what is located in its territory, *centrality* reveals itself by what is moved within this territory, thus gaining relevance the understanding of centrality, within the conceptual plan, under a prevalent light, regarding the temporal dimension of reality" (Sposito, 2013, p. 73-74).

The same author (Sposito, 2013) goes on to distinguish the concepts of multi-centrality and policentrality. Multi-centrality is equivalent to "more

than one commercial and services concentration area in a city" (p. 74), whilst policentrality represents the "more recently observed dynamics" when it comes to greater commercial and services surfaces "which redefine the spatial structure that had come to establish itself steadily over time" (p. 75), thus exercising "attraction over the whole of the city" or perhaps serving as a polarizing agent of other cities in the urban surrounding (p. 75). This dialectic relation between the center and the periphery, the center and centrality, as well as between multi and policentrality is reason enough to redefine consumption standards and spatial practices, thus altering the content of the main center of the city.

The medium-sized cities studied here, are currently, multicentric, and in some cases policentric, since new choices are "those carried out by large incorporations responsible for the implementation of new commercial and service surfaces" (in accordance with defined economic mindsets) that "do not seek out the city, but expect and carry out actions so that the city and its inhabitants seek them out instead" (Sposito, 2013, p. 77-78), which in turn also conditions spatial practices of people, be they individuals or collectively.

The emergence of central areas aside from the main center is the result of new location choices of large commercial and services groups (generally of an outside capital city to those cities - often moved by foreign capital, to be more precise), such as shopping centers, supermarkets, multiple branch chains (e.g.: appliances) and franchise systems. This process multiplies urban centralities and potencializes socio-spatial fragmentation processes, as the city restructures itself through location choices regarding territorial differentiation of urban space values. In other words, the city and social happenings form a pair that gets dialectically closer and farther within space and time and indeed manifests itself via the changes in spatial forms.

This article draws examples in order to study new spatial practices through the cities of Presidente Prudente, Marília and Ribeirão Preto, all located in the state of São Paulo, during the period between 2000 and 2010 (v. images. 3 & 4). By using the reference of population growth, Ribeirão Preto is situated in an area of relative growth, yet Presidente Prudente and Marília are both located in areas of relative decline. From an economic standpoint (value added by industries), all three cities are found in areas of relative expansion, with Ribeirão Preto being in an area of relatively greater growth than the remaining two others.

This comparison serves to show that space and time are different between the three cities, despite the fact that they belong to the same socio-spatial formation resulting from the formation of a coffee complex and which marked the strongest industrialization process of the country. These economic moments set a mark during both the 19th and 20th centuries and were instrumental for structuring the São Paulo urban network and the conformation of the larger territorial dynamics in the state.

Moreover, Image 5 demonstrates that the three cities may be classified as middle and distant from the greater urban clusters in the state and far from the metropolis.

Image 3. State of São Paulo: Population growth (2000-2010)

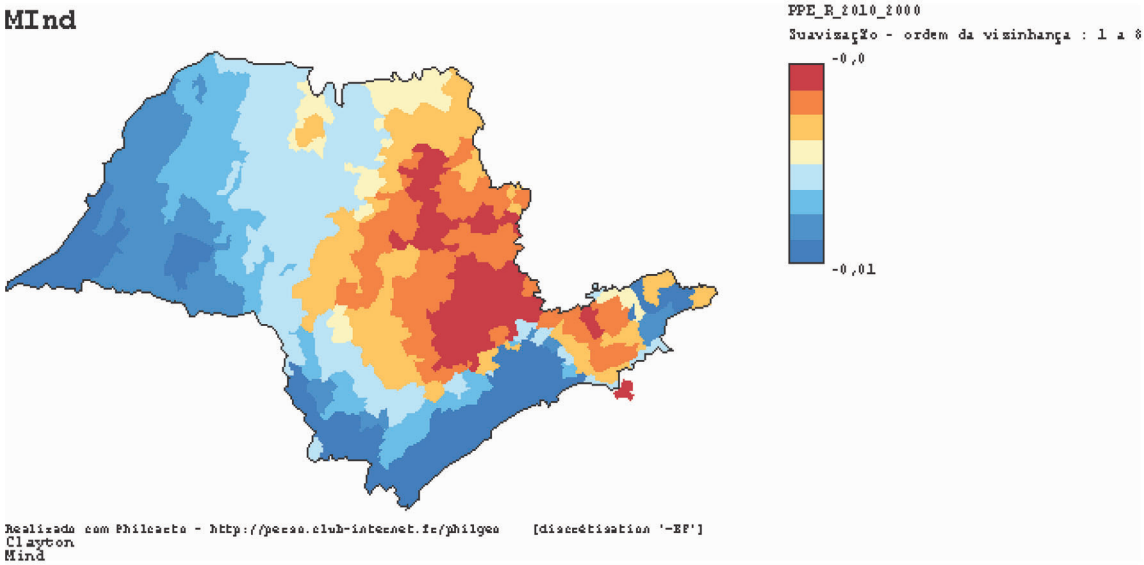


Image 4. State of São Paulo: Value added (production of goods) (2000-2010)

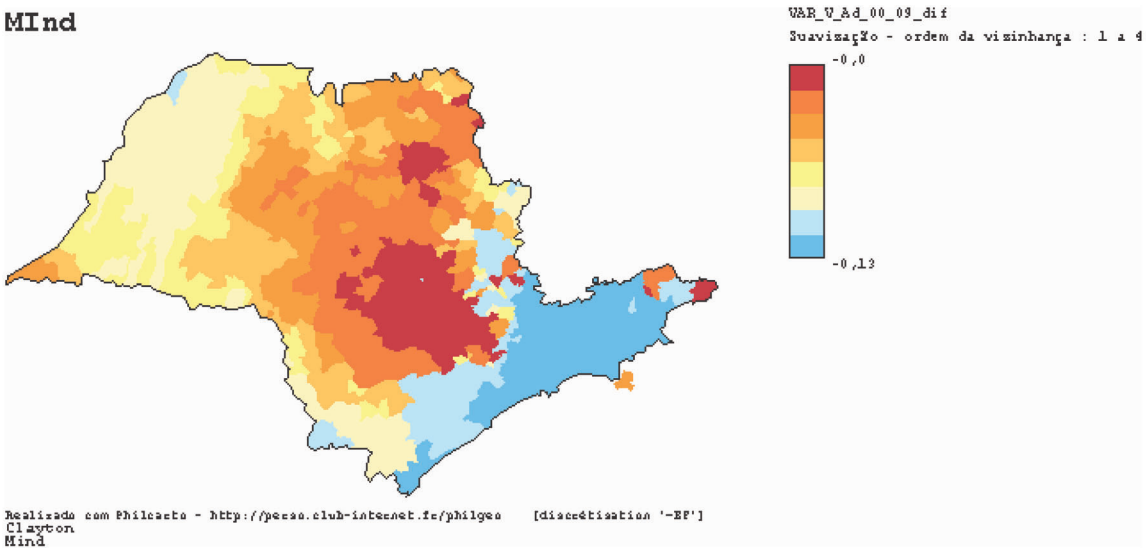
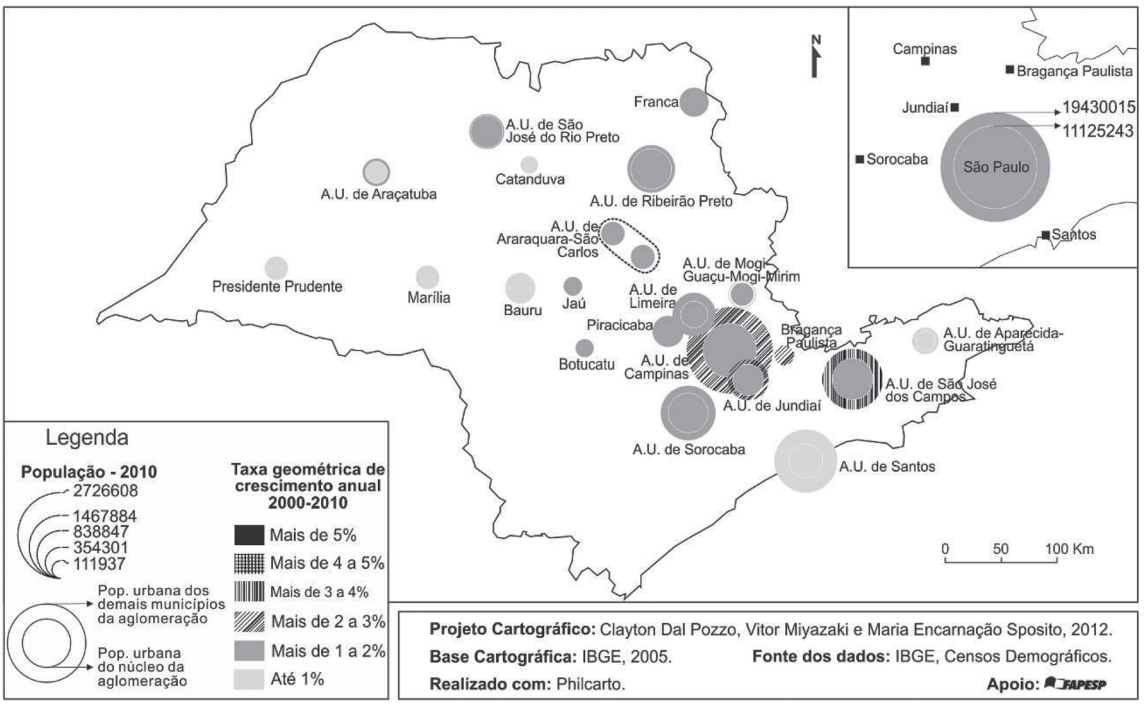


Image 5. State of São Paulo: Urban clusters and middle cities (2010).



4. Third level: case studies

The location of points of sale chosen by companies from the retail market is mainly defined by corporate strategies, which in turn are conditioned by their own economic rationales established by the capitalist production system. For Sposito (2017), one should not neglect "the efforts made by companies so that over time options become homogenized, hence relying on major brands" (p. 631). This means that the role of large businesses "formalizes" a type of structuring of the urban system (in terms of urban hierarchy and heterarchy) and the city (from the stance of points of sale location), even though we hold, as a focus, the socio-spatial conditions and forms of mobility in the city which in turn condition choices by means of consumption (through both quantity and quality) as well as how individuals traverse the city.

One consequence of this movement is the contradictory trend to homogenization and urban differentiation. In the first case, the repetition of brands, architecture, colors and manners of service demonstrate a trend towards pasteurizing daily life, thus seeking to uniform behaviors. In the second case, the differentiation is territorialized due to the diverse potentialities of consumption through dif-

ferent social groups as well as their distribution by city, i.e., the city distinguishes itself, territorially, in high income neighborhoods (be they in closed communities, or high-end residential buildings) and on the other end of the spectrum, the neighborhoods where underprivileged populations survive, either in areas close to the city centers or far away from them.

This brings forth a repetition of movements and behaviors. At times, in exchange areas (shops), others in areas of displacement of people (mass transport, private vehicles, etc.). This repetition may constitute an urban mobility system that crystallizes and conditions the decision-making process of individuals in their needs to move and shop (as an important moment in the consumption process).

4.1 The Presidente Prudente case

The municipality of Presidente Prudente (image 6) would be a halfway case, with a strong main center providing a high concentration of commerce and service activities, as well as with the formation of sub-centers, the main one in this case being carried away by Prudenshopping. The municipality of Presidente Prudente boasts a population of 220,599 inhabitants, as estimated the 2014 IBGE[2] census. At present it is one of the main industrial, cultural and service poles west of São Paulo.

The city is articulated by four main roads: Manoel Goulart, Washington Luiz, Coronel José Soares Marcondes and Brasil avenues, which end up crossing each other, thus forming a square, concentrating the core of the main center, which contains the greatest proportion of commerce and services in the city. Manoel Goulart avenue links the main center with the western part of the city. This avenue is the location axis for retail and service activities of greater importance, such as a number of banking branches, furniture stores, car dealerships, restaurants and others. Washington Luiz Ave. also links the west end to the city center, though there one will find more sophisticated venues, including designer brand clothing and footwear stores. Located in this avenue are several of the city's private medical and dental clinics. Coronel Marcondes Ave. on the other hand, cuts through the center, linking the north and south of the town. This avenue presents numerous public institutions, the Santa Casa Hospital as well as a plethora of private medical and dental clinics, banks, several chains of drugstores, and a great deal of less specialized retail stores. Brasil Ave. sets the the limit between the main center with the east part of the town, and specializes in paint and automotive parts shops, and in more modest sense, it is also represented by the city's street vendors and bazaars[3].

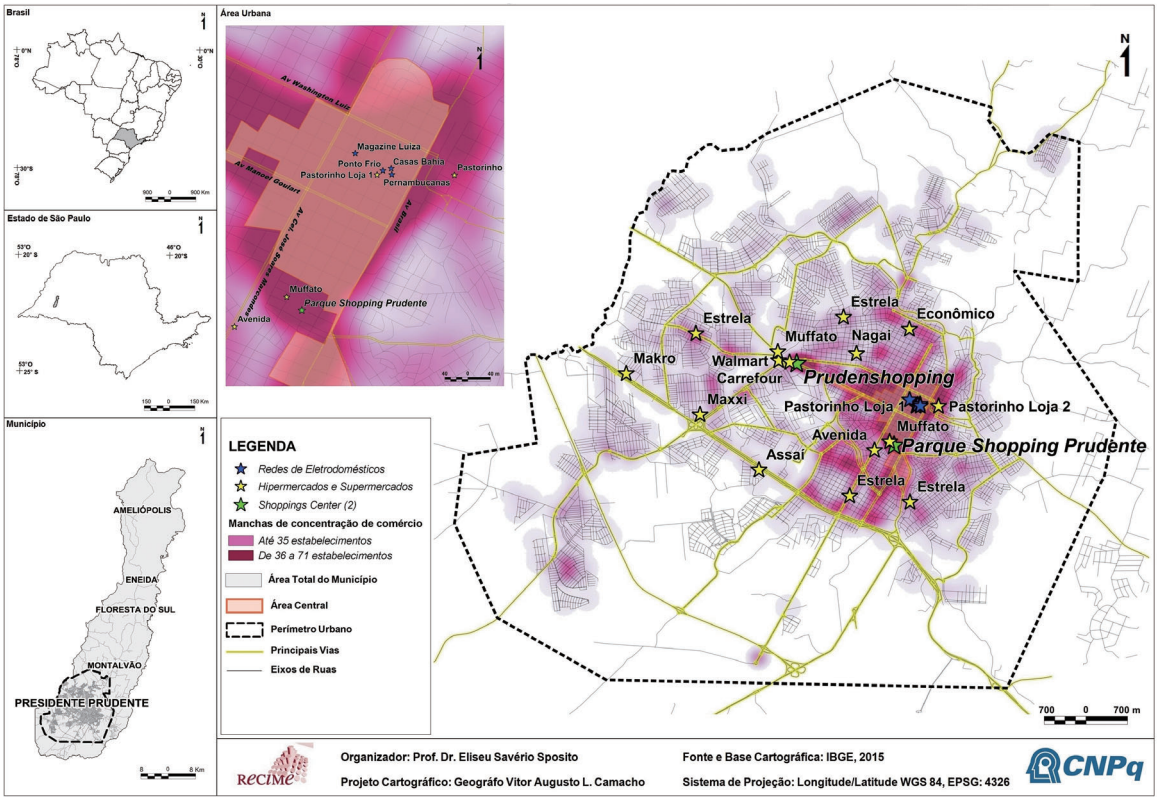
Despite Presidente Prudente being of the same size as Marília (next in line for this study) in terms of lanuse and occupation?, it displays a process of decentralization of retail and service activities and this is also due to the fact that it is a regional center of importance (Regional Capital C, as per the REGIC classification). As the main center continues to concentrate the greater part of retail and service activities in the city, this is where one finds points of sale from some of the major household appliance retail chains in the country, such as Ponto Frio, Magazine Luiza, Casas Bahia and Lojas Pernambucanas, which become intertwined with regional chains as Cybelar, J. Mahfuz and Romera, as well as clothing, footwear, eyewear retail shops and other banks, e.g., Banco do Brasil, Bradesco, Itaú, Santander, etc. There is also a trend toward decentralization around Manuel Goulart Ave., where Prudenshopping and numerous department stores are located, such as Walt-Mart, Muffato and Maxxi Atacado. This avenue is then converted into an extension of the main center, since there is where you will find a variety of retail activities and services. Prudenshopping was built in 1990 and covers an area of 85,000 m², with 208 stores, including a supermarket, Carrefour, and a number of anchor shops, such as Casas Bahia, Magazine Luiza, Ri Happy, Centauro, C&A, Marisa, Renner, Riachuelo McDonald´s, Habib´s etc. Aside from Prudenshopping, the city contains another shopping center called Parque Shopping, inaugurated in 1986, which houses numerous stores retailing goods such as clothing, footwear, accessories, and others. The crowning stores at this location are namely Lojas Americanas and Super Muffato hypermarket.

In Presidente Prudente, the areas which may be deemed sub-centers either follow the main circulation accessways or are found in neighboring areas farther from the main center. With its 20 hypermarkets and supermarkets in the city, the area close to Prudenshopping became a sub-center of major importance to commercial density due to the fact that it boasts three hypermarkets.

2. Data available online at: http://www.ibge.gov.br/home/estatistica/populacao/estimativa 2014/

3. Area administered by the municipal public office (located at the Bandeiras square) which congregates sales booths peddling bargain goods at a lower quality than those found in proper stores.

Image 6. Presidente Prudente – SP. LOCATION OF RETAILER TRADE ESTABLISHMENTS



> "Social differentiation becomes evident under the division of the social space, yet the role of the main center is still paramount, since it functions as an indicator that there is an important area in the city for the whole of its consumers" especially when the consumption of goods and services stands out from the rest (Sposito, 2017, p. 646).

The displacement of consumers demonstrates that the distances are vast within the city. Consumers commute from far corners (north and west areas) to, from top to bottom order, Prudenshopping, the main center, Parque Shopping and Parque do Povo. Shopping and leisure are the main reasons for the commute. (img. 7).

This research was based on different types of consumers, representing the socio-economic diversity of the population, in order to express mobility as well as the social differences found in the city. This is made ever more clear on img. 8.

Image 8 shows where consumers come from as well as characteristics of the urban space, starting from social groups with a monthly income of 20+ minimum salaries, as opposed to those who earn less than two. The centralities are defined by consumption and leisure, considering different types of interviewees[4].

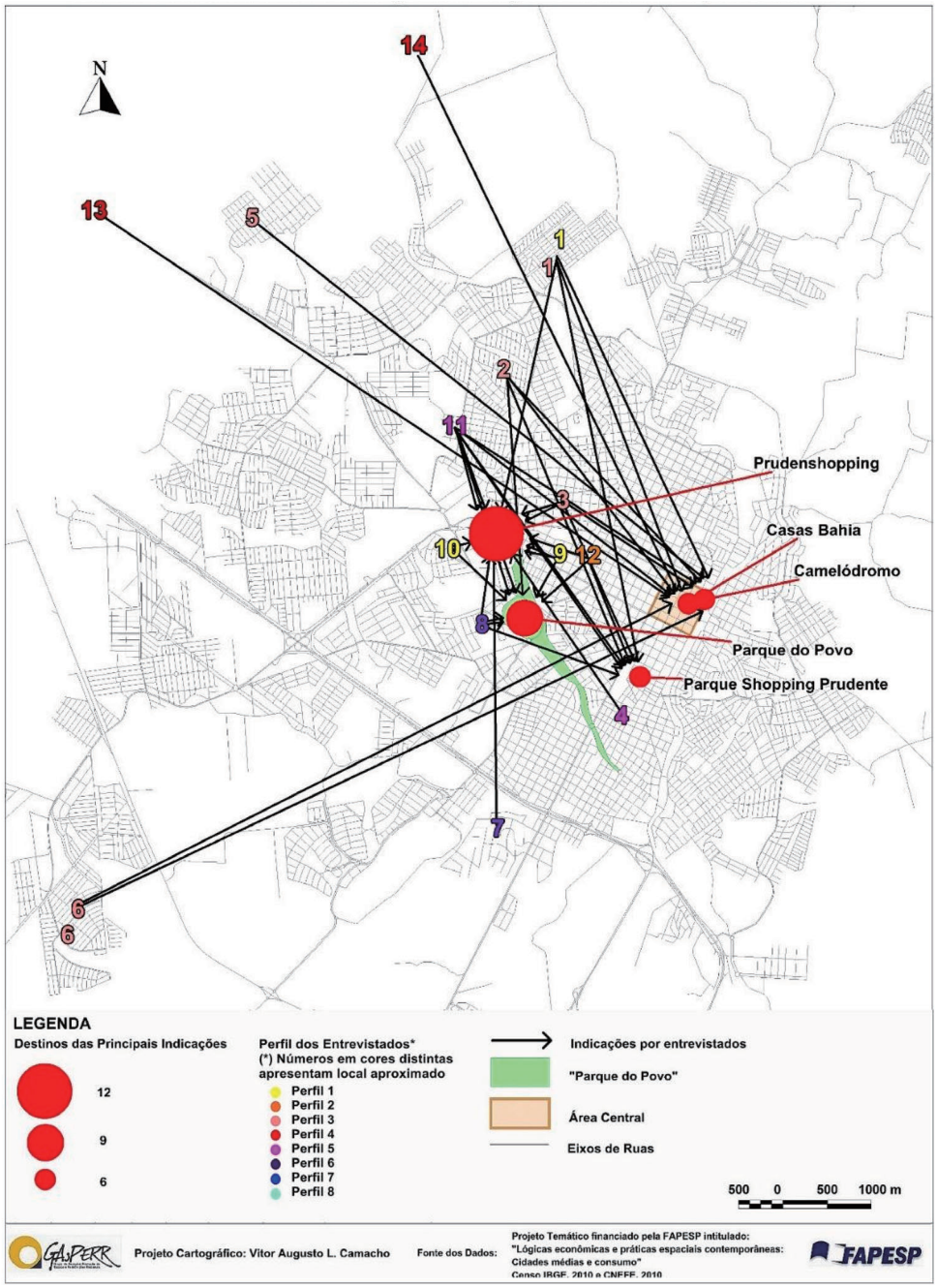
The characteristics of consumer movement in Presidente Prudente, are the following: 1) the main center with its shopping appeal (of a more diversified character and lower prices), though with lesser intensity when compared to other areas; 2) the formation of two important sub-centers (Prudenshopping and Parque Shopping) for shopping and an area with a strong leisure appeal (Parque do Povo); 3) these two points indicate the growing role of new centralities in the city; 4) lastly, Presidente Prudente exerts an important role from a regional standpoint due to the convergence of consumers from cities that makeup its urban network.

4.2 The Marília case[5]

The municipality of **Marília** (image 9) contains an estimated population of 230,336 inhabitants, according to 2014 IBGE data[6], and is classified by REGIC as a Regional Capital C (v. img. 1). Some of the highlights of this municipality are its industry, commerce, and service companies, which distribute their products to the national and interna-

4. In this article we will not expose nor analyze the interviews performed, but present the conclusions deduced from them as well as the observations from field research.
5. For the description of the city of Marília, the study is based on Sposito and Lozano (2017) – unpublished text.
6. Data available online at: http://www.ibge.gov.br/home/estatistica/populacao/estimativa 2014/

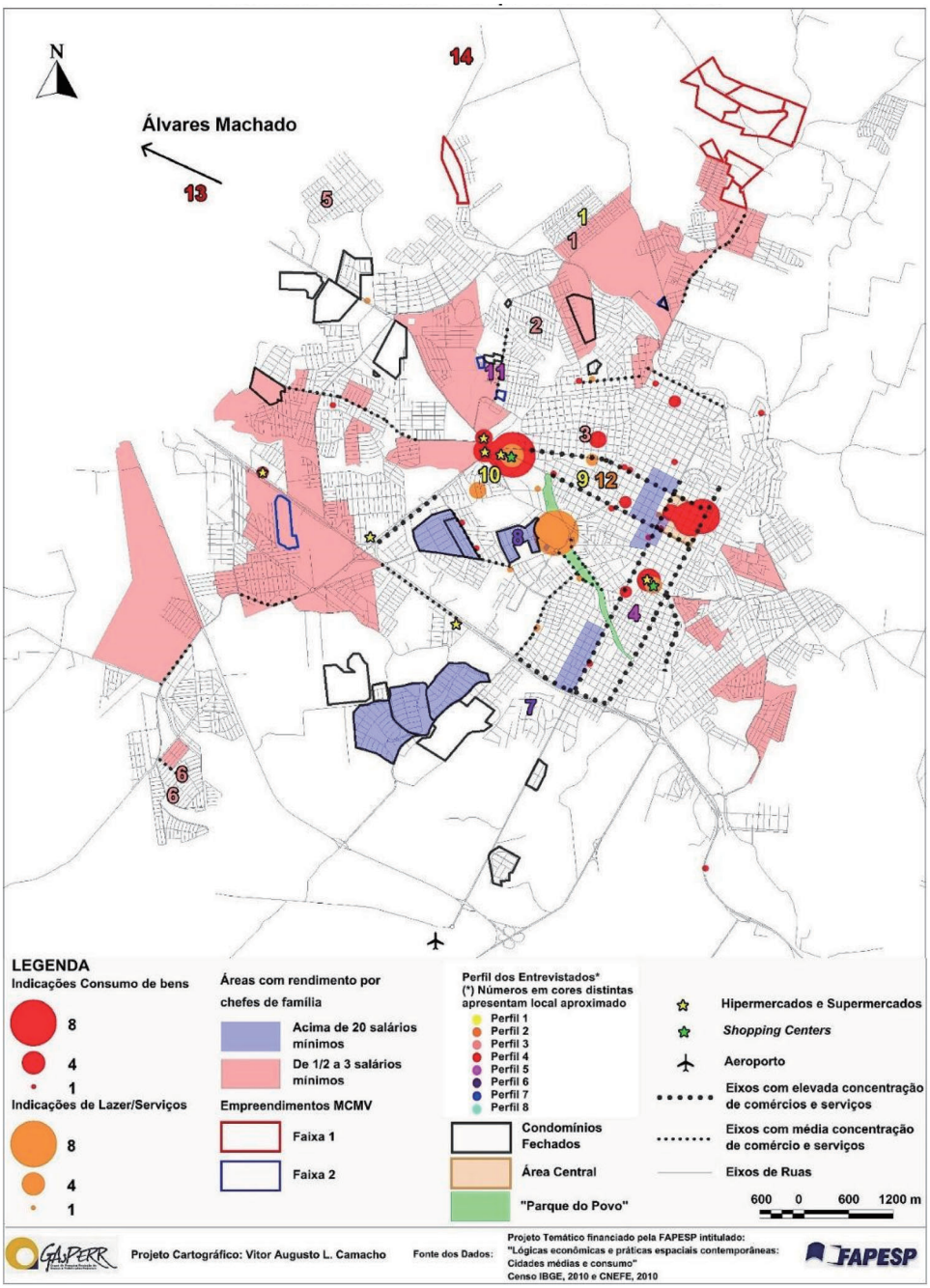
Image 7. Presidente Prudente – SP. MAIN CONSUMPTION INDICATIONS BY CONSUMER PROFILE. 2013



tional markets; this explains why it is known as the National Foods Capital.

Among the main roadway axes in the city are República Ave., which cuts through the city from north to south; Tiradentes and Sampaio Vidal Aves. That start from the center and head toward the east side of the town; das Esmeraldas Ave. that runs parallel to Tiradentes and begins in the center and runs eastbound, and Rio Branco Ave. which crosses other avenues and also has its starting point downtown and heads southbound. Sampaio Vidal Ave. is a roadway specialized in the retail and services sector. Here one finds a variety of of the main banking agencies in the country, such as Banco do Brasil, Bradesco, Caixa Econômica Federal, HSBC Premier, amongst others. Tiradentes Ave., on the other hand, is the main gateway from those coming into the city from Interstate SP-294 (which leads to Bauru and São Paulo), serving as linking point between the center and other neighborhoods from the southern and southeast sections of the city. This avenue is comprised of a number of car dealerships, gas stations, banking branches, and others. Das Esmeraldas Ave. is located in a higher end of part of town and serves as the gateway to Esmeralda Shopping, the closed communities whose population is considered of high income, and the Bus Station, having crossed the railway line. Situated in this av-

Image 8. Presidente Prudente – SP CONSUMPTION MAP – 2013



enue are some of the most luxurious shops in town. Rio Branco Ave. cuts through the most vertical area of the city and is an important roadway that binds the center to various locations of the city; the university campus and south and west of Marília districts, for instance.

In terms of the location of appliance store points of sale, major retail groups (chains of national reach, e.g., Magazine Luiza, Ponto Frio, Casas Bahia) as well as those of more regional operations (such as the case of Cybelar and J. Mahfuz) have placed their stores in the main center (and, in this particular case, the more traditional center) area of the city, precisely on the *calçadão* sidewalk area, also known as Rua São Luiz. In this area of the city, along with other major appliance stores, are also located key department stores, such as, for instance: Casas Pernambucanas (which also deals in household appliances) as well as renowned furniture, clothing, and footwear shops as Riachuelo, World Tennis and Renner, to name a few. It was observed a highly intense specialization process in the retail market, characterized by the conglomeration of more popular and sophisticated retail chains in one single space, be it of a local, regional or national nature.

Marilia Shopping, located in the north area of the town, was first built in the year 2000. With a to-

tal used area of 60,000 m2, it holds upwards of 170 shops; amongst them clothing, footwear stores of nationally recognized brands, as well as a number of other shops displaying accessories, toys, foods, beverages, etc. When it comes to appliances, there are only two points of sale, one being Lojas Americanas and the other Polishop. In this sense, this shopping center does not characterize, albeit for now, a sufficiently important centrality in the sense of its capacity to compete with the center area, thus allowing us to state that Marília is still very much structured by its main center.

From the interviews carried out, consumption and the movement of people in Marília may be characterized as follows: 1) the city restructures itself through the construction of closed residential communities that are distanced from each other; 2) the division of the social space, as evidenced by these characteristics, does not fragment its center-periphery relations due to the fact that the main center still maintains an important role for its set of consumers, since it is where most of them end up converging (v. consumption of goods, red circles); in other words, this is still a typical structure defined by the center-periphery pair, which defines a city with strong monocentrism; 3) this results in a certain differentiation in regard to the search between the main center and the defined sub-centers featuring shopping centers, as much as in the price difference in goods offered, which shows a social differentiation in the consumption of goods (in Marília, sub-centralities are defined by Marilia Shopping and WalMart); 4) a socio-spatial distance is clearly observed between wealthier and poorer classes.

Image 9. Marília – SP. LOCATION OF RETAILER TRADE ESTABLISHMENTS

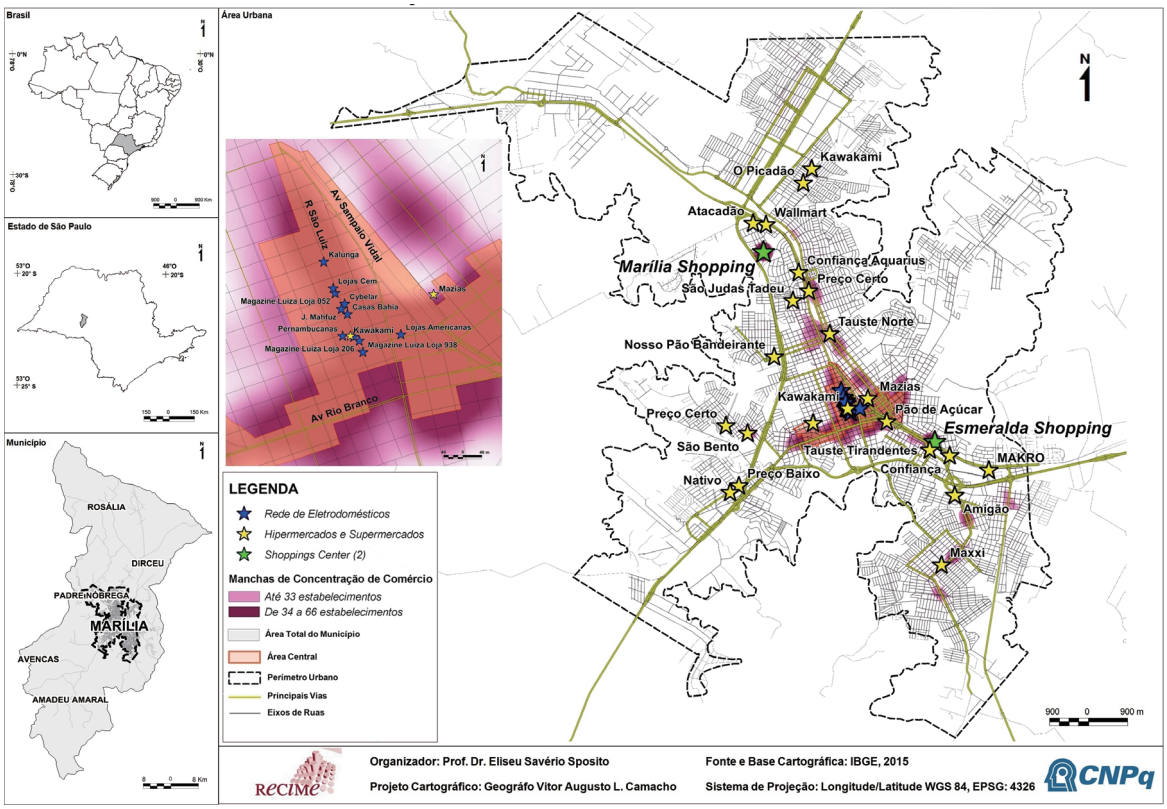


Image 10. Marília – SP CONSUMPTION MAP – 2013

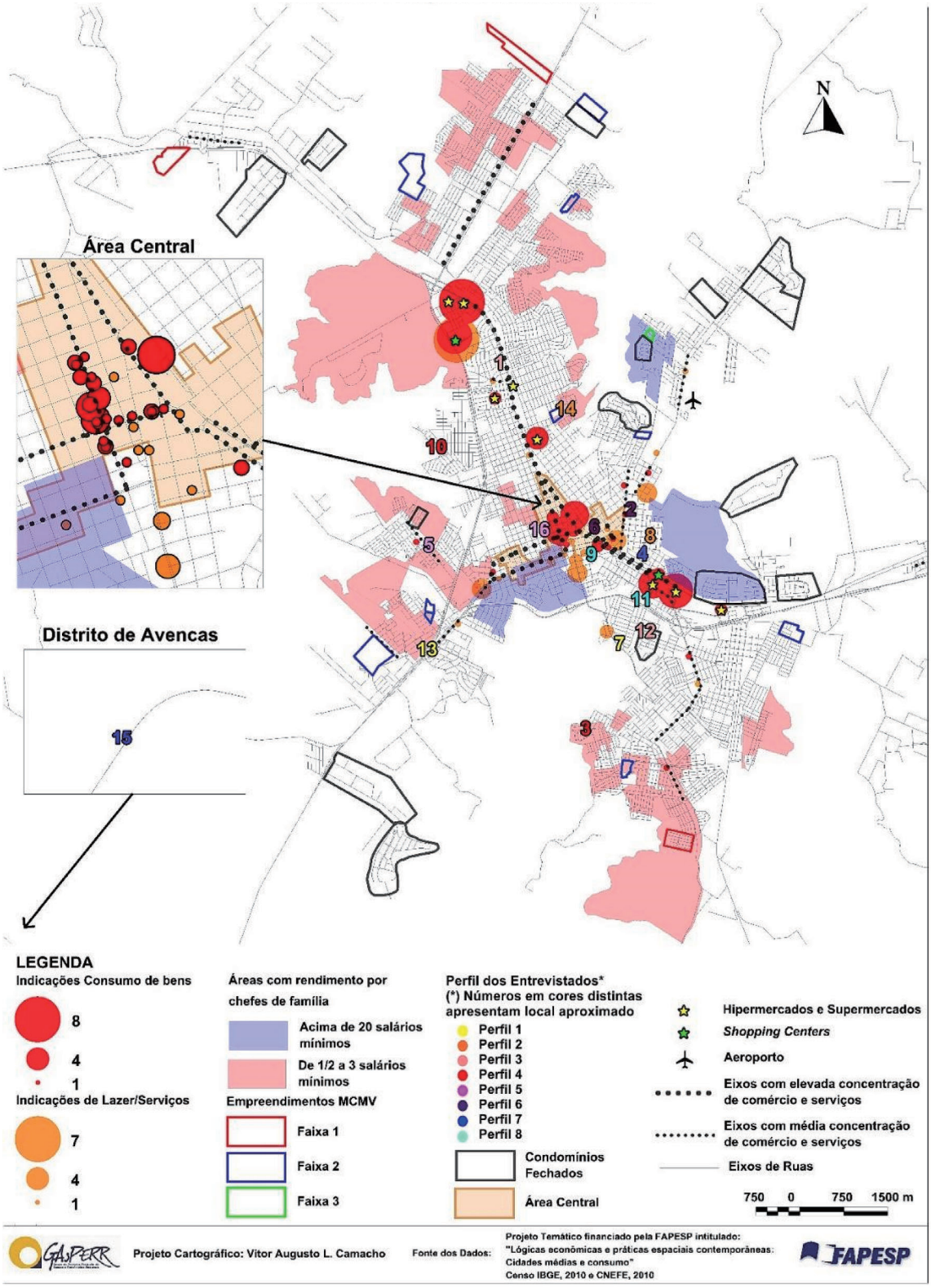
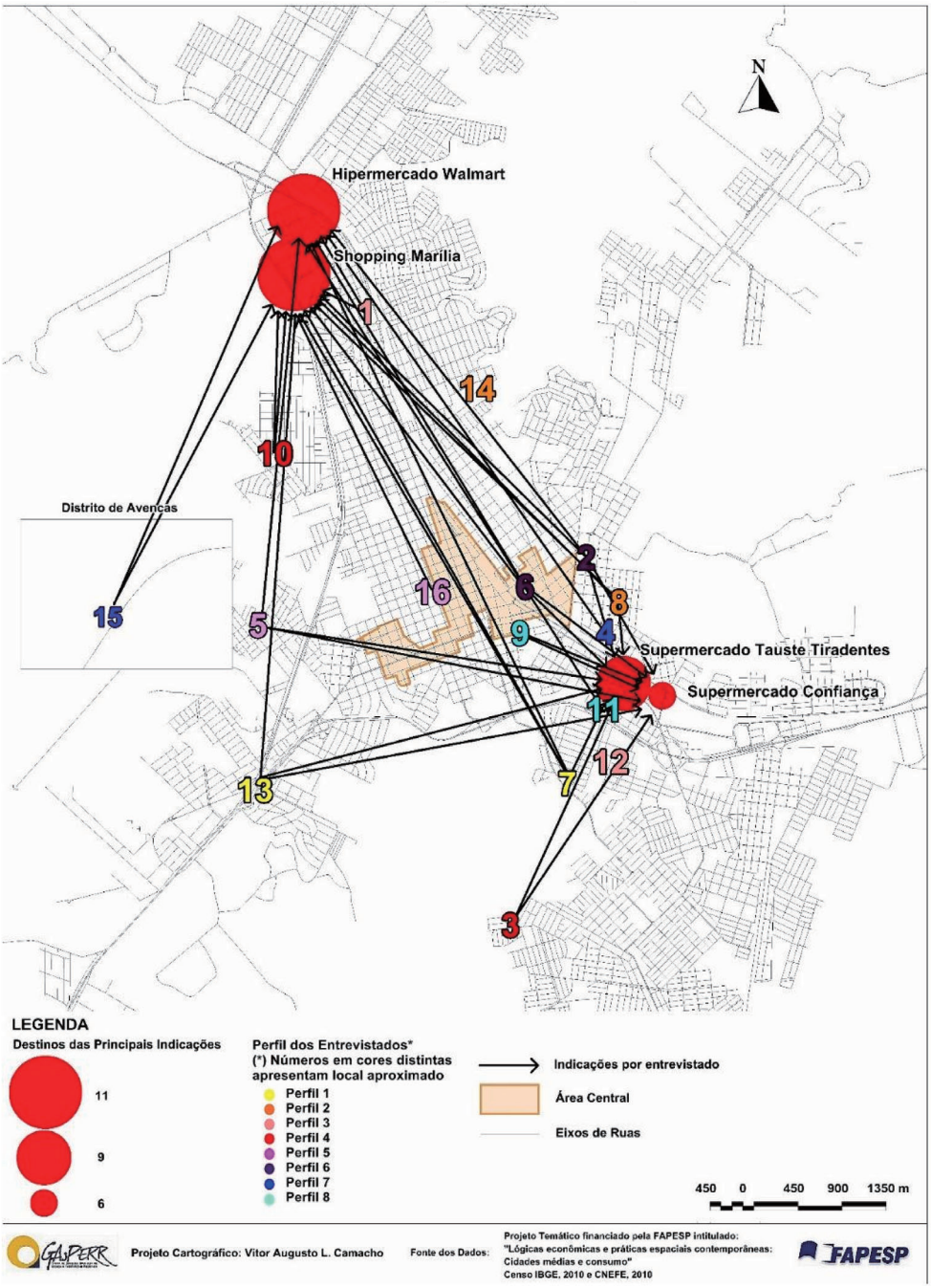


Image 11. Marília – SP. MAIN CONSUMPTION INDICATIONS BY CONSUMER PROFILE. 2013



The Ribeirão Preto case

The municipality of Ribeirão Preto, as per data from IBGE, had an estimated population of 658,059 inhabitants in 2014[7], thus turning it into one of the municipalities of greatest growth within the State. Ribeirão Preto is classified as a Regional Capital B, as per REGIC, and is configured as an attraction nucleus for industrial, commercial and service activities region, whose influence extrapolates the limits of the governing region itself, thus extending into other cities such as Barretos, Araraquara, São Carlos, Franca and others from the state of São Paulo and even other states, such as into the cities of São Sebastião do Paraíso, in the state of Minas Gerais.

In general terms, it is a city that is undergoing an evident process of deconcentration of functions, due to the very accelerated process of urban expansion that has been lately felt. The city's growth process has increased the spatial segregation processes in the population: there are a great deal of shanty towns that, little by little, are going through land settlement processes. The area with the lowest income per capita is located in the northern

7. Data currently available onine at: http://www.ibge.gov.br/home/estatistica/populacao/estimativa 2014/

region, and, at present, contains a total population of 204,929 inhabitants. In contrast to all this, the southern and southeast areas are where one may find the wealthiest cut of the city's population.

The main development axis of Ribeirão Preto is Presidente Vargas avenue, which begins near the central region and extends itself throughout the southern district and is considered to be the greatest growth symbol of the city, in the area that goes from the intersection between Nove de Julho Ave. — initial landmark of Presidente Vargas — all the way to the South beltway, thus designing an important urban corridor, whose main vocations are retail and services. In this region are two main shopping centers, Ribeirão Shopping and the upscale Shopping Iguatemi Ribeirão Preto. The east of town (whose most symptomatic name is Ribeirânia) is also drawn into that direction of strongest real estate expansion, i.e., the Novo Shopping Center.

The location of appliance chains points of sale is similar to that of other researched cities: most of the more conventional stores, be it on a national or regional scale, may be found in the city center. In the first case we have Magazine Luiza, Casas Bahia, Ponto Frio, Lojas Pernambucanas, Lojas Americanas and, second, Lojas Cem, Lojas Xavier and Ricardo Eletro. The starting point for the decentralization process in Ribeirão Preto may be identified in the southern portion of the main center, precisely in the Higienópolis borough, where Shopping Santa Úrsula is located, as well as points of sale from department chains such as Ponto Frio, Fast Shop and Lojas Americanas. Situated in the south-southwest areas of town are Shopping Ribeirão and Iguatemi, respectively, which house shops from such major chains as Ponto Frio, FNAC, Fast Shop and Poli Shop, whose main target demographic are higher income families. In the eastern portion, commonly known as Ribeirânia, one will find Novo Shopping Center which contains a diversified *mix* of stores, amongst which are Casas Bahia, Magazine Luiza, Lojas Americanas, Kalunga, etc.

Hyper and supermarkets which, depending on their size and dimensions may also sell appliances, are distributed throughout the vicinities of the city, primarily in the central and main central neighboring regions.

There are a total of 40 hyper and supermarkets in Riberirão Preto, which, as discussed in the previous cities, are distributed across the urban sprawl, with some of them being in periphery areas of the urban mesh or perhaps along certain roadways.

Image 12. Ribeirão Preto – SP. LOCATION OF RETAILER TRADER ESTABLISHMENTS

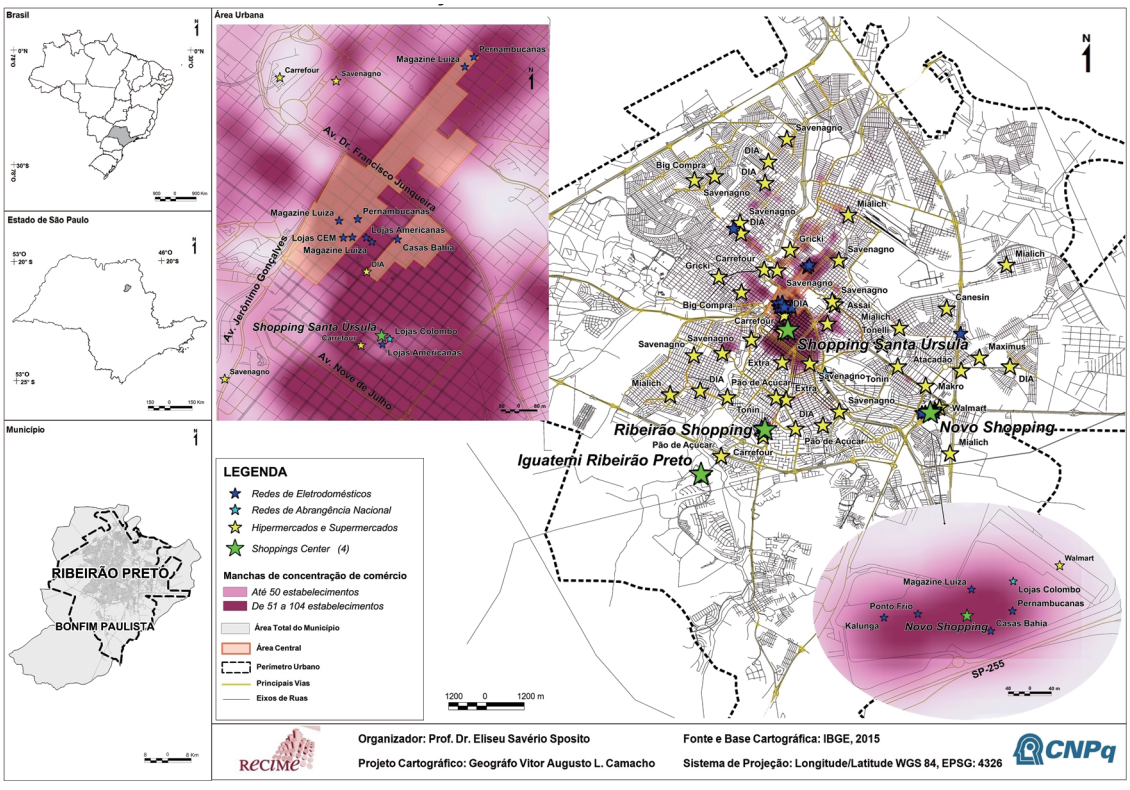


Image 13.eu Ribeirão Preto – SP. MAIN CONSUMPTION INDICATIONS BY CONSUMER PROFILE. 2013

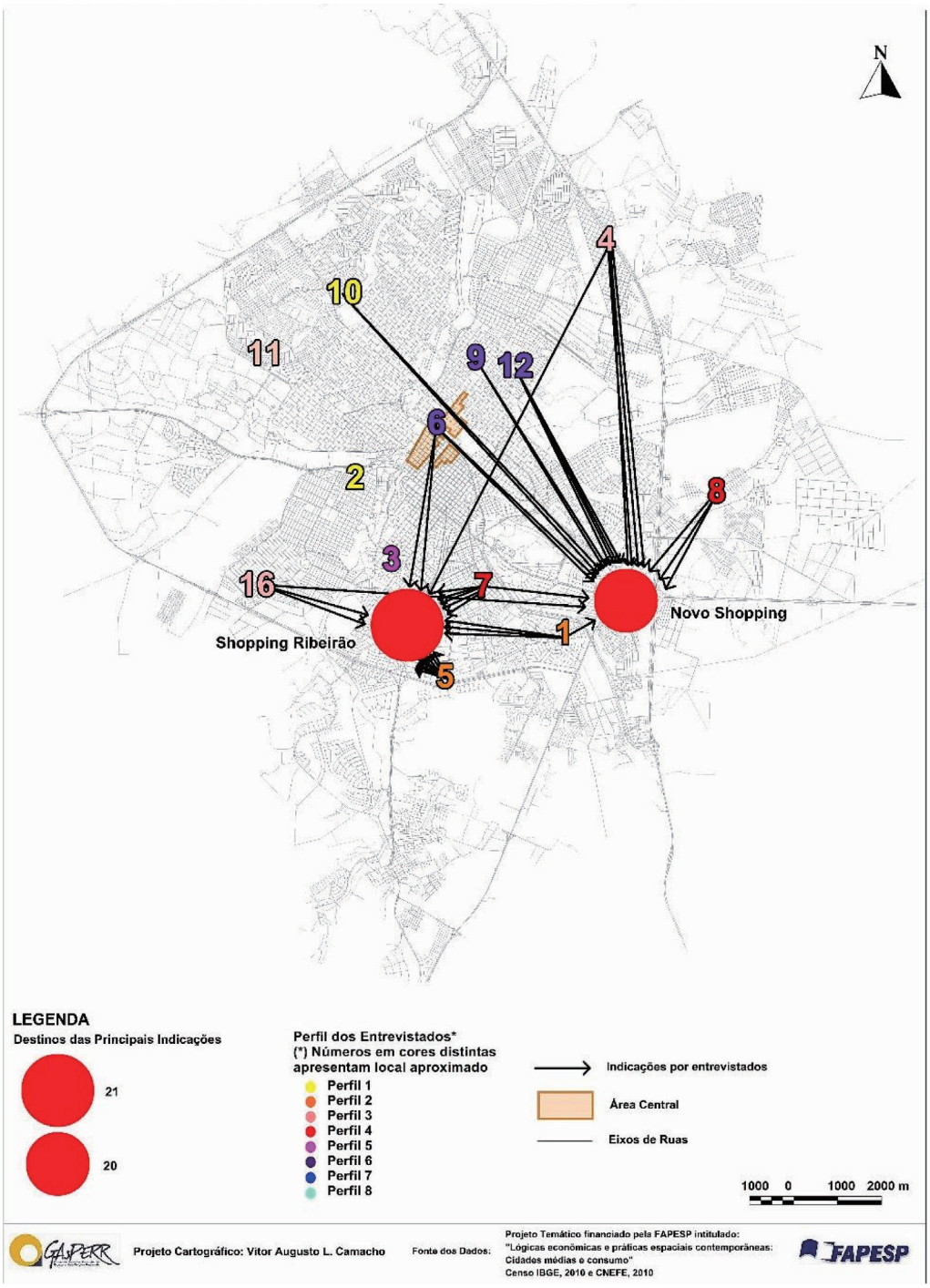
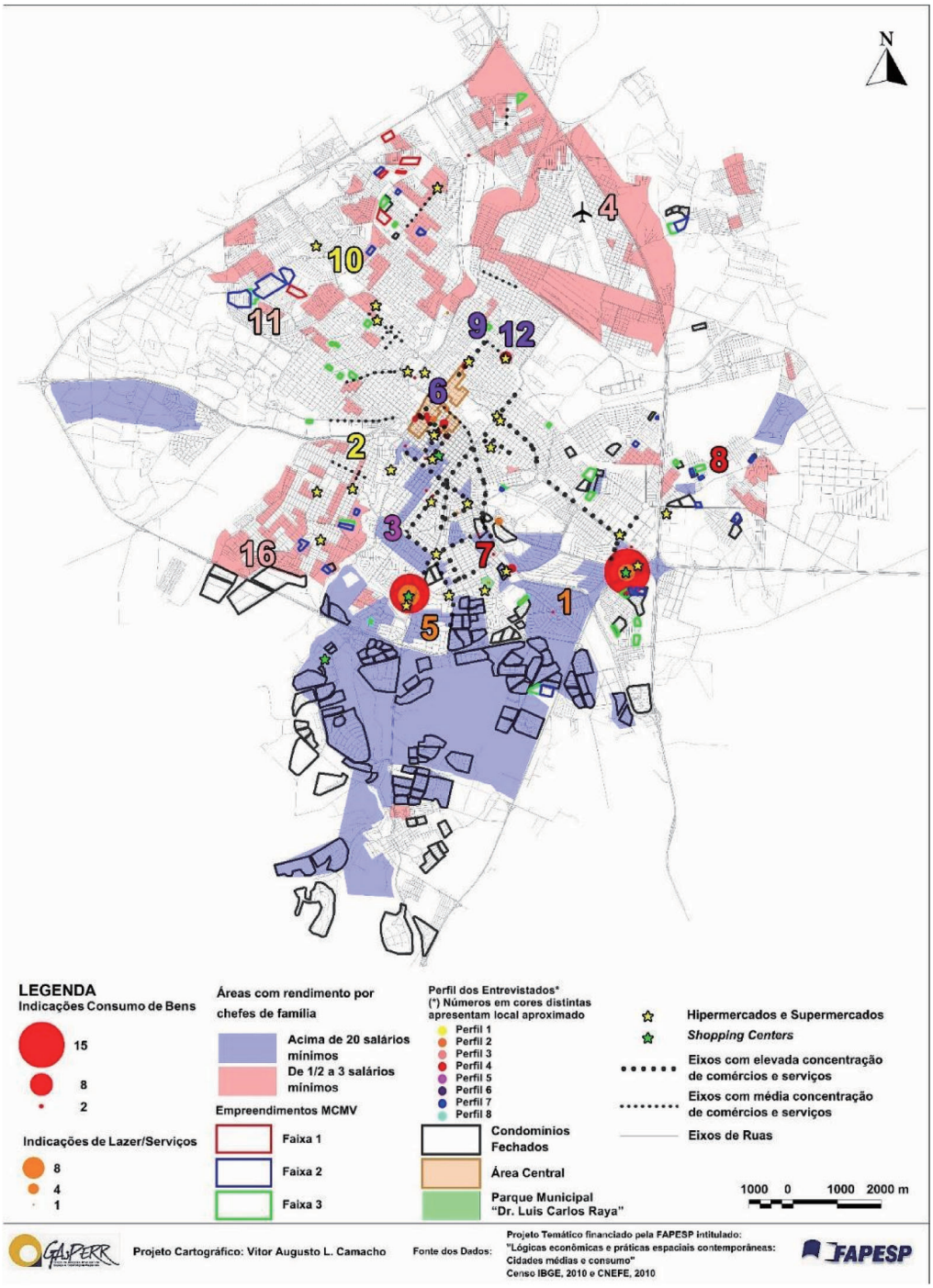


Image 14. Ribeirão Preto – SP. CONSUMPTIO MAP – 2013.



In general terms, in Ribeirão Preto: 1) the loss of importance of the main center is paramount to comprehending the restructuring of the city; 2) sub-centers are the new areas which draw in consumers, and are represented by the shopping centers located south of the town; where those with monthly incomes of 20+ minimum salaries reside; 3) socio-spatially speaking , the city presents itself dichotomized between north and south; the north being home to most of the underprivileged population, with the south being the polar opposite (where coincidentally one also finds a predominance of guarded residential areas; an indicator of the ongoing trend towards the socio-spatial fragmentation[8] of the city).

5. Conclusions

From a methodological point of view, the interviews carried out took into consideration different types of subjects and their different locations in the

8. Socio-spatial fragmentation is here understood, in general terms, as a differentiation in space and consumption between social groups which distance themselves economically and socially, thus becoming specific living areas and areas where residents don't meet.

city. The use of cartography allowed for the visualization of differences in the urban space, as well as the origin of consumers interviewed.

From the point of view of each city, they structure themselves with the power imbued by the main center and the formation of sub-centers, thus displaying different relations of density. Form and process are empiricized by this data. The cities presented (Presidente Prudente, Marília and Ribeirão Preto) demonstrated differing structures: Marília has an important role exercised by the main center, exhibiting a persistent center-periphery relation in its structure of monocentrality; Presidente Prudente shows a trend toward policentrality, resulting from the separation of shopping and leisure areas and the emergence of two sub-centers, as evidenced by the shopping centers; Ribeirão Preto presents the city with two very different areas (north, with a predominantly impoverished population, in contrast to the walled-community, mostly wealthy southern residents) as well as the strong polarization from the sub-centers, as represented by shopping centers.

Even if located in an area of the same socio-spatial formation, the three cities are characterized by different dynamics in regards to their structure.

From an urban space standpoint, the comparison of the types of consumers with extreme strata (those who earn incomes higher than the equivalent of 20 minimum wage a month and those who earn less than two), result in centers and sub-centrality processes that show varied social dimensions of the urban space from the three analyzed cities, as well as, different trends and magnitudes toward socio-spatial fragmentation. These are in different moments marked in the urban space, since the three cities possess center-periphery relations, the formation of sub-centers and a densification of walled residential areas.

From an urban perspective, the issue of the systemic interaction between city structure and consumption demonstrate a relevant regional role with a strong participation of each city's residents, as well as, the participation of residents from those cities which form their regional network, without becoming an urban heterarchy which is more evident for business activities (commercial and industrial) and not for individuals.

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Seminar Overview

第３回日伯文化環境研究会

「都市・地域・自然システムの寿命」

共　催：京都大学研究連携基盤学知創成ユニット・日ASEAN研究プラットフォームグローカル情報ネットワーク・京都大学研究連携基盤グローバル生存基盤展開ユニット・京都大学総合生存学館

日　時：２０１８年3月１３日（火）～１５日（木）

会　場：京都大学稲盛財団記念館３階３３３号室（京都市左京区吉田下阿達町 46）

（注意：３月１３日の基調講演のみ日本語・英語の逐次通訳あり。それ以外の発表と討論は英語で行う）

講演者：泉拓良（京都大学総合生存学館）、近藤哲生（国連開発計画UNDP駐日代表事務所）

発表者：ネリ・デ・メロ・テヒ（サンパウロ大学芸術科学人文科学研究科）、ヒカルド・フラガ（バイーア連邦大学地球科学研究所）、アンヌ　ハップ（西パラー連邦大学社会の科学研究所）、クライデ・モラエス（西パラー連邦大学・社会の科学研究所）、エルヴェ・テヒ（サンパウロ大学・芸術科学人文科学研究科／フランス国立科学研究センター・米州研究研究所）、エリゼウ・スポジト（サンパウロ州立大学理工学地球科学研究所）、萩原八郎（四国大学経営情報学部）、山敷庸亮（京都大学大学院総合生存学館）、ホベルタ・フォンタン（京都大学東南アジア地域研究研究所）、フゥマン・ファルザネ（京都大学エネルギ理工学研究所）＊

挨拶とコメント：河野泰之（京都大学東南アジア地域研究研究所）水野広祐（京都大学東南アジア地域研究研究所）、アンドレア・フロレス・ウルシマ（京都大学東南アジア地域研究研究所）、柳沢雅之（京都大学東南アジア地域研究研究所）、幸島司郎（京都大学野生動物研究センター）、ウイル・デ・ヨン（京都大学東南アジア地域研究研究所）、ローハン・デスーザ（京都大学アジア・アフリカ地域研究研究科）、岡部明子（東京大学大学院新領域創成科学研究科）、松本裕（大阪産業大学建築環境デザイン学科）、原正一郎（京都大学東南アジア地域研究研究所）＊　［＊登壇順］

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問い合わせ：

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3rd Brazil-Japan Seminar on Cultural Environments

LIFETIME OF URBAN, REGIONAL AND NATURAL SYSTEMS

Co-organization: Unit of Academic Knowledge Integration Studies of Kyoto University Research Coordination Alliance (UAKIS-KURCA); Glocal Information Platform of Japan-ASEAN Platform for Transdisciplinary Studies; Research Unit for Development of Global Sustainability (RUDGS-KURCA); Kyoto University Graduate School of Advanced Integrated Studies in Human Survivability (KU-GSAIS)

Date: 13-15 March 2018

Place: Kyoto University, Inamori Foundation Memorial Building, 3rd floor, Large Meeting Room

Access: https://en.kyoto.cseas.kyoto-u.ac.jp/. Nearest train station: Jingu-Marutamachi St.

Program

DAY ONE: 13 March (Tue.)

9:40~10:00 OPENING FIRST DAY

Greetings (KŌNO Yasuyuki, KU-CSEAS)

Greetings (MIZUNO Kōsuke, KU-CSEAS/ RUDGS)

Theme's Rationale: *The Systemic View in the Debate about Human-Nature Interactions* (Andrea URUSHIMA, KU-CSEAS)

10:00~ 12:20 SESSION 1

Chairman: YANAGISAWA Masayuki (KU-CSEAS)

Presentation 1: *Brazilian Atlantic Forest -- Occupation, Death and Protection of Forest Remnants and Biodiversity*. Neli DE MELLO-THÉRY (USP-EACH/IEA)

Presentation 2: *Earth's System Under Transformation -- Humans and Geodiversity in an Anthropocene Perspective*. Ricardo FRAGA PEREIRA (UFBA-IGEO)

Presentation 3: *Lifetime of Human Occupations in Amazonia: Rethinking Human Presence and Landscape Transformation*. Anne RAPP/ Claide MORAES (UFOPA-ICS)

Comments: Wil DE JONG (KU-CSEAS)/ KOHSHIMA Shiro (KU-WRC)

12:20~ Lunch

14:00 ~ 15:30 KEYNOTE LECTURE

Chairman: YAMASHIKI Yōsuke (KU-GSAIS)

Ancient culture and natural disaster - examples in East Asia (Provisional Title)

IZUMI Takura (KU- GSAIS)

(Obs.: *Japanese-English Consecutive Translation will be available*)

15:30~ Coffee Break

15:45~18:00 SESSION 2

Chairman: Andrea URUSHIMA (KU-CSEAS)

Presentation 4: *Life Cycle of Brazilian Cities*. Herve THÉRY (USP-EACH/ CNRS-CREDA)

Presentation 5: *Center, Centrality and Consumption in Middle-Sized Cities' Systems*. Eliseu SPOSITO (UNESP-IGCE)

Presentation 6: *Traditional Farming Systems on the Steep Slopes in Mountainous Areas of Tokushima*. HAGIWARA Hachirō (Shikoku U-FMIS)

Comments: OKABE Akiko (UTokyo-GSFS)/ MATSUMOTO Yutaka (OSU-FDT)

18:00~ 18:30 First Day Closing

Moderator: Rohan D'SOUZA (KU-ASAFAS)

19:00~ Dinner

DAY TWO: 14 March (Wed.)

9:40~9:45 OPENING SECOND DAY

Greetings (HARA Shōichirō, KU-CSEAS/ UAKIS-KURCA)

9:45~11:45 SESSION 3

Chairman: Andrea URUSHIMA (KU-CSEAS)

Presentation 8: *Intercomparison survey among cities for the sustainable use of surface water and its impact of untreated wastewater in the river / lake basin system*. YAMASHIKI Yōsuke (KU-GSAIS)

Presentation 9: *Multiple Benefits Assessment of the Clean Energy Development in Asian Cities*. Hooman FARZANEH (KU-IAE)

Presentation 10: *Brazilian Metropolitan Natural Areas: Dissonances and Interactions between Rural and Urban on Macro Metropolitan Context*. Roberta FONTAN (KU-CSEAS)

Comment: Neli DE MELLO-THÉRY (USP-EACH); Herve THÉRY (USP-EACH/ CNRS-CREDA)

11:45~12:30 SPECIAL TALK:

Chairman: YAMASHIKI Yōsuke (KU-GSAIS)

SDGs and Its Goal 11: Sustainable Cities and Communities (Provisional Title)

KONDŌ Tetsuo (UNDP Tokyo)

12:30~ Lunch

14:00~18:30 Field Trip Survey

DAY THREE: 15 March (Thu.)

10:30~12:30 FINAL CLOSING DISCUSSION:

Moderator: Andrea Flores Urushima

LIST OF PARTICIPANTS*

(*The list follows the order of appearance in the program)

KEYNOTE LECTURE:
Izumi Takura (KU-GSAIS)

PARTICIPANTS IN SESSIONS:
Neli de Mello-Théry (USP-EACH/IEA)
Ricardo Fraga Pereira (UFBA-IGEO)
Claide Moraes / Anne Rapp (UFOPA-ICS)
Hervé Théry (USP-EACH/ CNRS-CREDA)
Eliseu Sposito (UNESP-IGCE)
Hagiwara Hachirō (Shikoku U-FMIS)
Yamashiki Yōsuke (KU-GSAIS)
Roberta Fontan (KU-CSEAS)
Hooman Farzaneh (KU-IAE)

SPECIAL TALK:
Kondō Tetsuo (UNDP-Tokyo)

DISCUSSANTS:
Kōno Yasuyuki (KU-CSEAS)
Mizuno Kōsuke (KU-CSEAS)
Andrea Urushima (KU-CSEAS)
Yanagisawa Masayuki (KU-CSEAS)
Wil de Jong (KU-CSEAS)
Kohshima Shiro (KU-WRC)
Rohan d'Souza (KU-ASAFAS)
Okabe Akiko (UTokyo-GSFS)
Matsumoto Yutaka (OSU-FDT)
Hara Shōichirō (KU-CSEAS)

LIST OF PARTICIPATING INSTITUTIONS*

KU-CSEAS (Kyoto University, Center for Southeast Asia and Area Studies)
KU-RUDGS (Kyoto University, Research Unit for Development of Global Sustainability)
USP-EACH (University of Sao Paulo, School of Arts Sciences and Humanities)
USP-IEA (University of Sao Paulo, Institute of Advanced Studies)
UFBA-IGEO (Federal University of Bahia, Institute of Geosciences)
UFOPA-ICS (Federal University of Western Para, Institute of Sciences of the Society)
KU-WRC (Kyoto University, Wildlife Research Center)
KU-GSAIS (Kyoto University, Faculty for Graduate School of Advanced Integrated Studies in Human Survivability)
CNRS-CREDA (French National Centre for Scientific Research, Centre for Research and Documentation on the Americas)
UNESP-IGCE (Sao Paulo State University, Institute of Geosciences and Exact Sciences)
Shikoku U-FMIS (Shikoku University, Faculty of Management and Information Science)
UTokyo-GSFS (University of Tokyo, Graduate School of Frontier Sciences)
OSU-FDT (Osaka Sangyō University, Faculty of Design Technology)
KU-ASAFAS (Kyoto University, Graduate School of Asian and African Area Studies)
KU-IAE (Kyoto University, Institute of Advanced Energy)
UNDP-Tokyo (UNDP Representative Office in Japan, Tokyo)

Short Profile of Lecturers

Keynote Lecturer

Izumi Takura Born in Kanagawa, completed his studies in the faculty and graduate school of Literature in Kyoto University. He is a Japanese archaeologist and writer. He is a Professor of Archaeology at Kyoto University and Professor Emeritus of Nara University. He specializes in the archeology of prehistoric times and has authored books on the appearance of Jōmon Pottery and its history, in addition to the early history and birth of Japan. He is a member of the Japanese Archaeological Association, Japan Society of Scientific Studies on Cultural Properties, West Asian Archaeology Society, Japanese Society for West Asian Archeology, Japan Orient Society and The Society For Near Eastern Studies on Japan

Invited Lecturers

Neli Aparecida de Mello-Théry Full-professor at University of São Paulo, School of Arts, Sciences and Humanities. Doctor in Geography by Paris-Ouest Nanterre University and São Paulo University, specialized in public policies, especially in environmental planning and management. Developed a research on sustainability of agricultural production and adaptation policies to climate change in Mato Grosso and Brittany during a post-doctoral period (2012-2013) at the Université de Rennes 2. Participates in research networks and laboratories in Brazil and France. In addition of being an associate researcher at the University of Brasilia, she has been a visiting professor at the University of Paris X, Nanterre (2000), Université de Rennes 2 (2005 and 2008) and Université Paris Sorbonne-Nouvelle (2008). Author of Territory and Environmental Management in the Amazon: Public lands and the dilemmas of the State (2011), Territorial Policies in the Amazon (2006) and co-author of Atlas do Brasil - Disparities and Dynamics of the Territory (2005, 2008 and 2018) (In Portuguese, Annablume, 2011, 2006 and Edusp, 2005, 2008 and 2018.

Ricardo Galeno Fraga de Araújo Pereira Geology bachelor (1995) and a Master of Sciences (1998) received from the University of São Paulo (Brazil). Between 1997 and 2007, worked with environmental consultancy, dealing mainly with environmental impact assessments and management plans of protected areas in karst systems. Also conducted environmental assessment varied types of facilities, environmental audit, monitoring campaigns of soil and groundwater, and operation of remediation systems in several States in Brazil. In 2007 started a PhD program in the Earth Science Department at the University of Minho (Portugal), defending the thesis: “Geoconservation and Sustainable Development in Chapada Diamantina (Bahia - Brazil)”, with a scholarship from the High Level Scholarship program for Latin America (Programa Alβan). His PhD thesis was awarded with the 2011 Scientific Award of the Casa de América Latina / Santander Totta, in the category of Technologies and Natural Sciences. After the conclusion of the PhD, in 2011 he started to work at the Federal University of Bahia – UFBA, where he is an Associate Professor in the Geosciences Institute and teaches undergraduate courses of Environmental Geology and Geological Mapping, and graduate courses of Karst Relief and Speleology, Geoconservation and Geoheritage, with participation in master and doctoral examinations at several Brazilian universities, in the areas of hydrogeology and water resources management, karstic reliefs and geoconservation. Since 2017, he is the Director of Scientific Programming of the Brazillian Geological Society (for Bahia and Sergipe States) and the General Secretary of the Brazilian Association for Groundwater (for Bahia and Sergipe States). Author of two books about geoconservation, and articles about environmental geology, karst, hydrogeology and management of natural resources.

Anne Rapp Py-Daniel Associate professor, since 2011, at the Archaeology Undergraduate Course of the Federal University of Western Pará State, Brazil. She earned her degree of doctor (2015) and master (2009) in Archaeology from the University of São Paulo, and a Bachelor´s degree (2000-2004) in Prehistory from

the Panthéon-Sorbonne University in Paris, France. Her academic and professional work deals with Amazonian Archaeology, specifically Funerary Contexts. She has researched about the formation processes of archaeological sites in different Amazonian regions and periods in collaboration with varied institutions, which resulted in the production of 13 papers and books published in the past five years. She has advised undergraduate students since 2010, and is nowadays responsible for conducting archaeological research in maroon communities near Santarém city, State of Pará, Brazil. She has participated in interdisciplinary groups studying ancient Amazonian archaeological sites in the States of Pará and Amazonas; and is responsible for formulating books about archaeology for elementary and high school students.

Claide de Moraes Archaeologist and associate professor at the Federal University of Western Pará, Santarém, Brazil. He earned the degrees of doctor (2013) and master (2007) in Archaeology from the University of São Paulo, and a Bachelor's degree (2003) in History from the Catholic University of Goias, Brazil. During the master and doctoral research, he has investigated the emergence, maintenance and fall of the societies in Central Amazonia around the year 1000 A.D., focusing on studies about the formation processes of archaeological records, ceramic industries, conflict and territorial expansion. He is currently developing studies of lithic industries from different moments of occupation in the Amazon. He is a member of a Franco-Brazilian research group investigating the first human occupations in South America, and has worked with contemporary indigenous populations in order to build a long term indigenous history perspective. He is author of 12 papers and books chapters about Amazonian archeology and a member of the Ethics Committee of the Brazilian Archaeological Society.

Hervé Théry Specially Appointed Professor at Universidade de São Paulo-USP since 2005, and Emeritus Senior Researcher at CREDA - Documentation and Research Centre on the Americas, CNRS-University Sorbonne Nouvelle Paris III, where he was researcher from 1979 to 2016. After receiving Bachelor degrees both in History (1972) and Geography (1973) and a Master degree in Geography (1973) he completed the doctoral program in Geography (1976) at the University Paris I Panthéon-Sorbonne, and he specialized on the pioneer fronts of the Brazilian Amazon basin and the dynamics of Brazil's territory. He has been Professor at the École Normale Supérieure, in charge of the Geography Department (1998-2002), environmental expert from the scientific and technical board of the French Ministry for Foreign Affairs (1994-1996), member (1993-2002) and chair (2000-2002) of the International Advisory Group (indicated by the G7 countries and the World Bank) of the pilot program for the conservation of Brazil's tropical forests. His main publications are: Le Brésil, Armand Colin, Paris, 6th édition 2012; Le Brésil, pays émergé, Armand Colin, Paris, 2016, and Atlas do Brasil, Disparidades e dinâmicas do território (with Neli Aparecida de Mello-Théry), Edições da Universidade de São Paulo EDUSP, São Paulo, 2005, with a third edition due to be published in February 2018. He is the Chief Editor (with Neli Aparecida de Mello-Théry) of the French-Brazilian geography journal Confins (http://journals.openedition.org/confins/).

Eliseu Savério Sposito Full Professor at São Paulo State University (UNESP). Doctor and Master in Human Geography by São Paulo University (USP). Specialized in studies about middle-sized cities, industrialization of São Paulo and geograpahical thought. Responsible for the Geography area at FAPESP (Foundation to Support São Paulo State Research). Post-doctor from the Paris University, Sorbonne-Panthéon. Author of books (8 monographs and 13 edited books), articles (46) and book chapters (48): including, Geografia e Filosofia (Geography and Philosophy), 2004; Redes e cidades (Urban networks and cities), 2009; O novo mapa da indústria no estado de São Paulo (The new map of industry in São Paulo State), 2016; Diccionario de Geografía y Planeamiento (Dictionary of Geography and Planning), 2016; Reestruturação produtiva e urbana no Estado de São Paulo (Urban and productive restructuration in São Paulo State), 2007; The role of large commercial companies in the dynamics of traditional commercial spaces: Presidente Prudente (Brazil) and Lleida (Spain). Visitor professor at the universities of Cá Foscari (Venice), Salamanca (Spain), San Juan (Argentina) and some others in Brazil. Directed 37 Masters and 26 PhD theses in Geography.

Hagiwara Hachiro Full-professor at Shikoku University, Faculty of Management and Information Science. Born in Tokyo, he earned a Bachelor degree from Waseda University, in the Faculty of Pedagogy, with a major in geography and history. He also earned the Master degree and completed his doctoral course at Rissho University, in Geography. During the post-graduate research, he investigated water supply and drainage systems of Mexico City and Sao Paulo, as well as, Tokyo and Paris. His specialty is urban geography and regional studies of Latin America, and in Tokushima he organizes visits to rural areas with students in cooperation with the local government.

Yamashiki Alexandre Yosuke Professor at the Graduate School of Advanced Integrated Studies in Human Survivability (GSAIS) , Kyoto University. Born in Otsu, Yosuke Alexandre Yamashiki attended Kyoto University where he earned his B. Eng. in Civil Engineering in 1990. From Kyoto he went to the University of Sao Paulo, Brazil (Escola Politecnica da Universidade de Sao Paulo http://www.poli.usp.br), earning his Master of Engineering in 1994, then studying Global Environment Engineering in Kyoto in the Graduate School of Engineering where he earned a Doctorate of Engineering in 1999. During his doctoral course, he worked in the international NGO (ILEC) as researcher. After this, he worked at UNEP-DTIE-IETC as an Associate Programme Officer for two years, contributing to the establishment of La Plata River Basin Environmental Management Network (RIGA) and the 3rd La Plata River Basin Workshop held in the City of Posadas, Argentina in 2001.

Hooman Farzaneh Jr. Associate Professor at the Institute of Advanced Energy (IAE), Kyoto University, Japan. He has a BSc in Chemical Engineering and MSc and PhD in Energy Systems Engineering from Azad University, Tehran, Iran. Dr. Hooman worked at the United Nations University Institute for the Advanced Study of Sustainability, Tokyo, as a Postdoctoral research fellow, before joining the Kyoto University. He also collaborated with the graduate school of energy science, Kyoto University as a research fellow and a member of the GCOE scenario planning group. Dr. Hooman is particularly interested in issues related to quantitative and qualitative analysis focusing on developing research patterns of low carbon energy scenarios and policy implementations designed to tackle air pollution problems in both regional and local scales. Particular interests are in energy systems integration studies, energy systems modeling (Demand and Supply), Low Carbon Society, energy management in industrial and transportation sectors and energy recovery systems design. Dr. Farzaneh serves as an editorial board member for J-SustaiN and as a regular reviewer for several international journals in the field of energy engineering. He is currently conducting a comprehensive research on clean energy development for urban sustainability and serving as the Principle Investigator of a funded project entitled " Assessing the multiple benefits of clean energy policies in Asian mega-cities" at the Institute of Advanced Energy, Kyoto University.

Roberta Fontan Architect and urbanist, with PhD in Environmental Science and master's in Architecture and Urbanism, both at University of São Paulo (USP, financed with a scholarship from Ministry of Education CAPES Program). She has experience as a geoprocessing specialist at University of Campinas-UNICAMP, with a bachelor in architecture and urbanism from the Federal University of Pernambuco and a bachelor in Computer Science at the Catholic University of Pernambuco. She used to be, since 2009, a research assistant at the Metropolis Laboratory at the Faculty of Architecture and Urbanism at University of São Paulo (Lume/FAU/USP), and investigated about rural areas of Sao Paulo metropolitan and macro-metropolitan context. She is currently a short-term visiting assistant professor in the Center for Southeast Asian Studies at Kyoto University. Her actual research is concerned with the urban expansion and rural area transformation in Kyoto and Osaka metropolitan areas since the 1950s.

ABSTRACTS OF PRESENTATIONS

(13March) SESSION 1

Brazilian Atlantic Forest: occupation, death and protection of forest remnants and biodiversity

Neli Aparecida de Mello-Théry (USP)

Metropolitan dynamics totally remodel natural systems. Is it an inevitable process of destruction of the latter, or are there possibilities of socio-cultural and political co-existence? The Atlantic forest biome, formed by diverse forest ecosystems, is a long coastal area extending from south to northeast of Brazil, presenting a variable depth, reduced to a narrow coastal strip in the North and Northeast from the state? of Amapá (AP) to the city? of Salvador (BA), but entirely covering the States of Espirito Santo and Rio de Janeiro, and wide stretches of the southernmost states. It is the most anthropized biome in the country.

These coastal regions were the first occupied by the Portuguese colonization and are the areas where much of the economic cycles of the Brazilian history were developed and where, for that reason, the destruction of the nature has been more profound. Geographical factors such as the location and availability of natural resources, such as abundant wood, were favorable to the installation of the political and economic power centres, and these coastal areas became the site of construction of two of the former Brazilian capitals, the cities of Salvador and Rio de Janeiro.

In the first half of the twentieth century this untouched ecosystem still covered the center-west of São Paulo State? and the north of Paraná State?. But historical, socio, cultural, and political factors contributed to its decay: the colonization and occupation of the coast and the progression of a pioneer front base on the development of agriculture, especially coffee plantations, caused the destruction of this dense vegetation. The logging activity, in particular, led to the conversion of the forest into an agricultural domain, where maize and wheat were first produced, and then soybeans. The use of timber? for construction, transported on railroads which later, served as a base for the industry of São Paulo, led to the near disappearance of this biome. It was also during this century that the installation of industry, concentrated in the areas near the city of Cubatão in Sao Paulo State, and the emission of polluting chemical substances in the air, constituted important factors for the destruction of the forest itself.

Currently, there are only remnants of this biome usually on riverbanks or in hard-to-reach areas, and it covers less than 7% of its initial extension. Since the late 1970s, the notion of environmental protection gained global relevance and began to guide public policies around the world. This notion has also made promising advances in the national context because it has gained voice through the pressure from nongovernmental organizations such as SOS Mata Atlântica, ISA , WWF, Greenpeace. As a result, these remnants were declared a Biosphere Reserve by the United Nations Educational, Scientific and Cultural Organization (Unesco). Its conservation can nowadays rely on specific environmental legislation and biodiversity conservation policies that contribute to the fulfillment of the country's international commitment towards multilateral institutions.

However, this coastal area simultaneously shelters, between the cities of São Paulo and Rio de Janeiro, a region of intense urban-metropolitan dynamism which provokes conflicts of use of the territory. Are these reserves, and the group of protected areas of this biome, able to resist to the situation or would these fail to do so, which would lead to the final demise of these natural systems? Or would public actions articulated with those of society, allow the beginning of a new cycle?

Earth's system under transformation: Humans and geodiversity in an Anthropocene perspective

Ricardo Fraga Pereira (UFBA)

Earth Sciences´ investigations allow us to know that the planet Earth has an age of 4,6 billion years. During this elapsed time many processes changed radically some aspects of the planet. In the first four billions of Earth´s history, life was in its initial stages and was restricted to the ocean bodies. In the other remaining 500 millions of years, living organisms became more diversified, occupied the continental lands and the human society started to participate in the Earth System at about 12.000 years ago, although our species were already present at the planet for at about 200 million years. This means that human's presence in the planet is just a small fraction of the Earth´s history. But, on the other hand, human's modern lifestyle caused critical changes in this system, what led some scientific currents to say that we are responsible for the global warming. Beside this, the International Commission on Stratigraphy - ICS, which is the scientific body that sets the global standard for the time scale that expresses the history of the Earth, has a working group that is nowadays discussing the establishment of a new geological epoch known as Anthropocene. This new geological epoch is marked by substantial changes, in part irreversible, to the Earth System that are comparable to or greater in magnitude to other natural phenomena or processes that occurred previously in the planet, such as glaciers and volcanic activity. Will be discussed here the interactions between human societies and the geodiversity elements, which includes minerals, rocks, soils and reliefs, throughout the human history, focusing on the needs of resources to sustain the modern urban life and the myriad of limits, values and services of natural systems and their abiotic elements. Some examples will be presented, including the reality and conflicts of the geodiversity use in Chapada Diamantina, an ancient diamond mining region in the Northeast of Brazil.

Lifetime of human occupations in Amazonia: rethinking human presence and landscape transformation

Anne Rapp/ Claide de Moraes (UFOPA)

Following the approach of Historical Ecologists this presentation will use data from different collaborative projects in order to demonstrate that today's Amazon forest, considered by many as one of the few pristine and unchanged wild environments of the planet, is in fact the result of a long term human management of positive impacts. This assumption is extremely important to rethink the role of traditional populations for the preservation of the Amazon.

Scientific standard view presents Amazonia as a place where local societies were unable to reach a fully developed stage as a result of a supposed shortage of resources and an oppressive environment. In this perspective, humans would not have been able to domesticate animals and plants of significant importance to their daily diet. Therefore, forest groups would have lived in continuous dependency and limited by the availability of wild game and plant resources in nature.

With the better understanding and accumulation of data provided by Amazonian archaeological sites and remains, nowadays it is possible to offer an alternative viewpoint to understand the long relationship thread between humans and their environment. Different from the first assumptions presented in archaeological studies from the 1950´s to the 1990´s, we suggest that Amazonian people developed mechanisms of manipulation and interaction with the environment that allowed animals and plants to be managed or semi-domesticated in different ways and that these choices acquired, throughout time, more importance in the manner they obtained food from the forest.

Dealing with some undomesticated plants has freed humans from laborious agricultural work and from the need to choose more fertile soils as the only settlement possibility for home and production sites. We understand that this process was not an imposition from the environment, but rather, it was a cultural choice. The evidence that several plants were fully domesticated in archaeological sites shows that ancient societies knew how to cultivate, but

nonetheless, gave a secondary importance to these plants, choosing a more flexible approach.

This presentation will focus on four main moments of the human occupation history in Amazon: first, the arrival of the earliest comers, around 12 thousand years ago and how they interacted with a "pristine environment", we will mention evidence that these new comers initiated a process of environment manipulation following distinct strategies; second, a few millennia later, this process culminated in large occupations and populous societies in distant parts of the Amazon around the year 1000 A.D., which created a large network of exchanges (social, economic, political, material, etc.); third, we will mention how these large societies entered a moment of intense disputes in some parts of the Amazon, and subsequently experienced a population decline. When these populations apparently started to regain stability, the European contact drastically changed Amazonian societies forever with the arrival of new foreign populations. At the same time, many bias and harmful concepts emerged. Finally, we will focus on nowadays occupants, who still have a traditional life style and that were influenced by ancient indigenous societies. By dealing with these four moments of occupation, we will revisit a few key concepts like: environment, human-nature interaction, urbanism, human ecology, sustainability, negative and positive human impacts.

Life Cycle of Brazilian Cities

Hervé Théry (USP/CNRS)

One of the remarkable features of Brazil is that it is possible to observe there the complete cycle of birth, growth, decline - and sometimes disappearance - of cities in short time spans, often less than a century. This is particularly the case of cities that were created on the pioneer fronts, such as the coffee front, during the first half of the 20th century in the States of São Paulo and Paraná, or on the soybean front since the 1970s in Mato Grosso. Earlier cases from the colonial and imperial period allow to follow the cycle up until their final decline, such as the gold towns of Minas Gerais, which reached their economic and demographic peak in the 18th century, suffered a sharp decline in the 19th century and sometimes have witnessed a recent renaissance due to the increase of touristic activities. In addition, the country has, in several occasions, created ex-nihilo new cities to become capitals of federal states or, in two occasions, to become the capital city of the entire country, on dates that span between the end of the 19th century and the end of the 20th century.

We will therefore analyze these three cases, focusing at first on the examples of the city of Londrina (Paraná), founded in 1929, then in a second moment on that of Sinop (Mato Grosso), founded in 1974, and finally in a third moment on those of Ouro Preto (Minas Gerais), founded in 1711, and Paraty (Rio de Janeiro), founded in 1597. Among the creation of federal states capitals, we chose the examples of Belo Horizonte (1897) and Palmas (1989) and at the national level the case of Brasília (Federal District), founded in 1960, which reached in 2017 the three million inhabitants mark.

In each case, we will analyze the reasons for the founding of the city, generally related to an economic cycle of production, for export, of ores or agricultural commodities. Then the modalities of its growth and its positioning in the pre-existing urban and transport networks, already existing or created for a specific occasion (e.g. “royal route” for the gold export, coffee railways, trans-Amazonian roads). Special attention will be paid to cities that for a certain period played the role of boca do sertão, gateways to frontier zones, which lasted only until competitors supplanted them when the pioneer front advanced a step further.

Then we will focus on the ulterior destiny of those cities after the end of the peak of the economic cycle that gave birth to them: either growth stabilized on different bases, or a more or less pronounced decline, followed or not by a recovery in another situation. In the case of voluntarily created capitals, it will be examined whether this initiative has had the expected success in giving the new city a real command role and rebalancing the territory in their area of influence.

The extraordinary dynamism of the Brazilian urban network thus offers many examples, observable until today, of the lifetime of urban systems, much more than in the countries of Europe or Asia, where the origins of the cities are so remote and their history so long and complex that it is difficult to reconstruct their life trajectory.

Center, Centrality and Consumption in Middle-Sized Cities' Systems

Eliseu Savério Sposito (UNESP)

The text is structured in three parts. In the first, we present a discussion about the concept of center (downtown) and its role for the retail trade. The center is understood as a place of confluence (as a dialectical and hierarchical pair in relation to the periphery) resulting from the search by the economic agents for the best locations for commercial establishments, making use of the land in the city. Next, we discuss the formation of subcenters defining new centralities in medium-sized cities to show how the city restructures in response to changes at different scales, from the broader process of globalization to the localization of commercial activities, in a geographic articulation of scales. The redefinition in the location of commercial activities in areas other than the city center allows the formation of new centers and, consequently, the projection of their roles as new centralities. Finally, the displacement of people in their consumption actions shows how mobility presents itself in urban space. Urban mobility is here explained from the choices and preferences of consumers in their search for the place of purchases articulating what we call centrality to their individual economic profile. We present, in the end, some partial conclusions of a collective research carried out in several medium-sized cities in the State of São Paulo. We have chosen, as case studies, the cities of Presidente Prudente, Ribeirão Preto and Marília, each one with their specific characteristics that condition and are the product of the new relations of people in their choices of consumption. As it deals with a collective work, some descriptions and conclusions are analyzed and explained in function of the spatial, temporal and thematic clipping presented. Although the definition of average city is taken from the position of the city in the urban network, in this study we will privilege the city in its specific restructuring, that is, in the reconfiguration of its urban design.

As partial result, we will demonstrate the following: 1) consumption is conditioned by the social class to which the individual belongs; 2) urban mobility (independent of means of transport) shapes the new centralities and modifies the role of the main center of the city; 3) the city restructures because of the locations that differ according to people's purchasing power.

From the methodological viewpoint, the information was obtained indirectly and directly through field observation, questionnaires and interviews with different groups of people. As a way of visualizing the relationship between the dimensions of the city center and the location of retail activities, the conformation of new centralities and how consumers are distributed according to their specific characteristics, we use cartographic representation.

Traditional Farming Systems on Steep Slopes of Mountainous Areas of Tokushima Prefecture

Hagiwara Hachiro (Shikoku Univ.)

Keywords: unfavorable local natural environment conditions, *genkai-shūraku* (marginal villages or villages at risk of extinction), continuous maintenance of traditional landscape, tanada (terraced paddy fields), *ishigaki* (stone wall), and *kyōdō* (to work together with outside people).

Tokushima Prefecture is located on the eastern side of Shikoku Island, and 80% of its area is mountainous with 75% of the soil surface covered with trees. In the 1950's period, the local population in such rural mountainous areas reached its peak. In Tokushima and across Japan, people needed to develop agricultural fields even on the steep slopes, and tried to grow rice by making terraced paddy fields, by piling stones vertically. Since the Rapid Economic Growth period, which began in the middle of 1950's, people started to leave their home villages and move to urban areas for work. When they left their agricultural fields, they planted cedar trees, because cedar wood was sold at a high price at that time. Decades later, however, the cedar lumber price dropped due to the increase in the importation of cheaper woods. Abandoned cedar trees continued to grow covering the former agricultural fields.

Today, many villages in mountainous areas of Tokushima are at risk of extinction due to the falling population and aging (*genkai shūraku*). Many agricultural fields are left abandoned. In the context of re-vitalization of the diminishing rural communities, traditional landscape is being reappraised as a local treasure. Consequently, the UN Food and Agriculture Organization (FAO) founded the World Agricultural Heritage Systems in 2002, and 45 regions in 19 countries were registered by the end of 2017, of which 9 regions are located in Japan. The traditional farming systems on the steep slopes in mountainous areas of Tokushima are among the candidates for registration. The top 100 Terraced Paddy Fields in Japan were selected by the Ministry of Agriculture, Forestry and Fisheries in 1999, and two of them are located in Tokushima Prefecture.

Stone walls (*ishigaki*), built to make flat land on a steep slope, are constructions that use a traditional type of architectural technique, and recently it has been reappraised from an ecological viewpoint in comparison with contemporary concrete constructions. Generally, the earths and soil slide down the steep slopes due to gravity, so it is necessary to bring these back upward from time to time. On the steep slopes people try to keep earth and soil in its present position by mixing thatch with earth and soil. If local people abandon their agricultural activities and discontinue the maintenance works, this kind of traditional landscape on the steep slopes will deteriorate soon. The speaker will discuss about steep slope agricultural systems, terraced paddy fields (*tanada*), and a village rich in stone walls in Tokushima.

Multiple benefits assessment of the clean energy development in Asian Cities

Hooman Farzaneh (KU)

Cities throughout Asia have experienced an unprecedented economic development over the past decades. In many cases, this has contributed to their rapid and uncontrolled growth, and has resulted in multiple problems, which include a rapid population increase, enhanced environmental pollution, collapsing traffic systems, dysfunctional waste management, as well as a rapid increase in the consumption of energy, water, and other resources. Given their growing scale and significance, Asian cities will have to be active in the global fight against climate change if it is to be effective. Municipal authorities in Asian cities therefore have a significant scope to pursue urban low emission strategies and clean energy initiatives in ways that will also foster economic development.

Moreover, clean energy initiatives at the city scale could generate knowledge and innovations that can have wider economic and social benefits, in addition to inspiring climate action in other cities and at a national scale. Without more coordination between international, national, regional and local institutions, integration into different sectoral priorities and policies, and engagement between the public, private and civic sectors it seems likely that the cities in Asia will lock in more fully to high-cost, high carbon development paths. Because of the global significance of Asian cities, policies and programs, facilitating large-scale adoption and deployment of clean and renewable energy will need to play a central role in this area.

There are significant benefits from climate change mitigation strategies, including improvement in local air quality, economic savings, public health and safety in Asian cities. The Sustainable Development Goals (SDG) can be achieved through considering the additional, which would enable local governments to obtain comprehensive insights into the potential co-benefits of their future climate mitigation strategies.

This research will demonstrate a new strategic planning mechanism for achieving multiple energy, environmental, public health and economic benefits of clean energy development strategies in Asian cities, together with a robust analytical framework that can be used to assess those benefits during the development and implementation process. The research will address in detail the role of executive clean energy policy targets to support the control of Greenhouse Gas (GHG) emission and air pollution in selected Asian cities. The final part will summarize the opportunities for and the institutional barriers to mainstreaming concerns about clean energy development in Asian cities.

Brazilian Metropolitan Natural Areas: Dissonances and Interactions between Rural and Urban on Macro Metropolitan Context

Roberta Fontan (KU / USP)

The pattern of physical expansion of the urbanization in main metropolitan cities in Brazil has provoked/resulted in several urban and environmental problems that affect its population and its territories. During the last decades, many of these issues have been intimately linked to the human dwelling occupation over natural areas whose environmental relevance cannot be overseen (GROSTEIN, 2001). The protected environmental areas which are mainly represented by: forests and sources of water supply in São Paulo, Curitiba, and Belo Horizonte metropolitan areas; dunes and lagoons in Natal and Fortaleza metropolitan areas; igarapés in Belém do Pará metropolitan area; cerrado in Brasília; and mountains and margins of rivers and streams in Rio de Janeiro and São Paulo metropolitan areas. The "peripheral pattern of urbanization" already widely discussed by several scholars in Brazil persists in the metropolitan areas mentioned here.

On one hand, the urban, social and environmental problems arising from this pattern of urbanization must be identified and regarded as a whole equated to ensure the preservation of areas that respond to the larger interests of the metropolitan population. On the other hand, these urbanizing areas have served as a source of income and of productive activities on a set of scales have been transformed into rural, touristic, and leisure activity areas.

This paper discusses the diversity of natural areas that exist within the Brazilian metropolitan contexts. We seek to present how the urbanization process has impacted the varied natural environments in Brazil, and indicate the most relevant issues of the debate concerning the transformation of rural areas into inter-metropolitan areas, as seen in the Paulista case. Finally, the present study considers some important aspects that should be further developed in order to allow a better articulation between the two mentioned aspects of this relationship.

Considering the Brazilian natural, rural, and urban areas as a whole, this approach seeks elements to comprehend the complex opposition/integration system of the Paulista Macrometropolitan Region (known as Macrometrópole Paulista or MMP) on São Paulo State, through the observation and analysis of the urban sprawl evolution, protected natural areas, and productive activities of some Paulista municipalities.

Seminar Photos

(Photos appear in the same order of the program)

Kono Yasuyuki

Mizuno Kosuke

Yanagisawa Masayuki

Neli de Mello-Théry

Ricardo Fraga

Claide de Moraes

Anne Rapp

Discussion

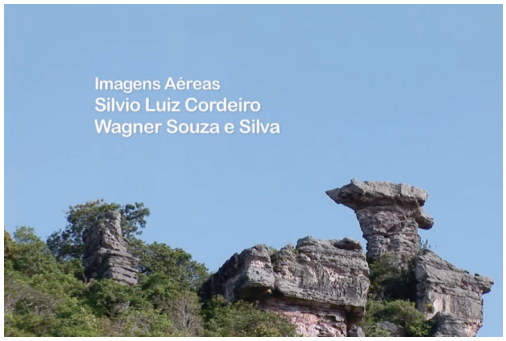
Wil de Jong

Kohshima Shiro

Session 1: Discussion

Session 1: Discussion

Lunch by Hoxai Kitchen



Images from the documentary “Antiga Amazonia Presente”, produced by Silvio Cordeiro, screened during lunch time (https://vimeo.com/132530920)

Lunch by Hoxai Kitchen, prepared by Nakagawa Keita

Izumi Takura

Hervé Théry

Eliseu Sposito

Hagiwara Hachirō

Okabe Akiko

Matsumoto Yutaka

Rohan D'Souza

Session 2: Discussion

Hara Shoichiro

Yamashiki Yosuke

Hooman Farzaneh

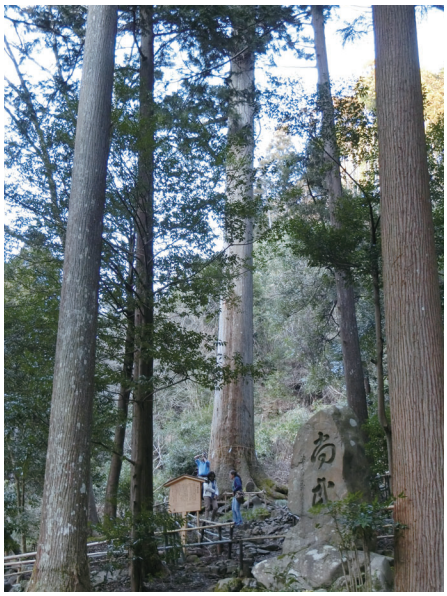
Roberta Fontan

Session 3: Final Discussion

Kondō Tetsuo


Anne RAPP
Claide MORAES
KOHSHIMA Shin
WIL DE JONG
Eliseu SPOSITO

FIELDTRIP SURVEY: Kitayama Sugi Plantation (Nakagawa-chō, Kyoto) *



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* We would like to express our gratitude to NAKATA OSAMU（中田治）from Nakagen Forest (www.nakagen.jp) for the warm support to this initiative.

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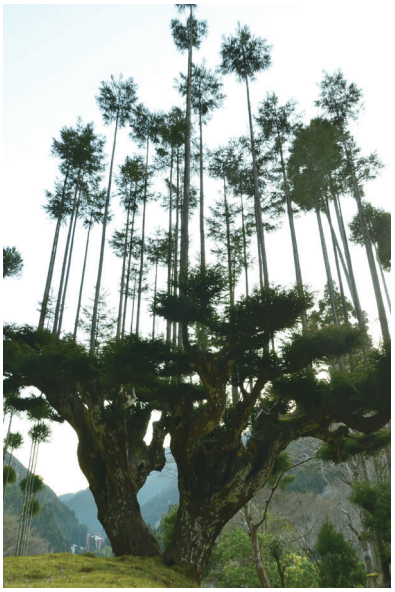

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CIRAS Discussion Paper No.90

アンドレア・ユリ・フロレス・ウルシマ 編

Lifetime of Urban, Regional and Natural Systems:
examining examples from Brazil and Japan

発　行　2019年3月

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