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DISSERTATION

Natural resources governance, artisanal fishers and institutional articulation along coastal
municipalities in Rio de Janeiro state

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**NATURAL RESOURCES GOVERNANCE,
ARTISANAL FISHERS AND INSTITUTIONAL
ARTICULATION ALONG COASTAL
MUNICIPALITIES IN RIO DE JANEIRO STATE**

PhD Thesis presented to the Post-Graduate Program in Public Policies, Strategies and Development, Institute of Economics, Federal University of Rio de Janeiro, as a partial requirement to obtain the title of PhD in Public Policies, Strategies and Development

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ABSTRACT

Under three directional working hypotheses, this dissertation explores the institutional framework of natural resource governance in coastal municipalities of Rio de Janeiro state through the participative collective bodies that are involved in public policy decision making procedures relevant to natural resources governance, and more specifically to biodiversity conservation efforts and water resources management. Exploratory interviewees with representatives of civil society involved in the water management of the metropolitan region of Rio de Janeiro indicate that various actors, including public institutions, academics and other independent researchers, do not consider a more holistic approach in their work and/or actions that would permit more positive predisposition for the integration of sectoral public policies. Instead, all agents, and foremost public institutions, still adopt a rather fragmented vision of the complex reality, as is the case with the vulnerable artisanal fishing communities in the highly urbanized coastal territories of Rio de Janeiro state. Quantitative analysis of the combined data from the 2010 IBGE survey and the registries of the beneficiaries of the defeso compensation from the Transparency portal of the Government of Brazil demonstrate that the artisanal fishers are also present in highly urbanised conglomerations for the case of the municipalities of Rio de Janeiro state. It also proves that the municipalities in the Norte Fluminense, Metropolitan and Baixadas Litorâneas regions have most of the artisanal fishers registered for the defeso benefit, the great majority of which are from coastal municipalities according to the categorization of the Ministry of Environment of Brazil. These areas were selected for a fieldwork in 12 coastal municipalities of Rio de Janeiro state, merely Araruama, Armação dos Búzios, Arraial do Cabo, Macaé, Maricá, Niteroi, Cabo Frio, Rio de Janeiro, Rio das Ostras, Saquarema, São Pedro da Aldeia, and São João da Barra, which provides valuable insights on the socio-economic profile of the artisanal fishers and, most importantly, the level of participation and knowledge on specific environmental and territorial public policies concerning their area of interest. The interviews with 55 artisanal fishers reveal that both colonies and associations failed to advance agency in issues not only regarding the territory and the environment, but also the fishing sector, which remains, almost exclusively, the primary interest of the artisanal fishers. Moreover, the fieldwork further indicates that institutions do not effectively involve artisanal fishers, legally categorized as rural workers, as a relevant socio-economic group for decision making procedures for the development of the highly urbanized coastal zones of the municipalities of Rio de Janeiro state. The historical territorialization traumas of traditional communities in Brazil, the institutional instability of the fishing sector and the lack of an overarching mission of the government of Brazil to support the sustainable development of artisanal fishing rather than major value chains in the fishing industry, perpetuate the precariousness of the small-scale fishing activity and continues to discourage institutional collaboration among institutions and artisanal fishers' representative bodies

for issues related to natural resources governance in coastal and marine ecosystems. Yet, the interviewees demonstrated a positive predisposition for the case of defeso, a measure for the protection of the reproductive cycle of the commercialized species, not only conditioned to the received benefits, but also to their personal interest for preserving biodiversity. Thus, a wide matrix of inter-connected incentives, including financial, cultural and legal, would be fundamental to the reinforcement of sustainable and just governance of the coastal and marine ecosystems in Rio de Janeiro state. Yet, such solutions need to bridge the democratic gap in forming environmental and territorial public policies for the coastal territories in recognition of the potential contribution of the artisanal fishers' local ecological knowledge (LEK) in the service of biodiversity conservation.

Keywords: artisanal fishers, natural resources governance, coastal municipalities, territoriality, Rio de Janeiro state, public policies, neo-institutionalism, agency

RESUMO

Sob três direcionais hipóteses, esta dissertação explora o arcabouço institucional da governança de recursos naturais em municípios litorâneos do estado do Rio de Janeiro através de órgãos coletivos participativos envolvidos em decisões políticas públicas relevantes para a governança dos recursos naturais, focando aos esforços de conservação da biodiversidade e gestão de recursos hídricos. As entrevistas exploratórias com representantes da sociedade civil envolvidos na gestão da água no Rio de Janeiro indicam que vários atores, incluindo instituições públicas, acadêmicos e outros pesquisadores independentes, não consideram uma abordagem mais holística em seu trabalho e/ou ações que permitam uma predisposição mais positiva para a integração de políticas públicas setoriais. Em vez disso, todos os agentes, e as principais instituições públicas, ainda adotam uma visão fragmentada da realidade complexa, como é o caso das vulneráveis comunidades de pescadores artesanais nos territórios costeiros altamente urbanizados do estado do Rio de Janeiro. A análise quantitativa a partir dos dados combinados da pesquisa de 2010 do IBGE e dos cadastros dos beneficiários da compensação do defeso do portal Transparência do Governo do Brasil demonstra que os pescadores artesanais são também presentes em aglomerações altamente urbanizadas para o caso dos municípios do Estado do Rio de Janeiro. Também comprova que os municípios das regiões Norte Fluminense, Metropolitana e Baixadas Litorâneas possuem a maioria dos pescadores artesanais cadastrados para o benefício do defeso, a grande maioria dos quais são de municípios litorâneos segundo a categorização do Ministério do Meio Ambiente do Brasil. Essas áreas foram escolhidas para trabalho de campo em 12 municípios litorâneos do Estado do Rio de Janeiro, incluso Araruama, Armação dos Buzios, Arraial do Cabo, Macaé, Maricá, Niteroi, Cabo Frio, Rio de Janeiro, Rio das Ostras, Saquarema, São Pedro da Aldeia, e São João da Barra, fornecendo informações valiosas sobre o perfil socioeconômico dos pescadores artesanais e, principalmente, o nível de participação e conhecimento sobre políticas públicas ambientais e territoriais específicas de sua área de interesse. As entrevistas com 55 pescadores artesanais revelaram que as ambas colônias e associações não conseguiram avançar em questões não apenas em relação ao território e ao meio ambiente, mas também ao setor pesqueiro, que permanece, quase exclusivamente, o principal interesse dos pescadores artesanais. Além disso, o trabalho de campo indica ainda que as instituições não envolvem efetivamente pescadores artesanais, sendo legalmente categorizados como trabalhadores rurais, como um grupo socioeconômico relevante para a tomada de decisões para o desenvolvimento das zonas costeiras altamente urbanizadas dos municípios do estado do Rio de Janeiro. Os traumas de territorialização histórica das comunidades tradicionais no Brasil, a instabilidade institucional do setor pesqueiro e a falta de uma missão abrangente do governo brasileiro para apoiar o desenvolvimento sustentável da pesca artesanal em vez das grandes cadeias de valor na indústria pesqueira, perpetuam a precariedade da atividade pesqueira de

pequena escala e continua a desencorajar a colaboração institucional entre instituições e órgãos representativos de pescadores artesanais para questões relacionadas à governança de recursos naturais em ecossistemas costeiros e marinhos. Ainda, os entrevistados demonstraram uma predisposição positiva para o caso do defeso, uma medida para a proteção do ciclo reprodutivo das espécies comercializadas, não apenas condicionada aos benefícios recebidos, mas também ao interesse pessoal por preservar a biodiversidade. Assim, uma ampla matriz de incentivos inter-relacionados, incluindo financeiros, culturais e legais, seria fundamental para o reforço da governança sustentável e justa dos ecossistemas costeiros e marinhos no estado do Rio de Janeiro. No entanto, tais soluções precisam preencher a lacuna democrática na formação de políticas públicas ambientais e territoriais para os territórios costeiros, em reconhecimento à contribuição potencial do conhecimento ecológico local dos pescadores artesanais (CEL) aos esforços para a conservação da biodiversidade.

Palavras-chave: pescadores artesanais, governança de recursos naturais, municípios litorâneos, territorialidade, estado do Rio de Janeiro, políticas públicas, neoinstitucionalismo, agência

LIST OF GRAPHS

Graph 1- Total number of artisanal fishers receiving <i>defeso</i> per month & per group of municipalities (coastal or interior) in the state of Rio de Janeiro in 2016, 2017 and 2018.....	75
Graph 2- Total number of artisanal fishers receiving <i>defeso</i> per political-administrative region in the coastal area of Rio de Janeiro state in 2016, 2017 and 2018.....	76
Graph 3- Cumulative distribution of artisanal fishers per urban population in the respective municipality in Rio de Janeiro state, per month in 2017.....	81
Graph 4- Cumulative distribution of the artisanal fishers per percentage of urban population in 12 municipalities for the year 2017.....	85
Graph 5- Reasons for no active participation of the members of the artisanal fishing community to collective entities.....	96

LIST OF FIGURES

Figure 1- Map of the 12 municipalities of the state of Rio de Janeiro.....	46
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LIST OF TABLES

Table 1- Information on the exploratory interviews A, B, C, D & E.....	40
Table 2- Aggregated information from the 2017 socioeconomic status of the 11 municipalities (except the capital of the state) visited during fieldwork.....	48

LIST OF ABBREVIATIONS

ANA - Agência Nacional das Águas
APA - Área de Proteção Ambiental
CBH - Comitês de Bacia Hidrográfica
CEPERJ - Fundação Centro Estadual de Estatística, Pesquisa e Formação de Servidores Públicos do Rio de Janeiro
CERHI - Conselho Estadual de Recursos Hídricos
CIPA - Complexo Industrial e Portuário do Açú
CNUC - Cadastro Nacional de Unidades de Conservação
CONEMA - Conselho Estadual de Meio Ambiente
COMPERJ- Complexo Petroquímico do Rio de Janeiro
IBAMA- Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis
IBGE- Instituto Brasileiro de Geografia e Estatística
IE- Instituto de Economia
INEA - Instituto Estadual do Ambiente
INEPAC – Instituto Estadual do patrimônio cultural
FAO - Organização das Nações Unidas para Alimentação e Agricultura
MMA - Ministério do Meio Ambiente
ONG - Organização Não-Governamental
PECS - Parque Estadual Costa do Sol
PMMA- Plano Municipal de Conservação e Recuperação da Mata Atlântica
PNGC- Plano Nacional de Gestão Costeira
PPED- Políticas Públicas Estratégias e Desenvolvimento
SEAS/RJ - Secretaria de Estado do Ambiente e Sustentabilidade do Rio de Janeiro
SMAC/RJ - Secretaria Municipal de Meio Ambiente
SNUC - Sistema Nacional de Unidades de Conservação
TCE/RJ - Tribunal de Contas do Estado do Rio de Janeiro
UFRJ- Universidade Federal de Rio de Janeiro
ZEE -Zoneamento Ecológico Econômico

TABLE OF CONTENT

1.INTRODUCTION.....	14
1.1 CONTEXTUALIZATION AND FORMULATION OF THE RESEARCH PROBLEM.....	14
1.2 GUIDING QUESTIONS AND HYPOTHESES.....	16
1.3 OBJECTIVES.....	18
1.3.1 General Objectives.....	18
1.3.2 Specific Objectives.....	19
1.4 STRUCTURE OF THE THESIS.....	19
2 THEORETICAL FRAMEWORK.....	21
2.1 INTERDISCIPLINARITY IN ENVIRONMENTAL STUDIES.....	21
2.2 NEO-INSTITUTIONALISM IN ENVIRONMENTAL STUDIES.....	32
2.2.1 Historic review of the environmental governance trajectory in the national and subnational levels.....	34
2.2.2 Institutional change and complexity in SESs.....	35
2.3 NATURAL RESOURCES GOVERNANCE SYSTEMS.....	37
3 METHODOLOGY.....	38
3.1 EXPLORATORY INTERVIEWS IN THE METROPOLITAN AREA OF RIO DE JANEIRO.....	39
3.1.1 Sample definition of the exploratory interviews.....	39
3.1.2 Proceedings of interview during the exploratory interviews.....	40
3.2 COMPLEMENTARY QUANTITATIVE ANALYSIS ON URBAN ARTISANAL FISHERS.....	41
3.3 FIELD WORK IN RIO DE JANEIRO STATE.....	44
3.3.1 Sample definition of the Field Work.....	44
3.3.1.1 Analysis of the study area.....	46
3.3.1.2 Analysis of the study area per municipality.....	51
3.3.2 Proceedings of interviews during Field Work.....	60
3.3.3 Content of the interviews during Field Work.....	62
4 RESULTS.....	64
4.1 EXPLORATORY INTERVIEWS.....	64
4.2 COMPLEMENTARY QUANTITATIVE ANALYSIS.....	73
4.3 FIELD WORK.....	87
4.3.1 Socioeconomic profile of the artisanal fishers.....	87

4.3.2 Participation and Environmental Awareness of the Artisanal Fishers.....	90
5 DISCUSSION.....	107
5.1. INSTITUTIONAL CHANGE IN NATURAL RESOURCES GOVERNANCE IN RIO DE JANEIRO STATE.....	107
5.1.1 Institutional top-down panaceias influence performance of environmental public policies	107
5.1.2 Institutional gaps to biodiversity protection policies for Mata Atlântica biome.....	110
5.1.3 Socio-environmental equilibrium in environmental public policies.....	115
5.1.4 Integrated environmental public policies for coastal and marine ecosystems.....	116
5.2 TERRITORIAL MANAGEMENT IN NATURAL RESOURCES GOVERNANCE.....	119
5.2.1 Territorial divisions in environmental public policies.....	119
5.2.2 Scaling territorial units for harmonised environmental governance.....	123
5.2.3 Territorialisation traumas in Brazil.....	128
5.2.4 Democratic gap in territorial division.....	132
5.3 NATURAL RESOURCES AND FISHING COMMUNITIES.....	135
5.3.1 Identification of artisanal professional fishers in Rio de Janeiro.....	135
5.3.2 Institutional arrangements for the artisanal fishing activity in Brazil and impediments to sustainable development.....	136
5.3.3 The Local Ecological Knowledge (LEK) of artisanal fishers in the service of biodiversity conservation.....	140
5.3.4 Urban communities of artisanal fishers.....	142
6.1 FUTURE RESEARCH.....	148
REFERENCES.....	151
ANNEX.....	169
APPENDIX A- COMPLEMENTARY QUANTITATIVE ANALYSIS.....	173
APPENDIX C- PARTICIPATION AND ENVIRONMENTAL AWARENESS OF THE ARTISANAL FISHERS.....	185
APPENDIX D- CALENDAR OR ATTENDED EVENTS.....	191
APPENDIX E- QUESTIONNAIRE.....	192
APPENDIX F- IMAGE REGISTRATION OF THE FIELD WORK.....	202

1.INTRODUCTION

1.1 CONTEXTUALIZATION AND FORMULATION OF THE RESEARCH PROBLEM

Coasts in Brazil continue to play a strategic role for development as it has been throughout history, not only for the significant population density of the coastal states as well as for the important economic activity, which represent the 70% of the national GDP, including mineral extraction of petroleum, being the main source revenue for the coastal municipalities, natural gas and carbon, shipping services, fishing, an activity of significant socio-economic value being equally important for subsistence purposes as well as for job creation, aquaculture and tourism/leisure (SCHERER *et al.*, 2009). The complex and dynamic socio-ecological systems (SESs)¹ of the highly urbanized coastal areas in the south-eastern coasts of Brazil concentrate within their territories many conflicting issues. Such conflicts derive inherently from the failure to address inequality and to safeguard efficiently the environment, considerations still seen as a hindrance for the dominant economic development, which is consequently questioned (ISSBERNER, 2017).

Brazil lacks both the necessary academic and/or political consensus on the orientation of the socio-economic development paradigm, and an existing institutional system that could accommodate the transition towards a model of a dynamic and open information, participatory pro-growth economic model. In this vein, the demand for the planning and implementation of sustainable coastal management frameworks is constant and even indispensable given the rising pressure of human activity and of climate change. Even more, lower instances of governance, including municipalities and states, are called to manage those systematic issues with very limited resources and operational capacity, often not analogous to the scale or level of complexity of the issues that need to be addressed. So, institutions at local, regional and national level precise a new collaborative culture and a process of consolidation under tripartite coalitions that will target the tackling of inequalities observed among states or municipalities.

Moreover, the historical evolution of the environmental public policies in Brazil reveal that integration of coastal and marine ecosystems is poorly explored within the public policies regarding inland ecosystems and natural resources. Yet, the stage of the sedimentary processes that define the

¹SESs are complex systems, composed of multiple-level social, economic, political and environmental subsystems, such as the resource system, the resources units, the resources users, and governance systems, each of which is determined by internal variables. The interacting cycles of those separable subsystems produce outcomes at the SES level, affecting equally other larger or smaller SESs which in turn affect these subsystems and their components in a feedback loop (OSTROM, 2009).

coastal landscape and the micro-topography settings of the mangrove forests' zonation depend on environmental factors such as climatic and hydrologic conditions, which, in turn, situate the socio-economic development in the coastal territory of Brazil, as in the case of the Cananeia-Iguape Coastal System, in the southern end of the coasts of São Paulo (CUNHA-LIGNON *et al.*, 2009). Similarly, Rio de Janeiro state, one of the most vibrant in social and economic terms states of the country, often is challenged by the persisting issues of fragmented environmental policies and insufficient public services such as sanitation and waste treatment, which further demonstrated the systemic vulnerabilities and fueled discussions among different stakeholders.

The municipal environmental council, management councils for the conservation units and watershed committees were institutionalized with the purpose to democratize and decentralize the public policy decision-making processes in natural resource governance procedures at sub-national levels -municipalities and/or states-, while securing equal participation of all local stakeholders (ANA, 2011; MMA, 2014) on the basis of a rather European model of participative governance. While positive cases communitarian and/or participatory regimes in natural resource governance need to be acknowledged both internationally, and nationally, ineffectiveness or inefficiency is also demonstrated at the coastal states of Brazil, for issues related both to water resources management, as for the case of the Hydrographical Basin Committees in Rio de Janeiro (AGUIRRE *et al.*, 2013), and to biodiversity protection, as for the case of the Catimbau National Park in Pernambuco (MACHADO *et al.*, 2012). Such structures within the decentralized governance system of Brazil that suffers from the overlapping and multi-scale jurisdictions, fail to attract civil actors as their contribution to the public debate.

Also, the fragmented vision of the stakeholders for their surrounding reality reinforces the operational and institutional limitations of the lower-level governance structures. The artisanal fishers, whose traditional role and presence in inland and oceanic waters turn them to be fundamental for the natural resources governance, are among the principal institutionalized interlocutors, foremost along the coastal states of Brazil. Yet, they constitute a socio-economic group particularly vulnerable when deprived from proper basic services, including sanitation, or when their territories suffer from environmental degradation caused by other economic activities important for local and regional development.

1.2 GUIDING QUESTIONS AND HYPOTHESES

This thesis explores the environmental and territorial public policies for the coastal municipalities of Rio de Janeiro state more thoroughly in order to test the following directional hypothesis:

Question 1.

In the highly urbanised coastal territories of Rio de Janeiro state, are the artisanal fishers considered to be a relevant target population for environmental public policies implemented locally?

Hypothesis 1.

(H1)- The lack of recognition of the relevance of the socio-economic group of artisanal fishers in coastal waters for highly urbanized states such as Rio de Janeiro state lead to inefficient, unjust or fragmented public policies related to natural resources governance.

Under this first hypothesis (H1), it is examined the target population of the artisanal fishers in the urbanised centres and its peripheries in the Rio de Janeiro state. The territorial distribution of the total population of the officially registered artisanal fishers in both rural and urban municipalities in the aforementioned state can determine whether highly urbanized settings are relevant to the target population. If so, their socio-economic role and their contribution to the local development by introducing targeted information on local SESs needs be further exploited. Also, to examine further this hypothesis, the research focuses on the perception of the artisanal fishers and their representatives in regards to the public policies for the management of conservation units and hydrographic basins as applied in their territories.

Question 2.

The artisanal fishers are sufficiently represented by their sectoral collective bodies, such as colonies and associations, to the collective bodies, such as hydrographic basin committees and municipal environmental councils, which were institutionalized in order to democratize the decision making for important natural resources?

Hypothesis 2.

(H2)- The representative collective bodies of the artisanal fishers incentivize participation and capacitate their members in order to participate in collective institutionalized bodies that decide upon common-pool resources for a more inclusive and sustainable management.

Under the second hypothesis (H2), the role of colonies and fisher's associations is explored in the institutionalized democratic decision-making processes for important natural resources at local, municipal and state level. The hydrographic basin committees were created with the purpose to democratize the policy-making procedures and to secure equal participation of all local stakeholders, including vulnerable socio-economic group, such as the fishing communities. Despite the decentralized tradition in the post-constitutional era and the existing participatory bodies, participation to those bodies appears to be limited for reasons including lack of available resources, time or willingness of the artisanal fishers to participate in those procedures. The inherent discriminations of race, classes and educational levels within the local culture prevent from full and transparent dissemination of the information and/or the financial resources.

The hypothesis H2 examines whether incentives of various types would be sufficient condition to fill this participation gap. Based on interviews with the artisanal fishers in Praia Grande in Paraty, De Mesquita Nora *et al.* (2017) conclude that most of the interviewees justified participation in colony as means to retirement rather to exchange opinion and decision-making in the fishing sector, while the majority recognises no representative of the community in the decision-making procedures related to fishing activities. Still, further from the economic dependency, the capacity of the artisanal fishers to provide meaningful contributions to the collective bodies and to exercise influence is essential aspect. The hypothesis H2 explores further whether the colonies, associations and other collective bodies, to which artisanal fishers participate, manage to establish for their members equal footing with other stakeholders in environmental and territorial public-policy processes.

Question 3

Is there a strategic and integrated vision for the sustainable management of the natural resources of the coastal zone of the Rio de Janeiro state considering its multiple uses and the territorial rights of vulnerable socio-economic local actors, including the artisanal fishers?

Hypothesis 3.

(H3)-The lack of a strategic vision or mission for the state and local governments blocks the potential for institutional adaptation for an integrated and just natural resources governance

The model of economic development based on large-scale activities is performing poorly on the costs of the SESs sustainability. Yet, these privileged highly impacting economic sectors influence local development decisions that affect the local economy without providing a clear vision and mission coherent with the international agenda for sustainable and inclusive development. In this context, local institutions and organizations seem not to be prepared for the incorporation of new actors under multilevel regimes of governance.

1.3 OBJECTIVES

1.3.1 General Objectives

A sustainable model of governance is still needed despite the international impetus from the catalytic international environmental conferences that occurred in Rio de Janeiro state², establishing the strategic role of Brazil in the field of biodiversity conservation and clean energy, and the attraction of investments and funds for the preparation of the mega-events that steered the development strategies of the state. All the more so, the current times of weak and slow economic recovery from the recession and political instability³, require more elaboration on adaptive and participative forms of local and state governance as a potential strategy to avoid the risk of governance paralysis or the continuation of traditional regimes at the expense of the local society and the environment. The thesis aspires to identify and capture how seemingly separate environmental issues, such as land management, biodiversity conservation and water management, may interact within the existing frames of multilevel institutional and organizational settings for the management of complex coastal ecosystems within the fragments of Mata Atlântica biome, particularly of the Serra do Mar Corridor, that are still maintained within the territory of Rio de Janeiro state, in an effort to contribute to the exploration of more effective, participative and sustainable regimes for integrated natural resource governance in the particular coastal territories

² In reference to the United Nations Conference on Environment and Development (Earth Summit) in 1992 and the United Nations Conference on Sustainable Development (Rio+20) in 2012.

³According to the OECD economic forecast summary. Source: <<http://www.oecd.org/eco/outlook/economic-forecast-summary-brazil-oecd-economic-outlook-june-2017.pdf>> Accessed on 20 February 2018

under analysis. In this context, this thesis also focuses on the local artisanal fishers to explore whether the colonies or fishing associations instituted in the coastal municipalities of the state of Rio de Janeiro provide the means for agency within those communities, or for institutional collaboration with other local actors in regards to environmental public policies. The focus on the colonies or the fishing associations is based on the premise that inclusive and participatory management on the natural inland and marine resources is relevant to the level of empowerment or organizational efficiency of the actors' representation in the collective/ institutional bodies that decide for the common resources (FELDMAN; KHADEMIAN, 2000; BÉNÉ; NEILAND, 2006; BERKES, 2010). Through their narratives and their involvement, or abstention, in the currently existing institutional structures that formulate environmental public policies, this thesis investigates whether Rio de Janeiro state perpetuate the rigid institutional structure despite the efforts for democratization and inclusion.

1.3.2 Specific Objectives

To illuminate the questions under the general objectives presented above, this thesis therefore analyses public policies for the management of natural resources, with particular focus on the management councils and hydrographic basin committees within the Rio de Janeiro state. More specifically, the objectives of this thesis consist of:

- i. Present and discuss the institutional role of the hydrographic basin committees and management council of the Conservation units in the management of water resources and protected areas respectively in the coastal zone of Rio de Janeiro state;
- ii. Examine the efforts for integration of environmental policies as applied in the coastal municipalities of Rio de Janeiro state;
- iii. Identify the particularities of the coastal territory and the existing territorialities as developed historically by local stakeholders in the Rio de Janeiro state;
- iv. Examine the possibilities for articulation and protagonism of the artisanal fishers through the colonies and other representative bodies.

1.4 STRUCTURE OF THE THESIS

The structure of the thesis is outlined in five main chapters including the introduction and the conclusion remarks. In the introductory chapter, the general context is provided on the current governance gaps of the SESs in the coastal municipalities of Rio de Janeiro state. The objective of

this thesis and the research questions that has specifically explored are also presented in this chapter. In sequence, the second chapter is dedicated to the theoretical framework that informed and guided the research. Particularly, the adopted perspectives of interdisciplinarity and neo-institutionalism are presented and analysed, as well as the historical evolution of environmental governance in Brazil and the questions raised by scholars in relation to the institutional structure of natural resources governance, either top-down, or bottom up instituted in Brazil since the 90's, including the permanent management committees and the CU councils.

In the following chapter, it is presented the methodology followed in a research procedure of three phases, including exploratory interviews, a complementary quantitative analysis and fieldwork conducted in 12 municipalities of Rio de Janeiro state. More specifically, the chapter initially describes the procedures and processes that were followed to accumulate explorative information from actors in the metropolitan area of Rio de Janeiro state. Further, I demonstrate the method of the cross-elaboration of quantitative data on the population of artisanal fishers and the total urban population of the municipalities and their centers/capitals from the publicly available databases of IBGE. Finally, the sampling and operations followed to determine the interviewed sample population of artisanal fishers during the field work in Rio de Janeiro state are presented in detail. In the fourth chapter, the respective results of the three-phase research are demonstrated and analysed.

Further, the discussion of the results is unfolded in the forth chapter in relation to the natural resources governance Rio de Janeiro state under the perspective of institutional change and territorial management focusing foremost on the impacts and contributions of artisanal fishers. In this context, I identify the main points from the review of the scholars on natural resources governance that stimulate, inform and give perspective in my analysis identifying gaps in the available knowledge that my research attempts to address. In the last chapter, the conclusive remarks revisit the information provided through the aggregated analysis to validate or not hypotheses as stated in the introductory part of this dissertation. Finally, I present some suggestions for future research beyond the framework of this current dissertation in research of an integrative, just and sustainable model of natural resources governance in the coastal municipalities of Rio de Janeiro state.

2 THEORETICAL FRAMEWORK

In this section, it is presented the main theoretical framework that informed the formulation of the research questions and the directional hypotheses as presented in the previous section. Interdisciplinarity, neo-institutionalism, agency and governance are the main topics explored for their fundamental role in forming the approach adopted in this dissertation.

2.1 INTERDISCIPLINARITY IN ENVIRONMENTAL STUDIES

In line with the area of Strategies, Development and Sustainability of the department of Public Policies, Strategies and Development (PPED- Políticas Públicas Estratégias e Desenvolvimento) of the Institute of Economy (IE- Instituto de Economia), UFRJ, interdisciplinarity is the main academic perspective adopted in the analysis of this dissertation in regards to the natural resources governance in complex coastal territories. Such orientation to employ various disciplines, emerges from the increasing demand from policy-making stakeholders and academia to address real challenges acknowledging the complex reality, inter-linkages and interdependencies among the environment, the society and the economy within the perspective of the Anthropocene. According to Padua (2017), Anthropocene is an era of radical human lead transformations (POLANYI, 2001) that lead to great acceleration of the natural socio-ecological cycles impacting heavily our planet. This new emerging ecological conscience triggered the re-evaluation of the constructed scientific narratives, the recognition of the limitations of the competences of each discipline and the search of a mutual understanding among disciplines in the defence of nature by embracing complexity in the interaction of humans and nature.

Compartmentalization as methodology in problem-solving produces side-effects in other areas as social problems in the real world are neither isolated, nor fragmented interventions can have a predictable resulting effect. Klein (2004) also subscribes to the perception of the reality as a dynamic nexus with multiple and interrelated dimensions, as evidenced by the occurring problems, for instance, of human intervention, through societal, economic and cultural organization, to natural systems. Klein provides with historical examples of applied interdisciplinary approach in the area of exact sciences for warfare or developmental purposes. Transdisciplinarity was according to the author a first attempt to reorganise the structure of knowledge production as means to effectuate problem-solving when affronted with specific demands. To overcome yet another barrier, the post-normal science offered its assumptions that consider plurality in both operative mechanisms within

and among systems, as well as in the social values and inputs of relevant stakeholders and/or communities. Moreover, uncertainties and divergences mark the output limitations of scientific production. Despite technological evolution and the merits of increasing expertise, analysing big data and forecasting, complexity cannot be limited to the simple addition of variables in the models, nor it is possible to provide a permanent solution. Instead in the realm of practice, the author claims continuous management to be more appropriate for the end goal of professionals. The analysis that cross scientific fields seek for consensus, feasibility and contribution for sustainable solutions.

The interdisciplinarity is defined by Frodeman et. al. (2017) to be “*most commonly used as a portmanteau for all more-than-disciplinary approaches to knowledge, with the overall implication of increased social relevance*”, and is rather observed in so-called umbrella projects whose parts are linked by the overall topic but focus on separate research objectives, methodologies and conceptual frameworks. Such limited juxtaposition of sub-projects is more precisely categorised as encyclopedic multidisciplinary by Huutoniemi et al. (2010). Yet, their research proved that this category is not as common as expected: the authors explored the ongoing scientific knowledge production to picture better the prevailing practices and the type of projects proposed for funding support⁴. The findings revealed interdisciplinary proposals of narrow scope, or else from adjacent fields, to be more common than multidisciplinary ones, as well as to be more oriented towards epistemology and the advancement of the cognitive process for a deeper understanding and/or more comprehensive explanations.

The notion of interdisciplinarity is understood for the purposes of this dissertation as a position of the researcher that seeks a dialectic approach among different academic areas in order to unveil more aspects of the issue under analysis by sharing ideas, methods, theories and experiences (SHELLARD, 2017; HICKS *et al.*, 2010). Gauer (2013) describes interdisciplinarity as “*a new way of processing and organizing ideas beyond the own purposes of each scientific area considering its disseminated effects and possible transformations on the society*”. In particular, Hicks *et al.* (2010) revealed a significant potential for scientific advancement by promoting synergies within the interdisciplinary network, for instance environmental sciences, anthropology, planning and development and operations research and management. Yet, these authors claimed that this interactive process is not limited in an exchange of basic notions and knowledge from one

⁴ The authors considering the rhetoric bias as a strong indicator for the nature of the research process, opted to limit their research to proposals instead of the actual research for considerations related to possible budget constraints or other emerging issues during the research that may lead to modifications despite initial intention and perspective. Also, the authors acknowledged the inherent subjectivity, given limitations on the inter-rater methodology, and the limitation on having available experts to all the relevant fields as presented in the proposals to reveal appropriately the extend of relationships among fields.

discipline to another, but it is also manifested through the evolutionary process of scientific specialization and therefore the disciplinary subdivision of “macro-sciences”, such as social and environmental sciences, which over the time facilitate synergies among different disciplinary perspectives. Interdisciplinary studies are mostly perceived to be promoting a process of reflection and composition of a more comprehensive perspective of a complex reality, rather than extracting specific conclusions about isolated topics per discipline.

Newell (2001) define interdisciplinary studies those that draws and integrates insights from relevant disciplines in order to achieve a more specific, whole and comprehensive understanding. A distinct characteristic of interdisciplinary studies is the synthesis based on non-linear components, or else variables, contrary to the strict linearity from the perspective of the disciplinarian approaches. Influences and responses rather than cause and effect connections. Yet, the author views the interdisciplinary studies as “attempts”, not a definitive understanding of the self-organising patterns of the complex systems⁵ under analysis,

A double precondition that establishes the need for interdisciplinary approach for an object of study is both the observation of multifaceted phenomena and the verification of coherence among those individual facets, therefore specific complex systems and their behaviour. Conforming Newell (2001), one type of complex systems are the living complex systems into which processes of “self-organization, self-correction, and self-replication” are identified. Those processes are accelerated when human beings are involved in those systems, due to their differentiated responses to stimuli depending on morals, values, form of self-interests, means available etc. As the author observes: *“human components create further indeterminacy in a complex system by turning causal links into mere influences, creating new feedback loops, and even changing relationships that shape the overall behaviour of the system”*. Namely, Newell defends the assumption of social sciences that pictures humans able to learn and adapt, thus not merely performing automatic reflexive actions that may trivialize the perpetuating patterns as described by the chaos theory. Moreover, the observation that models based on simple invariant rules applied at great numbers ignore human feedback loops, and cannot be definitely applied at larger scales. Thus, the author consider a general form of complexity to be an adequate theoretical base to interdisciplinarity, instead of chaos theory or autopoiesis.

The practice of contextualization common for many areas, can be enhanced once it is identified as a study of features and conditions -in essence, conforming the author, a study of behaviour- within a complex system. When this double precondition is not satisfied upon analysis, then disciplinary or multidisciplinary approaches are more suitable. Justification of the

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methodology applied and determination of the range of its application are the two guidelines highlighted by the author.

During these last decades, at various paces over time, international organizations and academic institutions have endorsed and promoted interdisciplinary activities for various motivations and purposes. For instance, the production of innovative knowledge and the procurement of solutions to multifaceted and interrelated issues, social, political, economic, environmental or otherwise, are few among the latter. As indicate Klein and Newell (1997) education was an area where early interdisciplinarian efforts thrived, along side international, cultural, historical studies etc. According to the authors, the evolution of such efforts expanded interdisciplinarity to areas that combined core both branches of science, natural and social, to programs that accept the premise of the inner, fundamental interdisciplinarity of knowledge. Yet, the forthcoming hybrid fields cannot sufficiently guarantee that the efforts are not limited to simple coordination.

At a latter study, knowledge is depicted as a network or a web with multiple nodes of connection, and a dynamic system (KLEIN, 2004). The author describes an ongoing change of the very own notion and goals of knowledge that moves from depth, compartmentalization, expertise, universalities and certainties, towards practices that promote dialogue, interaction, integration, and negotiation while crossing disciplinarian boundaries. She observes historically within the current educational system the accelerating separation of disciplines that may turn rather obsolete when juxtaposed with the reconsideration of the various properties that simultaneously determine an object. The kaleidoscope metaphor⁶ that the author uses, serves exactly to demonstrate the possibilities through advanced technological tools that reveal a new imagery of knowledge. The university, as an institution of knowledge, is called upon to assume a new mission in the post-modern era of increasing hybridization of culture, identities and foremost knowledge production that may clarify mutlidimensional and multidirectional relations. In this regard, Frodeman (2017) divides the interdisciplinarity in two tasks, the epistemic and the rhetorical for which the adaptation of language use and content is fundamental to communicate among peers in academia as well as non academics. Given this consideration, the challenge of the interdisciplinarity in one sense is to contribute to the reorganization of knowledge production, whose structure is socially defined. In essence, interdisciplinarity has the potential to provide a fruitful space for a dialogue between academia and society in an era of vast availability of information through technological advances and means for communication, or else “*ubiquitous knowledge*”.

⁶ The exact phrasing is “from microscope to kaleidoscope” (KLEIN, 2004)

Also Rayanatt (2014) recognises a movement towards new paradigms, categories of thinking, new methodologies and teaching practices that penetrate the current disciplinary framework with historically prevails in all pedagogic and academic institutions. Despite this, great historical interdisciplinary achievements in real life, the ongoing and established collaborations are quite opportunistic in nature, as the rigidity of the departments or fields within institutions limits interaction to mere expert information sharing for punctual and temporary problem-solving situations. Moreover, the institutional resistance and the interpersonal conflicts result to rigid responses that undermine the implementation of interdisciplinary efforts or even its conceptual construction. At a broader view, international dynamics and geopolitical imbalances, also globally define the level of cooperation and the stability of international networks among academics and professionals from different institutions and countries. It consequently impact the available human and financial resources, as well as the accessibility to information, technology for common solutions (PRETTY, 2011). Ultimately, a chain of international interdependencies directly or indirectly result in the restrain or instead the reinforcement of trans-, cross- multi or interdisciplinarity.

The difficulties of interdisciplinary efforts among professionals of different fields are extensively depicted in the chronicle of a case of an 8-year collaboration on fisheries management project funded by the European Union Haapasaari et al. (2012). The institutional settings, including the network among scholars of various fields, the extended time period given for the completion of the project and the available financial resources, despite promoting interdisciplinarity as stated the research proposal and objective, ultimately did not suffice. The project management hierarchical structure had already embedded the prevalence of a field over others, which lead consequently to the predominance of certain methodologies. Furthermore, the lack of motivation for cognitive integration, or else the rigidity in defending disciplinarian assumptions and paradigms by the members of the scientific group, for instance the premises of economic growth deemed incompatible with other sciences, whereas a reductionist and strictly mathematical methodology was challenged by social sciences, restricted the determination of the overall objective in regards to fisheries management and the scientific results at the level of multidisciplinary. Overtime, the extensive learning process and the development of more interpersonal relations among scholars facilitated collaboration or even a deeper understanding of each field.

Nevertheless, Darbellay (2015) perceives interdisciplinarity to be a polymorphous field of study that despite efforts to undertake the epistemological issues, to establish production and evaluation mechanisms, and to implement the produced knowledge on real-life problems, by definition, it cannot produce a universal paradigm to define methodologies or theoretical

backgrounds. Any levels of coherence among interdisciplinary efforts is mostly achieved by common epistemological values and interest for more embracing understanding of specific complex systems within the reality and research practices that derive from national and international academics and professionals. Yet, both elements though necessary, are insufficient to overcome difficulties and eliminate incomprehension due to interpersonal, communicative, epistemological obstacles, even more so when there is lack of a systematic implementation of strategic communication tools for the discussion, negotiation and co-definition of the conceptual framework. This observation of inaction or unwillingness to persist in a continuous transformative epistemologic process for the production of new knowledge, is the point where the interdisciplinary paradox stands as identified by Darbellay. Rather than an underlying and automated process, interdisciplinarity is promoted not only as means to create common grounds for collaboration but also to facilitate innovative rupture from the disciplinary boundaries. So, the author concludes that the very own transformative or revolutionary potential of interdisciplinarity is contested and limited by the need for normalization and conformity to disciplinary order.

Moreover, Darbellay observes that academic institutions still promote heterogeneity by typically offering positions and creating scientific communities on the basis of standard disciplinary specialization and expertise. In order to legitimize a field for and within the scientific community, publications are crucial indicators, so that researchers tend to work on distinct disciplines in order to establish their careers, despite the impermeability of other disciplines into their work through communication and networks that favours intradisciplinary variations. Alternatively, researchers when depart from interdisciplinarity tend to standardize their working framework mimicking a disciplinary field. This permeability of working attitudes between the interdisciplinary and the disciplinary framework creates another oxymoron that questions their own identity of, on the one side, the dynamic, dialectic, evolving working nature, and, on the other, the fixed, consensual and homogeneous paradigm

In Brazil, CAPES contributed to the directed but gradual institutional promotion of interdisciplinarity through CAPES that instituted the Multidisciplinary Committee, renamed a decade later to Interdisciplinary Committee in recognition of the need for interdisciplinary approaches and with the intend to legitimize and encourage pedagogical innovations beyond the disciplinary restrictions support and create parameters for the evaluation of interdisciplinary initiatives (RAYNATT, 2014, PEREIRA; DO NASCIMENTO, 2016). The process of developing post-graduate interdisciplinary programs especially on areas that are considered to be strategic for the development of Brazil was promoted, despite reactions, by funding opportunities and the creation of research groups in different departments and institutions (PEREIRA; DO NASCIMENTO, 2016).

The authors observe that there are still an ongoing debates on the extend that the interdisciplinarity can compromise polars of thoughts and practices, such as theory-operational or philosophy-science, in order to establish meaningful dialogue among areas. So despite progress in this direction and more cases that engage in interdisciplinary research, academic institutions still maintain a disciplinary structure and employ professionals that align to disciplinarity. This results to the sidelining of interdisciplinarity among academia, as clearly reflected to the discipline oriented curricula of the academic institutions, despite efforts to introduce hybrid specialization such as interdisciplinary departments and interdisciplinary majors.

Hereof, a new form of institutional conformism may emerge in the absence of critical thinking and innovation in theoretic constructions and/or methodologies (RAYNATT, 2014). The failure to identify and accept diversity in research is the impediment to efforts for the wider and deeper integration of knowledge and experiences from various fields in order to be adept for more complex and hybrid projects that emerge from real world issues. To overcome this stagnation, in the frames of both inter- and transdisciplinary approach, Darbellay (2015) visions a researcher willing to work towards the development of a new collective thought of style beyond the hierarchical structure of academic institutions on the basis of the values of information-sharing, passion, pleasure and the circulation of knowledge, what the author identifies as hacker attitude that complies with the modern era of networks and wide data and information exchange. On the contrary, Pereira and Do Nascimento (2016) propose more institutional agility to internalize the integrative processes for the production of knowledge with emphasis on the methodological aspects that define whether the dialectic processes will lead to more productivity or drawbacks for the advancement of integration into the academic institutions of Brazil. So the challenges lay on the direct dialogue among disciplines of different areas of knowledge, the incorporation of interdisciplinary methodologies in the research projects in the academia, the validation of diversity in research and the evaluations from the interdisciplinary field.

Successful integration processes need to secure important thresholds to produce interdisciplinary research as identified by the management expertise including: (a) consideration of all relevant disciplines, (b) close collaboration among researchers and stakeholders when applicable, (c) commitment from the involved parties to not exercise the right for withdrawal even in the absence of consensus, (d) anticipation and agreement upon asymmetries in the development of disciplinary work depending on the flow and emerging needs of the research (PRETTY, 2011)

Klein and Newell (1997) deploy the example of the educational system, as referral to the linear and reductionist thinking with which it operates, as opposite to the non-hierarchical and complex systems which demand for analogy, non-linear thinking, as well as pattern and network

analysis. In this frame, it is not sufficient for an interdisciplinary curricular reform to adapt courses or programs, but also to evolve the institution by generating conditions that communities and interactions through research projects, databases, collaborations among individual researchers and/or institutes, networks and even less visible groups. In other words, interdisciplinarity, according to the vision of the authors, translates to the use of an abundance of resources, and the coherent combination of quantitative measures and qualitative conclusions from a set of disciplines according to the identified issue in order to mitigate the eventual costs of fragmented research.

In the same direction, Raynatt (2014) deems a new structure necessary for a more durable perspective that can combine fields that deal with both materialism, as manifested in physical and biological processes, and non-materialism -symbols, sentiments, behaviours, networks, imagination, ideas etc.-, a dualistic separation of the exact sciences and humanitarian studies, which yet recognises mutual implications in the real world, and thus implies the need for mutual respect and recognition of their contributions. The author points out that does not embrace a deterministic approach over reality as there are causality chains that do not imply the intervention of the material settings, yet its existence is conditioned by the latter. He further proposes a heuristic model, as he defends that the interdisciplinary practice can be only constructed methodically in order to create its own scientific universe and ultimately to resolve any ambiguities. In this vein, pedagogy conditions the level of predisposition and capacity for dialogue and collaboration among the professionals with expertise from various fields. While its practical for an individual to accumulate adequate knowledge for an interdisciplinary research, it is important for experts to acknowledge the limitations of their intellectual fruits and develop communication skills for a deeper understanding that promote collective reflection on the object of the research.

The scientific debate is still very vivid as even the complex systems precondition for applying interdisciplinarity is disputed, whether should be an unconscious effort rather than systematize steps in the procedure (KLEIN, 2004). In response to the lack of consensus of the interdisciplinary process itself, Newell (2001) concludes to a methodology according to which, broadly, the relevant disciplines are identified first, and then the perspectives are integrated into a new construct. The methodology is based on observed interdisciplinary practices and the guiding sequential steps proposed by Klein (1990) that seem to be rather the fundamentals of project planning and management, as it includes the stages of definition, planning, organization, collaboration, execution, assessment and feedback. The theoretical validation of this methodology comes through a rigid comparison with the complex systems theory.

Huutoniemi et al. (2010) formed a three-dimensional typology for interdisciplinarity to identify the scope, types and goals, or else, to respond to questions about what, how and why

respectively. Starting from the scope, is merely separated per case into to categories, the narrow or broad interdisciplinarity, that depends from the level of ease during interactions among the fields. The more similar epistemological presuppositions, such as in natural and social sciences, the less demanding is the use of concepts, methods and/or theories among the fields. When the domains are entirely diverge, there are instead more pitfalls due to conflicting outsets. Also, the authors differentiate multidisciplinary from interdisciplinarity: the former describes a scientific collaboration during which tasks as performed in parallel or simultaneously while maintaining the integrity of the discipline, or field, at a great extend. The latter, permit a composition of new knowledge that derive from active integration of the existing relevant fields' data, methods, tools, concepts and/or theories in order to synthesize common grounds for complex sub-system within the real world. In short, a juxtaposition or accumulation of knowledge versus the dialogic innovative production of a new integrated framework. The creation of common ground, which for Newell (2001) is the ultimate goal of the interdisciplinarian process include steps such as (a) the redefinition of terms, (b) extended application of the former, (c) continuum of meaning, (d) transformation of opposing axioms, (e) rearrangement to activate facilitation, (f) encapsulation or absorption among facets. As the author point out, the produced result for the complex system as a whole is characterized by unity and coherence.

Furthermore, the type was separated into encyclopedic, contextualizing and composite multidisciplinary, on the criteria of merely downsizing costs and efforts through collaboration for a project with topical focus for the first case, the limited interaction on the theoretical level that applies only to a specific setting, and, for the third case, the addition of technical and operational coordination to address the issue explored by the project, Additionally, the authors categorized interdisciplinarity in empirical, methodological and theoretical depending on the focus: to test a hypothesis or solve an issue, to achieve methodological development through triangulation of methods, or create theoretical knowledge in order to establish a new paradigm. The key factor is the deeper integration, whether it is synergic or antagonistic, Newell (2011) contests the view of varying interdisciplinarity depending from the type of use -for instance teaching, research, problem solving or radical critique purposes-, and favours arguably conceptual clarity and quality standards over concerns on the aspects that are potentially excluded from more specific definitions of interdisciplinarity.

Finally, Huutoniemi et al. (2010) make a distinction between epistemologically and the instrumentally oriented research, while recognizing a third hybrid category of mixed orientation to avoid rigid dichotomies. Whether the motivation stems from an urge to explore theoretical boundaries, to contribute with solutions for a specific real issue or both, the authors identity

differences in the phases of the interdisciplinary process without actively criticising them nor without acknowledging the case per case idiosyncrasies. Nevertheless, according to Newell (2011), the diverse motivations for interdisciplinary studies⁷ do not create different kinds of interdisciplinarity, but instead establish a fruitful, flexible and liberal environment for innovation, reinforces critical thinking and synthesis, and/or prepare professional for more apt responses to real world circumstances.

The concern on ongoing ecological crises reinforces the need to enhance the role of knowledge production in informing accurately and meaningfully all public policy making processes that intend to protect critical natural resources and restore social equality. The inherently complexity of incorporating human behaviour, or else choices, actions and networks presents often a challenge as many social fields already have been presented with. Even more so the consequences and influence of the existing institutional arrangements on the evolution of the ecological crisis, are not straightforward either. Dahberg (1985) early on observes that the very understanding of concepts are influenced by the research processes as promoted by institutions, and by dominant western cultures that also define the prevailing approaches and values (rationalistic and/or utilitarian respectively) and, thus, affect decisions concerning economic exploitation or ecological conservation. Similarly, technological innovation and capabilities that transform means and levels of interaction with the reality. Yet, interdisciplinary attempts to globally assess human impacts on resource systems stumbles upon analytic and data problems, conceptual gaps among different disciplines, and lack of terminologies that properly describe and express the multidimensionality of social, environmental and technological interactions (DAHLBERG, 1985).

Issues traversing social, cultural and ecological systems lead new fields to emerge, which Pretty (2011) perceives as sub-disciplines including ecological economics, ecological anthropology and environmental public policies, in the frames of which, through cognitive integration of core fields in both natural and social sciences, is intended to create new terminologies, theories, methods and applicable solutions. Those sub-disciplines, whose primary intend is to provide reinforce support for more sustainable and resilient social-ecological systems, also recognized the cognitive and practical value of exploring alternative sources of knowledge, referring to local ecological knowledge and ecoliteracy, within the place-based realities, or else, local idiosyncrasies as developed by traditional and indigenous communities (PRETTY, 2011). Also Newell (2001) appreciates the idiosyncrasies as appear in response to the specific features of a location, facet or

⁷ The author refers to the following list: (a) general and liberal education (b) professional training, (c) social, economic and technological problem solving, (d) social, political and epistemological critique, (e) faculty development, (f) financial exigency, (g) production of new knowledge (Klein, Newell 1997).

sub-system, within a complex system. Local knowledge matters or as the author point out “*every location is unique*”.

Environmental problems and its sub-problems present a new level of complexity, referring to the multi-scalar and multi-sectoral dimensions of its biophysical and social elements (KLEIN, 2004). This is also projected in interdisciplinary studies, that need to derive solutions from a number of areas in science and humanities without neglecting the spatial and temporal dimensions and the micro, meso and macro levels of the particular case under analysis. As specifically Klein ascertains “*the reality being investigated consists of a nexus of phenomena that are not reducible*”. As such, the environmental issues cannot be simply resolved in a straightforward manner through the evaluation of its specific qualitative or quantitative aspects. There are preferences and values of a variety of stakeholders and administrators that steer the decision-making processes. Still, in this setting, the author alerts for under-representation and disregard of local realities or knowledges. Recognizing that the study of integrated governance of multi-jurisdictional, subject to multiple uses of coastal areas needs consideration of other public policy fields, for instance, social, economic, industrial, etc., the focus of this discussion is on the concepts and uses of the coastal territory in public environmental policies that are often neglected (PRESTRELO; VIANNA, 2016). As suggested by Douvère e Ehler (2009), from the analysis of the existing fragmentation in one field of public policies, the identification of aspects that need interdisciplinary approaches becomes more evident, and thus establishes a starting point for integration with other fields.

Overall, the 2030 Agenda for Sustainable Development of the United Nations, have mainly brought about a rearrangement of pre-existing goals and a major advance in environmental issues (CARVALHO; BARCELLOS, 2015), including new topics such as food security, energy; economic growth; industrialization and innovation; as well as peace, justice and institutions. Hence, the principles of interdisciplinarity and integration become key elements in reaching the goals envisaged in various areas including the management and planning of coastal and marine areas. However, in reality, it is still necessary to explore more models of analysis for the establishment of new territories such as marine protected areas, based on interdisciplinary criteria that include social and cultural aspects. In this dissertation, linkages are explored among planning and development, environmental studies, urban studies, water resources, biodiversity conservation, fisheries, social studies, and geography, acknowledging the epistemologic difficulties that may occur as those disciplines are explored by a singular researcher.

The construction of a new scientific perception is not always a harmonic linear process of scientific analysis, nor a can be applied universally as a dogma opposite to the individual disciplines, as it lacks an ontologic status (GAUER, 2013). Yet, according to the author,

interdisciplinarity provides with an opportunity of reorganization of knowledge, similarly to the processes of constant organizational renovation of chaotic systems. Klein (2004) particularly affirms that “*the ultimate objective of any interdisciplinary inquiry becomes understanding the portion of the world modelled by a particular complex system*”. Yet, the element of strategic planning is imperative for the implementation of this new open and not thoroughly defined knowledge and for more impacting discourses that seek to trigger behavioural change of key social actors towards more sustainable practices and political transformations beneficial for the complex social-ecological systems as a whole (KLEIN, 2004). As the author supports, such tasks cannot dismiss the consideration of languages, social structures, as well as other types of knowledge embedded in both Western (colonial) and non-Western (indigenous) traditions.

The guiding principles for the effective dialogue among disciplines (FAZENDA, 2003; PEREIRA; NASCIMENTO, 2016) within the academic realm, can be equally introduced to other, not so conventional sources of knowledge, such as the local ecological knowledge of traditional communities. Reciprocity, openness, humility, compromise, involvement, construction and even greater responsibility are conditions for the overall advancement of the frontiers of knowledge and/or transfer methods, through the cooperation not only among scholars of various disciplines, but also with their very own research subjects particularly in the area of social and environmental studies. Seixas *et al.* (2011) emphasize the need to identify the degree of dependence of the communities of the users on the natural resources by employing parameters that include the customs, uses and dimensions of the territories of interest. Prestrelo and Vianna (2016) already incite the conjuncture of the natural and social sciences to optimize the coastal management and propose the systematization of the multifactorial tools for marine spatial planning (MSP). The authors consider local ecological knowledge as means to determine socioeconomic uses, yet they do not directly mention territoriality as a historical and cultural element, in the process of establishing plausible and viable marine restricted areas. However, disparities between economic and social development derive both from inadequate management and regularization, and the historical evolution of dominant institutions and cultures.

2.2 NEO-INSTITUTIONALISM IN ENVIRONMENTAL STUDIES

According to Rocha (2005) neo-institutionalism is adopted as a school of thought to explain the nature of governmental public policies by recentering the focus, response to pluralist and marxist models of institutionalism, on the state whose organisation influence civil society and provides

with valuable insights for per case analysis, though the efforts to consolidate new theoretical assumptions remains limited. The state, through its institutions and bureaucratic agencies, procures the means to establish and reproduces its control over society, so it is not simply submitted to the interests and directions as manifested in the society. Yet state capabilities is fruit of continuous historical processes that conditioned the available instruments and the existing structure. The author continues to analyse the second phase the evolution of the neoinstitutionalism that shifted the focus of the scholars to a more policy-centered analysis recognizing other important agents apart from the central governments, including lower levels of government and social agents recognising the opportunities for collaboration and identification of common objectives, thus not simplifying the relationship between state and society to merely antagonistic. The generic conception of society over the state affects their political organizations and consequently their objectives. Similarly, people working and/or representing the state, namely bureaucrats or politicians, apart from the incentive to serve more those policies that are also compatible with needs, ideas and career aspirations, without necessarily ignoring to the needs of society, thus affecting the outcome of the political processes which in turn determine the distribution of opportunities among social groups to achieve political goals. The allocation of power and its redistribution from formal institutions with relatively stable structure, through incentives and disincentives and other mechanisms that restrict or amplify the range of choices to social actors. This dual direct or indirect interrelation creates a positive or negative feedback loop of transformations deriving from public policies that sequentially change administrative capabilities of the state, in response of which social groups re-identify themselves and initiate a political game that ends with new public policies and so on. So bureaucrats and policymakers claim to be also critical factors within neoinstitutionalism. Political discourse, which serve both as social learning and power play, also is a significant factor from the point of view of the language used and the nuances of power that communicates to society. Altogether, public policy analys need to consider a number of elements including the divergence of interests and of social characteristics, interest groups, bureaucrats and public institutions. The neoinstitutional perspective, as the author points out, escapes from studying strict causalities, and embarks to policy-centered case by case empirical analysis while considering cultural, social and other subtexts.

With the view to address specific issues and conflicts as emerge with the environmental public policies in Brazil, the approach of neo-institutionalism is adopted for an “*interaction oriented policy research*” (SCHARPF, 1997). Agency and institutional structures, including laws, norms, values, bureaucratic procedures or formal rules, are both central in explaining policy outcomes, yet the level of influence depends from the established system through which strategic

interactions are channelled (SCHARPF, 1997). For instance, the decentralized system of Brazil, most certainly permits various parallel strategies from various levels of power, (national, regional, local) that either complement or compete with other, yet the actors are often impeded. Thus, the consideration of the institutional structures as formed historically in Brazil a posteriori the national constitution of 1988 is equally fundamental with the observation of the individual or collective behaviour of the actors, being formal or not, in the policy-making procedures. Within these frames, it is crucial to identify the involved actors throughout the range of institutions involved, as well as the structure and the internal and external circumstances within which those institutions operate.

2.2.1 Historic review of the environmental governance trajectory in the national and subnational levels

The historical marks for the progressive evolution of the institutional arrangements in Brazil to the actual context of public policies for the environmental protection and conservation is pointed out for the period mostly after the re-establishment of the democratic regime. More explicitly, the National Environmental Policy Law in 1981 transformed each level of public authority to co-responsible managers of environmental issues giving them the discretion to provide licensing and conducting evaluations, in parallel with the strict liability law as a preventive measure though presented some shortcomings in its application due to inability to prove guilt or to collect compensation from supra-individual legal entities. To its reinforcement came a series of initiatives to establish the legal notion of the environment as public heritage, diffuse interest or common good; the enactment of the state prosecutors upon the legal principle for the remedy of environmental damages, or else the user-pay principle-; and finally the preventive principle under which environment must be protected for future generations was included in the Brazilian Constitution of 1988. The article 225 of the Constitution of 1988, clearly set the obligation for the Government to protect and guarantee a balanced environment. Reflecting a demand from civil organizations, such as the pro-nature Foundation (Funatura), and the Brazilian Institute for the Forest Development (Instituto Brasileiro de Desenvolvimento Florestal)⁸, the legislators proceeded in defining the conservation units that should be considered under the spirit of law as expressed in the aforementioned article. Consequently, the National System of the Conservation Units (SNUC) was instituted by law n° 9985/2000 almost twelve years later due to civil mobilization in regards to the definition of the types of units. In parallel, the pollution offences were better defined and criminal

⁸In 1989 the institute transferred all its competencies to the Brazilian Institute for the Environment and the Renewable Natural Resources (IBAMA). Source: <http://www.ibama.gov.br/biodiversidade-aquatica/gestao-pesqueira/historico-da-gestao-pesqueira-no-brasil> Accessed on 24 June 2017

liability became possible for offenders that it be individuals, legal entities or managers (NEVES, 2015). According to author, the state and municipal governments applied the administrative sanctions while the national government remained the principal agent for environmental preservation through the rule of law, or, according to the author's phrasing, the ordering principles. Much later, as the author points out, there is an acceleration of the process of attributing responsibilities to the municipality through the Complementary Law 140 recognizing better expertise on their ground owing to the possibility of making coherent coalitions in forming, implementing and planning environmental policies.

2.2.2 Institutional change and complexity in SESs

Further, the quest of identifying and evaluating institutional change is valuable for a better understanding mutations of the complex SESs triggered by fast and dramatic changes in the environment and technological innovation that permits greater and faster accumulation of knowledge and economic development. In the study of Ostrom (2009) on the potential catalysing disturbances in SESs across spatial and temporal scales, complexity is presumed to be integral part of the systemic relationships that should be further explored rather than eliminated. The perception of complexity of the institutional matrices appears also crucial for Chang (2010) in this criticism of the mainstream discourse on institutions and economic development. According to Chang (2010), the static, linear and one-way causations between those elements are based on weak evidence which ignores important features of heterogeneous systems, as exist in real-life.

The consideration of complexity is essential for the thorough understanding of the challenges facing SESs regarding not only climate issues but also the use of natural resources, such as water resources. Gradually, water governance over the years evolved into more complex structures: the introduction of the hydrographic basin/watershed principle redefined the political and administrative spatial jurisdiction on actual geographical scale of the principal inland water bodies. Also, during the consequent changes in the institutional framework, heterogeneous agents, including government, market and civil society, emerged as potential contributors at moments of strategic shifts despite the fact that all of them proved to be part of the problem and its solution simultaneously (Pahl-Wostl, 2015). As North (1990) points out diverse multi-scale institutional arrangements and complex motivational structures may generate outcomes that are productive and innovative or, on the contrary, destructive and perverse. Evans (2008) supports the adoption of creative and flexible synergies for diversion from public bureaucratic and deliberative institutions of the “developmental state” which will continue to play a crucial a role in economic growth and

social transformation in the 21st century. The author envisions instead a knowledge driven participatory economic development targeting well-being (both target and as means), based on the expansion capabilities theory of Amartya Sen, and development depending on the generation of intangible assets (ideas, skills, and networks). Networks as formed in the public spaces or the e-spaces interrupt the traditional institutional loops allowing experimentation towards new institutional settings for participation and co-formation of rules.

According to (OSTROM, 2005; KINGSTON; CABALLERO, 2009) this innovative political-bargaining process in institutions might be effective in cases where bounded rationality and risk aversion prevails leading to unwillingness to perform changes, especially when there is an incorrect understanding of the effects of potential changes, though the challenge lies upon how the existing institutions will accompany this transitory procedure and how to reassure positive attributes to the societies. Koontz *et al.* (2015) in an effort to trace causal relations consider networks and learning procedures to be fundamental variables of their theoretical framework on institutions that change in order to maintain or improve to a desirable state. Still, the authors acknowledge that the networks depend from the specific historical and socio-economic context, including rule compliance, power pressure groups, social capital, the interactions of scales and biophysical conditions, transaction costs, and overlaps among other variables. Equivalently, in the absence of homogeneous collective interests or compensation for potential losses, Kingston and Caballero (2009) suggest that power asymmetries among or in the pressure groups could lead the most powerful to block or impose inefficient change through coalitions or rivalries, which, in the case of institutional settings that provides more autonomy for differentiated policy-making, could generate further fragmentation (AFFONSO, 2003) instead of consolidated institutional networks.

Ostrom (2009) defends the position that the challenge lies to identify a general classificatory framework that will guide scholars in each phase of the identification process, including data collection, fieldwork or analysis, of the type of arrangements for collective action and self-organization that sustain specific SESs or on the contrary, collapse them. By definition, the SESs are, or else result from, the intrinsic connection of the social and ecological systems consisted of a total of subsystems, which interact horizontally and vertically, bringing mutual effects on subsystems, the whole SES, and other SESs of bigger or smaller scale (DE MESQUITA NORA *et al.* 2017). In more detail and in establishing an analogy for the fishing sector, the authors perceive the subsystems to include: a) the resource systems, such as the marine fish stocks; b) resources units, such as particular species; c) systems of governance, such as local arrangements among government and other organizations responsible for the management of fishing; and d) the resource users, such as the artisanal fishers in coastal areas. For each subsystem, Ostrom (2009) proposes a

nested framework of potentially relevant 10 subsystem variables in multiple and deeper analytical levels depending from the issue and the dimensions, both time and space, of the SES under analysis. Among the distinguished variables, some are subject of analysis in this dissertation, including i) number of users, ii) leadership, iii) norms and social capital, iv) knowledge on the SES, v) significance of the SES to resource users, vi) collective-choice rules⁹, through the data obtained from artisanal fishers during the fieldwork as a first step to establish a better understanding of the SES in coastal municipalities of Rio de Janeiro state.

2.3 NATURAL RESOURCES GOVERNANCE SYSTEMS

The traditional top-down model, especially in the natural resources governance, is deeply challenged for its rigidity and for not allowing adequate representation from other affected actors, including a range of organizations that are neither public or private; the so-called third sector among which we may include universities, institutions, NGOs, social enterprises, associations. Those entities, considered to be independent, value-driven and with no governmental affiliation, have claimed a greater participation in decision making and implementation on the basis of expertise, social justice and democratic values, such as transparency, accountability and social equitability.

Newig and Fritsch (2009) by conducting a meta-analysis of 47 case studies in Northern America and Western Europe, conclude that highly polycentric governance systems yield higher environmental outputs though causal relations could not be identified either between governance effectiveness and the decision-making scale, or policy delivery and institutional fit to ecosystem. It is worth mentioning, another conclusion of the empirical findings of Newig and Fritsch (2009) is that the involvement of non-state actors in the governance does not significantly increase the utility of local knowledge and the potential of social learning for achieving more sustainable outputs. Though this study excluded Latin America, those conclusions are valuable in the quest of polycentric regimes which recognise and mainstream local environmental knowledge.

⁹The term specifies rules that determine how and who can participate in processes of changing operational rules (SCHLAGER; OSTROM, 1992)

3 METHODOLOGY

This section describes the methodological steps of this study for the further systematic investigation of the object of analysis as defined forehead. It is structured in accordance with the chronological order of the completion of the separate phases of the research throughout the doctorate program. For each stage, goals, means, target population and sample determination are analytically presented.

The adopted methodology considers both quantitative and qualitative techniques that transcend the disciplinary boundaries under the evolutionary world-view of the ecological economics according to which human preferences, perception, technology and culture define the dynamic changes within multi-scale SESs (COSTANZA, 1992). Overall, the study is divided in three stages: (a) literature review, (b) the exploratory one-to-one extended open interviews conducted with selected individuals in the municipality of Rio de Janeiro, (c) field work in selected municipalities of Rio de Janeiro state for interviews with local artisanal fishers.

In the initial stages of the qualitative research procedure, the focus was mainly steered on both the collection and analysis of relevant academic literature on the challenges and opportunities of the environmental public policies related to natural resources management and ecological zoning at national and subnational level principally at coastal areas, as well as to small-scale fishing and the fishing communities. The access in the CAPES database and the online research engine Google Scholar were fundamental sources for my research using relevant keywords including ‘coastal management’, ‘fishing communities’, ‘traditional communities’, ‘water resources’, ‘ecological zoning’, ‘coastal zoning’, ‘adaptive institutions’, ‘adaptive governance’, ‘participative governance’, ‘territory in environmental public policies’, ‘territoriality’, in both English and Portuguese. Also, other documentation was collected and analysed, such as reports, legislation, announcements, maps, as provided by official Brazilian governmental bodies, international and local NGOs, and from the interviewees of the exploratory interviews. This research allowed to identify divergences on the context of the distributed information, and to verify the difficulty in tracking and accessing publicly available consolidated and validated data.

The second stage complements the literature review, with a thorough, honest and transparent procedure of qualitative analysis of the transcript that resulted from the individual exploratory one-to-one interviews that I conducted in order to explore the natural resource governance reality of the metropolitan region of the Rio de Janeiro state from the perspective of the civil society representatives and experts. More specifically, it is analytically described the adopted

approach for the identification and approximation of the local actors, as well as the methodology of the analysis posterior to the interviews.

Finally, the third stage, explores the methodology applied in order to explore the natural resource governance of three regions of the Rio de Janeiro state from the perspective of the artisanal fishers. It is divided in two parts: (a) the complementary analysis that contributed in the determination of the sample population, and (b) the methodology applied in preparation of the field work as well as for the analysis of the results.

3.1 EXPLORATORY INTERVIEWS IN THE METROPOLITAN AREA OF RIO DE JANEIRO

3.1.1 Sample definition of the exploratory interviews

As Biernacki and Waldorf (1981) describe, the researcher begins an exploratory research by establishing contacts while controlling general characteristics of the target population without excluding individuals from different classes, races, educational levels and geographical areas. Also, and most importantly, gender should also consider in the research progress, as women are often under-represented. The authors also point out that the identification of potential and eligible respondents for issues related to natural resources governance is possible through representatives of organized civil society groups. Similarly, to identify the interviewees in this initial and exploratory face, I attended several events, meetings, and conferences relevant to natural resources management issues in the metropolitan region of Rio de Janeiro state during the first semester of 2017, as indicated in the Appendix A, with the purpose to register principal concerns and identify local actors or experts that either represent a social group or have an important role within the organizations.

During those events, a protocol was followed of registering minutes for each attended meeting, event or conference, dividing the end-document to sections including practical information of the event (title, date, address, format), context explored in the agenda (subject, important points, results or conclusions if any) and finally follow-up notes and list of contacts for future interviews. This process contributed in assessing information and adapting my research focus accordingly. Also, these records served to validate information obtained from later interviews as most of the interviewees referred to those events.

Finally five interviewees were selected (Table 1), two out of which were women. In order to maintain the anonymity of the participants, they appear as interviewees A, B, C, D and E respectively. The educational backgrounds, ages and socio-economic status of the interviewees is highly varied, though such an information was indirectly retrieved during the interviews, not

explicitly requested as a pre-selection criteria of the candidate interviewees. On the contrary, the level and years of active involvement with environmental and social issues was primordial.

Table 1- Information on the exploratory interviews A, B, C, D and E

Interviewee	Association of interviewee with institution/organization:	Focus of the interview:	Duration
A	President of APEDEMA-RJ & Sub CBH Oeste BG	Historic description of the civil society movements and organizational impediments	1:03:29
B	Member of APEDEMA-RJ & Sub CBH Oeste BG & ECOCIDADE	Historic description of the environmental public policies and issues of conflict within Rio de Janeiro state	2:32:43
C	Researcher of IBASE (previously INEA & IBGE)	Socio-environmental analysis and territorial management, fishers in Marica	2:09:52
D	Co-founder of Baia Viva	Environmental degradation of Guanabara Bay and legacy of the Olympic Games	1:45:34
E	Sectoral Development Analyst -FIRJA & PhD student PROAPE-UFRJ	Urban architecture and hydrologic areas and basins in Rio de Janeiro state	1:30:43

Source: Elaborated by the author.

3.1.2 Proceedings of interview during the exploratory interviews

All the interviews were conducted within the headquarters of the RIO+ Center of UNDP, a partnership between the United Nations Development Programme (UNDP) and the Government of Brazil, located at the center of Rio de Janeiro. As PhD intern, I was given access to rooms that permitted isolation, and a quiet and comfortable environment for the interviews to be conducted. This conveniently accessible space for the interviewees facilitated significantly my research, thought, due to the institutional image of the center, it was necessary to explicitly differentiate my position as a PhD student and to emphasize the exact purpose of the interviews to avoid misinterpretations, false expectations or even to allow the interviewee to focus on the information that he/she provided.

During the procedure, I encountered some difficulties as described by Biernacki and Waldorf (1981); primarily, the misleading recommendations from colleagues that lead to false starts, as individuals proved to have limited experience on the issue, and the speed of initiation of the referral chains. In particular, my introduction to certain networks was often creating a sense of urgency to

establish new contacts and to complete the interviews often on the spot. Nevertheless, I opted for a more paced approach that would permit me to isolate the interviewee, reassure availability and time and as well as post-interview analysis of the transcript data for the latter to be considered for the next interview. This is necessary as a less controlled environment for the conduction of the semi-open interviewees would distract the interviewee from the main research questions, or would not allow for a clear recording of the conversation. One of the drawbacks of this methodology is that the relationship circles that I have followed with those individuals were not completed, due to interview cancellations, primarily from fishers.

The elaboration of the material, both audio and written notes, from the interviewees followed specific steps: after the complete transcription of the text according to the recorded audio, I proceeded in careful initial reading, while in parallel I continued to listen the audio, in order to verify that the text is in the same vein with the intention of the interviewees. I also, noted first impressions and comments from the information provided. Then, I proceeded to the first codification according to new or contradictory information, repeated information, emphasis from the interviewees, sequence and frequency of statements that are relevant for the research questions. For the purposes of the preliminary analysis, there were used units of analysis including only the segments -lines, portions or several lines-, that are meaningful for coding in relation to the preset research questions:

- i. What are the main issues in the Guanabara Bay and evolution of these issues along time?
- ii. What is the role of fisher and woman in civil society movements?
- iii. Institutionally how the participation is actually taking place?
- iv. What is the capacity level for participation of the civil society movements?

Hence the coding exercise targets to register the socio-environmental conflicts as perceived by those actors. The coding exercise is repeated thoroughly until all basic issues, as defined by the research questions, were covered. Then, linking points among the codes were identifies and ultimately categories among the codes in order to be able to draw some initial hints.

3.2 COMPLEMENTARY QUANTITATIVE ANALYSIS ON URBAN ARTISANAL FISHERS

The complementary quantitative analysis served to identify whether the number of professional artisanal fishers living in urban environments is significant in order to be considered in public policies regarding highly urbanized coastal municipalities in the Rio de Janeiro state. For the identification of the urban population in the municipalities of Rio de Janeiro state, the definition of

the urban areas at the municipal and district level is adopted in accordance to the definition given by IBGE for the 2010 survey¹⁰:

“Em situação urbana, consideraram-se as áreas, urbanizadas ou não, internas ao perímetro urbano das cidades (sedes municipais) ou vilas (sedes distritais) ou as áreas urbanas isoladas, conforme definido por Lei Municipal vigente em 31 de julho de 2010. Para a cidade ou vila em que não existia legislação que regulamentava essas áreas, foi estabelecido um perímetro urbano para fins de coleta censitária, cujos limites foram aprovados pelo prefeito local.”

Despite the urban definition of the 2010 IBGE survey is based on the legal framework established by the Decree 311/1938, the political-administrative dichotomy of the territory between urban and rural was criticized for depreciating the rural areas as simply the external part of the urban, as well for not considering the inequalities in infrastructure, or the available socio-economic and cultural functions within the defined and legally recognized limits of the city, “*cidade*” or village, “*vila*” of the respective municipality (BRAZIL, 2017). So, additional operational strategies are implemented considering the morphologic aspects of the area, population density or further subdivisions within the urban perimeter.

Furthermore, the target group is recognized officially by the Federal Government of Brazil only when registered to the fishing colonies, which are official institutions that provide the primary support for the exercise of the craft including the activation of *defeso* benefit as established by the law no 10.779/2003 (CLAUZET, 2003; CLAUZET; BARRELLA, 2004). This payment scheme under the responsibility of the federal fishery and employment agencies is operating since 1989, was associated with the law 8.287/1991 for social assistance to the artisanal Brazilian fishers, and was justified as a compensatory income for periodic restrictions imposed in the craft (BEGOSSI *et al.*, 2011).

Nevertheless, the division between fishers and non-fishers is faint and currently there is no solid national registration of the fishing population or of its production. Equally, the fishing colonies are not systematized in a unified registry or a platform, as there is no normalization procedure. Moreover, studies suggest that differences, both in the available financial resources among colonies and the institutional administrative regimes that exclude colonies from the redistribution cycles, can significantly impact the offered services and consequently for the registration ratings of the fishers (CLAUZET, 2003; CLAUZET; BARRELLA, 2004). However, Freire *et al.* (2015) consider the

¹⁰ Source: <http://biblioteca.ibge.gov.br/visualizacao/periodicos/93/cd_2010_caracteristicas_populacao_domicilios.pdf>

Accessed on 20 February 2019

official number of fishers registered in the annual statistics of the IBGE, IBAMA and MPA on subsistence fisheries in the coastal states.

Thus, acknowledging the aforementioned and for the purposes of this analysis, I considered the registration data retrieved from the Transparency Portal of the Federal Government that discloses information on the *defeso* benefit as compensation for the periodic prohibition of the artisanal fishing activity targeting certain species carried out by individuals or families who meet the criteria established by Law 10,779/2003. The data provide information on the artisanal fishers that received *defeso* for all the municipalities in Brazil and are available from 2011 to 2017 for all months¹¹, with the exception of the year 2018 that has only data from January to September, because at the time of the elaboration of the dissertation, the Transparency Portal of the Brazilian government had yet to publish the data for the last trimester of 2018. Out of those files, I analysed the data only for Rio de Janeiro state for the years 2016, 2017 and 2018, and calculated also the means and the standard deviation in order to identify the number of individuals for each month and for each year respectively.

Despite lacking some data, the provided data for 2018, already indicate similar patterns that are repeated on a yearly basis for the years before, and, thus, were included for the sake of comparison only for the available months. Therefore, I proceeded to the following elaboration of the original database of the Transparency Portal of the Brazilian Government: first, I filtered the excel file available online for the Rio de Janeiro state for each month of each year, and created separate excel files for each result. Then I filtered per municipality to see how many fishers are actually registered, and again created a new file with the aggregated number of fishers per municipality per state, as well as another one with the percentages of the number of the fishers per municipality in relation to the total population of fishers for the respective state, per month and per year, excluding, on many occasions, for multiple registrations of the same artisanal fisher, the number of which correspond with the number of parcels of financial compensation that the individual receive for one month of *defeso*¹².

In detail, I eliminated any duplicated items in the column containing data of the NIS registration number of the beneficiaries “NIS favorecido” (Phase A) per month. In order to control for errors in the elimination process of the duplicates, I repeated the process for the total data only

¹¹. Source: <http://www.portaltransparencia.gov.br/downloads/mensal_.asp?c=SeguroDefeso#exercicios2016> Accessed on 06 June 2017

¹² “A lei garante ao pescador receber tantas parcelas quantos forem os meses de duração do *defeso*, conforme portaria fixada pelo IBAMA. O valor de cada parcela é de um salário-mínimo.”. Source: Governo do Rio de Janeiro <<http://www.rj.gov.br>> Accessed on 04 January 2019

for the year 2016. I concluded that there is no duplicate from month to month and the total number of fishers stay the same either way. Then, I identified the number of municipalities that are included in the database by eliminating multiple registries in the respective column (Phase B) of the database per month. This permitted to create the list of municipalities that are registered in the database. Finally, I counted the number of individuals per municipality on the basis of the database in the Phase A per month for the years 2016, 2017 and the months January to September in 2018. Finally, in correspondence to the registration records of the professional artisanal fishers for each month, year and municipality, the urban population percentages of the respective municipalities of each state were selected on the basis of the available data from the portal of IBGE for the synopsis of the Demographic Survey of Brazil for 2010. Initially, the Microsoft excel, or Libreoffice Calc, in the Windows software operating system was exclusively used for the analysis of the data for the month of January, but in continuation, in order to facilitate and accelerate the procedure, the Python programming language was used though the open source software operating system Ubuntu.

3.3 FIELD WORK IN RIO DE JANEIRO STATE

3.3.1 Sample definition of the Field Work

At the third stage of the study, one-on-one interviews were conducted with artisanal fishers between July and August 2018 in the frames of field research in Rio de Janeiro state. The municipalities were selected with twofold criteria. First, for the identification of the target population, 35 coastal municipalities were separately identified from the municipalities in the interior of the Rio de Janeiro state out of a total of 92 municipalities according to the registration of the municipalities in the coastal zone of the IBGE¹³ available at the website of the Ministry of Environment (Ministerio do Meio Ambiente)¹⁴. Then, a secondary selection was made on the basis of the list of the 28 entities of the fishing sector as indicated by the Foundation of Fisheries of the State of Rio de Janeiro (FIPERJ¹⁵). In total 23 entities are located at coastal municipalities including: São Francisco de Itabapoana (Z-01), São João da Barra (Z-02) Macaé (Z-03), Cabo Frio (Z-04), Arraial do Cabo (Z-05), São Pedro da Aldeia (Z-06), Niteroi (Z-07 and Z-08), Magé (Z-09),

¹³Source: <<http://www.ibge.gov.br/home/geociencias/geografia/costeira.shtm>> Accessed on 23 May 2017

¹⁴Source: <<http://www.mma.gov.br/destaques/item/10599-rio-de-janeiro-munic%C3%ADpios-da-zona-costeira>> Accessed on 23 May 2017

¹⁵Source: <<http://www.fiperj.rj.gov.br/index.php/entidade/index/>> Accessed on 20 February 2019

Rio de Janeiro (Z-10, Z-11, Z-12, Z-13, Z-14)¹⁶, Mangaratiba (Z-16), Angra dos Reis (Z-17), Parati (Z-18), Campos dos Goytacazes (Z-19), Rio das Ostras (Z-22), Armação dos Buzios (Z-23), Saquarema (Z-24), Quissamá (Z-27), and Araruama (Z-28).

Subsequently, the municipalities of these identified entities are categorized in consideration of the political-administrative division in regions within the state of Rio de Janeiro which are mainly separated into four categories for the coastal area of Rio de Janeiro a) Região Metropolitana, b) Região do Sul Fluminense (Costa Verde), c) Região das Baixadas Litorâneas, d) Região Norte Fluminense¹⁷. Accordingly, the municipalities/entities of Mangaratiba (Z-16), Niteroi (Z-07 and Z-08), Magé (Z-09), and Rio de Janeiro (Z-10, Z-11, Z-12, Z-13, Z-14) are included in the metropolitan region. Respectively, the region of Sul Fluminense (Costa Verde) encloses the municipalities of Angra dos Reis (Z-17) and Parati (Z-18). Also, in the region of Baixadas Litorâneas are included the municipalities/entities of Cabo Frio (Z-04), Arraial do Cabo (Z-05), São Pedro da Aldeia (Z-06), Rio das Ostras (Z-22), Armação dos Buzios (Z-23), Saquarema (Z-24) and Araruama (Z-28). Finally, the region of Norte Fluminense are included the municipalities/entities São Francisco de Itabapoana (Z-01), Campos dos Goytacazes (Z-19), São João da Barra (Z-02), Quissamá (Z-27) and Macaé (Z-03). This categorization aims to secure the representation of all regions in the sample. The priority during the field work was given on the metropolitan and the northern coastal regions. Municipalities in the Sul Fluminense (Costa Verde) region were not visited though due to financial limitations.

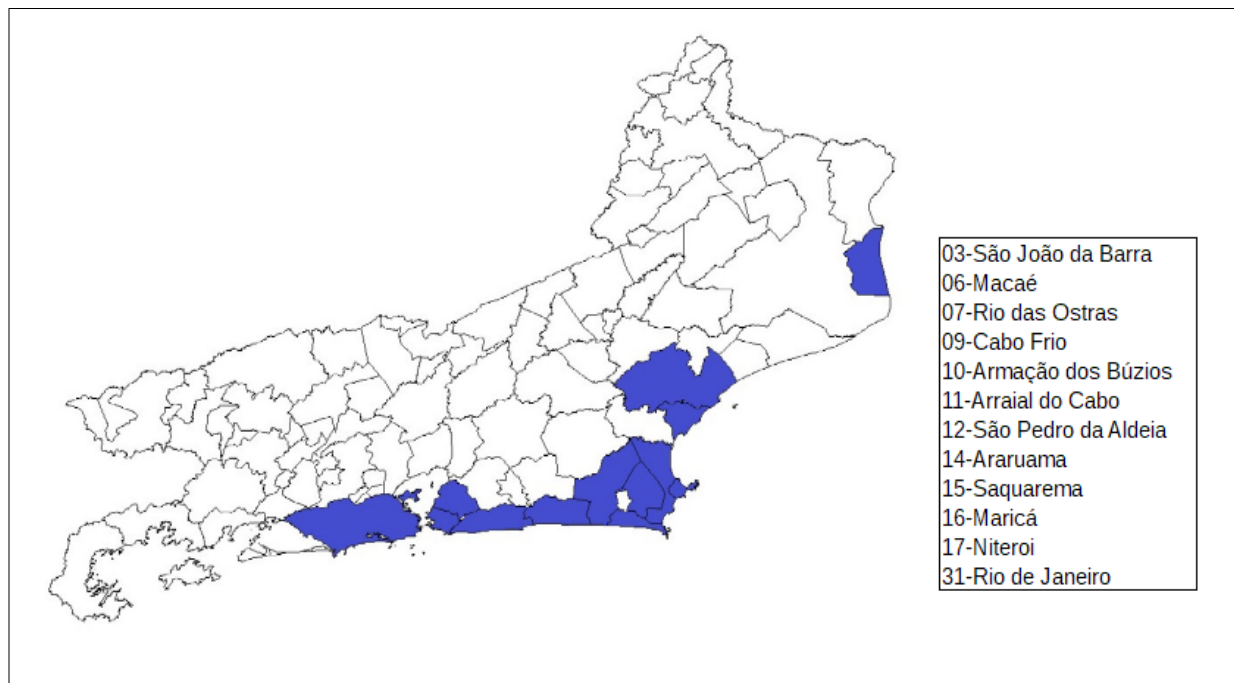
Based on these criteria, the field research was carried out in 12 coastal municipalities of the regions of Metropolis (Rio de Janeiro, Niteroi and Maricá), Baixadas Litoraneas (Saquarema, Araruama, São Pedro da Aldeia, Cabo Frio, Arraial do Cabo, Armação dos Búzios, and Rio das Ostras) and Norte Fluminense (Macaé and São João da Barra) in Rio de Janeiro state (Figure 1). Despite having no coast in its territory, the municipality of São Pedro da Aldeia was included for two reasons: (a) the municipality depended its economic development on artisanal fishing activities, and (b) belongs to the municipalities surrounding the Lake of Araruama (LA), a coastal saline lake that extends to six municipalities, five of which were visited during the field work, including also Saquarema, Araruama, Arraial do Cado and Cabo Frio. LA is recognised as an important ecosystem

¹⁶ The municipality of Rio de Janeiro due to its high population density, is divided in subdivisions, or else neighbourhoods. Particularly, according to FIPERJ, within the municipality of Rio de Janeiro are included the colony in Ilha do Governador (Z-10), colony in Ramos (Z-11), colony in Caju (Z-12), colony in Copacabana (Z-13), and the colony in Pedra da Guaratiba (Z-14). Each colony, is instituted in neighbourhoods whose socio-economic state is significantly varied.

¹⁷Source: <http://www.ceperj.rj.gov.br/ceep/info_territorios/divis_regional.html> Accessed on 23 May 2017

not only for its landscape, but also its ecological services that historically attracted artisanal fishing activity in its waters.

Figure 1- Map of the 12 municipalities of the state of Rio de Janeiro that were visited during the field work (indicated in blue).



Source: Elaborated by the author.¹⁸

3.3.1.1 Analysis of the study area

The 12 municipalities selected for the fieldwork research have very distinct geographic and socioeconomic profiles that determine the management of the natural resources, though, with the exception of the municipality of Rio de Janeiro, all of them share an historical trajectory to which the artisanal fishing community had a pivotal role. Valuable information on the majority of those municipalities visited during fieldwork, with the only exception of the municipality of Rio de Janeiro, which is the capital of the state, is retrieved from the annual data for the 92 municipalities of Rio de Janeiro state elaborated by the General Secretariat for Planning of the Court of Auditors of

¹⁸This sampling technique is mainly used in the field of sociology but it expanded to other fields that make use of this technique including interviews in rural areas for issues regarding the solid waste management (SEVERO *et al.*, 2017).

Rio de Janeiro state (Tribunal de Contas do Estado do Rio de Janeiro, TCE/RJ)¹⁹ for the year 2017 (Table 2).

Araruama municipality is rapidly growing demographically due to its proximity to Rio de Janeiro Petrochemical Complex (Complexo Petroquímico do Rio de Janeiro, Comperj). According to data of TCE/RJ (Table 2) Araruama augmented its population by 35,3% within a decade, estimated to 124.940 individuals, ranking 16th for the year 2016 among other municipalities within the Rio de Janeiro state.

According to the data of the TCE/RJ, Rio das Ostras is steadily registering a leading annual performance in e-governance public administration services both in sharing information (17 out of 19 items), interaction with users (13 out of 18 items) and transaction services in comparison with other municipalities in the region of Baixadas Litorâneas. For instance, Araruama municipality satisfy less criteria in regards to interaction (11 out of 19 items) or information sharing (7 out of 18 items) services. It is noteworthy that information related to environmental issues is only provided by Rio das Ostras and São Pedro da Aldeia. Yet, Rio das Ostras along with the majority of the municipalities of Rio de Janeiro state demonstrated low score for not facilitating citizens to request for or follow-up specific information through the municipal e-platform (9 out of 20 items).

Furthermore, the report of the TCE/RJ provide information in regards to the transparency and social accountability of the municipalities by controlling for the provision or not of electronic services, data and information related to the law on access to information (Lei de Acesso à Informação, LAI), fiscal responsibility law (Lei de Responsabilidade Fiscal, LRF), the information citizen Services (Serviço de Informação ao Cidadão, SIC), the transparency webside access (Portal da Transparência, PT), and the ombudsman's office (Ouvidoria). The municipalities of Cabo Frio and São João da Barra, Arraial do Cabo, Saquarema and Rio das Ostras are within the municipalities with the lowest below average score, whereas São Pedro da Aldeia and Macaé have high score. Exceptionally, Niteroi satisfied all the criteria.

¹⁹ Source available at: <<https://www.tce.rj.gov.br/documents/10180/74189685/Estudo%20Socioecon%C3%B4mico%202017%20-%20Araruama.pdf>> Accessed on 20 February 2019

Table 2- Aggregated information from the 2017 socioeconomic status of the 11 municipalities (except the capital of the state) visited during fieldwork

	Araruama	Armação dos Búzios	Arraial do Cabo	Cabo Frio	Saquarema	São Pedro da Aldeia	Maricá	Niteroi	Macaé	Rio das Ostras	São João da Barra	
Population growth (ranking within a decade in RJstate)	16	6	31	9	12	13	2	61	4	12	25	
	35.30%	51.40%	16,1%	46.80%	41.50%	39.00%	66.10%	6,1%	56,1%	190.20%	18,3%	
Estimated population (2016)	124.94	31.674	29.077	212.29	83750	98.47	149.876	497.88	239.471	136.626	34.884	
Mata Atlântica coverage per mun. (2013-2014)	0.04	0.22	0.06	0.08	0.16	0.06	0.22	0.23	0.25	0.15	0.17	
Municipal Human Development Index (ranking in RJ state)	35	28	20	19	51	47	6	1	7	3	76	
Tourism (ranking in RJ state)	C	A	B	A	B	C	C	B	A	B	C	
E-services	Informative (19 types)	11	14	5	5	6	13	11	10	19	17	15
	Interactive (18 types)	7	6	7	4	6	8	8	8	11	13	18
Transparency & social control (LAI, SIC, PT, Ouvidoria, LRF) (20 items)	16	13	5	1	7	18	15	20	19	9	4	
Councils (ENV, HEALTH, EDU, SOC, MOB)	0	0	0	4	0	5	5	5	5	1	0	
Index of Development for Basic Education Goals	NO	Limited	NO	NO	Limited	NO	NO	NO	NO	Limited	NO	
Revenue per mun. in RJ state (2016)	ranking	22	37	45	11	30	31	10	2	4	14	27
	ranking per capita	72	8	15	59	61	80	27	24	1	35	3
	millions	300	184	145	614	236	210	663	2240	2060	537	256
	% related to oil extraction	0.03	0.19	0.33	0.15	0.12	0.04	0.46	0.13	0.15	0.18	39
	ranking related to petroleum	73	8	4	24	32	70	3	17	7	14	1

Source: Elaborated by the author from the data of Court of Auditors of Rio de Janeiro state²⁰

With the exception of São Pedro da Aldeia, Maricá, Niteroi, and Macaé which provide information for all the municipal council for the environment (ENV), healthcare (HEALTH), education (EDU), social assistance (SOC) and mobility (MOB), the rest municipalities provide

²⁰ Source available at: http://www.tce.rj.gov.br/estudos-socioeconomicos1?p_p_col_id=column-1&p_auth=j5oYxMyG&p_p_lifecycle=1&p_p_id=estudosocioeconomicomunicipios_WAR_tcerjestudosocioeconomicomunicipiosportlet&p_p_col_count=2&estudosocioeconomicomunicipios_WAR_tcerjestudosocioeconomicomunicipiosportlet_javax.portlet.action=doSearch&p_p_state=normal&p_p_mode=view&estudosocioeconomicomunicipios_WAR_tcerjestudosocioeconomicomunicipiosportlet_doSearch=doSearch > Accessed on 20 February 2019

partial, for the case of Cabo Frio and Rio das Ostras, or none information, for the case of Araruama, Armação dos Buzios, Arraial do Cabo, Saquarema, and São João da Barra. This indicates other the lack of consolidation of institutional bodies that address the relevant issues of each sector and/or low priority to citizen participation to those bodies. Further the Index of Development for Basic Education demonstrate for all cases no or very poor performance in education, the quality of which is a necessary precondition for the capacity of future generations to navigate the complexities of policy making procedures, and thus, a future deficit in the capacity of local actors to participate.

The touristic region, namely Costa do Sol, in which Rio das Ostras, Araruama municipalities belong, concentrate the 22-32% of the tourism in Rio de Janeiro state. Both Costa do Sol and the metropolitan region are considered to be strategic priorities for the development of the sector in the state. The interactive map for the sector of tourism, that categorize municipalities according to the yearly touristic flow and job creation relevant to the sector²¹, indicate that similarly to Rio de Janeiro municipality, Armação dos Buzios, Cabo Frio, and Macaé have also a very high ranking position, followed by Arraial do Cabo, Niteroi, Saquarema and Rio das Ostras (Table 2). At a lower ranking are the municipalities of Maricá, São João da Barra, Araruama, and São Pedro da Aldeia. Furthermore, the two latter have also a very low percentage of revenue related to the oil industry, ranking at 70th and 73th position out of 92 municipalities respectively, and, correspondingly, their total revenue per capita is at the lower end among the 11 municipalities under analysis at 72th and 80th place in comparison to the total of 92 municipalities.

More analytically, the most prevalent revenues per municipality is registered for Niteroi and Macaé registering second and forth place in the ranking, followed by Maricá and Cabo Frio at tenth and forth place and even lower for the municipalities of Rio das Ostras, Araruama, São João da Barra, Saquarema, São Pedro da Aldeia, Armação dos Buzios and finally Arraial do Cabo at the 45th place. The revenue differences are exorbitant, despite the total of the municipalities belong to places higher than the median, with Niteroi registering revenue of BRL\$ 2.240 millions and at the lower end Arraial do Cabo only BRL\$145 millions in 2016.

Yet, considering the population in each municipality, the ranking changes dramatically. More specifically, Macaé rises to the 1st position, followed by São João da Barra at the 3rd position, Armação dos Buzios at the 8th position and Arraial do Cabo at the 15th position, overpassing Niteroi, Maricá, Rio das Ostras and Cabo Frio by far. Also considering the absolute revenue per capita figures, the deviation is considerable, for instance Macaé register approximately BRL\$ 8.601, while São Pedro da Aldeia municipality BRL\$ 2.128 for the year 2016. Except for Maricá, it is observed (Table 2) that the per capita revenue ranking of those municipalities increases analogously to the

²¹ Source available at: <<http://mapa.turismo.gov.br/mapa/init.html#/home>> Accessed on 20 March 2019

percentage of revenues derived from the oil industry, indicating the determinant role of the sector in stimulating the local economy of the coastal municipalities of Rio de Janeiro state. Indicatively, the total revenue of the Araruama municipality in 2016 was BRL\$ 300 millions, only 3% of which derived from activities related to the oil industry. Nonetheless, TCE/RJ report that municipalities that depend more from the oil industry have experienced in 2015 a recession to their economies, foremost Cabo Frio, Rio das Ostras and Armação dos Búzios.

The total of the 12 municipalities under study belong to the greater Hydrographic Region of South-east Atlantic that extend beyond the state of Rio de Janeiro state²², and four separate territorial subdivisions of the state according to the physical ecosystemic features of the natural drainage systems, including lakes and rivers: (i) Rio de Janeiro, Niteroi belong to the Hydrographic Region V of Guanabara Bay; (ii) Araruama, Armação do Buzios, Arraial do Cabo, Cabo Frio, Saquarema and São Pedro da Aldeia belong to the Hydrographic Region VI of Lagos do São João; (iii) Macaé belong to the Hydrographic Region VIII of Macaé and das Ostras; and (iv) São João da Barra to the Hydrographic Region IX of Baixo Paraíba do Sul and Itabapoana. The territory of the municipality of Maricá is divided between the fifth and sixth hydrographic region, whereas Rio das Ostras between the sixth and ninth.

At a sub-level of those aforementioned subdivisions are the hydrographic basins. The need to conciliate the management of their common pool resources lead to intermunicipal initiatives such as the Consortium of São João Lakes that today encompasses five distinct hydrographic basins within the administrative territorial division of Baixadas Litoraneas, extending to stretches of the coastal zone from Ponta Negra in Maricá municipality to the Ponta dos Pecados Mortais in Rio das Ostras municipality including the lakes at the respective coastal areas of Araruama and Saquarema municipalities²³. Particularly, the Araruama lagoon is surrounded by the municipalities of Saquarema, Araruama, São Pedro da Aldeia, Arraial do Cado, and Cado Frio, each of which have established fishing colonies.

Another example of coastal ecosystem that demands for intermunicipal collaboration in the study area is the Costa do Sol state park (Parque Estadual Costa do Sol, PECS) (BRAZIL, 2011). It is divided into four sectors, which in total encompass 27 dispersed and segmented areas of environmental protection including dunes, mangroves, lakes, lagoons, forests and coastal islands within the jurisdiction of Saquarema and its neighbour municipalities, merely Araruama, Arraial do

²² Source available at: <<http://www3.ana.gov.br/portal/ANA/as-12-regioes-hidrograficas-brasileiras/atlantico-sudeste>> Accessed on 20 February 2019

²³ Source available at: <<http://cilsj.org.br/hidrografia-regional/>> Accessed on 20 February 2019

Cabo, São Pedro da Aldeia, Armação de Búzios²⁴. Since 2015, the initiative of the Secretariat for the Environment of Rio de Janeiro state to expand the territorial delimitation of integral protection of PECS to approximately 2.500 hectares brought out intense conflicts as well as revealed the divergent perceptions on the conservation strategies among local actors, and more specifically whether areas of low ecological value due to deterioration of the natural ecosystem should be included or not to preservation and reservation efforts. Further, the study for the determination of the new limits, while manages to secure a positive balance for preservation purposes, is contested for biased exclusion from PECS delimitation of lands of intense human occupation or activity, including livestock farming, real-estate speculation and mining activities, in favour of local private interests²⁵.

3.3.1.2 Analysis of the study area per municipality

More analytically, in this section, each municipality of a total of 12 under study is presented in alphabetical order with the information on main economic areas, level of public services, population, water and waste management, education and environmental sustainability given from the socio-economic analyses provided by the Court of Auditors of Rio de Janeiro state²⁶.

Araruama²⁷

The coastal Araruama municipality is characterized by the Araruama hypersaline lagoon, a source of income from fishing and touristic activities. Its population is estimated approximately at 100.000 people, the mean economic growth of the municipality for a decade up to 2000 was at 3,83% and with a high rate of urbanization of its population in comparison to the region Baixadas Litorâneas. Its proximity from the metropolitan region of Rio de Janeiro municipality, the beaches in the borders in the Araruama lagoon the creation of the Parque Hotel neighbourhood and other establishments that advancing the services offered in the area of tourism, as well as the creation of national highways that facilitated access to Araruama, all factors contributed historically to the diversification of its economy, which was based on sugar cane cultivation, and extraction of salt, to

²⁴ Source available at: <<https://www.saquarema.rj.gov.br/forum-do-parque-estadual-costa-do-sol/>> Accessed on 20 February 2019.

²⁵ Source available at: <<https://projetocolabora.com.br/florestas/costa-sol-preservacao-ou-especulacao/>> Accessed on 20 February 2019.

²⁶ Source available at: <<https://www.tce.rj.gov.br>> Accessed on 20 February 2019.

²⁷ Source available at: <<https://www.tce.rj.gov.br/documents/10180/1092026/Estudo%20Socioecon%C3%B4mico%202007%20-%20araruama.pdf>> Accessed on 20 February 2019.

the reinvention of the municipality as a popular summer destination, and upgrading the function of the port. During that period the growth of urban areas, pasture areas augmented, without implying that livestock production augmented and the reduction of forest areas were reduced. The touristic sector is so predominant in local economy that 72% of out of approximately 50.000 settlements, are seasonally occupied due to the touristic profile of the municipality. The fishing activity is more intense in the northern part of the hypersaline Araruama lagoon, and its character is predominantly artisanal, and focusing mainly to specific local species such as pink shrimp, mullet, sardines etc. The constant fragmentation of the forest belonging to the Mata Atlantica biosystem, the excessive demand for water resources, pollution and eutrophication of the lake due to accelerated urbanization and lack of adequate sewage treatment, are some of the environmental consequences. In view of extraction of sand, excessive land occupation or house building in the borders of the lagoon and other behaviours that are either illegal or not environmentally responsible the Intermunicipal Consortium for the Management of Basins in the Lagos Region, São João River and Coastal Zone provides with technical and scientific support to the municipalities involved including geographic information system (GIS) mapping to anticipate issues regarding sewage infrastructure. Under the responsibility of the state, annually dredging for the removal of sand, reformulation of beaches, removal of abandoned salt and irregular works, as well as build floodgates in tributary channels of the lagoon to capture polluted water. Furthermore, the socio-economic conditions are reflected by the access to water , only 80% of the settlements have connection with te distribution system, and sanitary system services with only connects 7% of the settlements, while the collection of trash, which is consequently deposited at open pits, cover almost 80% of the settlements in the municipality. Moreover up to 2005, there was no institution of higher education levels in the municipality. From the period from 2001 to 2007 the number of new jobs either as first employment, transference or career change in the municipality represents approximately only the 20% of the total in the Micro Region of the Lagoons that include also the municipalities of Armação dos Búzios, Arraial do Cabo, Cabo Frio, Iguaba Grande, São Pedro da Aldeia and Saquarema, Finally, due to the fact that despite many seasonal residents owing a property in the municipality, there is a distortion of the actual tribute paid to the municipality in order to balance its revenue.

Armação dos Buzios ²⁸

The coastal municipality of Armação dos Buzios has approximately 31.067 habitants and the main occupations in the area involve fishing and touristic activities. The area was transformed

²⁸ Source available at: <<https://www.tce.rj.gov.br/documents/10180/74189685/Estudo%20Socioecon%C3%B4mico%202017%20-%20Araruama.pdf>> Accessed on 20 February 2019

from a fishers' village to an area of great touristic attraction since the 1960s, the year marked by the visit of a famous actress that still mark the local narrative. On the contrary, Cabo Frio municipality that is adjacent to Armação dos Búzios had a development much earlier on, specifically, since the construction of roads, concentrated on tourism and fisheries, salt industry. Still, for the municipality of Armação dos Buzios, whose location has all year long favourable conditions, from the perspective of climate, its natural ports that protect from bad weather, the benefits of the touristic activities are significant, as they generate income to local population and indirectly other benefits including the improvement of the public transportation. Nevertheless, 60% of households in Armação do Buzios do not have access to water and, even worse, in the case of sewage central services as only 4% are available through existing pipe connection with the houses. The rest quantities of sewage are thrown into the sea in natura.

The need for effective and more competent water, sewage and waste management all together implies interventions in monitoring, as well as technical on site improvements for instance monitoring the lower water level at the saturation zone, to open and pump wells, to improve the sewage and waste dumps etc. The municipality appears to be the fifth in the state of Rio de Janeiro that provides with IT workshops at elementary school. Moreover, in the municipality despite the fact that there are not people living in subnormal conditions and there are overall improvements in the housing conditions, lesser households have access to running water pipes (-9%). Armação dos Búzios was in 38th place among the ninety-one municipalities in the state of Rio de Janeiro in 1991, when the synthetic indicator measured 83.92, at a scale with maximum indication of 100, indicating a good status, that was nevertheless dropped almost a decade latter. The economic performance of Armação de Buzios represented almost 10% of the GDP of the Rio de Janeiro state. To maintain the touristic activities, synergies have been developed among the areas of tourism and fishing to maintain the traditional character and image of tá fishing village.

Arraial do Cabo

The growth of Arraial do Cabo municipality was strongly boosted by the National Alkali Factory, and the seasonal tourism during summer, in particular its diving services. Within the touristic region of Costa do Sol, Arraial do Cabo municipality has a very high rating to the contribution to the economy from touristic activities, reaching categories B and C. In 2010, the municipality had approximately 28.000 inhabitants, to whom were added approximately 1.000 people five years later. The municipality was one of those that participated to the initial phase of Agenda 21 for the definition of its methodology and implementation, though in continuation it was not followed through by the participatory forums within schedule. In the municipality of Arraial do

Cabo approximately 69 settlements have established access to the water network, whereas 90% have adequate sanitary sewage. The municipality also dispose of solid urban waste in São Pedro da Aldeia. The municipal administrative structure is the 7th largest in the the state of Rio de Janeiro with an average of 104 employees per thousand inhabitants. The search on electronic government points out that the official website on the internet offers a small number nine of the types of information services, thus allowing a minimum online transaction. According to data from the Annual List of Social Information from the Ministry of Labour, the municipality participated in the labour market with new 3,037 formal jobs, reaching a total revenue of R \$ 132 million in 2015, 23% of which is linked with the oil industry sector and thus claiming the 12th place in the state of Rio de Janeiro. All revenues are attributed to cover administrative costs. Regarding revenues linked to the oil, the municipality had 23% of its total revenue, the 12th place in the state. About the Basic Education Development Index, the municipal network did not reach the target set by the Ministry of Education for the initial and final years of (infantile and elementary schooling.

Cabo Frio

Historically, Cabo Frio was an important conquest and development in the territory due to the significance of its port. After the economic collapse that was triggered by the end of human exploitation in the agriculture, Cabo Frio recovered much later developing the salt industry, fishing activities, the construction of the national highway, and tourism, The touristic activity in Cabo Frio turned into a primary economic activity for the region, yet it does not have yet a tourist offer inventory mainly due to the lack of physical infrastructure and personnel. The delays in implementation of such diagnosis or not willingness to participate to programs such as Prodetur that means to incorporate the elements of planning and management in alignment with the national public policies fro tourism and local needs, demonstrates the lack of strategical planning within the lower levels of governance, nor inter-municipal collaboration. Similarly, it does not have a mapping for potential risks. In administration the mean number of bureacrats per 1000 habitants is 64, and the official site of the municipality offer 16 out of 19 types of information services The population of Cabo Frio municipality is estimated currently approximately 216.000 inhabitants, and it has more services available as mirrored by the number of post offices, bank agencies and hotel establishments. Further, Cabo Frio has a mobility plan as necessary for municipalities with more than 20.000 inhabitants in order to secure access to federal resources for investments in the area of transportation. Yet, there is no actual planning on identifying potential environmental, technological and biological risks. Only 73% of the population has access to public water distribution services, while its waste is also deposited to the open pit of São Pedro da Aldeia. Still the Index for the

Human Development in municipalities demonstrate an increase from 1991 to 2010 of 32%, mainly referring to educational level, despite the fact that there are lesser registrations to the educational system, income and longevity, being at the 19th position within the Rio de Janeiro state. Yet, the index for the development of basic education dropped and the municipality failed to achieve specific goals as set by the Ministry of Education. The total revenue for 2017 reached approximately BRL 775 millions, yet per capita both investments and dispenses were rated at moderate levels in comparison with the 91 municipalities in Rio de Janeiro state.

Macaé

The municipality of Macaé once having a strong community in its territory, undergone a strong socio-economic transformations due to the local installations of the national extraction oil company Petrobrás, which intensified disputes for labour and territory also in other coastal municipalities of Rio de Janeiro state. More analytically, due to the national oil industry, namely Petrobrás, that installed in the area after the discovery of oil deposits in 1974, the economy of the municipality was revitalized, and thus attracted, since then, a great number of foreigners and dislocated Brazilians that were seeking job opportunities, as a results Macaé is the municipality with the 4th biggest population growth in the state of Rio de Janeiro, with an estimated population in 2017 approximately 244.000 people and approximately 81.000 settlements of permanent residence. Its economy was revitalized and it is indicative the great number of general services in the private sector including nine postal offices, 29 banks and 70 hotels. Despite its population size and its development, the municipality was not obliged to elaborate on an urban mobility plan as prerequisite to obtain federal resources. Yet, the municipality constituted exclusively a Transportation Secretariat and a Management Council for funds destined to intermunicipal transportation. Due to the prevalence of Petrobrás in the area, being a public industry, the public transportation was accessible to all students and workers alike as a social measure. Moreover, Macaé has a plan for protection from potential floods, being the risk of highest intensity in the area, along with inundations and soil erosion. Similarly, the municipality has a plan for the cases of severe droughts. Almost 79% of the population has access to public water services network, yet there are no information in regards to waste and sewage management, as contrary to other cases among the municipalities under study, Macaé has an autonomous system to the treatment and disposal of the residuals.. Overall, Macaé has a high index of human development in terms of education, despite not reaching the goals of the Ministry of Education in regards to the years that children enroll and end their basic education program, income, by offering more than 102.000 official positions in the job market, and longevity, elevating the municipality to be the 7th in the Rio

de Janeiro state. In addition the municipality was recognised to be in high rate development as it achieved in 2015, which is one of the 500 best indicators of Brazil.

Maricá

The municipality of Maricá is estimated to have approximately 153.000 inhabitants. In regards to the public services, it is estimated that per thousand citizens correspond 42 bureaucrats and its site, not only provides an average amount of online services, it also permits online transactions. The municipality have already identified and mapped potential risks for inundation and vulnerable allotments. Being in the wider metropolitan region, there is a collaboration for the disposal and treatment of waste and sewage with other municipalities of the east metropolitan subdivision. The municipality achieved its goal regarding attendance levels in basic education, yet it is not the case with the state establishments. The case of Maricá is a focal point being a peripheric municipality of the megacity or the metropolitan region of Rio de Janeiro state. The municipality offers approximately 13.000 positions in the job market. The total revenue for 2017 reached approximately BRL 1171 millions, 65% of which is related with the oil industry. The investment through the enterprises in petroleum and gas is concentrated in this municipality, in which context the role of the artisanal fishers is pivotal. Existing conflicts related to the real-estate market around the lake area and the coastline involved and divided the artisanal fishers~community.

Niteroi

Currently, the municipality of Niteroi, which belongs to the Metropolitan region of Rio de Janeiro state is in the midst of economic development reflected on the social improvements and the urban architecture, and thus an area mostly chosen for residential purposes with available private services including 17 post offices, 101 bank agencies and 40 hotels. It has an estimated population of approximately 499.000 inhabitants, with public services which are equipped so that 29 public servants correspond to one thousand citizens. Similarly, but at a lower level that the case of Maricá, Niteroi has developed online services and transactions, as well as the municipality has joined the consortium for disposal of solid waste to an urban landfill. The rate of registrations to basic education institutions is calculated negative in 2018, and did not achieve any goals as set by the Ministry of Education. Niteroi offer almost 149.000 formal positions to the job market, and achieved the highest revenue in relation to the other municipalities under study, reaching BRL 2648 millions in 2017, a high percentage of which it is dedicated to administrative costs. It is worth mentioned that Niteroi has established a traditional market for the artisanal fishers' yield, as it is assembled and sold in a specific market.

Rio das Ostras

The municipality of Rio das Ostras has an estimated population of approximately 141.000 inhabitants, with public services which are equipped so that 46 public servants correspond to one thousand citizens. Similarly with the case of Maricá, the municipality of Rio das Ostras has developed online services and transactions, but on the other had it manages independently the disposal of solid waste and sewage. Rio das Ostras has developed plan to identify risks from inundations, especially of illegal residential occupation and allotments in risk, but it lacks a contingency plan for periods of drought. The rate of registrations to basic education institutions is calculated to be negative in 2018, and partially achieved goals at the municipal level as set by the Ministry of Education. Rio das Ostras offer almost 20.000 formal positions to the job market, and achieved a revenue of BRL554 millions in 2017. Rio das Ostras is a quite impoverished area. Indicatively all the main fishing point are located in very close proximity with 'favelas'.

Rio de Janeiro

The municipality of Rio de Janeiro is one of the municipalities that surrounds the hydrographic basin of Guanabara Bay in the metropolitan region of Rio de Janeiro state. Egler and Gusmão (2014)²⁹ identify in the metropolitan region of Rio de Janeiro, the territorial localization and the vulnerability of the poorest classes among the urban population due to environmental risks associated with climate change. The intense port activity and the heavy industry in Rio de Janeiro has developed with rather lenient environmental regulations, standards or legal restrictions that cause disturbances to local flora and fauna of local marine ecosystems as well as the local stakeholders that depend on these ecosystems for subsistence or recreation.

Despite pollution, dead zones, and the restricted remaining area of mangroves to the Guapimirim Environmental Protection Area, the biodiversity in bays is alive and resisting in the case of Guanabara Bay. Moreover, bays have a social, cultural and historical value that define the identity and the social behaviour of local residents and traditional communities. In particular, the urban landscape and hills around Guanabara Bay landscapes are characterized by UNESCO as cultural and ecological heritage for its unique fusion between nature and culture. A great emphasis is given to Guanabara bay not only for being an important biodiverse estuarine ecosystem

²⁹ In their analysis the authors don't consider Rio Bonito nor Cachoeiras de Macacu to be in the metropolitan area of Rio de Janeiro, yet include Mangaratiba for being a territory of conflicts due to the industrial and urban expansion and socio-economic activities that weakens the efforts for the protection of natural heritage.

surrounded by a dense urbanised environment, but also for the various instances of socio-ecological conflicts that such coexistence may bring.

Saquarema

The municipality of Saquarema has an estimated population of approximately 85.000 inhabitants, with public services which are equipped so that 46 public servants correspond to one thousand citizens. The municipality of Saquarema has developed online services and transactions, but offers very few information on its official website, and it lacks any planning to deal with potential risk factors in the area. In regards to the sanitation, participates to the consortium Lagos I, but the solid urban waste are dismissed to a dumping ground. The rate of registrations to basic education institutions is calculated to be positive in 2018, and partially achieved goals only at the municipal level as set by the Ministry of Education. Saquarema offers a little more than 11.000 formal positions to the job market, and achieved a revenue of approximately BRL226 millions in 2017.

São Pedro da Aldeia

The municipality of São Pedro da Aldeia has an estimated population of approximately 100.000 inhabitants, with public services which are equiped so that 43 public servants correspond to one thousand citizens. The municipality of São Pedro da Aldeia has developed online services and transactions and offers most of the types of information necessary on its official website. It has already elaborated a plan to deal with potential risk factors in the area, including inundations, flooding, allotments in risk and extreme droughts. In regards to the sanitation, participates to the consortium Lagos II, but the solid urban waste are dismissed to a landfill. The rate of registrations to basic education institutions is calculated to be positive in 2018, and partially achieved goals as set by the Ministry of Education only at the state level. São Pedro da Aldeia offers a little more than 9.000 formal positions to the job market, and achieved a revenue of approximately BRL205 millions in 2017. The economy of São Pedro da Aldeia a traditionally artisanal fishers municipality is principally based on small-scale fishing, local commercial activity, salt extraction and tourism and is visibly poorer in comparison with other municipalities in its proximity such as Cabo Frio. Sanitation and sewage services are still inadequate and therefore source of pollution for the Araruama lagoon.

São João da Barra

The São João da Barra municipality of approximately 35.000 habitants has a significant population growth during the last decade that had also great impact on the growth of public services that are equipped so that 84 public servants correspond to one thousand citizens, as well as the private sector, for instance more human resources in municipal administrations, more bank agencies, post-offices and hotels ³⁰. Yet the interactive electronic services remained at low levels at the official webpage of the municipality which covered only 32% of the necessary information, lacking information on economy, environment, job opportunities etc. The rate of registrations to basic education institutions is calculated to be negative in 2018, and partially achieved goals as set by the Ministry of Education both at the municipal and state level. Until 2015 there was no alumni attending University. According to the mapping of the Secretary of Civil Defense, São João da Barra is vulnerable to floods and coastal erosion, The coastal zone of the São João da Barra municipality, namely Atafona district, undergoes a severe erosion process since 1975 due to dams and water supply to the states of São Paulo, Rio de Janeiro and Minas Gerais that changed the flow of water of the Paraíba do Sul river into the ocean and consequently affected the balance between the deposition of sediments at the continental shelf and/or the dunes, and the dynamic changes of the coastal drifts (RIBEIRO *et al.*, 2006). The deterioration is also attributed to tidal variations due to syzygy, as well as to waves due to the frequency, direction and intensity of the winds (AZEVEDO, 2004; RIBEIRO *et al.*, 2006). Both causes are potentially affected by climate change phenomena such as the rising sea levels and intensified or even extreme weather. The phenomenon periodically oblige the municipality to be in a state of emergency for the protection of the livelihoods of the locals.

The sea advances abruptly over the years resulting in the destruction of residencies and other private and public infrastructure such as the Chapel Nossa Senhora dos Navegantes and the fishing cooperative Coopenorte (AZEVEDO, 2004), built across the shoreline of Atafona district of São João da Barra municipality ^{31,32,33}, which is mostly populated by artisanal fishers. Resorts built in the area were also affected. According to the author, the extend of this phenomenon that sunk

³⁰ Source: <<https://www.tce.rj.gov.br/documents/10180/74189685/Estudo%20Socioecon%C3%B4mico%202017%20-%20S%C3%A3o%20Jo%C3%A3o%20da%20Barra.pdf>> Accessed on 20 February 2019.

³¹ Source: <<http://g1.globo.com/rj/norte-fluminense/noticia/apos-invasao-do-mar-moradores-de-atafona-rj-se-preparam-para-alerta-de-ondas-de-ate-25-metros.ghtml>> Accessed on 20 February 2019.

³² Source: <<http://g1.globo.com/rj/norte-fluminense/noticia/2016/09/fenomeno-cessa-e-mar-deixa-de-invadir-atafona-em-sao-joao-da-barra.html>> Accessed on 20 February 2019.

³³ Source: <<http://g1.globo.com/rj/norte-fluminense/noticia/2015/02/avanco-do-mar-ja-destruiu-15-ruas-em-sao-joao-da-barra-no-norte-do-rj.html>> Accessed on 20 February 2019.

neighbourhoods under the ocean, set the artisanal fishing community extremely vulnerable, who nevertheless resist suggestions from municipality to abandon their traditional territories in the shoreline for a more secure area, demanding instead more preventive measures to be taken. The author reports that fishers highly evaluate the possibility to have their houses next to the water, to facilitate boarding to their vessels. When dislocated to residencies provided by the municipality, the artisanal fishers had to adapt to the implications in time and costs that the distance of their residency from their working territory brought. Further, they didn't coordinate or exhibit actively collective agency in order to despite being members of the artisanal fisher's colony of São João da Barra municipality. The municipality of São João da Barra has already elaborated a plan to deal with potential risk factors in the area, including inundations, flooding, allotments in risk and extreme droughts. In regards to the sanitation, participates to the consortium Norte Fluminense II, but the solid urban waste are dismissed to a landfill. São João da Barra offers a little more than 6.400 formal positions to the job market, and achieved a revenue of approximately BRL316 millions in 2017.

Apart from Petrobrás, and Shell in the wider region, the platforms of Açú Industrial and Port Complex (Complexo Industrial e Portuário do Açú, CIPA) were instituted in a marine zone of São João da Barra municipality that had been historically the focus of the local artisanal fishers for some commercialized species, and also brought port infrastructure investments in the continent. The platforms create artificial reefs that attract species, but, on the other side, noise pollution and seismic underwater disturbances are often caused by the procedures that are used to find new exploitable resources (FALCÃO, 2014). Further, the routes of the fishing vessels are forced to adapt to the tugboats' traffic from the platforms to the coasts to avoid damages to fishing material. Overall, the author observes the exclusion from or refinement of the use of those territories and services by artisanal fishers, which create conflicts and/perpetuate illegal behaviours partially tolerated or encouraged by other actors, such as the people working in the platforms, that affect the sustainable exercise of the artisanal fishing craft.

3.3.2 Proceedings of interviews during Field Work

In total, 13 colonies of artisanal fishers were visited in the Metropolitan region, including Rio de Janeiro (Z-13), Ilha do Governador (Z-10) (Figure 14, 15 and 16, Appendix F), Niteroi (Z-08) (Figure 12, Appendix F) and Itaipu (Z-07) (Figure 17, Appendix F), in the region of Baixadas Litoraneas, including Saquarema (Z-24) (Figures 18 and 19, Appendix F), Araruama (Z-28), São Pedro da Aldeia (Z-06) (Figures 20 and 21, Appendix F), Cabo Frio (Z-04) (Figures 4, 5

and 6, Appendix F), Arraial do Cabo (Z-05) (Figures 2 and 3, Appendix F), Armação dos Búzios (Z-23) (Figure 1, Appendix F) and Rio das Ostras (Z-22) (Figure 13, Appendix F), as well as in the region of Norte Fluminense including Macaé (Z-03) (Figures 7, 8 and 9, Appendix F) and São João da Barra (Z-02). Also, members of local artisanal fishing associations were visited including the Associação Comunitária de Cultura e Lazer dos Pescadores de Zacarias (ACCLAPEZ) (Figure 10, Appendix F), and Associação de Moradores e Pescadores de Zacarias (AMORPEZ) in Maricá (Figure 11, Appendix F), and Associação dos Pescadores e Amigos da Gamboa (APEAG) in Cabo Frio .

The interviews were directed to the representatives of those sector entities, including associated members, board members, and the elected presidents, or other artisanal fishers found in areas of interest, mainly ports, fish markets and neighbourhoods indicated by interviewees, after each interview, or by local residents. The sampling technique of chain-referral sampling, referred as the ‘Snowball-sampling’³⁴, was chosen for the identification of the candidate for the interviews. It is primarily used to approximate social groups that are not easy to access for an academic or an individual external to the target social group. Despite this sampling methodology may present some limitations due to tendencies , but it can effectively be used in cases with restricted timeframe. The approach of the candidate interviewees, initially was attempted through communication with each mean available (e-mail, facebook, whatsapp groups). Since there was no feedback or response, the candidates were approached spontaneously at the premises of the colonies or locations of interest for the artisanal fishers at the selected coastal municipalities. After each interview, the interviewee was asked to identify other possible candidates for interview or to suggest points of interest. Most of the fishers, especially those approached at open public spaces, mainly ports, were reluctant to participate, though the majority was eager to indicate other possible candidates, or even assist the interviewer in communicating with them. The interviews conducted in headquarters of colonies or the associations enabled a more isolated environment, yet distractions for the interviewees could not be avoided in all cases either due to ongoing demands related to their profession, or to the presence of friends, colleagues or employees.

Before the questionnaire, the interviewer presented the consent form for willing participation to the interview. After reading and explaining the objective of the research, methodology, duration, confidentiality terms and information data of the interviewer, the candidate interviewee was called to sign the form. The time spend in this process, the difficulty of understanding the need and the context of this formality from the part of the interviewees, as well as

³⁴This sampling technique is mainly used in the field of sociology but it expanded to other fields that make use of this technique including interviews in rural areas for issues regarding the solid waste management (SEVERO *et al.*, 2017).

the demand for signature, were all factors that disincentivized participation of some candidates. Yet, information on both the purpose of the interview and the affiliation to public university (UFRJ) established a level of trust among the interviewer and the interviewee that ultimately facilitated the interview.

3.3.3 Content of the interviews during Field Work

The content of the questionnaire included both quantitative and qualitative research questions, a total of 102 items, some of which were grouped under the same objective though presented different options for responses (Appendix B). The detailed analysis or repetition of some questions aimed to limit the need for the interviewer to note down other options as presented spontaneously by the interviewees. The combination of closed and open questions intended to address the observed difficulty of the fishers to be more specific or to add more dimensions in their responses. In this vein, the open questions permitted the interviewee to answer spontaneously and also provided the interviewer the opportunity to validate mutual understanding of the context. In addition, the closed questions offered a list of characteristics or dimensions, each of which was addressed individually to the interviewee, and also served as validation of the initial response.

The elaboration of the questionnaire in a form that facilitate communication and linguistic understanding in Portuguese was of high priority, given that the interviewer, is foreigner. During the field work, the questionnaire adapted to the vocabulary used by the local interviewees in order to facilitate communication and understanding. For instance, the word “*relacionada*” was substituted by the word “*ligada*”, the phrase “*areas de atuação de pesca*” for “*ponto de pesca*” or “*marca de pesca*”, “*mudança climática*” for “*aquecimento global*”, and “*intervalos de renda*” for “*salários mínimos*”. Also, the sequence of the questions would adapt accordingly to the information provided by the fisher, in order to permit a better flow of the interview and to avoid repetitions.

In essence, the questionnaire aimed to collect information on two general sections. First, the profile of the interviewee from question Q1 to Q9, including educational level, main profession, income level, and conditions of living, as well as elements that define the relation of the interviewees with the territory from question Q10 to Q28, including questions on the time period of him/her living and acting at the area of focus, and the characteristics of the local artisanal fishers’ community. Second, the level of qualified participation of the interviewees in the institutionalised entities, in particular, fishing colonies, conservation units and hydrographic basins under the criteria of the level of awareness on existing environmental public policies focusing on coastal areas, participation to collective groups and professional representation, observed environmental problems

and the position of the fishers in regards. Accordingly, the second section was divided into three subsections, including: (a) participation and agency from question Q29 to Q78, (b) level of understanding of specific terms used in environmental public policies, as well as knowledge on relevant public institutions or agents, and on environmental public policies from question Q79 to Q91, and (d) identification of primary local environmental issues from question Q92 to Q102. Particular attention was paid on identifying the possible causes for limited participation considering parameters such as financial state, socio-economic discrimination, schooling, dissemination of information, time and willingness to participate in commons.

4 RESULTS

In this section, the results of the all the different stages of the research are explored separately, in the same chronological order as in the section of the methodology in a manner that demonstrates how the results of one stage inform the results and the methodology adopted of the following.

4.1 EXPLORATORY INTERVIEWS

Initially, the results of the exploratory interviews are presented and analysed per interviewee with the sequence presented in Table 1. The interviewees covered historical environmental and social issues at micro level, local and regional in Rio de Janeiro state, but also global level, emphasizing on the window opportunities presented through international initiatives and organizations, but also their limitations in effectuating change for civil society. Consequently, the overall retrieved information and conclusions are presented.

The interviewee A elaborated mostly on the internal organization of the regional civil society association that he/she represents, namely APEDEMA-RJ, officially registered in 1991, was awarded in 2016 by the Regional Council of Engineering and Agronomy of Rio de Janeiro, (Conselho Regional de Engenharia e Agronomia do Rio de Janeiro, CREA-RJ). Despite being an activist for many decades, he/she claimed to be in a transition phase as the interviewee expressed the intension to resign from APEDEMA-RJ in order to participate to the commission of the project, but still, at the time of the interview was member to eight more organizations with a range of social and environmental goals in regards to organic agriculture producers, human rights and environmental awareness in the northern and north-east municipalities of Rio de Janeiro state.

As president at the time, shared his/her vision/purpose to centralize the organizational structure of entities such as APEDEMA, while respecting diversity and reinforcing the role of women within the association. Yet, some issues were admitted including the voluntary character of the membership and the lack of both organization and technological support. Indicatively, the interviewee mentioned that documents were made by hand and that each person was keeping the archives, not permitting a thorough follow-up when people were substituted in APEDEMA and partial loss of institutional memory of the events occurring since 1991. The interviewee A also mentions the anarchistic influence of the initial steps of APEDEMA and its transformation towards gradual bureaucratization as a result of influences and acquired information from participation to conferences, national, regional and local gatherings. Also, the issue of representativeness, as APEDEMA-RJ lacked sufficient members “*não teve perna*” to participate effectively in different

instances such as the various technical chambers, and plenaries of the Committees of more than 33 conservation units of Rio de Janeiro state, leading them to reconsider the criteria “*selecionar melhor a participação*”.

Also, many members would not be disposed to participate in forums at regional and national level due to the distance and fear of not having the same level as other interlocutors. Yet this attitude of avoiding participation was rather attributed to personal traits, as the interviewee characteristically referred to “*timidos*”, “*humildade*”. Further, many new affiliated entities emerged in Rio de Janeiro with only one person representing its members, what the interviewee perceived as an individualistic attitude. Among the partners of APEDEMA the interviewee cited agricultors, artisanal fishers, such as AHOMAR (Associação Homens e Mulheres do Mar da Baía de Guanabara Angra) in Baixada Fluminense, SINDIPESCA reuniting fishers from Cabo Frio, Lagos, Angra dos Reis among others. Those partnerships reinforced the interest of APEDEMA for the coastal areas of the metropolitan region, which is also verified by the statute of APEDEMA-RJ, and the participation of the association in both the National Forum for the Hydrographic Basins and the west sub-committee of Guanabara Bay in the metropolitan region of Rio de Janeiro state.

The metropolitan region of Rio de Janeiro concentrates most of the national economic activity as its geographical localization encouraged an important industrial fishing activity, and, most importantly, sea transportation of people and merchandise, including exportation of bulk, iron, aluminum, cargo of vehicles and containers as well as activities related to tourism. Most importantly, it is the principal economic center for the oil industry due to the presence of the refineries in Duque de Caxias and Manguinhos, the petrochemical industrial conglomeration in the municipality of Itaboraí and the metal industry in the western metropolitan area (EGLER; GUSMÃO, 2014). According to Silva *et al.* (2016) during the 20th century, the urban growth and the related human activities caused inland and coastal expansion of the metropolitan region through heavy infrastructure investments which influenced significantly the morphology and the number of the beaches in the Guanabara Bay.

Challenges and pressures from the economic activities in the Rio de Janeiro metropolitan region result in long-term accumulation of industrial and residential waste at the surface waters and the drainage water as well as effluents from ships released in estuaries, bays and oceans (SCHERER *et al.*, 2009, BEGOT; VIANNA, 2016). Besides, contamination over the years from oil derivatives from both refineries and activities related to the offshore oil platforms occasional incidents change radically the already fragile environmental balance of the Guanabara Bay. Such are the exceptional events of the oil spills, including the case of REDUC at the mangrove protected area at the seashore

of Guanabara Bay in 2000 that caused acute devastation of the local habitat and impacted profoundly the livelihood of the local artisanal fishers due to a sharp decline of the fish stock and subsequently of the fisheries yield. In regards to the oil spill in 2000, the interviewee A depicts its impact on the local communities that led them in the diversification of their professional activities, as well as the inefficiency of the institutional measures in protecting effectively those communities:

“The overflowed oil was a plague which ended with everything: there was no more crab, or fish. It looked as if it was all black. While alternatives were proposed, the fishing community became multiply divided... That job [the fishing activity] was not sufficient even for many years before, there was not a lot of job for everyone...every time the territory was turning into harbour area, and they were suffering... and the consumed fish was found to have great concentration of residuals and pollutants. They finally decided to do something else, and they raised bees in the mangrove forest. They changed territory and they ultimately became more united. Today they cultivate organic vegetables and they distribute it collectively. They received a lot of money [as recompense from the oil industry] but poor investment decisions didn't benefit the community.”

The interviewee B was eager to be interviewed and to tell his/her story, exhibited experience and familiarity with academia and with research processes. Indeed, in the doctoral thesis titled *“Os Fluxos da Água na Metropole- usos múltiplos e gestão participativa na Baía de Guanabara”* of Maria Angelica Maciel Costa in 2013, the interviewee appears to be among the sample interviewees as vice-president of the directory of the Committee of the Hydrographic Basin of Guanabara in 2007-2008 and 2010-2012 as representative of civil society “Ecocidade”. The interviewee B narrated his/her participation to civil society movements as a community leader that involved initially in social movements, while he/she analyzed thoroughly the historical incidents that triggered institutional change or public policies relevant to the environmental protection in Rio de Janeiro, nationally and even globally since 1992.

Historically, the grass-root residents' associations organized at state and federal level with the support of the religious organizations for issues related to the regularization of land uses and property, and triggered the informal capacitation of some individuals, that later took central role in the socio-ecological movements after the re-establishment of civil rights with the constitution of 1988. The interviewee B was personally involved in this process due to chemical contamination in a residential area with disputed ownership rights between local residents and the municipality, that turned the interviewee B to connect socio-ecological with public health issues. Despite

descontinuities from the historical civil rights movements, the priorities continue to be primarily sewage and waste treatment, and at a second level the definition of territories that can be occupied.

Environmental degradation is also attributed to social phenomena despite a decade of public programs and governmental interventions in infrastructure health and education. Low-income migrant populations that, since the beginning of the XX century and foremost during the era of industrialization, came from the northeast to settle to the favelas of the hillsides of Rio de Janeiro metropolitan region, hinder effective risk management of the territory. Settlements and big infrastructures suffocated or dramatically changed the natural streams and depositories of inland water, and even intruded its natural shorelines as in case of the expansion of international airport and the Rio-Niteroi bridge. Phenomena of urban violence (Silva *et al.*, 2016) and crime only exacerbate governmental ineffectiveness due to lack of social cohesion (De Sherbinin *et al.*, 2007; cited in Hardoy and Pandiella, 2009).

In this context, the interviewee B pointed out that issues of the irregular residential occupation in areas with high ecological value are dealt by the institutions and academia in a manner that undermines already vulnerable social groups, what the interviewee mentions as “*culpabilização dos pobres*” for the resulting high environmental risks, despite been excluded from other options due to the real-estate market. Similarly, Costa (2015) denotes the established power systems and inequality that, in addition to the lack of capacity and leadership from institutionalized collective bodies such as the watershed committee of Guanabara, result to the marginalization of citizens’ voices within the overall objective of cleaning the Guanabara Bay. The specialized and high technical level disincentivizes dialogue with civil society due to lack of knowledge or for practical reasons that prohibit civil society accumulate experience:

“... the commission penalized us very much ... it had ten different secretaries to discuss each different topic...funding, licensing, technical issues ... a way to wear out the social movement because we participated to the meetings .. some were tired, others had health issues or quit for personal issues, and (thus) we fail to accumulate knowledge because the social movement has never had a depository of experiences”

Moreover, the interviewee B stated on shared management that civil society is stagnated as there are not able to accompany all the policy making procedures: “*a gente não tem condições de acompanhar...acabam sendo sequestrados*”. In this context, the interviewee B criticized academics for not contributing by sharing their knowledge to the social causes that aim the improvement of the

conditions of life in the territory. This democratic gap in the decision making procedures resulted to the emergence of citizen initiatives, such as the Instituto Baía de Guanabara³⁵ and Baia Viva³⁶.

In regards to the programs for the recuperation of the Guanabara Bay, the interviewee B denoted “Brasil queria mostrar projeto”. According to him/her, the restoration process started from 1993, incentivized by the Brazil ambitious commitment, and financial opportunities for international resources. Yet, he/she reported the misuse of those resources and the failure to control efficiently the industrial pollution, the use of petrol from vessels in the Guanabara Bay, or to secure the quality of water from the affluents. The interviewee B presents a confrontation with the public institutions including INEA and CEDAE, over the centralized management of the financial resources that are destined for the basin:

“The INEA showed a homeric failure but the Brazilian legislation did not define how a basin agency should work. INEA centralizes all funds and ... the governor (of Rio de Janeiro) made suggestions for all to be used by the state water and sewage company CEDAE... so 90% of the money was used by CEDAE... our struggle was to reverse this and we still can not”

Important forests and coastal ecosystems partially remain in the metropolitan region of Rio de Janeiro state because of urban reforestation efforts and the creation of national, federal and municipal conservation units within the metropolitan region though their management is still in some cases insufficient for its full protection in terms of risk aversion, land management and preservation (EGLER; GUSMÃO, 2014). In this context, the interviewee C presented the importance of the restinga flora in the APA Maricá as it belongs to the wider Mata Atlântica forest and the debates of the Management Plan of the area and development projects that threaten the natural heritage of the coastal environment. The interviewee C also mentions that the institutional instability from the central government of Brazil regarding the fishing activities permitted for corruption and punctual political interventions from local governments and religious organizations. Nowadays there are no consolidated data for the exact number of the fishers nor of the economic figures related to *defeso* data and/or other benefits.

According to the interviewee C, Maricá, there are three fishing associations that nevertheless act locally and they do not deal with issues at the municipal level. Those associations even from the same territory have different levels of administrative capacity, documentation, or access to public policies. Fishing communities are fundamental for the fishing communities and are

³⁵ Source: <<http://baiadeguanabara.org.br/site/>> Accessed on 20 February 2019

³⁶ Source: <<https://www.facebook.com/BaiaViva123/>> Accessed on 20 February 2019

those who principally legitimize an individual as fisher, a right that was previously only granted to the fishing colonies. Women, in this process are widely underrepresented as their involvement is expanded to other parts of the supply chain in the fishing sector. In the process of environmental degradation, the traditional fishing activity is losing its own value as means for subsistence, which ultimately threatens the historical continuation of those communities. Generally, the public authorities and the dominant private industry in the state of RJ is dealing the fishers with suspicion and lack of trust, considering them as speculators, especially at the case of oil-spill in 2000 that the indemnification took years and in some cases is still ongoing despite that the fishing communities are facing poverty. According to the interviewee justice cannot be operationalized once there are unequal relations within the institutions. Questions of morality and forced appropriation from the public authorities in the expense of the most vulnerable communities especially in frames of big infrastructure projects and the tolerance of other institutions. Primarily INEA was mentioned as it permitted licensing of the industrial complex without considering relevant for its evaluation the social indemnification.

The interviewee C, referring to the free riding issues in relation to *defeso* due to beneficiaries that falsely declare that depend exclusively from fishing activities, reported that in order for the fishers to secure their income all year long while the fish stocks are diminishing and the environmental restrictions are reinforced, alternative economic activities are unavoidable and event desirable to secure resilience of those communities. Begossi *et al.* (2011) also consider that the current mechanism as instituted and operated, in terms of the seasons and the timing in compensations, does not contribute to income stability that is primordial for the beneficiaries. Moreover, as these authors report such phenomena in combination with rare monitoring efforts, and application of sanctions diminishes the role of *defeso* as management instrument, incentivizing rather perverse behaviour from the beneficiaries or the potential ones.

Additionally, the interviewee C referred to the process that is instituted for an individual to be recognised as fisher. The artisanal fishing communities have the right to include individuals on the basis that two more fishers can guarantee that the claim for inclusion to the right regime of professional exploitation of the fishery resources is justified. According to Schlager and Ostrom (1992) this is the exercise of the right of exclusion which define access rights in common property regimes. Nevertheless, in practice the non-participative governance consider the fishers to be only authorized users, as cannot fully exercise the right of management that define the operational-level rights of withdrawal. The majority of the artisanal fishing communities in Brazil, with few exceptions, does not exercise this right. Often, regimes overlap, complement or even conflict with

one another, such as parallel government top-down imposed rules and fishers self-organization/rules, creating 'hybrid' arrangements (SCHLAGER AND OSTROM, 1992). These authors also point out examples of de facto proprietor arrangements where local fishers possess de jure authorized user or claimant rights which are clearly understood, followed, and perceived as legitimate within the local community, and suggest that such regimes could present more chances to eliminate conflicting arrangements in the similar common-pool resources. Nevertheless, fishing communities do not belong in a closed system, as new-comers or changes to the status of the very fishers are inter-temporally changing the community and thus impacting the accumulated local ecological knowledge.

The interviewee D pointed out the scale of impact of the infrastructure and the transformation of the coastal limits of Guanabara Bay that was constant since the colonization, as well as the importance of the APA Guapimirim that maintains the biodiversity of Guanabara Bay. He/she also refers to the catalyzing effect of the international events that took place in Rio de Janeiro, referring to ECO 92 and the RIO+20, having significant local and national impact on public policies, a common point among all interviewees. The interviewee D also proudly narrates the occasions that Baia Viva and other local civil society representatives participated in the processes of fiscalization and control from the public authorities and the legislative bodies, Comissão Parlamentar de Inquerito- CPI. He/she nevertheless, stands critically in any strong belief in the constitution and the rule of law, as according to the interviewee D it proved to be insufficient.

Referring to the Hydrographic Basin Committee, and the issue of lack of willingness for participation, refers to the unequal power distribution within this instrument for wider participation of civil society and stakeholders. Self-infringement of the role of the Hydrographic Basin Committee and adoption of strategies to overcome obstacles. The interviewee narrates a scene from the visit of the representative of the International Olympic Committee (IOC) of the Summer Olympic Games in 2004 and the effort of the government to show a positive image of the city and the Guanabara Bay, while Viva Baia, tried with interventions to take the opportunity of the media coverage and the international pressure for the depollution of the Guanabara Bay to show the challenges that specific municipalities within the metropolis were facing. The interviewee D mentioned the punctual, and superficial interventions from the national committee in order to show improvements for communication purposes. The interviewee D also questions the legitimacy of the international directed coordination of various international agents that influenced the procedures.

The thesis of interviewee E focused on the expansion of the Seropedica municipality that is situated in the hydrographic region of the Guandu River, and the river basin of Joana located in the

Guanabara Bay hydrographic region. His/her analysis was mainly technical, derived from the field of computational hydrological analysis, and focusing only on the issue of floods and the need to integrate the municipal territorial management with the ecosystem dimensions of the watersheds. He/she had a very firm conception on the natural and urbanized environments considering the first as stable and the latter as dynamic. This anthropocentric conceptual construction of the stable ecologic space, was firmly defended not in terms of the evolution of each system over time but on the basis of the functional stability of the ecologic services and the patterns of the water flows. She perceived the human interventions on the environment as highly dynamic given that there many actors involved, different priorities, cultures and knowledge over time, a set of variables that transformed drastically the urban landscape. The interviewee E also pointed out the fact that the technical people rarely consider exosystemic connections or the wider environmental balances when offering solutions in urban architecture.

The interviewee E presented a firm anthropocentric view of the environment, perceiving it as external and stable factor. Yet, the time scale is indirectly, though not consciously, implied. Though the interviewee E did not proceed to analyse public policies or possible practical implications of her/his suggestion, insisted on ad hoc inter-municipal collaboration according to the level of analysis of the basin or the sub-basin, and compensatory technical interventions within the urban environment in order to restore the natural hydrologic cycle or to minimize impact from urban expansion and consolidation. The interviewee E considers the Rio de Janeiro state to be largely urbanized, though there are different grades of urbanization that permits the characterization of rural in the cases of Sepetiba and the east side of the Rio de Janeiro state. Though not in the analysis of the Master thesis of the interviewee, sewage and waste treatment should also be considered in flood prevention management as both systems often communicate. In regards to the terms used, region -area to describe hydrologic autonomous bodies, the interviewee E claimed that the level of analysis is arbitrary as all basins could be potentially referred as sub-basins. Nor a specific number of basins could be identified within a municipality of a state without previously define the level of analysis.

Overall, the preliminary results indicate that various actors including stakeholders, public institutions, academics and other independent researchers, do not consider a more holistic approach in their work and/or actions that would permit more positive predisposition for the integration of public policies. Instead all agents, and foremost public institutions, still adopt a rather fragmented vision of the reality. In the absence of solid metropolitan institutions, inter-municipal initiatives thrived such as the Consórcio Intermunicipal de Desenvolvimento do Leste Fluminense

(CONLESTE) and the Hydrographic Basin Committees of Guandu river, Guandumirim and Guarda, the Hydrographic Basin Committee of Guanabara Bay (CBH-BG) and the lagoons of Maricá and Jacarepaguá (EGLER; GUSMÃO, 2014). Despite pre-existing state legislation since 1974 and the Metropolitan Chamber of the Rio de Janeiro State, which was instituted in 2014, the institutionalization of the metropolitan region of Rio de Janeiro as a territorial intergovernmental and multifunctional autarky was effectuated by the federal law 13.089/2015. Its function and organization is yet to be established by legislation, though the Rio Metr pole / Pr Gest o II plan, funded by the World Bank, already set the priorities projected for 2030 among which are listed transportation, housing and risk prevention from flooding. Thus, the scale of analysis remains rigid to the focus area and there is no complementary analysis to frame holistically the issue in question.

As for the case of the metropolitan region of the Rio de Janeiro state, the existing institutional means that were employed to enable wider participation of the civil society to the policy-making, was not accompanied by analogous changes in values and perceptions, nor by fundamental changes in the socio-economic structure of the local society that would enable fair and equal dialogue. Instead power relations were maintained and broadly reflected on the organizational structures of the participative organizations, including the hydrographic basin committees. Phenomena of racism, discrimination and intimidation, along with practical impediments to the members or to the functioning of the organizations discredited any expectations for institutional change. These exploratory interviewees for the case of the metropolitan region of Rio de Janeiro state seems to confirm the conclusions of Van den Brandeler *et al.* (2014), after studying four cities in the Global South, including Guarulhos in S o Paulo, that no transformative changes in legal and institutional frameworks, nor changes in values and attitudes in regards to water governance, which includes the provision of clean water and sanitation, have sufficiently changed the status quo of power structures yet.

Further, in the metropolitan region of Rio de Janeiro do not occur sufficient territorial planning and infrastructure to deal with consequences from the industrial and population growth resulting in destruction on local flora, irregular lands, damages from extreme events such as floods and diminished the capacity of ecosystem autoregulation mechanisms. In 2000, only ¼ of the waste was treated while less than 10% of the urban population to the surrounding municipalities have access to sanitation services (FERES, 2014). According to the author, the decision-making processes that lead to the implementation of programs for the depollution of Guanabara Bay, not only was highly centralized, alienating municipalities from the process, but also failed to consider the population growth and the dynamics in land use.

A study (FISTAROL *et al.*, 2015) indicates that those constant environmental pressures by sewage, liquid and solid waste charged into the Guanabara Bay, hinder sustainable management of the local fishing activity as it affects navigation and the native fauna. Particularly, leaves the local fishing communities, which are most vulnerable and poor, exposed to health problems and deprived from a living within an unharmed natural environment thus impacting, among other, their leisure activities besides the natural ecosystem of the bay. Yet, the local fishing communities do not have an effective mediating interlocutor during their communication with government institutions, leaving a significant institutional gap that does not facilitate the local implementation of public policies. In this sense, the management of the artisanal and industrial fishing activities is uncoordinated, and the inspection of the fishing legislation applied in extensive and remote areas, considering the enormous territorial extension of the coast of Brazil, as well as of its interior rivers, can be challenging.

4.2 COMPLEMENTARY QUANTITATIVE ANALYSIS

The results of the complementary quantitative analysis, conducted a priori and posteriori to the field work, to identify the number of artisanal fishers in relation to the urban population of the municipalities of Rio de Janeiro state. The data for the years 2016, 2017 and 2018 were obtained from the Transparency Portal of the Federal Government, which disclose information on the benefit granted as a standardized compensation for the periodic prohibition of artisanal fishing activity of certain species carried out by individuals or families that meet the criteria established by the law 10,779 / 2003³⁷. The Graph 1 in Appendix A shows information, retrieved from CEPSUL/ICMBio (Graph 1/A in Appendix A), FIPERJ (Graph 1/B in Appendix A) and IBAMA (Graph 1/C in Appendix A) that have published through their online platform on the regulated periods of *defeso* per month for marine species captured in Rio de Janeiro state and at a national level considering both coastal and continental ecosystems, such as the coastal lakes.

It demonstrates, the divergence of information provided among the three sources in relation to the protected species and the months during which the *defeso* is implemented. Such observation indicate either lack of coordination among the institutions that are relevant for the management of the fishing sector and governance of the natural resources, or deficit in providing solid and updated information to citizens through their platforms. It worth noticing though, that while visiting the municipalities surrounding the Araruama lagoon during the month of August as

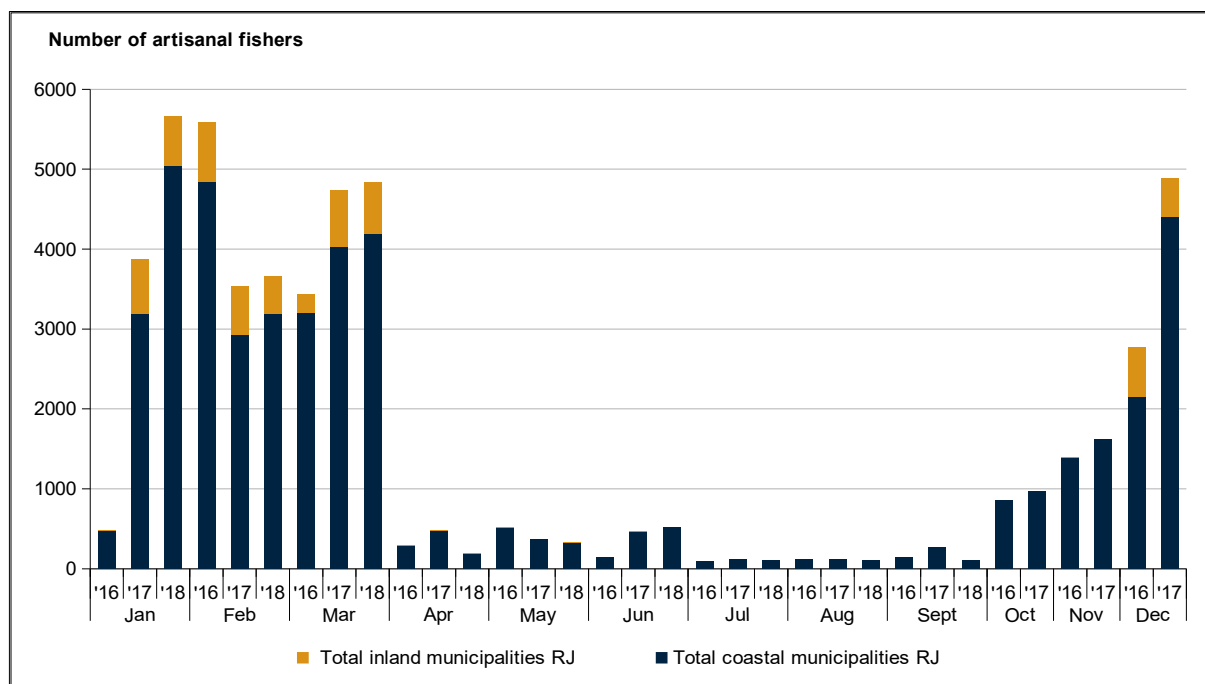
³⁷ For the year 2018, the available published data was up until the month of September at the time of the elaboration of the present dissertation. Source: <<http://www.portaltransparencia.gov.br/download-de-dados/seguro-defeso>> Accessed on 20 December 2018

part of the fieldwork, the *defeso* period had just opened in accordance with Graph 1/B in Appendix A. Also, the data disclosing information on the urban population were retrieved from the IBGE portal for the synopsis of the demographic survey of Brazil for 2010³⁸. The data were filtered for the state of Rio de Janeiro and then to eliminate multiple registrations of the same fishers as they receive the *defeso* in parcels, the entries were filtered on the basis of the registries of the column on the Number of Social Identification of the beneficiary “*NIS favorecido*”. In the Graph 2 in Appendix A, despite the lack of data for the last three months of 2018, it is observed on a yearly scale, an increasing number of fishers receiving *defeso*. Based on the number of artisanal fishers that received *defeso* for the year 2018 until September, it is expected that the tendency will be maintained. For the year 2016, February, March and December appear to have a greater number in relation to other months, particularly from April to September, a pattern that repeats for the years 2017 and 2018 as well.

Furthermore, Graph 1 shows the total number of artisanal fishers receiving *defeso* per group of municipalities (coastal or inland) in the state of Rio de Janeiro per month in 2016, 2017 and 2018, for which year there are available data only for the months from January to September. In 2016, as demonstrated in Graph 1, most receive *defeso* for the months of February and March. Increasing numbers of fishers are observed at the coastal municipalities throughout the months of October, November and December. There is also a considerable, but relatively low, number of fishers in the inland municipalities of the state of Rio de Janeiro that receive *defeso* in the respective months, February, March and December (Graph 1). A similar pattern in relation to the distribution of artisanal fishers receiving *defeso* in coastal and inland municipalities is observed for the years 2017 and 2018. Yet some differences are observed, as for instance, December 2017 concentrates most of artisanal fishers followed by the month of March, January and February respectively. In 2018, most fishers are registered during the month of January, followed by March and February. Most importantly, Graph 1 indicates consistently that the striking majority of the fishers are active at the coastal area of Rio de Janeiro state for all the three years under analysis, validating the focus of the field work on this group as sample for the population of the artisanal fishers in the Rio de Janeiro state.

³⁸ Source: < <http://www.censo2010.ibge.gov.br/sinopse/index.php> > Accessed on 20 February 2019

Graph 1- Total number of artisanal fishers receiving *defeso* per month & per group of municipalities (coastal or interior) in the state of Rio de Janeiro in 2016, 2017 and 2018.

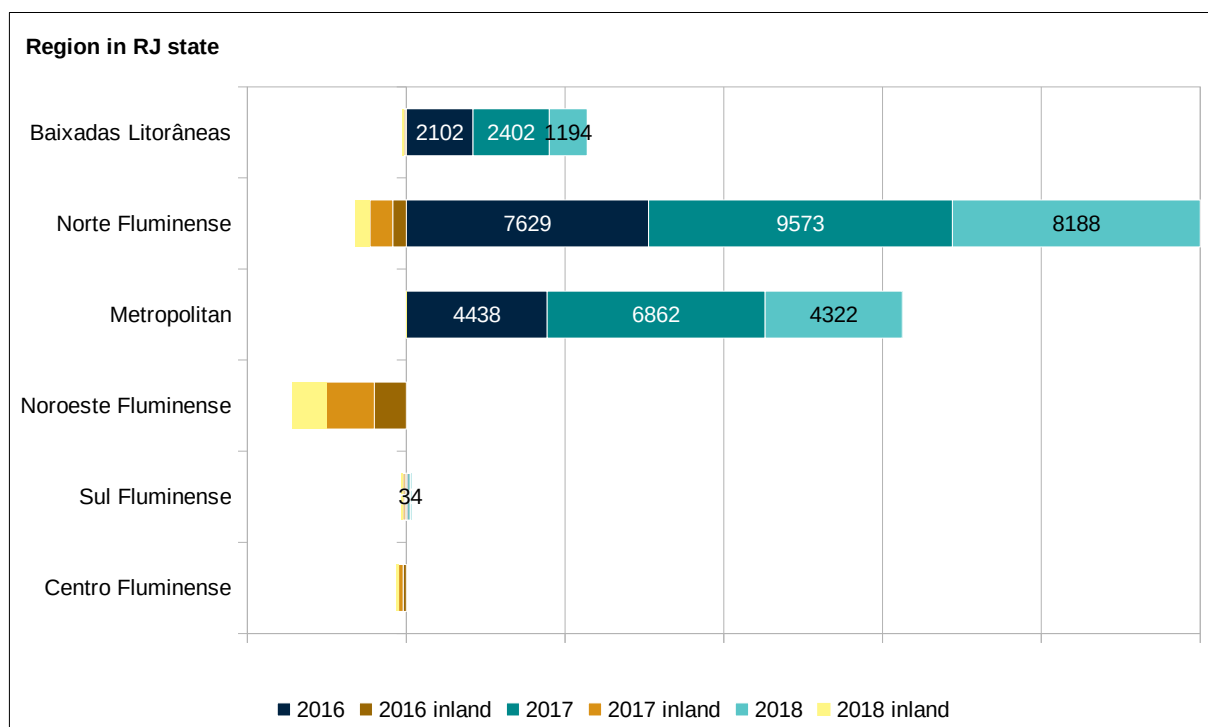


Source: Elaborated by the author.

Moreover, the Rio de Janeiro state is divided to eight political-administrative regions according to the law n° 1.227/87: Metropolitan, *Noroeste Fluminense*, *Norte-Fluminense*, *Baixas Litorâneas*, *Centro Fluminense*, and *Sul Fluminense*³⁹. Accordingly, Graph 2 illustrates the total number of artisanal fishers receiving *defeso* per political-administrative group of both coastal and inland municipalities (*Região Metropolitana*, *Região da Costa Verde*, *Região das Baixadas Litorâneas*, *Região Norte Fluminense*) of Rio de Janeiro state for the years 2016, 2017 and 2018. For the latter year, 2018, there were available data only for the months from January to September. As expected, the great majority of the artisanal fishers receiving *defeso* for the years 2016, 2017 and 2018 are registered in coastal municipalities, principally from the region of *Norte Fluminense* and the metropolitan region.

³⁹ Source: <http://www.ceperj.rj.gov.br/ceep/info_territorios/Div_reg/Quadro_MesoeMicrorregioes_Geograficas.XLS> Accessed on 20 February 2019.

Graph 2- Total number of artisanal fishers receiving *defeso* per political-administrative region in the coastal area of Rio de Janeiro in 2016, 2017 and 2018.



Source: Elaborated by the author.

At a lesser extend, the region of *Baixas Litorâneas* also shows a significant number of fishers. In conclusion, Graph 2 demonstrates that the Metropolitan, Norte Fluminense and Baixadas Litorâneas regions are most significant for artisanal fishers registered in coastal municipalities, and therefore validates, the focus of the field work on those regions. Analytically, for the 12 municipalities visited during the fieldwork Graphs 3, 4 and 5 in Appendix A show the distribution of the registered beneficiaries per month for the years 2016, 2017 and 2018 respectively. The municipalities of São João da Barra and Rio de Janeiro have consistently, throughout the years 2016, 2017 and 2018, the highest number of artisanal fishers receiving *defeso* on a yearly basis.

Nevertheless, the distribution of the fishers per municipality does not indicate a pattern from one year to another. For instance, in Saquarema, the number of registered fishers drop from 2016 to 2017, and increases again to the previous levels in 2018. On the contrary, São Pedro da Aldeia maintain the same number in 2016 and 2017, but then shows an acute drop in 2018 in comparison to the months until September. Moreover, the number of artisanal fishers in Cabo Frio,

Niteroi, Maricá and São João da Barra gradually augments at different rates respectively, while Araruama, Armação dos Búzios, and Rio das Ostras remain stable at a very low number of fishers for all the studied years. Arraial do Cabo has also relatively low numbers of artisanal fishers, similar to Araruama, yet the number of fishers drops from 2016 to 2017 with indications for a moderate increase in 2018. Despite the low number in 2016, Graph 4 in Appendix A indicates an increase in Macaé fishing restrictions due to *defeso* which is implemented from March to May in 2017 for shrimps and fish within the Macaé river and at the point that flows out to the sea, namely *Pontal da Barra*. This *defeso* period affects a significant number of artisanal fishers in relation to other months as observed in Graph 4 in Appendix A. Similarly, during the respective months in 2018, the number is also considerable for the same municipality (Graph 5 in Appendix A).

Furthermore, conforming the inter-ministerial normative instruction MPA/MMA N° 2/2013⁴⁰ that establishes criteria for the fishing activity in Araruama lagoon, the artisanal fishers registered in the surrounding municipalities, including Araruama, Arraial do Cabo, Cabo Frio, and São Pedro da Aldeia, enter in the period of *defeso* from August to October of each year. Indeed, Graphs 3, 4 and 5 in Appendix A register the *defeso* for those months in 2016⁴¹, 2017⁴² and 2018⁴³ respectively. São Pedro da Aldeia and Araruama are municipalities that depend more from fishing activity in the lake, as demonstrate the number of registered artisanal fishers during those months (purple colours in Graphs 3, 4 and 5 in Appendix A) in relation to the total number for each year and for each respective municipality. The other two municipalities, namely Arraial do Cabo and Cabo Frio, depend mostly from fishing in the open sea. Similarly, in Saquarema, which is located in the Região da Lagôas, the *defeso* period for shrimp also apply at the same months, namely from March to May, yet the number of fishers is low for this period, indicating a relative preference for exercising the fishing craft in the open sea.

The fluctuations of the numbers of irregularities in the payment of *defeso* from 2012, as well as the more strict requisites for the registration of the beneficiaries according to the law n° 13.134 in 2015 (BRAZIL, 2015) due to phenomena of fraud, and institutional delays in attending the protocols for the registration process⁴⁴ may have disincentivized artisanal fishers to register during the following years. Also, fishers opt not to be registered officially, in order to be able to

⁴⁰ Source:<<http://www.oads.org.br/leis/2599.pdf>> Accessed on 20 February 2019

⁴¹ Source: <<http://g1.globo.com/rj/regiao-dos-lagos/noticia/2016/08/lagoa-de-araruama-entra-em-defeso-e-proibicao-de-pesca-vai-ate-novembro.html>> Accessed on 20 February 2019

⁴² Source:<<https://g1.globo.com/rj/regiao-dos-lagos/noticia/periodo-de-defeso-na-lagoa-de-araruama-rj-comeca-nesta-terca-feira.ghtml>> Accessed on 20 February 2019

⁴³ Source<<https://g1.globo.com/rj/regiao-dos-lagos/noticia/2018/08/01/lagoa-de-araruama-rj-entra-no-periodo-de-defeso-e-equipas-patrolham-pontos-para-inibir-pesca-ilegal.ghtml>> Accessed on 20 February 2019

diversify the source of their income conforming the opportunities presented in their area. Particularly, the low numbers of fishers being registered for *defeso* benefits in Cabo Frio, Arraial do Cabo and Armação dos Búzios, do not reflect the actual number of fishers, but rather the effects of other economic activities that can be compatible with fishing activity and are thriving at these municipalities, mainly in the sector of tourism. Moreover, the *defeso* periods have been object of great discussion among the fishers and the official authorities for the rigidity of the set periods without the previous conduction of specialized and updated study considering the dynamic changes in the reproductive cycles of the species in question, particularly shrimps. Hence, the periods are subject to readjustments from one year to another.

In continuation of the analysis of the data presented above, based on the data derived from the data of 2010 IBGE survey on urban population at the total area (Figure 3 in Annex), including both the municipal capital and other agglomerations, of all the municipalities of the Rio de Janeiro state, the following Graph 3, as well as the Graphs 6 and 10 in Appendix A, demonstrate the cumulative distribution of the artisanal fishers receiving *defeso* in Rio de Janeiro state per percentage of urban population of the municipality which declared in the registry as demonstrated in the database of the Transparency Portal of the Brazilian government for all the months of the years 2016 (Graph 6 in Appendix A), 2017 (Graph 3) and only the months of January to September for the year 2018 (Graph 10 in Appendix A), as the last trimester is yet to be available. The dark blue dash lines correspond to the standard deviation (3σ) from the average value for each point. The x-axis corresponds to the percentage of the urban population of the municipalities in Rio de Janeiro state as registered in the 2010 population survey of IBGE. The size of the interval of the percentage of urban population per municipality within the Rio de Janeiro state is 0.5%. The y-axis represents the cumulation of the calculated percentages of artisanal fishers per municipality in relation the total number of artisanal fishers for the state of Rio de Janeiro that received financial recompensation for the same month during the period of *defeso*.

The data are presented on a yearly basis from January to December of each year, conforming to the fact that the *defeso* benefit payments are based on the previsions of the yearly national budget. Yet, the natural reproduction cycle of the protected species may surpass the logistical year in a manner that the month of December of the previous year is connected with the

⁴⁴ For the period from 2014 to 2017, the Secretary of Fisheries did not emit new fishing professional licenses after the recommendation of the Federal Court of Auditors that identified 1 out of 3 fishers to have been receiving *defeso* in an irregular manner for receiving income from other sources, or for been specialized on fishery that was not included in the *defeso* period. Source: Agência Senado <<https://www12.senado.leg.br/noticias/materias/2017/10/24/secretaria-da-pesca-precisa-de-mais-autonomia-aponta-audiencia>> Accessed at 04 January 2019

January of the next year. More specifically, in this analysis of the data, it is observed that the behaviour of the data corresponding to the month of December in 2016 (Graph 6 in Appendix A), are consistent with the data of January in 2017 (Graph 3). Likewise, the month of December in 2017 (Graph 3), matches the data of January in 2018 (Graph 10 in Appendix A). Nonetheless, each December has, also, a behaviour similar with the months of the first semester of the same year. So, in order to facilitate the analysis, considering the annual distribution of the official data, the month of December was included in the analysis of cluster of months of the first semester of the same given year, as an approximation of the same month for the previous given year. Hence, the data have been divided in two groups: (i) from December to June, and (ii) from July to November (hereafter groups A and B respectively).

The year 2016 (Graph 6 in Appendix A) indicates a significant acute increase of the number of artisanal fishers, from 12% to 38% (0% - 40% as appear in Y axis), at 10% of urban population only during the months of group A, followed by a second important peak, an increase from 5% to 30% (12% -60% as appear in Y axis) at municipalities with approximately 25% of urban population. Subsequently, a gradual increase with variations depending on the month within the cluster of group A is observed at percentages of urban population up to 65%, where another final peak occurs, an increase from 10 to 40% (55% - 95% as appear in Y axis). On the other hand, group B has negligible number of artisanal fishers (0% - 10%) in municipalities with urban population up to approximately 33%, where an increase is registered at levels from 1% to 45%, and a second peak at 68% of urban population, which demonstrates an increase from 5% to 38% (5% - 42% as appear at the Y axis), followed by a third at 75%, and finally a fourth at 93% of urban population reflecting increases of the number of the artisanal fishers from 8% to 15% and from 10% to 25% respectively. Moreover, taking into consideration the mean typical distribution of Rio de Janeiro in 2016 (red dashed line), a non-negligible number of fishers, approximately 25% of the total fishers, are registered in very highly urbanized municipalities (80% - 100%) for all the months in 2016. Overall, for the year 2016, 50% of the artisanal fishers are registered in municipalities with low to moderate percentages of urban population (10% - 67%) and respectively the other half in municipalities from moderate to very high percentages of urban population (67% - 100%).

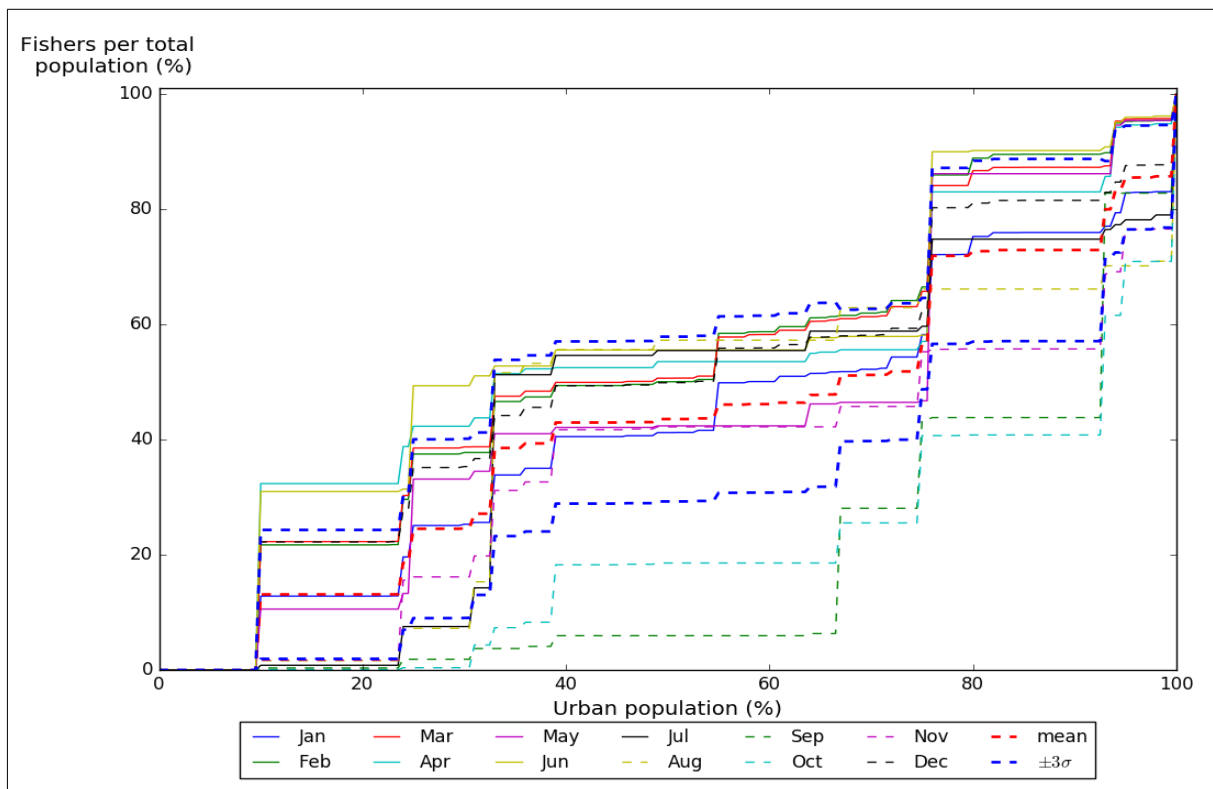
For the year 2017, the mean distribution (red dot line) of Graph 3 also demonstrates that at 67% of urban population, the number of the artisanal fishers reaches 50% for all the municipalities within the period of a year. In detail, for the group A in 2017, at 10% of urban population, it is also observed an increase of the number of artisanal fishers from 12% to 32% (0% - 35% as appear in Y axis), with variations within this range depending on the months including in the group A, followed by a second important peak, an increase from 12% to 22% (10% -50% as appear in Y axis) at

municipalities with approximately 25% of urban population. Subsequently, another small peak at 33% demonstrate increases varying from 1% to 10% (25% - 52% as appear in Y axis), to be followed by a gradual increase up to 75%, where another final peak occurs, an increase from 20 to 40% (45% - 90% as appear in Y axis).

Moreover, similarly to the year 2016, the group B in 2017 has negligible number of artisanal fishers (0% - 10%) in municipalities with urban population up to approximately 25%. Yet, at that percentage of urban population, an increase is observed only for the months July, (8%) August (8%), and November (15%), followed by a second peak at 33% of urban population, demonstrating 40%, 40% and 10% increases of number of artisanal fishers respectively. The rest months of the group B, namely September and October, have a very low first peak (0% - 5%) at 30%, followed by a second peak at 39% of urban population corresponding to an increase of 7% to 19% respectively, and a third peak at 67% increasing the number among 8% to 20% respectively. Finally, all the months of the group B have two important peaks at 78% of urban population, demonstrating an increase from 10% to 18% (25% - 68% as appear in the Y axis) and at 93%, from 1% to 28% (42% - 75% as appear in the Y axis).

Conclusively, a pattern of behaviour is observed for each pair of months July-August and September- October, both belonging in the period of the group B, that differentiates 2017 from the previous year in relation to the attribution of the defeso benefit. In 2018 (Graph 10 in Appendix A), we observe the same patterns as the previous year, though the 50% of the artisanal fishers are registered in municipalities with urban population from 10% to 55%, and the other half from more urbanised municipalities (55%-100%), as indicated by the mean typical distribution (red dashed line). Yet, it is expected a higher number of artisanal fishers registered to more urbanised municipalities as more data is added from the last trimester of 2018. For the Rio de Janeiro state, the results demonstrate a significant distribution of fishers over the urban population. Less fishers exist in the municipalities with the most urban population percentages, though the number of fishers is not negligible. In particular, it has been found that fishers in municipalities with urban population higher than 80% varies from 5-70% (Graph 10 in Appendix A) depending on the month. Considering such yearly minor variations, the overall analysis indicates that the demonstrated behaviour of Graph 3 of the year 2017 is observed also for the previous and following years (2016 and 2018), confirming that despite the institutional instability and changes in relation to the defeso benefit, the number of fishers and their distribution to municipalities of different percentages of urban population in relation to their total population is relatively stable throughout the years.

Graph 3- Cumulative distribution of artisanal fishers per urban population in the respective municipality in RJ, per month in 2017



Source: Elaborated by the author.

In light of this, the analysis above was repeated by the same method on the basis of the IBGE data of the 2010 survey on urban population only at the urban centers corresponding to each municipality of the Rio de Janeiro state (Figure 3 in Annex) to further explore the insights provided so far. It is demonstrated the cumulative distribution per month, from January to December in 2016 (Graph 7 in Appendix A) and 2017 (Graph 9 in Appendix A) respectively, of the artisanal fishers in relation to the urbanization level in percentage (%) of the urban centers of the municipalities in Rio de Janeiro state, where the artisanal fishers appear to have been registered. Exceptionally, Graph 11 in Appendix A demonstrates the data only from January to September in 2018. Furthermore, similarly with the previous analysis, the data have been divided in two groups for the years 2016, 2017 and 2018 as appear in Graphs 7, 9 and 11 in Appendix A respectively: (i) from December to June, and (ii) from July to November (henceforth referred as group A and B).

In 2016, the group A exhibits a first peak at approximately 50% of urban population corresponding to an increase from 15% to 38% (0% - 38% as appear in the Y axis) of the fishers for the respective months. The second significant peak of the group A occurs approximately at the point

of 78% as appear at the X axis, indicating that in the municipalities that correspond at that percentage of urban population, there are additional registered artisanal fishers varying from one month to another in a range from 6% to 28% (or else, from 22% to 68% as appear in the Y axis). Indicatively for the month of June at municipalities with 78% of urban population, there are approximately 28% additional fishers in relation to the rest of the Rio de Janeiro state for the respective month. On the other hand, the month of January has a smaller percentage of additional fishers (6%). This behaviour is followed by an even greater peak for municipalities with urban population higher than 90% of urban population, where appear a significant number of additional registered artisanal fishers ranges from 12 to 38% varying from one month to another (from 30 to 95% as appear in the Y axis). For instance on September, it is observed that 38% of artisanal fishers originate from high urban municipalities, whereas on January this number declines to 12%.

Regarding the group B, a cluster of months from July to November, exhibits a very low percentage of artisanal fishers (from 0% to 5%) at municipalities with urban population less than 76%. Approximately at that point, the first important peak occurs, followed by a higher peak at approximately 78%. This observation, demonstrates that the population of artisanal fishers during this period (group B) registered in highly urbanized municipalities is significantly important (up to 80%). The differences among the behaviour of the groups A and B, are consistent with variations in biodiversity, the natural reproductive cycles of the species (Graph 1 in Appendix A), and the focus of the artisanal fishery at the municipal and local level, all of which factors affect the time of application of the *defeso*.

Overall for the year 2016, half of the artisanal fishers (50%) have been registered in municipalities with urban population ranging from 50% to 90%, and the other half (50%) in municipalities from 92% to 100% as indicated by the mean typical distribution in Graph 7 in Appendix A (red dashed line). These results verify that artisanal fishers in highly urban environments are equally important with those registered in municipalities with less urban characteristics for the case of the state of Rio de Janeiro in 2016. Between summer and autumn (group A) high urban municipalities encompass from 40% to 50% of the total population of artisanal fishers in the Rio de Janeiro state. This number becomes higher (80%) during the winter-spring time period.

Similarly, in 2017 as shown in Graph 9 in Appendix A, the group A agrees with the observations of Graph 7 in Appendix A. In particular, from December to June, there is a significant peak reaching an increase from, minimum, 10% to, maximum, 32% (or else, 0%- 32% as appear in the Y axis) of additional artisanal fishers registered at municipalities with urban population at 50%. The second significant peak is observed at municipalities with 78% of urban population, where 7%

to 20% increase of the number of the artisanal fishers (or else, from 15% to 50% as appear in the Y axis) of the total registered during the months of group A. A higher third peak occurs at municipalities with 90% of urban population with the number of additional artisanal fishers ranging from 15% to 40% (or else, 40% - 80% as appear in the Y axis). However, as expected from the analysis of the previous year (Graph 7 in Appendix A), during the months from July to November (group B), the number of additional artisanal fishers registered in the municipalities with urban population between 50% and 76% is zero or very low (0% - 5%). Further, the second significant peak occurs approximately at municipalities with high urban population (88% - 93%) registering approximately low number of additional artisanal fishers varying from 8% to 40% (5% - 59% as appear in the Y axis). A final great peak of the number of artisanal fishers, which increases from 20% to 77% (23% - 100% as appear in the Y axis) occurs approximately at municipalities with very high percentage of urban population (98 - 100%). Broadly, 50% of the artisanal fishers are from 50% to 90% and the other half of the additional fishers are for more urbanized municipalities from 93 to 100% according to the mean typical distribution (red dashed line) (Graph 9 in Appendix A).

Despite the lack of information about the last trimester of 2018, merely the months of October, November and December, I argue that the same tendency observed during 2016 and 2017, apply for this year as well. The group A, has a first peak at municipalities with 50%, representing an increase from 20% to 30% (0% - 30% as appear at the Y axis), followed by small increases up to a significant peak, an increase from 1% to 20% (25% - 48% as appear at the Y axis) at municipalities with approximately 78% of urban population. Finally, an additional number of artisanal fishers from 18% to 30% (43% - 80% as appear at the Y axis) come from highly urban municipalities (90%), as well as an average 10% increase from municipalities at 93% and from 98% to 100% of urban population. However, fishers during the months of the group B remain at very low numbers (0% - 5%) up to municipalities with urban population of 75%, at which point there is an increase that reaches from 1% to 20%. Equally, a small increase 5-8% occurs also at 78% to be followed by a second great peak, up to 50% increase at 93% of urban population, and a third one, up to 85% at 98% to 100% of urban population. Overall, in the Graph 11 in Appendix A, half of the artisanal fishers are registered in municipalities with urban population from 50% to 93%, and, accordingly, the other half in municipalities from 93% to 100%.

Overall, the identified clusters of months, namely groups A and B, the Graphs 7, 9 and 11 in Appendix A demonstrate the similar behaviours. In particular, during the months included in the group A, despite yearly variations, there are three significant peaks at approximately 50%, 78%, and 90% of urban population observed each year. Likewise, the peaks for the group B were observed at approximately 73%, 93% and 98%. Hence, there is strong indication that a significant number of

fishers are registered consistently, at least throughout the last three years, in highly urbanised municipalities in the Rio de Janeiro state. However, it is important to mention that the elaboration of the Graphs 7, 9 and 11 in Appendix A were based on data regarding the percentages of urban population only at the cities/capitals of the municipalities, which as expected, it would not demonstrate significant results for lesser percentages of urban population. Indeed the first significant peak is observed for 50% of urban population for all years respectively⁴⁵. So, in these cases, it is observed an offset to higher urbanized populations. Indicatively, the number of fishers for urban population over 80% in 2016 appears to range between 15 and 100%, with a mean value of 60% and standard deviation (3σ) between 40% and 85% (Graph 7 in Appendix A). I argue that this analysis based on the urban centers of municipalities give a systematically higher number of fishers for municipalities for each percentage of urbanized populations above 50%. Thus, these numbers may overestimate the population of fishers in the aforementioned municipalities. Yet, Graphs 7, 9 and 11 in Appendix A already provide an insight for the monthly patterns of the *defeso* compensation. In conclusion, I argue that artisanal fishers, including fishing activities throughout the value chain in both inland and coastal territories, are a relevant socio-economic group in Rio de Janeiro state despite the high level of urbanization in the territory of both cases. The clear difference between the ratio of the total number of the coastal municipalities in relation to the inland municipalities in Rio de Janeiro state, is indicative of the different weight of the fishing activity in inland waters and the coasts respectively in Rio de Janeiro state, and more broadly, the socio-economic importance of the coasts for the whole state. In particular, the yield produced in Rio de Janeiro from fishing activities is principally by extraction in marine environments (Begot and Vianna, 2016).

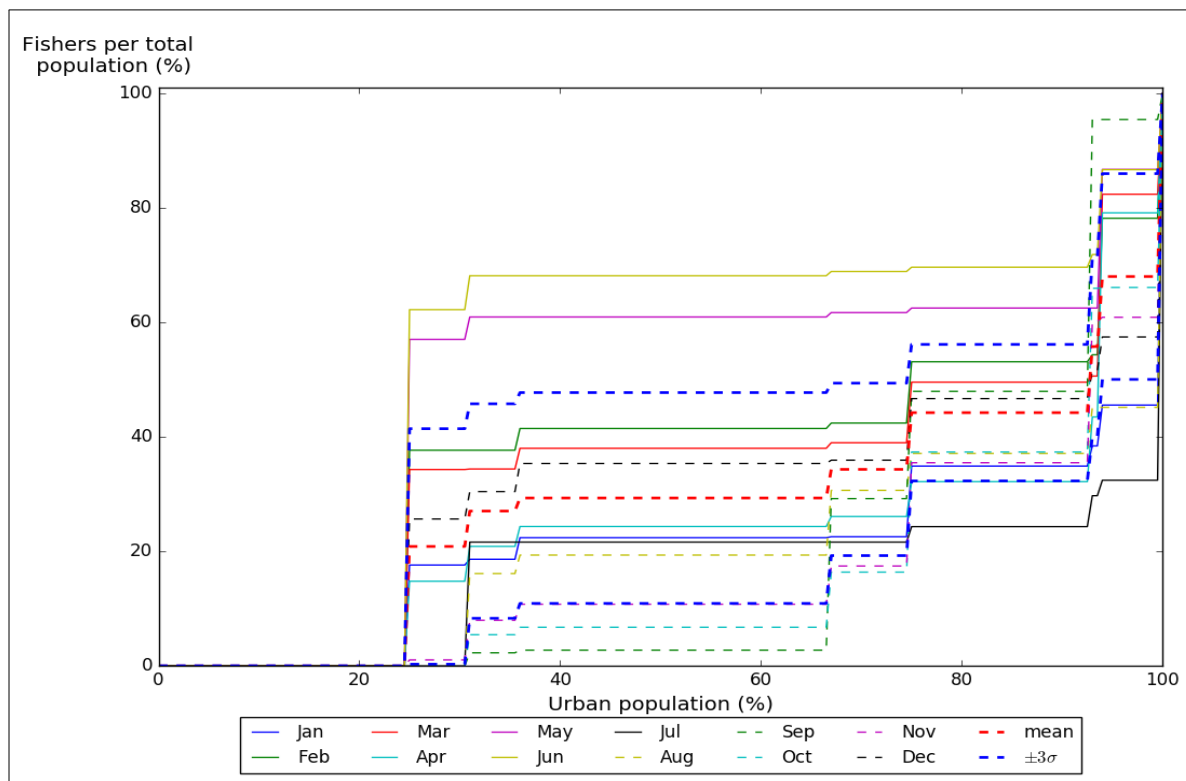
Narrowing down the analysis, for the more specific case of 12 municipalities⁴⁶ that were visited during the field work, it is also demonstrated the distribution of the registered fishers on these municipalities in relation to the urban population of all the area under the jurisdiction of each respective municipality for the years 2016 (Graph 8 in Appendix A), 2017 (Graph 4), and 2018 (Graph 12 in Appendix A). The data presented in the aforementioned graphs were extracted by the previously analysed set of graphs concerning the urban population of all the territory of all municipalities in Rio de Janeiro state for the years 2016, 2017 and 2018 respectively. The mean

⁴⁵ The straight line in cumulative distribution graphs indicates that there is no significant number of additional fishers registered in the municipalities with percentages (%) of urban population within the range of the line, until to the point that the line scales up.

⁴⁶ Namely Araruama, Saquarema, Maricá, Cabo Frio, Arraial do Cabo, São Pedro das Aldeias, Armação dos Búzios, Rio das Ostras, Macaé, São João da Barra, Rio de Janeiro, and Niteroi.

number of artisanal fishers registered in these 12 municipalities, is at a very high percentage of urban population (97% as appear in the X axis) for the years 2016, 2017 and 2018 respectively.

Graph 4- Cumulative distribution of the artisanal fishers per percentage of urban population in 12 municipalities for the year 2017.



Source: Elaboration from the author.

Despite the mean number of fishers, there are some variations from one year to another. In more detail, during the period of the group A in 2016 (Graph 8 in Appendix A), the number of registered fishers in municipalities from 25% of urban population reaches 65% to 80% increase, particularly for the months of April, May and June. For the months of January, February and March the percentages are much lower from 10% to 30%. On the contrary, for the months of August, September, October and November of the group B, there is a negligible number of artisanal fishers in areas up to 67% urbanization, therefore, it indicates that most of the fishers come from municipalities for percentage higher than 67% of urban population in the respective municipalities.

During the following year, in 2017 (Graph 4), there is also a high peak at 25% of urban population for the months of the group A. Yet, unlikely 2016, only during May and April, the number reaches the higher percentages of increase at approximately 60%, while for the months of

January and April significant increases are observed only at 97% of urban population. On February and March, Graph 4 also registers peaks systematically 20% less than May and April up to 97% of urban population. The months of group B have low percentages of artisanal fishers (1% - 35% as appear in the Y axis) up to 75% of urban population with previous peaks at 25%, 30% and 68% respectively.

Finally, for the year 2018 (Graph 12 in Appendix A), during the period of group A (only for the months from January to June), while on June the peak reaches up to 50% of artisanal fishers at 25% of urban population, the month of April and May register lower increase (12-25%) urban population up to 75% as appear in X axis, on the contrary of the months of February and March in comparison to the previous year. For the period of the group B (only for the months from July to September), all months register extremely low peaks at 25%, 35%, 68% and 75% of urban population. At 97% of urban population, the group B has a very significant peak displaying increases from 10% to 60% (10% -95% as appear in Y axis), during the period of group A (only for the months from January to June), while on June the peak reaches 50% of artisanal fishers at 25% of urban population, the month of April and May register low increase (12%-25%) until 75% of urban population as appear in X axis, in an opposite behaviour of the months of February and March in comparison to the previous year. For the period of the group B (only for the months from July to September), all months register extremely low peaks at 25%, 35%, 68% and 75% of urban population. At 97% of urban population, the group B exhibits a very substantial peak on the artisanal fishers reaching increase between 10% and 60% (10% -95% as appear in Y axis).

The agriculture and extractivism is juridically recognized as a rural activity. Similarly, the artisanal fishers receive the pension as rural workers, since they receive no salary. Yet, this legal definition does not capture the more complex reality the artisanal fishers experience. Walter and Petrere (2007) challenge the common perception that fishing communities are primarily rural by specific examples in the states of the Federal District, São Paulo and Rio de Janeiro. These authors also identified a tendency of rural or periurban fishing communities to be gradually incorporated into large Brazilian urban agglomerations; a trend confirmed by Brazil's demographic census conducted by IBGE (BRAZIL, 2010), conforming to which 84% of the Brazilian population lives in urban areas (PEDROSA *et al.*, 2013). The coastal area of Brazil is the most urbanized, and consequently the areas of interest for the artisanal fishers, particularly in the coastal municipalities of Rio de Janeiro state, have been affected by the urbanization processes. As a result, in most cases for the municipalities of Rio de Janeiro state the artisanal fishers live in urban environments but exercise their profession in nature. This intermediate condition renders “invisible” the urban

citizenship of those traditional communities, while, simultaneously, oblige them to adjust their craft and their lifestyle to the multiple actors and activities as typically emerge in urban environments.

4.3 FIELD WORK

In this section, the accumulated information from both the qualitative and quantitative analysis for the case of the Rio de Janeiro state is offered for identification of the evolution and nature of the socio-ecological issues that have emerged in regards to the coastal ecosystems within the territory of each municipality, the levels of institutional adaptability and responses to those challenges, as well as the nature, role and participation of local civil society and particularly the artisanal fishing communities in urbanized settings accordingly.

4.3.1 Socioeconomic profile of the artisanal fishers

A total of 55 interviewees participated in the research, mostly men (52 individuals). The vast majority of the interviewees are between 33 and 58 years old (89%), as calculated considering the date of birth of the interviewees (Graph 1 in Appendix B) and the base year 2018. Also the vast majority of the interviewees is alphabetized (96%). Yet, only 8 interviewees have completed the primary education (Graph 2 in Appendix B), which demonstrates the education level distribution of the interviewees⁴⁷. As presented, only the primary and the higher levels have been divided in sub-levels of the years of attendance, or else, the grade that was reached before dropping out from the educational system according to the statements of the interviewees. In particular, the primary education (*Ensino Fundamental* in portuguese) demonstrates all the nine grades as established since 2010, indicating the widely assorted attendance of the interviewees that reached this level of education, despite been obligatory for children. Respectively, the higher education level (*Educação Superior* in portuguese), despite been divided into 4 levels, only two are shown at the Graph 2 in Appendix B, as among the 3 interviewees that reached this level of education, two have reached second year before dropping out, and only one managed to complete the studies. In the same graph, the rest of the educational levels shown, including pre-primary (*Educação infantil* in portuguese) and secondary (*Ensino Médio* in portuguese), indicate that all interviewees that attended up to those levels have completed their respective studies.

Most interviewees were either born or raised in the area that are actually living and exercising their craft. In particular, as indicated in Graph 3 in Appendix B with the blue color, 32 out of 55 interviewees are living in the area where they are exercising their craft since birth. Among

⁴⁷ Source for the categorization of the education levels: <https://www.nafsa.org/uploadedFiles/Chez_NAFSA/Re-source_Library_Assets/Networks/ACE/EDU%20Systems%20Brazil.pdf> Accessed on 20 February 2019

the 23 interviewees that moved later in the area, as indicated with the yellow colour, 10 were under-aged, and the rest 13 individuals were mostly in productive age, being the maximum value 48 years. Furthermore, 39 out of 55 interviewees declared as main occupation artisanal fishing, though only 23 of them declared to do so exclusively. Only one interviewee declared not to be fisher, though was included in the analysis, as she/he is an elected member of the directory of the respective colony, as well as employed as director for the fishing sector in the Secretary for Fishing and Agriculture of the municipality in question. The exclusive exercise of the artisanal fishing activity is a fundamental parameter for an artisanal fisher to be institutionally recognised as such, and therefore determines her/his access to services and benefits relevant for the sector. Moreover, the majority of the 55 interviewees (70%) claimed to gain one or two minimal salaries (Graph 4 in Appendix B), as well as overall access to basic facilities as 87% live in their own house, 87% have tap water and 63% sewer system in their housing. Yet, for most regions, it was numerously reported either lack of a functioning sewage treatment or inefficiency during heavy rainfalls.

As expected in coastal municipalities, most interviewees (35 out of 39) exercise fishing as their main profession at the open sea (Graph 5 in Appendix B). Among those, 17 interviewees also fish in other environments (coast, lake, river, mangrove), mainly in lakes as expected due to the natural landscape of the coastal municipalities of Rio de Janeiro (Araruama lagoon). Likewise, 13 out of 15 interviewees fish as secondary or third profession at the open sea. Yet, the subcategories of fishers within the vast category of artisanal fishers contribute to the confusion and the difficulty to accurately identify the population of the artisanal fishers. The ownership (or not) and size of the boat, the use or not of technology (radio, gps, sonar), the way of preparation and use of fishing tools, the fishing positions in relation to the natural landscape are among the parameters that define the different socio-economical subcategories of the fishers. Those subcategories needs to be acknowledged in order to establish tailored public policies that guarantee environmental justice.

In the context of the results of the complementary quantitative analysis on the urban artisanal fishers, half of the 50 interviewees (52%) claimed to be urban fishers (Graph 6 in Appendix B). Yet, in Rio de Janeiro, none artisanal fishers identified him-herself as urban, despite been a municipality 100% urban according to the data (right side of Graph 6 in Appendix B). Thus, the dichotomy rural-urban for this professional category seizes to be accurate and needs to be updated or establish a new professional category for the artisanal fishers.

Further, the majority (88,1%) of the 34 fishers that responded the question Q21 and latter justified their answer accordingly, not contradicting their initial answer, claimed to belong in a traditional fishing community. In the Graph 9 in Appendix B (left side) are presented the following characteristics of the traditional fishing communities as identified spontaneously by the

interviewees themselves. Among the mostly mentioned characteristics was the accumulated knowledge of fishing activity from one generation to another (KF) at 10.40%, followed by way of life and customs linked directly with the natural landscape of the area (W) as well as historical presence in the area (H), at 5.56% each. To much lesser percentages two new characteristics were brought up by the interviewees, including handcraft tradition (HA) 1.39% and the sense of belonging in a community (COM) 2.08%. Only 2 interviewees responded negatively, namely denying a traditional identity without contradicting their previous response to question Q21, attributing the loss of the traditional character of the artisanal fishers to outsiders (OUT). Other interviewees that did not support with relevant arguments their initial standpoint on the current state of their community were not considered in the statistical analysis, as the validity of their answer is challenged. Yet, it is necessary to acknowledge the new parameters that have contributed to the loss of the traditional identity of the artisanal fishers, as introduced by the interviewees, including the spreading use of advanced technology, generational rupture with the profession and new legal standards that affect the craft.

In the follow-up closed-ended question Q23 to complement their response on the characteristics of the traditional artisanal fishing community with a specific number of items (right side, Graph 9 in Appendix B), the historical presence in the area (H) is predominant 10.2%, followed by individual or in small groups activity (I) 9.8%, knowledge on fishing activity from one generation to another (KF) 9.6%, knowledge of climate phenomena and the water cycle in the area (KC) 9.4%, autonomy in the fishing activity (A) and use of small boats and simple technology (U) 9.2% respectively, knowledge of underwater topography (KU) and way of life, customs linked directly with the nature and landscape of the area (W) 8.5% respectively. Finally the lowest percentages were in regard to characteristics mentioned were for fishing for both family consumption and trade (F) and knowledge of the behaviour of the species that inhabit the area (KB) 7.2% respectively. The overall responses were mostly positive in identifying the given items, despite not have been previously articulated spontaneously by the interviewees.

A significant number of conflicts over the use of territory in their respective areas was reported by the interviewees (34 of the 54). The management of natural resources in common use, or common goods, is modelled through the various relationships established between resources, users, institutions and the influence of factors external to nature, such as the state, market and technology (Ostrom, 1990). Despite the question “**Are there conflicts over the use of territory in your area?**” was purposefully general, the nature of those reported conflicts were mainly in regards to the exercise of the craft and much less in regards to environmental concerns. In particular, as demonstrated in the Graph 7 in Appendix B, big scale industries acting in the sea (BIG) 16.25%,

tourism (T) 15%, fishing points blocked by other fishing points of local or outsider artisanal fishers (BL) 12.5%. At a much lesser extend conflicts are generated due to real estate expansion (RE) 6.25%, mismanagement of the available deck area among the local users (MIS) 5%, illegal activity from outsiders (ILL) and territory that institutionally is claimed by the navy (NAV) both at 3%, and internal migration (IM) 2.5%. Ultimately, conflicts due to augmented fishing activity due to environmental restrictions in neighbour fishing areas (ENV), transferred pollution for other territories (POL), and sedimentation (SED) were reported by the interviewees only at 1.25% respectively.

Notwithstanding, when interviewees were asked more specifically on territorial conflicts that affect directly the artisanal fishers' communities, the majority (39 out of 55) declared that the area used by the artisanal fisher's community is sufficient in relation to the number of their vessels, In addition, most of the interviewees (33 out of 54) confirmed that the fishing points/areas traditionally occupied by the local artisanal fishers' community are maintained, yet many contradictions were observed upon the justifications given for their standpoint. In Graph 8 in Appendix B, the presented items are the following: variability of fishing points (VFP), real estate expansion (RE), mismanagement of property of the colony (MIS), exclusion from the Navy (NAV), dislocation of the colony (DC), ecological zoning (EZ), natural changes at the coastal landscape (CL), big port infrastructure constructions (BIGP), artisanal fishers abandon the craft (FAC), no regularization of the territory used by the artisanal fishers (NO REG), pollution (PO), fish stock diminished (FS), tourism (T), big scale industries acting in the sea (BIG). Out of those 33 interviewees that responded positively, 15 presented arguments contradictory to their initial statement, while only 3 interviewees affirmed that the community identify the fishing points by name (IFP) and that those points were not affected by tourism.

4.3.2 Participation and Environmental Awareness of the Artisanal Fishers

The subsection A that included questions from Q29 to Q78 was dedicated to explore the levels of participation and agency that artisanal fishers claim to have in different types of collective bodies, including artisanal fishers' colonies, hydrographic basin committees, management councils of the conservation units, residents' associations, syndicates, and artisanal fishing associations. For the case of the syndicates, no interviewee responded positively, so this parameter was no further analysed. This result is consistent with the fact the colonies assumed similar responsibilities with syndicates of other economic sectors. Notwithstanding, the status of the industrial fishers is substantially different, as their working license permits them to work as employees under the

conditions of a monthly salary and fixed contracts and therefore can be represented by the syndicates. Yet, some interviewees in Cabo Frio, which claimed to have been working under informal contracts with the owners of vessels with a maximum capacity of 20 tons within the limitations of artisanal fishing activity category under the law no 11959/2009 (BRAZIL, 2009), had not been represented by any institutional collective body; neither artisanal fishers' colonies, nor syndicates.

The majority of the 55 interviewees (80%) declared to be members of a colony. As indicated, the items presented in the Graph 1 in Appendix C on the reasons for membership in the colony for artisanal fishers (Q31) among all the interviewees, 47 declared that the criteria for choosing the colony were mostly related to its close proximity to residence (C) and other reasons (OT) (both percentages at 61,7%). For the latter, the interviewees specified that the lack of other options in the area determined also their registration to specific colonies. To a less extend, their choice was influenced by other family members already registered to the same colony (F) (36,2%), even less for reasons related to their moving from one municipality to another (MOV) (6,4%), or for the internal organization of the colony (MO) (2%). The following two reasons more benefits (MB), more available territory (MA) were not among those cited by the interviewees. The criteria of the artisanal fisher for choosing a colony indicate that the membership option to one or another entity is circumstantial, not a deliberate choice depending on the administrative capacity or the services provided by the colony.

On the contrary, upon asked whether colonies have differences on from another, the majority responded that all operate with the same way. Yet, the colonies that were visited during the fieldwork indicate the contrary. In the Rio de Janeiro municipality, the colonies in Ilha do Governador (Z-10) (Figure 14, 15 and 16 in Appendix F) and Copacabana (Z-13) were visited. The differences in infrastructure, including selling points (Figures 15 and 16 in Appendix F) and the headquarters (Figure 14), reflect the substantial difference in the economic class of the residents, with the former being in the most precarious conditions. In colony Z-10, the social issues are predominant, including the phenomenon of drug addiction and poverty which are accentuated by the lack of public infrastructure in the neighbourhood, such as street lighting in public spaces or bridges.

Such asymmetries are also evidenced among municipalities. For instance, the property that hosts the colony Z-07 in Itaipu, Niteroi municipality, as well as the building of the colony Z-03 in Macaé (Figures, 8 and 9 in Appendix F) provide space for administrative tasks and public healthcare services in order to accommodate demand from the fishing community (Figure 10 in Appendix F). Nevertheless, the offices of the colony of Cabo Frio (Figures 4, 5 and 6 in Appendix F) and the

colony Z-08 in Niterói, have only space for administrative services. Similarly, this is the case for the offices of the colony in Armação dos Búzios and in Arraial do Cabo (Figure 2 in Appendix F), though in both cases it is established a pier of exclusive use of the artisanal fishers (Figure 3 in Appendix F). The current headquarters of the colony Z-24 are currently situated in a building that was granted by the municipality Saquarema (Figure 19 in Appendix F), which, despite the available rooms for administrative services, as well as courses and local events (Figure 20 in Appendix F), is not appropriate for commercial purposes due to its close proximity to sewage treatment unit. The colony Z-02 in São João da Barra, apart from the administrative services, also have a separate space for naval courses and other educational programs and pier under construction.

On the other side, the headquarters of the fishers' colony Z-06 in São Pedro da Aldeia municipality (Figure 21 and 22 in Appendix F) is in state of abandonment and decay. Unlikely to the situation during the past decades, the colony currently offers neither services for the exercise of the fishing activity, such as port infrastructure and professional fridges, nor for the socio-economic advancement of the fishing communities, such as educational programs or access to health professionals. It was the first and only colony to be instituted in proximity to the lake Araruama lagoon, until the recent institution of the colony of Araruama municipality, once an association, in the west side of the Araruama lagoon, which raised questions of legitimacy and further undermined the former. In Rio das Ostras, the building of the colony is occupied by the public health services, so there is no secretariat. The employed staff varies also significantly from one colony to another. Some colonies have no other staff, than the members of the directory board, in other cases, the employed permanent staff in the secretariats reach up to three people such as in Colony Z-24, which does not necessarily corresponds to the financial capability of the colony or to the quality of offered services. Most of the services do not use technologically updated tools for information sharing, execution of administrative tasks and communication with the members such as colony Z-08 (Figure 12 in Appendix F).

In conclusion, colonies have, indeed, same common points as defined by the law (isomorphism), yet in practice each colony is autonomous, resulting in administrative problems, inconsistencies in available data on the registries of the fishers and their activity or lack of coordination among the entities despite the existence of the federal entity (Federação dos Pescadores do Estado do Rio de Janeiro- FEPERJ). Moreover, in correspondence to the conclusions of De Mesquita Nora *et al.* (2017), most interviewees who declared to be associated members in order to secure professional and social benefits, admitted being inactive participants during meetings and reunions, or even distanced from the issues. Additionally, other causes emerge, including the finding that most interviewees believe that those entities failed to secure

representation of the community in the decision-making procedures related to fishing activities which is, almost exclusively, their primary interest.

The Graph 2 in Appendix C demonstrates the type of services provided by colonies of artisanal fishers to their members. The colonies offer to their members access to social care services including pension but also financial services for their members to invest. Most of the interviewees were not aware about the participation of the colony to the hydrographic basins of the area, nor about services regarding maternity leave, indicating as well, the low percentages of women exercising their profession of the artisanal fisher. Colonies were deprived from certain autonomy in offering services, as the federal government limited their role to an administrative intermediary and re-centralized the budget distribution for the sector. The current functions of the colonies and the associations are mainly limited to common bureaucratic procedures related to the working conditions during the exercise of the craft, mainly the legal framework for fishing (*ordenamento pesqueiro*) and the bureaucratic procedures for fishing licenses and social benefits.

Overall, despite the decentralized tradition in the post-constitutional era of Brazil, the existing participatory institutionalized bodies representing fishers appear to be limited to social service and professional registration for reasons including mismanagement or lack of available financial resources and failure to evoke agency to artisanal fishers. So colonies have established historically their institutionalization as fishers presume their existence, though many consider them to be an operational branch of the main governmental organizations, not necessarily a legitimized representative agent for issues regarding the fishing sector or the environment. The emergence of artisanal fishers associations verify this institutional gap, yet those entities cannot still be considered to be a proper substitute for the colonies. Associations often are considered as a competitive actor to the colonies for the attraction of public or private funds, or even means to neutralize positions and practices of the colony externally, after failing to do so as a member of the colony.

Upon asked on the finances of the colony, Q33, contradictory responses were given from the interviewees over Z-28, Z-04 and Z-02 colonies: some stating normal whereas other precarious financial situation for the same colony respectively. Indicatively, for the case of the colony Z-02, out of six interviewees, two claimed that the colony was in a precarious financial state, mentioned a case of fraud and debt, while two others claimed that the financial condition is good and that there is no debt. Also for the colony Z-04, nine interviewees responded with a great discrepancy: responses varied from very good to precarious and with debt. This observation indicates a deficit on available information or lack of understanding by the members of the colony. Nonetheless, the statements of the interviewees are subjective and may be biased by comparing the actual financial state with previous periods or by own expectations in regards to the provided benefits.

On the contrary, there is consensus over the colonies Z-03, Z-06, Z-24 for having financial problems, and Z-07, Z-05 for being sufficient or good financially. No relevant information was provided for colonies Z-13, Z-10, Z-08, Z-23, Z-24, nor Z-22. Furthermore, most of the responders answered in a follow-up question that the resources of the colony mostly come from the monthly contribution of its own members, with the exception of the colony of Arraial do Cabo that receives a percentage of the port taxes that are paid by the tourists. The frequency of attendance to the reunions of the colony is fairly evenly distributed the 45 interviewees that answered the question Q37: 37.8% always, 22.2% never, 20% few times, 17, 8% more or less, only 2,2% often. Another indication of low participation in the colony is the pointed out by the following question Q38 on agency: the majority (51.1%) of the 45 interviewees that also answered the question Q37, have never pointed out an issue that was considered by the rest of members.

According to the perception for the participation levels of the others, the majority (37%) of the 46 interviewees questioned seem to confirm that a lot of members attend, whereas a lesser percentage (28,26%) affirm respectively that half or few members attend. The percentages of both participation and agency (initiative to talk and propose issues or solutions) were expected to be higher, given that the majority of the interviewees are members of the colony, if not members of the directory board. Yet, the interviewees indicated that the participation of the “others” is systematically claimed to be higher during reunions in the colony. This inconsistency may indicate a tendency of the interviewees to present a positive and active image for the colony, or to justify low frequency as a deviation of the interviewee from the mean tendency of attendance due to personal stand points or ongoing issues. Moreover, when the interviewees were asked on the challenges or impediments to fishers’ participation to the colonies, mostly positively identified 8% lack of interest (LI), 8.5% limited time due to work, family, other responsibilities (L), and 5% low educational level (LL) to be the primary causes.

Further, the question (Q42) examined the level of participation and agency of artisanal fishers in Hydrographic Basin Committees. The law no 9.433/1997 recognized the hydrographic basin as a territorial unit for the elaboration and implementation the National Water Resources Policy, and defined specifically the competences and organizational structure of the institutions that compose the National System from the Management of Natural Resources (Sistema Nacional de Gerenciamento de Recursos Hídricos, SINGREH), including the National Council of the Natural resources, the water agencies and the Hydrographic Basin Committees. Particularly, in the third chapter, the law 9.433/1997 determined that the committees act upon the entire area or the sub-area of the hydrographic basin, or eles a cluster of hydrographic basins. The committees, which are composed by government representatives of all levels, civil organizations and citizens, are

authorized to promote debates among the related stakeholders, to administer possible conflicts of interest, plan and execute the Water Resources Plan. The respective water agencies have a rather supportive role as secretariat to reassure the elaboration and execution of the water resources plan. In 2000, the law no.9984 introduced modifications, and, most importantly, established the National Water Agency (Agência Nacional de Águas, ANA) in an effort to coordinate the policies and decisions followed by individual sub-national agencies.

By creating multiple focal institutions, clusters of water bodies, and multi-purpose reserves, it was expected to eventually lead to consolidated, decentralized and capacitate structures for the management of water resources. Nevertheless, the emerged committees lacked legitimacy, as well as technical and financial autonomy challenging significantly their institutional role in their interactions with the conservative and often inert public sector (LOURENÇO, 2012). Most of 55 the interviewees (76%) claimed no affiliation with a Hydrographic Basin Committee in their area. Among those who do participate (12 interviewees), 33% participate always, 42% few times, while vast majority (75%) have never pointed out an issue that was considered. Also, 11 of those interviewees could not decisively point out a level of frequency of participation of other artisanal fishers from the community to the Committee of Hydrographic Basin, and only 4 interviewees declared few or none other to participate attributing it mostly to limited time due to work, family, other responsibilities (7,4%) and lack of interest (8,3%).

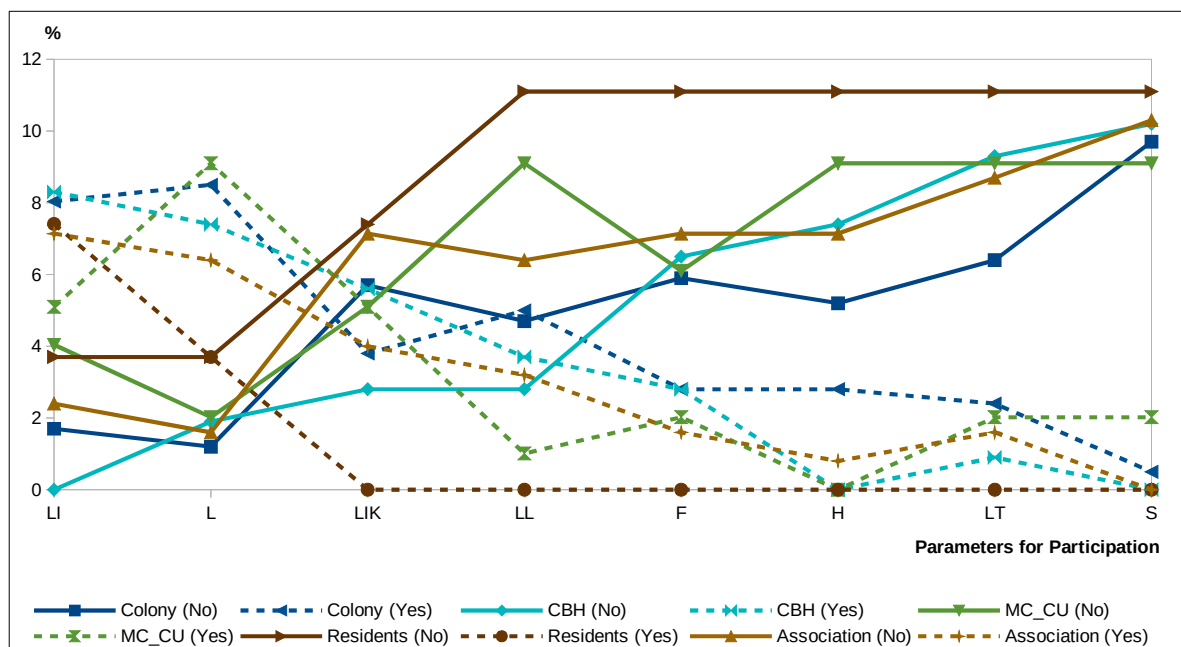
Also a very low percentage of interviewees participate to a Management Committee of a Conservation Unit (only 12 individuals out of 55), the majority of which either participate fully (45,5%) or more or less (18,2%) while more than half (55%) have never pointed out an issue that was considered. Moreover, among those, 10 interviewees that answered the question regarding the level of participation of others declared either a lot of fishers participating (30%) or few (40%). The levels of participation are attributed mostly to limited time due to work, family, other responsibilities (9,1%), as well as lack of information or knowledge on public policies and lack of interest (5,1% respectively).

Furthermore, only 4 interviewees declared to be members of a Residents' Association whose participation is rather weak (out of the 3 participates only 2 attended reunions few times or never), nor they have pointed out an issue during reunions (2 out of 3), Regarding the participation of others, no conclusive result could be retrieved (33% for options a lot, more or less, few times), attributing levels of participation to lack of interest (7,1%) and limited time due to work, family, other responsibilities (6,4%).

When asked if associated with other groups of collective representation for the fishers only 17 out of 55 interviewees responded positively, most of out of 14 responded that are fully

participating in reunions (57%) and 86% of which have already pointed out an issue during those reunions. Yet when asked about participation of other fishers from their community responded more or less, or even few (7,3%) respectively. Attributing it mostly to limited time due to work, family, other responsibilities (6,4%) and lack of interest (7,1%). Fishers feel excluded even in the discussion in the colony and feel that is limited to procedural processes.

Graph 5- Distribution of reasons for no active participation per collective entity.



Note: (LI) lack of interest, (L) Limited time due to work, family, other responsibilities, (LIK) lack of information or knowledge on public policies, (LL) low level of education, (F) financial Conditions, (H) chronic or serious health issues, (LT) lack of transportation, or accessibility, (S) social issues including violence, racism, discrimination. Valid [Colony (Yes)] and invalid [Colony (No)] reasons for no active participation in colony, valid [CBH (Yes)] and [CBH (No)] invalid reasons for no active participation in Hydrographic Basin Committees, valid [MC_CU (Yes)] and invalid [MC_CU (No)] reasons for no active participation in management committees for the conservation units, valid [Residents (Yes)] and invalid [Residents (No)] reasons for no active participation in local residents' association, valid [Association (Yes)] and invalid [Association (No)] reasons for no active participation in artisanal fishers' associations.

Source: Elaborated by the author.

The Graph 5 presents the distribution of the valid and invalid reasons according to the perception of the interviewees for no active participation of the members of the artisanal fishing community to collective entities such as colonies, hydrographic basin committees, management council for the conservation units, residents' associations and fishers' association. In particular, it summarizes information from questions Q41, Q48, Q55, Q62, Q69, and Q76. for each of which were were listed the same possible reasons for no participation: (LI) lack of interest, (L) Limited time due to work, family, other responsibilities, (LIK) lack of information or knowledge on public

policies, (LL) low level of education, (F). financial Conditions, (H) chronic or serious health issues, (LT) lack of transportation, or accessibility, (S) social issues including violence, racism, discrimination.

Yet each question refers to a different collective entity, including artisanal fishers' colonies, Hydrographic Basin Committees, Management Committees for the conservation units council, Artisanal Fishers' Association, Syndicates and Residents' Associations respectively. Nevertheless, the information retrieved from the question Q69 on syndicates was eliminated because colony is considered to be the collective group representing professionally the artisanal fishers. For each case, interviewees had options to respond "Yes", "No", or "Don't Know". The items from the listed reasons with no articulated opinion from the interviewee were also considered as response "0" for the elaboration of the data. Yet, the graph 5 only present the results for "Yes" and "No" as the most significant and relevant. The dot lines represent for each type of entity the distribution(%) of the positive answers, whereas the continuous lines the negative answer in regards to each potential listed reason respectively.

Overall, the Graph 5 demonstrates affirmations on the parameters that are perceived to be obstacles to wider participation of artisanal fishers (dot lines) per collective body from a close-end list of causes as mentioned aforehead. The Graph 5 demonstrates clear tendencies for all collective bodies. The interviewees had strongly rejected the options (a) financial conditions, (b) health problems, (c) lack of transportation, and (d) social issues (violence, racism, discrimination). On the contrary, (a) lack of interest and (b) limited time due to work, family, other responsibilities were altogether the reasons for limited participation.

It would be expected that lack of information or knowledge on public policies and low level of education would be two primordial reasons for no participation. Poverty, low levels of education and informal procedures that benefit only allies, strip out initiatives and protagonism from associated members, even the directory board and the presidents. In align with those observations, the report of the Ministry of Environment of Brazil for the 2015 on participative management pointed out that the the main obstacle for the continuity of action is the lack of financial resources, the rarity of human resources and the long distances that further burden the necessary logistics (BRAZIL, 2015). Yet, Graph 5 demonstrate that the interviewees did not recognized or not admitted that such causes are the most pivotal for their choice to participate of not. The lack of information or knowledge on public policies was significant for the low participation levels for the cases of both Hydrographic Basin Committees (CBH) and Management Committee for the Conservation units, while the low level of education was mentioned to impact participation at the Colonies and the CBH. The implications of lack of knowledge or understanding

for technical issues is more evident in the cases of participation other institutionalized collectives, such as the hydrographic basin committees. As an interviewee stated “*não falam nosso português...não digo nada em publico, mais depois pergunto*”. This situation is aggravated by the sense of depreciation of the social status of the fishers “o pescador é marginalizado, não é reconhecido”.

It is important to note that further evidence from the interviews indicate that the lack of information or coordination among colonies and associations is also associated with the culture of competitiveness and ruptures among fishers or within the communities of the fishers which prohibit sharing of important information for the craft, such as locations of high capture potential. Moreover, in the case of both fishers associations and colonies, the democratic procedures are very weak, informal, or not technologically updated for the associated members to exercise their rights weaken their capacity to exercise checks and balances on the board and the president.

Often, even members of the directory board showed anxiety, lack of confidence or declared lack of further knowledge when invited to participate to the interview. Most of the interviewees were unaware or uncertain whether their colony represents them actively or not to the hydrographic basins or the management councils for the CU. All of the interviewed members, urged direct communication with the respective president. Thus, the predominant figure continues to be the elected president who is either overly charged while exercising his/her own profession to maintain income, resulting to fatigue, or left without control from other members out of trust or lack of time, knowledge or willingness to follow through. In this context, participation or nor to committees or councils is merely decided by the president, according to his/her willingness to participate, and his personal stand. Besides, mismanagement of the colonies also cause fragmentation of the fishing community and discontinuity that is already vulnerable from social problems including violence, drug addiction and alcoholism.

Furthermore, the struggle among associations and colonies, or even among colonies for gaining legitimacy and influence in the area of interest is contributing to the fragmentation of the fishing community. For instance, around the extended area of the Araruama lagoon, there are two colonies that both claim legitimacy and jurisdiction. It is pointed out by the interviewees that the creation of new collective groups to represent fishers may undermine the fair representation of the community. The power for negotiation or deliberation is not analogous to the number of associated members. Associations deprive private funds that would alternatively be directed to colonies. Yet, on the other side, the membership to colonies is obligatory in order for the fishers to maintain their right for retirement.

Finally, in order to have a clearer indication on the predisposition of the interviewees in sharing information or adopting a public standpoint on issues regarding the fishing sector through collective activity, complementary questions were added (Q77 and Q78) to identify possible impediments to the agency culture. In regards to the question Q77, 35 out of 44 interviewees in total that answered claimed to have no fear or doubt for talking about their participation to collective bodies. Yet, a few claimed to have restrains at different levels and instances. For instance, causes, as revealed by the answers at Q78, include personal traits “*eu gosto quando está o grupo todo, a diretoria, tem coisas que eu respondo só se chamar, tem vergonha*”, lack of open participative procedures within the collective bodies “*complicado porque quem fala é só o presidente... (pescadores) ficam falando depois da reunião*”, but also fears for retaliations at a personal “*não gosto mexer sobre politica, cidade pequena, vai prejudicar*” or collective level “*ameaçaram de morte, roubaram três barcos e dois motores da colonia por causa da fiscalização*”.

The subsection B of questions from Q79 to Q88 intended to examine the familiarity of the interviewees with some notions and definitions that are relevant to the environmental governance. Most interviewees (38 out of 53) answered that there are conservation units in their area, yet the majority could not identify any of the official categories of terrestrial or marine conservation units in their area. Graph 3 in Appendix C shows the distribution of the identified Conservation Units in the local area as declared by the interviewees. Out of the 43 interviewees, most responded to know conservation units and named them as known locally, but failed to frame them within the official categories which were given as an option. Oftentimes, interviewees responded to multiple categories for the same unit.

Also, 23 out of 52 interviewees (42%) did not know whether their region is inserted in a hydrographic basin, and most of the 52 fishers stated that are not are aware of the meaning of the term climate change (56,4%), nor keep themselves updated on the decision-making procedures for environmental conservation in terrestrial (74,6%) and/or marine (51%) environments. Notably, in regards to the climate change phenomena, as indicated in Graph 4 in Appendix C, among the 53 interviewees many observed longer periods of droughts (LP) (8,3%), changes to the routes the fish follow during their different stages of life (F) (7,3%), as well as reduced variety and quantity of marine species (RV) (7%). On the other side, the interviewees did not observe any changes to the cycle of the tide (T) (6,8%), higher sea level (HS) (6,6%) nor a higher frequency of high-intensity storms (HF) (7,8%). Also, the interviewees observed a declined frequency of storms, independently from their intensity.

It worth noticing, though, that the interviews were conducted during the month of August. In Brazil, winter occurs from June to August and is characterized by low precipitation and a

particularly dry period during the last month of the season⁴⁸. The subsection C of questions from Q89 to Q91 intended to identify the depth of knowledge on environmental public policies and relevant institutional local, regional and/or national agencies. The question Q89 presents the distribution (%) of the familiarity of the interviewees with environmental institutions and agents. The items presented in Graph 5 in Appendix C are the following: CIRM (CI), GI-GERCO (GI), CERHI (CE), Superintendency of the Patrimony of the Union in Rio de Janeiro (SPU), ICMBio (ICM), FIPERJ (FI), Inea (IN), Municipal Secretary for the Environment (SM), IBAMA (IB). The majority of the interviewees claimed to know IBAMA (10,7%), Municipal Secretary for the Environment (10,2%) and FIPERJ (8,5%). On the contrary, their response was negative for the cases of GI-GERCO (9%), and CERHI (8%).

Institutional instability, as reflected to the multiple changes in the Ministry of Agriculture and Fishing, have attributed and perpetuated the lack of consistent governance of the fishing sector. The relationship of the Municipal Secretary for the Environment, or the Municipal Secretary for Agriculture and the Fishing Sector with the colony is questionable or not clear, even in the cases where the presidents hold the position of the coordinator for the Directory for the Fishing sector in the municipality.

Further, 51 interviewees answered the question (Q90) regarding their level of knowledge on terms related to sustainable natural resources governance. The items presented in Graph 6 in Appendix C are the following: local ecological knowledge (LEK), territorial planning (TP), biodiversity (BIO), payments for environmental services (PES), integrated management (IM), transition zone (TZ), core area (C), buffer zone (B). Among all the terms, only biodiversity was positively recognised by the interviewees by 6,6%. Respectively, for all the other terms the interviewees responded negatively. The most firm negative answers regarded the following terms: integrated management (9,6%), transition zone (10%), core area (11%), as well as payments for environmental services and buffer zone (9,3% respectively). Since artisanal fishers are unfamiliar with the nomenclature of the conservation units (Q80), they consequently ignore their legal and practical differences (Q90). Yet, at a certain level, fishers vaguely could identify areas of ecological interest in their area, that may in the past had been an object of conflict, not necessarily for evaluating their ecological properties. Artisanal fishers that exercise their craft in the open sea, have even less interest in dealing with terrestrial ecosystems, as seen irrelevant with their work. Moreover, the natural circulation of water bodies in the open sea also encourages the illusion that

⁴⁸Winter initiates on June 21st 2018. During this season, that includes the months of June, July, and August the climate is mild. In the Southeast region, the low temperatures during this period, the precipitation is of low intensity though some rain may occur occasionally (BRAZIL, 2016)

the ecosystems are successfully autoregulating anthropogenic environmental pressures, such as pollution, sewage, or even overfishing.

Moreover, 49 interviewees answered whether participate in conversations on environmental public policies during reunions of the collective bodies that represent them. Graph 7 in Appendix C presents the distribution of the familiarity of the interviewees with the environmental public policies, among which only the following were mainly mentioned: 4,4% Orla Project (OR), 4% Combate Lixo ao Mar program (CL), 4,4% Programa de Monitoramento Ambiental dos Biomas Brasileiros (PM). On the contrary, most interviewees denied knowledge of the listed public policies regarding coastal and water management, even more strongly about 6% Coastal Environmental and Economic Zoning (Z), 6,3% Macrodiagnostic (M), 6% IX Sectoral Plan (IX), 5,7% IV Plano de Ação Federal para a Zona Costeira (PAF), 5,8% Plano Plurianual (PPA), 5,1% Procosta (PRO) and 5,1% National Plan for Water Resources (PNR).

These results, in particular for the Plan for Federal Action for the Coastal Zone (Plano de Ação Federal, PAF-ZC), which was initially instituted in 2004 to explore sharing responsibility regimes considering the multiscale coastal environments and the dynamics of the estuaries, indicate the little involvement of artisanal fishers in long-term planning in their territories. The later Plan for Federal Action (III PAF-ZC) for the years 2015-2016⁴⁹ had also pointed out the need for better governance, the consensus on the prioritized missions, and the lack of mainstreaming of environmental considerations in the sectoral public policies. Similarly, artisanal fishers claimed to be not informed on the IX Sectoral Plan for Marine Resources which set critical priorities and actions for the period 2016-2019. In one of those, MMA is coordinating the evaluation, monitoring and the conservation of the marine biodiversity (Avaliação, Monitoramento e Conservação da Biodiversidade Marinha -REVIMAR) in ecosystems of the coastal and oceanic zones.

As the inland water affects significantly those ecosystems, both flora and fauna, ANA's role in providing information from the acquired in the field experience as the institutional manager of the national water resources, could prove to be strategically important for establishing a holistic and systemic vision. The IX Sectoral Plan also points out the necessity for the creation of national infrastructure to strengthen the planned actions. The thematic Programme "Oceanos, Zona Costeira e Antártica"⁵⁰ of the Pluriannual Plan 2016-2019 that has among other objectives to promote scientific and technical knowledge of the oceans and the waterways faced serious limitations for the advancement of the marine ecosystems globally. In this direction, the Ministry of Science,

⁴⁹Source: < http://www.mma.gov.br/images/arquivo/80247/PAF/Livro%20PAF-ZC_FINAL.pdf> Accessed on 20 March 2017

⁵⁰Source: < <https://www.mar.mil.br/secirm/publicacoes/psrm/IXPSRM.pdf>> Accessed on 20 March 2017

Technology, Innovation and Communication reconfirmed in 2016 its interest in institutionalizing the facilitating the National Institute of Oceanic Research and Waterways (INPOH) founded in 2013 as a civil association to implement scientific research on the coastal zones, ports and waterways⁵¹. Yet, Scherer *et al.* (2009) point out in regards to the knowledge and information sharing mechanisms, that there is lack of accessible means and language of the academic work that would allow the governmental organizations to incorporate knowledge in their decision-making processes, even less for municipalities. The authors further argue that the managerial processes do not involve the principles of transparency monitoring, assessment and feed-back, not permitting also the common citizens to have access or accompany the coastal management or to participate effectively in public consultancy processes. The results indicate that fishers are not properly equipped to deal with environmental and territorial public policies, as themselves are not officially informed in a consistent manner in regards to their local ecosystems.

Oftentimes, neither Presidents nor members of the directory boards have particular knowledge on the environmental public policies relevant to the coastal areas and/ or the CUs. Negative attitude of high-rank representatives of the collective bodies of the fishers towards environment and a combination of short-sighted opinions, lack of strategic vision, and “not in my backyard” attitudes may prejudice institutional interventions for environmental sustainability. Some interviewees, including Presidents, appeared to have a distorted perception of the real work of so-called “environmentalists” accusing them of acting upon private interest, referring to the level of the monthly salary that bureaucrats receive in contrast to the financial insecurity of the artisanal fishers as a result of the public policies that interfere or prohibit the fishing activity. However, certain comments on academic arrogance and lack of socio-economic care may indicate the dominant academic approach towards local communities. On the other side, it was pointed out the initiative of the technical chamber of the hydrographic basin committee of Araruama which intends to rectify the 445 decree on the regulation of the fishing that denounced the support from academia.

Further, the questions Q94 and Q95 intended to demonstrate that both positive and negative aspects are investigated of both the industrial and the artisanal fishing sectors in order to permit the interviewees to answer without feeling targeted, as a certain bias in the responses of the interviewees was expected. In Graph 8 in Appendix C, the responses of the interviewees on both Q94 and Q95 are compared on the basis of the six common aspects of the industrial and artisanal fishing sectors, merely the use of petrol derivative for the engine on the fishing vessels (P), the captured of prohibited species (PE), the quantities of captured fish in relation to their natural stock

⁵¹Source: [Governo e cientistas defendem a criação do Instituto Nacional de Pesquisas Oceânicas. Ministério da Ciência, Tecnologia, Inovações e Comunicações](#). Accessed on 20 March 2017

numbers (Q), employment opportunities for locals (E), contribution to local food security (A), and presence in the area as contributors to monitoring and prevention (PA).

The question Q94 explored the potential environmental and socio-economical impacts of certain aspects of the industrial fishing activity. Many of the fishers exercising exclusively their profession in lakes, claimed to have no particular knowledge on industrial fishing, thus, a smaller number of interviewees answered the question Q94. In particular, among the 31 fishers, the employment and the use of new technology were pointed out as the most positive aspects of the industrial fishing activity with percentages reaching 6.1%, and 3,6% respectively, whereas the most negative aspects were the volume of captured fish (7,5%), the use of petroleum derivative for the engines, specifically diesel, (6,8%), and the capture of prohibited species (6,1%).

For the similar question on the impacts of the exercise of the artisanal fishing activity (Q95), 49 interviewees answered in total. Among those, most claimed that the presence of artisanal fishers in the area of interest serve for monitoring and prevention of environmental risks (6.58%), the use of their specific knowledge on the species and the ecosystem in the area complements the scientific research (5.67%), and their captured fish is contributing to secure alimentation in local markets 4,99%. On the other side, the 4,76% of the interviewees admitted both the negative impact on the natural fish stocks by the capture of prohibited species by artisanal fishers, and the pollution caused by use of petrol derivatives for the engine of the vessels within the category of artisanal fishing, though not at the same extend as the industrial vessels.

Authors such as Lopes *et al.* (2013a, 2013b, 2015) have pointed out that the inefficiency of these top-down strategies to generate biomass indicates their misinterpretation or misunderstanding of important elements of local ecosystems, and favors negative attitudes by fisher communities. In addition, the need for small-scale fishers to catch differentiated species may conflict with the constraints imposed on the chosen areas (LOPES, 2013b), and compel them to choose between environmental conservation and subsistence objectives (BEGOSSO *et al.*, 2011). The first consequence is the lack of interest by users in adhering to conservation rules, creating a "maximum use" mentality that generates problems for the protection of natural resources and increases the time and public investments required for the implementation and monitoring of policies in the sector (LOPES, 2013a; 2013b).

The legitimacy of the state in this top-down system depends on the ability of articulation in the process of implementing policies in order to mediate the complex interests in dispute and establish social legitimacy for them (PIRES; GOMIDE, 2014; FONSECA, 2016). Yet, top-down models result in policies disconnected from local realities and in propagating a sense of not belonging among the local users, who feel disassociated or event excluded, and, consequently, do

not comply with the established rules (MCKEAN; OSTROM, 1995; RUDDLE; RICKEY, 2008; AGRAWAL, 2001; OSTROM, 2009; LOPES *et al.* 2013, 2015). As a result, the admitted, and in some cases, justified by the interviewees illegal activity⁵² resists the public policy restrictions, bringing collateral effects, such as unstable investments or partnerships between fishers, and perpetuating precarious solutions to their activity. The informal state of local fisheries management rules prevents individuals and communities from using institutional channels that would provide them with more information and resources to conduct sustainable and secure practices, contributing to food security and poverty eradication; both central to Agenda 2030.

Questions from Q96 to Q100 aim to shed light on the personal stand of each individual in regards to the environmental causes, the level of her/his mobilization and vision for potential contribution to relevant public policies. Most interviewees (52,9%) claimed not to be engaged voluntarily in any environmental activity (Q96). On the other side, those that claimed to have participated in civil initiatives mentioned a range of actions including (a) local garbage clean-up actions, either in surface or underwater, in rivers, lakes, and coasts, (b) monitoring of accumulation of waste, (c) recuperation of mangroves and other native flora by planting or prohibiting further deforestation, (d) assistance to the detection of sewage disposal points to the margins of lakes or coasts, (e) in one case, participation the demarcation process of coastal protected area Guapimirim, and (f) signalling emergencies, such as the site of dead sea mammals. The listed activities are principally annual or isolated initiatives from public institutions, including universities, and partnerships with the municipal secretaries of the environment, which implies a rather professionalised participation of local artisanal fishers as manual labourers rather than merely volunteers. It is worth noticing that while some interviewees exhibited a genuine preoccupation for the environment, the concept of voluntarism is not widespread among the often impoverished artisanal fishers' communities. Still, the majority of the interviewees (66,7%) are positively predisposed in the possibility of being more involved with decision-making procedures for environmental issues (Q98) and were adamant (84%) in defending the potential positive contribution of the artisanal fishers to environmental sustainability. This divergence among the willingness of the artisanal fishers and the deficit in more consistent and frequent partnerships that lead to a more active participation of artisanal fishers in environmental actions is indicative of the need of more exploration of possibilities for collaboration with those communities.

⁵² The illegal activity refers to fishing in unregulated areas with no conservation or management measures, or not fully regulated by the State due to difficulties in monitoring and in securing accountability, unregistered fishing vessels, as well as misreport of activities or direct violation of national, regional and international laws (FAO, 2018).

Graph 9 in Appendix C, presents the distribution (%) of the evaluation of the interviewees on the following public policies as implemented locally (Q101): *defeso* (DE), expansion or institution of new protected areas (MB), restrictions in size and quantity of fishing nets (R), monitoring (M), territorial planning or the coastal areas (T), other (OT). The interviewees evaluated positively some public policies for the artisanal fishing craft with environmental considerations, including *defeso* (10,5%) and restrictions in quantity and size of nets (11%), and at a lesser extend the expansion or creation of protected areas (7,4%). Yet, it is necessary to acknowledge some contradictory comments from the interviewees on the legal framework at municipal level concerning the fishing activity, for which some colonies claimed to have been actively participating in formal revision processes.

Similarly, a discordance regarding the determination of the *defeso* period of the species of shrimp that are locally reproduced was often mentioned. The interviewees discredited the scientific criteria used for the initial determination of the reproduction period of those species and even claimed that, according to their observations throughout their professional experience in the sector, the dates were misplaced. Conclusively, the positive predisposition for the case of *defeso*, is conditioned to the benefits that the artisanal fishers receive, but also indicate an interest for preserving the biodiversity of the marine ecosystem. On the other side, the most negative evaluation of the interviewees in regards to the question Q101 was registered in regards to monitoring (11,4%). Most of the interviewees, repeatedly pointed out the inefficiency, for instance the absence of persistent monitoring before and after the *defeso* period, and the limited disposed resources, including vessels, personnel and fuel, of the institutions responsible for the monitoring. A significantly fewer number of the interviewees mentioned aggressive practices towards the artisanal fishers engaged in illegal behaviour, discriminatory attitude of the monitoring institutions in relation to other competitive sectors, and even accusations of corruption in relation to the disposition of the yield illegally obtained. The majority of the artisanal fishers asked for more monitoring, yet mostly to restrict the activity of the competitive sectors, rather to reduce the admitted illegal activity (Graph 8 in Appendix C) among the artisanal fishers.

Despite, having a moderate percentage of interviewees been actually voluntarily engaged in environmental activities 24 out of the 51 interviewees (47%), 34 out of 51 interviewees (67%) would like to actively participate more on decisions over environmental policies in their area. This relatively low percentage of active participation to environmental issues is in great contrast with the majoritarian belief among the interviewees (85%) that artisanal fishers can contribute more for the improvement of the environmental conditions. In Graph 10 in Appendix C the possible natural resources governance options are illustrated. Among the 48 interviewees, the option of Autonomy

(A) was strongly denied (10,83%) as unrealistic due to limited resources, and enforcement power of the artisanal fishers' community. On the contrary, most responded that co-management (CO) (18,3%) is a preferred option for the mitigation and prevention of the potential negative impacts of the environmental public policies on the artisanal fishers' community in coastal municipalities. Co-management is one of the approaches to management planning of the commons, for which sharing of power and partnership are essential (CARLSSON; BERKES, 2005):

“ (it) refers to the governance of the system through collective control combining forces and minimizing the weaknesses and conflicts of each of the parties involved, through a continuous process of problem solving by a working group (network) that involves joint deliberations and learning (...)”

Such co-management structures, which assume collaboration among “traditional” competitors of different socio-economic status, require mediation, capacity building –mainly for the empowerment of the local communities- and an institutional arrangement that will reassure that both processes and the decision-making abide with a shared mission. Adger *et al.* (2005) argue that trust is fundamental to mobilize information sharing and equal distribution of benefits reinforce legitimacy and authority in such arrangements, given the different levels of power exercised by the stakeholders. Yet, through the results of the fieldwork indicate that institutions, collective bodies where artisanal fishers participate and even associations and colonies are discredited. The trust deficit eliminates one of the preconditions for shared management solutions. In this sense, fishers behavior and strategies, in regards to participation, are directly related to the historical-political-institutional culture of the coastal municipalities of Rio de Janeiro state.

5 DISCUSSION

In this section the issues that emerged from the three stages of the research are analysed and compared with previous studies regarding natural resources governance, territorial management and the fishing communities in Brazil and, foremost, in the Rio de Janeiro state. The discussion offer a broader context from the existing literature, the prism of which intends to inform and complement the obtain results as presented previously.

5.1. INSTITUTIONAL CHANGE IN NATURAL RESOURCES GOVERNANCE IN RIO DE JANEIRO STATE

5.1.1 Institutional top-down panaceias influence performance of environmental public policies

The notion of one-size-fits-all was questioned after economies in transition failed to imitate or copy effective public policy recommendations (OSTROM, 2009), and legal systems (TRUBEK; SANTOS, 2006) due to simplistic theories and analysis despite deviations in their pre-existing institutional environment. La Porta *et al.* (2008) develop the Legal Origins Theory based on the view that legal rules⁵³ differ in quantifiable ways across countries due to two main legal traditions: the English decentralized common law approach and b) the Romano-Germanic civil law, which enables top-down regulatory interventions, and, thus, according to the author, enforces more efficient solutions provided that the state is not submerged to private interests. Fedriksson and Wollscheid (2015) conforming also to this post-colonization path dependence theory of a legal framework evolution similarly finds a pattern of deviation of public policies that is correlated to the evolutionary trajectories of the legal tradition in each sector across different countries around the world. Despite differentiations, public policy systems in top-down models show the difficulty in capturing the complexity of local management systems and their institutions. In the institutional context, the lack of consideration of the forms of local organization among users has resulted in the imposition of institutional paternalistic regulatory arrangements that are disconnected from local realities, and ignore LEK or pre-existing local systems of management. Even more so, public

⁵³The term 'rules' refer to generally agreed-upon and enforced prescriptions that require, forbid, or permit specific actions in exercising a right of one or more than a single individual (Ostrom 1986 as cited in Schlager and Ostrom, 1992), and is categorised in operational, collective-choice, or constitutional-choice rules (SCHLAGER; OSTROM, 1992).

authorities distrust the efficiency of participative regimes⁵⁴ that lack the specificity on the role and function of each counterpart (BRAZIL, 2015). Yet, the different patterns of self-regulation of the use of natural resources in traditional societies globally prove the ‘blueprint policies’ to be inadequate (OSTROM, 2009).

Ostrom *et al.* (2007) criticizes the belief that perceptions and preferences of the natural resources users are such that permit the panacea use of simple governance model systems as a response to complex problems related to social-ecological systems. Academic and professional literature have largely dismissed self-regulating solutions despite empirical evidence in cases of common-property natural resources, such as the marine life in inland and coastal waters, thus neglecting the potential of users involvement in the processes and proposing sweeping reforms, whose costs are usually borne by the users, as in this case the fishers, instead of ‘fit-to-scale’ measures mounted up by local ecological knowledge, self-enforcement practices and adaptable costs (SCHLAGER; OSTROM, 1992). This dominant belief is challenged by Ostrom (2009) that suggests that there is sufficient evidence proving that natural resources users invest time, effort, and resources to design and implement sustainable governance systems the sustainability of which depend from the cost-benefit balance of the design, and the fear for free-riders or rule-breakers. According to Ostrom (2009) in the latter category can be included both larger-scale governance systems when fail to guarantee monitoring and enforcement, or when sway over a focal SES-level users’ rules and same-scale governance systems with divergent focus and priorities.

The plurality of the involved actors contributes to the internal coherence of the policies and their implementation the local communities, avoiding the failures of the top-down approaches that implicate high costs of inspection and the inefficiency of conservation efforts (LOPES *et al.* 2013; 2015; GOMIDE; PIRES, 2014). For the case of water resources governance of Brazil, OECD (2015b) recommends a bigger emphasis on decentralized decision processes to allow exchange of information on local realities and to enhance stakeholder engagement to improve the current comprehensive but complex environmental institutional setting including MMA, the ICMBIO and the National environmental council, which is even more limited at the municipal level due to insufficient budget and monitoring. Brazil along with other signatory countries adopted the 12 OECD principles on Water Governance⁵⁵ at the Daegu Multi-stakeholder Declaration (OECD,

⁵⁴ Original text: “...porém se constata que o poder público parece identificar na gestão participativa uma ameaça...”

⁵⁵a) clear allocation of responsibilities and roles for water policymaking, implementation, operational management and regulation; b) appropriate scale(s) within integrated basin governance systems; c) policy coherence through effective horizontal and cross-sectoral co-ordination; d) capacity building of responsible authorities; e) Produce, update, and share timely, consistent, comparable and policy-relevant water and water-related data and information; f) mobilization of sufficient financial resources in an efficient, transparent and timely manner;; g) effective implementation of sound

2015a) based on the viewpoint that clearly defined decentralized jurisdictions, as well as regulations, and sufficient financial resources for the benefit of the public interest and monitoring or evaluation mechanisms are highly desirable.

In this context, OECD suggests clearly to rationalize the multitude of co-ordination bodies while engaging local communities in compliance monitoring and applying a uniform system of data and strategic environmental assessments. Extending to other sectoral public policies, the regulation of the use of the natural resources should be determined through planning and implementation (co-implementation) by different institutions in local, regional, national and global scales; including control and monitoring of the exploration processes. In the same context, the reports on the Water Resources in Brazil in the years 2013 and 2017⁵⁶, continue to emphasize that the decentralized and participatory water governance model did not effectively manage the shared dominance between the Union and the States in certain hydrographic basins in the Brazilian territory, similarly to the cases of certain CUs, that interrupt integration efforts due to differences in operational capacity, influenced by the composition of the framework of the public servants, institutional rules in vigilance and protection and available financial resources (BRAZIL, 2015). Nonetheless, participation does not necessarily solve emerging issues related to representativeness and legitimacy as in the case of the extractive reserves (Reserva Extrativista, RESEX) whose management is diluted between government agencies and social groups. In practice, the articulation of the actors within participative regimes, despite being open to communities, is conditioned to a top-to-bottom approach due to the institutional environment, norms and regulations.

Visioning the sustainable economy, it stands-out, as fundamental, the empowerment of the local communities (users) as managers with the support by the formal public and private institutions. It is worth mentioning that representatives of the organized civil society, such as the *Pastoral da Terra*; the *Movimento das Pescadoras Artesanais do Brasil*, the *Baia Viva*, the *Teia de Apoio a Pesca Artesanal*, and the *Ouvidoria do Mar*, continuously claim representation in the formulation of the public policies regarding the fishing sector. Authors such as Gomide and Pires (2014) argue that after the constitution of Brazil in 1988, it was created a fertile field for

water management regulatory frameworks that serve public interest; h) Promote the adoption and implementation of innovative water governance practices; i) mainstream water policies; j) promote stakeholder engagement for informed and outcome-oriented contributions; k) encourage water governance frameworks that help manage trade-offs across water users, rural and urban areas, and generations; l) promote regular monitoring and evaluation of water policy.

⁵⁶Since 2009, the year of the first report of the Conjuntura Pleno (milestone), the annual reports update the following quadrennial report. To date, two more reports are published in 2013 and 2017 respectively. Source: <<http://www.snirh.gov.br/portal/snirh/centrais-de-conteudos/conjuntura-dos-recursos-hidricos>>

participatory institutions, as well as instruments of control over public administration⁵⁷; the capacities of the state would depend not only on the existence of qualified bureaucracies with transparency and accountability, but also on their ability to relate to market and societal actors in the processes of formulating and implementing development policies and goals, both in environmental and social fields.

5.1.2 Institutional gaps to biodiversity protection policies for Mata Atlântica biome

The Mata Atlântica biome⁵⁸, or else known as Atlantic Forest, a term that does not correspond to an official botanical or biological classification, but is nevertheless officially approved by the National Council on the Environment (CONAMA) two years after the initiative of the Fundação SOS Mata Atlântica in 1990 (DE GUSMÃO CÂMARA, 2003), has a tropical and humid climate with high temperatures and rainfall, and its flora mainly consists of large and medium-sized trees composing dense and thick rainforests whose type is extremely heterogeneous, (COUTINHO, 2006). Specifically, it encompasses five types of coastal rainforests including a) the *dense and open ombrophilous forests*, b) the *mixed ombrophilous forests*, c) the *seasonal and semideciduous forests*, d) *areas of ecological tension -transitional zones-*, and e) other (De GUSMÃO CÂMARA, 2003), referring to dunes, mangroves and restingas. According to IBGE (2004) the dominant forest types are the mixed ombrophilous forests, and the seasonal and semideciduous forests. Three axes of variation along latitude, altitude and longitude explain why the Atlantic Forest is consistently identified as one of the South America's most distinctive biogeographic units (MULLER, 1973; DA SILVA; CASTELETI, 2003). On the other hand, due to

⁵⁷ This constitutional vision of control for the protection of the fundamental rights in an ecologically balanced environment is reinforced by the recent decision of Supreme Federal Court (Supremo Tribunal Federal, STF) on the Direct Action of Unconstitutionality n° 4717. STF declared unconstitutional provisional measures on the creation, recategorization, extension, reduction or suppression of protected territories, while recognizing the formal law as an institutional guarantee mechanism of greater social control, since it requires public hearings and environmental impact analysis. Source: <<http://www.stf.jus.br/portal/cms/verNoticiaDetalhe.asp?idConteudo=374559>> e <<http://www.mpf.mp.br/pgr/documentos/nota-tecnica-n-01-2018-gtuc-4accr-reducao-de-unidades-de-conservacao-por-medida-provisoria/view>>

⁵⁸ IBGE (2004) conceptualizes biomes as a particular set of flora and fauna constituted by grouping identifiable vegetation types on regions with similar geo-climatic conditions and shared patterns of change. In the same vein, Coutinho (2006) consider biomes to be geographical areas with dimensions of even more than a million square kilometres, with distinguishing features and structures due to particular characteristics such as the level of uniformity of a given macroclimate, the type of flora, the fauna, and other related living organisms, as well as the environmental conditions such as the altitude, the soil, water etc.

these axes, covering a wide range of climatic belts and vegetation formations (TABARELLI *et al.*, 2005), the Atlantic Forest cannot be treated as a homogeneous unit but instead as a complex one with distinct biogeographic regions divided into two types: areas of endemism, including northeast rainforests (Brejos Nordestinos, Pernambuco, Diamantina, and Bahia) and the coastal mountain range (Serra do Mar); and areas of transition, including the São Francisco, the Interior Forests, and the Brazilian Pine Forests.

According to the Brazilian Institute of Forests (Instituto Brasileiro de Florestas-IBF⁵⁹) the geological characteristics and the flora of Mata Atlântica regions favours high rainfall levels and maintains hydrological processes that are of great importance for the quality and volume of ground and superficial water reserves. Nevertheless, the water reserves are negatively affected by global climate change and the economic activities of a continuously growing population living in the wider area of Mata Atlântica that lead to landscape fragmentation, pollution, and waste of water resources among other. Particularly deforestation in riparian and coastal areas result in creating locally sediments that interrupts the watercourse or even disappear water sources (WEBB *et al.*, 2005), as such processes have a great impact on the erosive state of the ground and local topography, and consequently to the spatial arrangements and zonation of the local ecosystems (CUNHA-LIGNON *et al.*, 2009), altering fundamentally the local landscape. Though, it remains only approximately a 12% of the original area under forest, Mata Atlântica extends currently in fragments to the 13,04% (IBGE, 2004) of the total Brazilian territory both to the interior area and to mountainous regions near the coasts from north to south, though the exact percentage or absolute number of the total area is often contested, not only due to the continuous phenomenon of deforestation, but also due to controversies for the minimum size of the forest fragments that should be considered.

De Gusmão Câmara (2003) refer to a rather cautious estimation in 1995 of 98.878 km^2 , considering only fragments of native flora above 10 km^2 . According to the IBGE (2004) the approximate extension area is estimated to be the 144.768 km^2 , 13,04% from the original area estimated at $1.110.182 \text{ km}^2$. In 2007, it was produced the final report of the Survey of the Native Vegetation Coverage of the Atlantic Forest Biome under the Project of the Conservation and Sustainable Use of the Brazilian Biologic Diversity-PROBIO (CRUZ; VICENTS, 2007). The survey was based on the biome map of IBGE (2004) considering as basis area for the research $1.110.182 \text{ km}^2$ and revealed a percentage of 26,97% of the remaining native vegetation coverage⁶⁰. Yet, the Fundação SOS Mata Atlântica in its most recent annual report of 2016 estimates

⁵⁹Source: <<http://www.ibflorestas.org.br/bioma-mata-atlantica.html>> Accessed on 20 February 2019

⁶⁰According to the clarifications published on the official website of the MMA, the results found significantly larger figures from the Atlas of the Atlantic Forest Remnants by SOS Mata Atlântica Foundation in 2002, due to the

the remaining area to be at 164.432,50 km², 12,5% of the original 1.315.460 km² in Brazil considering fragments of the native biome above 3 hectares. In different portions, Mata Atlântica extend in the wider geo-economic areas of North-East and Center-South that encompass as well the administrative areas, or else groups of states, whose nature depend from their physical and socio-economic characteristics, including the states of the South region (Rio Grande do Sul, Paraná and Santa Catarina), the South-east Region (Minas Gerais, São Paulo, Rio de Janeiro and Espírito Santo), the Center-east Regions (Goiás and Mato Grosso do Sul), and the North-East Region (Piauí, Ceará, Bahia, Sergipe, Alagoas, Pernambuco, Paraíba, Rio Grande do Norte).

According to the Portal Brasil (2014) the Mata Atlântica Biome fully covers the states of Espírito Santo, Rio de Janeiro and Santa Catarina, 98% of Paraná and areas of other states. Within this vast area which covers different latitudes, up to 27 degrees; altitudes, from the sea level up to 2,700m in Mantiqueira, Caparaó Mountains in the states of São Paulo, Minas Gerais, Rio de Janeiro and Espírito Santo; and diverse climatic regimes – subhumid, dry seasons in northeast, heavy rainfalls in Serra do Mar (DE GUSMÃO CÂMARA, 2003), a complex landscape emerges with mountain ranges, valleys, plateaus and plains (PORTAL BRASIL, 2014).

In its entirety, there is more than 120 million people that depend from this biome, that is, 70% of the Brazilian population, including a largely urbanized coastal society and remnants of traditional communities “*ribeirinhas*”, indigenous people, quilombolas and the “*caiçaras*” whose subsistence depend from fishing, agriculture, extractive activities and other crafts (MACIEL, 2007). In 2006, the Mata Atlântica Law 11.428⁶¹ was constituted with the intention not only to protect, but also to use sustainably natural resources in Mata Atlântica. In its article 38 previsioned the Municipal plans for the conservation and recuperation of Mata Atlântica (Planos Municipais de Mata Atlântica, PMMA), as an instrument that enables proactive measures at the municipal level for the conservation and the recuperation of the native fauna. The intention through the PMMAs is to include actions, such as mapping of the areas, decentralization of the environmental licensing, technical support, and operationalization of the municipal environmental funds among other, that reconcile the conservation of the biome with the economic and cultural development of the municipality while strengthens the participation of civil society in public policies⁶².

differences regarding the limits of the biome adopted, the different order of the mapping and analysis scales, the inclusion of non-forest flora, alluviums and sandy cords; also consideration of the forested savannas and all areas of ecological tension and of more advanced secondary vegetation. Source: <<http://www.mma.gov.br/biomas/mata-atlantica/mapa-de-cobertura-vegetal>> Accessed on 04 August 2017

⁶¹ Source: <http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2006/lei/111428.htm> _Accessed on 20 February 2019

Yet, up to January 2016 as only 5 PMMAs are implemented nationally, a number that raised to 28 PMMAs by 2018. For the purposes of this dissertation, which is limited to the state of Rio de Janeiro, it is considered only the endemic species of the biogeographic subregions corresponding to the state under study respectively. Rio de Janeiro state is composed of highly diverse landscapes that includes ecosystems of high biodiversity value within the Mata Atlântica biome, including the tropical forests, and foremost the mangroves of Serra do Mar in the southern and northern coasts respectively within the state. Accordingly, in Figure 7, the map of Da Silva and Casteleti (2003) presents Rio de Janeiro state to be covered exclusively by the Serra do Mar. Such delimitation of the focus area within the wider Mata Atlântica biome provides some insights for the principal characteristics of the natural ecosystems in Rio de Janeiro state, while still encompasses indigenous flora of high variety and complexity as the figure 8 suggests for the case of the Rio de Janeiro state, for which Scarano (2002) uses the term “mosaic”. The complexity does not exclusively refers to biodiversity but also the cultural and socioeconomic value of Serra do Mar, a stretch of which was recognised by the State Institute of cultural Heritage (Instituto estadual do patrimônio cultural, INEPAC) through the process E-18/000.172 in 1991. A total of approximately 656,700 hectares extends in 38 municipalities of Rio de Janeiro state, including five municipalities that were visited during the fieldwork, merely Macaé, Maricá, Niteroi, Rio de Janeiro and Saquarema⁶³.

Furthermore, in Rio de Janeiro state, 14 municipalities, all concentrated at the interior of Noroeste Fluminense area, had already implemented their respective PMMAs, 12 municipalities had only elaborated PMMAs, including Rio de Janeiro, Saquarema, Araruama, Arraial do Cabo, Cabo Frio, Armação dos Buzios, Rio Bonito, Silva Jardim, Iguaba Grande, São Pedro da Aldeia, Casimiro de Abreu and Rio das Ostras, and 2 municipalities, Laje do Muriaé and Maricá, are still in procedure of elaboration their respective PMMAs. Most recently, November 2018, was initiated the elaboration of PMMA of the municipality of Niteroi with the support of a joint project of UN and the National Association of the Municipal Institutions and Environment (Associação Nacional dos Órgãos Municipais e Meio Ambiente, ANAMMA).

The elaboration of the PMMA is based on a participative and integrative methodology to identify, prioritize areas of interest through (a) geo-referenced mapping from the consolidation of secondary data, including the Strategic Urban Plans (Plano Diretor), Plans of the Hydrographic Basins, regional plans in consideration of the state law on climate change, and (b) the cognitive mapping “*Mapa Falado*” of important actors such as municipal council for the environment,

⁶² Source: <http://www.pmma.etc.br/index.php?option=com_content&view=article&id=79&Itemid=1083> Accessed on 18 August 2017

⁶³ Source: <http://www.inepac.rj.gov.br/index.php/bens_tombados/detalhar/234> Accessed on 20 February 2019

secretary for the environment, Inea, ICMBio, universities among other. The adopted approach consider not only the biological corridors at regional level, but also, the hydrological basins as well as the existing administrative and socio-economical zoning. For each municipality was identified several action proposals for (a) the creation, implementation and management of CUs, (b) conservation and recuperation of fragments of Mata Atlantica biome in important areas not included in CUs, (c) monitoring, and (d) the management of the PMMA program by focusing on strengthening the political and institutional articulation and structure at municipal and regional level.

Particularly for the case of the coastal municipalities of the state of Rio de Janeiro that were visited during the fieldwork research, among the 12 in total only six municipalities have their PMMA already elaborated, primarily those around the lakes of São João, including Araruama, Arraial do Cabo, Armação dos Buzios, Cabo Frio, São Pedro da Aldeia, and Rio das Ostras, as well as the PMMA of the Rio de Janeiro municipality. Indicatively, the PMMA of São Pedro da Aldeia municipality recognizes the contribution of the artisanal fishing to the local economy and recognizes the historic perseverance of the artisanal fishers that continue to live and work in the areas around the Araruama lagoon despite the intensified territorial occupation.

Furthermore, those municipalities under analysis concentrate a vast number of federal state and municipal CUs that belong to the Mâta Atlantica biome. Indicatively, among the CUs of integral protection were identified through the platform of consolidated data of the National Registry of Conservation Units (Cadastro Nacional de Unidades de Conservação, CNUC)⁶⁴, exclusively or partially in their territories, four Natural Monuments, six State Parks, 22 Municipal Parks, two national parks, one Refuge of Wild Life, three Biological Reserves. Additionally, 35 APAs, two marine RESEX, 13 RPPN, and one recognized mosaic of CUs in the Carioca landscape are registered in the territories of the municipalities under analysis (Cadastro Nacional de Unidades de Conservação, MMA). A subcategory of 24 entities from the aforementioned registered CU in the municipalities visited during the fieldwork belong to shared biomes between Mâta Atlantica and marine ecosystems, and thus affect more directly the artisanal fishing communities. Among the

⁶⁴ Source: <<http://www.mma.gov.br/areas-protetidas/cadastro-nacional-de-ucs>> Accessed on 20 February 2019

latter, only seven have established management plans and councils⁶⁵, while the rest lack management plan⁶⁶, council⁶⁷, or even both⁶⁸.

5.1.3 Socio-environmental equilibrium in environmental public policies

The slow and long evolution of legal provisions and public policies from the perspective of preservationism have resulted in the creation, multiplication and historical expansion of CUs in the national territory. Such reality is based on the concept of the "untouchable" nature that Diegues (2001) devalues as a neomyth transposed for the developing countries. According to the author, this abstract idealization of the "wild environment" imposes the narrative of the modern man of the city in the search for lost Eden, and the romantic perspective of the landscape beauty and the purity of the natural areas without population, or else, the "empty space" (DIEGUES, 2000), which needs guardians to protect the last wildlife isolated territories from the man that devastates, invades and depreciates them, without exception for the traditional and indigenous communities that in reality occupy these public and communal spaces.

Menezes and Siena (2010) report that this aspect of preservationism, also named classic conservationism or deep ecology by several authors, valued the contribution of biology science, and tried to restrict economic activities through legislation and state intervention at the areas of interest even though the economic growth model has not been explicitly challenged. According to the authors, the current wave of sustainability proposed posteriorly a new economic model that establishes the valorization of natural resources while they are useful for development, cherishing not only the intrinsic value of nature but also the practices and cultural diversity of local communities. In Brazil, reflections on the value of protecting the natural environment from the political and economic perspective aimed at national progress pre-existed from this North American or European ecological romanticism, despite the fact that ultimately the predatory economy

⁶⁵ (a) Reserva Biologica Estadual de Guaratiba, (b) Monumento Natural dos Morros Do Pão do Açucar e Urca, (c) Parque Natural Municipal de Grumari, (d) Parque Natural Municipal da Prainha, (e) Parque Nacional Restinga de Jurubatiba, (f) APA da Bacia do Rio São João -Mico Leão, (g) Área de Proteção Ambiental de Maricá.

⁶⁶ (a) Parque Estadual da Costa do Sol, (b) Parque Natural Municipal da Restinga do Barreto, (c) Parque Natural Municipal Penhasco Dois Irmãos-Arquiteto Sérgio Bernandes, (d) Parque Estadual da Lagoa do Açú.

⁶⁷ (a) Refúgio da Vida Silvestre Municipal das Serras de Maricá, (b) Parque Natural Municipal Paisagem Carioca, (c) APA Municipal das Serras de Maricá.

⁶⁸ (a) Parque Natural Municipal dos Corais de Armação dos Buzios, (b) Monumento Natural Ilhas Cagarras, (c) Parque Natural Municipal Darke dos Mattos, (d) APA do Morro do Leme, (e) APA do Orla Marítima da Baía de Sepetiba, (f) APA de Grumari, APA da Orla Maritima, (g) APA da Prainha, (h) APA das Pontas de Copacabana e Arpoador e seus entornos, (i) APA Paisagem Carioca.

prevailed and environmental protection movements changed strategies. Thus, the prohibitions of the use of specific natural resources appear early, and later, conforming to international models, the delimitation of specific territories (COSTA; MURATA, 2015), which in many cases disregarded their use by traditional populations.

Nowadays, this aspect of applied environmentalism in Brazil's public policies not only values the perspective of the "untouchable" nature, but also recognizes the lands with a public character and presumes the nation-state as a central instrument to carry out total control over its territory based on results of scientific research (LITTLE, 1992), which in some cases may have been misused in making decisions according to interests of the hegemonic system.

A new paradigm is needed to escape the logic of the false antagonism between environmental protection and the well-being of traditional communities. The rigidity of preservationist public policies from the territorial perspective has already been challenged by another strand called socio-environmentalism (LITTLE, 2002). According to the latter, the dominant conservation model, as conceived by conservationists, fails to consider the set of social and cultural interrelations of local and / or traditional communities that are unjustly expelled from areas of ecological concern threatening their way of life (COSTA; MURATA, 2015). Menezes and Siena (2010) emphasize that this socio-environmental perspective recognizes economic and technological progress, but primarily appreciates the potential contribution of ecological knowledge of local communities as a valid complementary source of information that may be challenging segmented traditional sciences, and recognizes asymmetries in the use of natural resources or distribution of costs under the principles of human rights and respect for nature. It is worth noting that, despite the dominant influence of preservationism, Foletto (2013) observes that some public policies regarding conservation of biodiversity take into account the ecological balance and the quality of life at various scales of territory. Yet, the lack of consensus among government agencies and other institutional agents on the adopted line of environmentalism is reflected in the lack of coherence of environmental public policies on such territories.

5.1.4 Integrated environmental public policies for coastal and marine ecosystems

Jones *et al.*, 2013 in an effort to identify forms of governance that promote best effectiveness, adopts a rather positivist approach by comparing a small pool of worldwide cases scoring of five-governance-approach-categories on the basis of expert opinion that used key-incentives as indicators juxtaposed with the per capita GDP, the Human Development Index (HDI), and with the six-dimensional state capacity ranking of the World Bank. According to this study Brazil falls into the fifth category in which there is no "clearly recognizable effective governance

framework in place”, a category of medium per capita GDPs, low state capacity and low effectiveness. More particularly, the absence of political, leadership or state capacity prohibits mitigation of conflicting situations. Overall, a wide matrix of inter-connected incentives, including legal, are fundamental for the reinforcement of both the biological and the institutional diversity, fostering a dual perspective, to be key factors for improvement of governance as it permits “functional redundancy” and “response diversity” (JONES *et al.*, 2013).

This view though not adequately explored the impacts of possible distortions in those incentives. Nor can it be satisfactorily applied to the case of Brazil due to ineffective and not-coordinated local institutional interventions in the absence of complementary local capacity enhancement measures, in spite of having some proactive measures triggered by fiscal and credit incentives, as well as an excessive variety of mechanisms and institutions, among which secretaries and representative local councils, that promote participative governance (DA VINHA; MAY P.H., 2015). Jablonski and Filet (2008) observe that the Brazilian institutional framework fails to weaken conflicts of use in coastal territories, despite the recognition of the coastal zone -expanding 50km inland and 12 miles from the coastline to the sea- as part of the national heritage according to article n° 225 of the Federal Constitution of 1988, as the existing national, state and municipal planning, the coastal ecologic-economic zoning, as well as the creation of permanent preservation areas were either partial or restricted measures. In the absence of a stable legal regulatory framework and embedded rules within the extremely varied and multilevel political environment of shared responsibility in Brazil, Da Vinha and May P.H. (2015) further suggest that effectiveness depends highly from political will, commitment and the circumstantial intergovernmental agreements, which may be shortsighted at the local level.

In addition, speculation, conflicts, lack of knowledge and uncertainties weaken even further this decentralized regime as applied in Brazil, calling out for legitimacy, coherent strategies and financial reinforcement of the local governance for it to foster innovative solutions. In this direction, Tabarelli *et al.* (2005) accentuates the need of integration of the existing regulation, public policies, projects, programs and other tools that are already available, under a number of principles of sustainable governance including the consideration of the natural geographical boundaries and the restoration of the ecosystems under protection which are included in the biological network, collaboration among different agents and performance monitoring to guarantee the effective use of the resources for the implementation of the sustainable landscapes reinforcement.

A decade ago, UNEP already recognized the necessity for a holistic and intersectoral approach for the coastal and marine environment, as well as the hydrographic basins, under the Integrated Coastal Management regime. Yet, only recently, national and state environmental

policies included measures to strengthen the institutional capacity destined to implement interconnected instruments of policies in the process of improving the system of biodiversity governance within a complex regime of shared responsibility, set by the federal system of Brazil, which is rarely coordinated, complementary or applied consistently. Among other, the Ministry of Environment of Brazil (Ministerio do Meio Ambiente -MMA) has adopted the principle of the integrated coastal management that is not only administrating through specific tools the use of the resources of the coastal zone but also considers the sectoral activities that have a social and environmental impact.

In the report on the 25 years of coastal management in Brazil⁶⁹, it was clearly set the importance of elaborating environmental public policies that would minimize adverse impacts and implementing such systems of environmental management that would attend all interests including those related to the water resources. Nevertheless, in practice there are some challenges in the integration procedures, due to the disregard of the effects of the coastal hydrodynamics on the inland natural resources management planning⁷⁰, and the divergent territorial reference of the management systems; for instance, water resources set as unit the hydrographic basins whereas for the coastal management are the municipal territories⁷¹. The National Coastal Management Plan (Plano Nacional de Gerenciamento Costeiro, PNGC)⁷², legally obliges each coastal state to elaborate its State Coastal Management Plan (Plano Estadual de Gerenciamento Costeiro, PEGC) according to the pioneer PEGC of São Paulo in 1998⁷³, for the rational use of resources in the coastal zone by creating zones of uses and activities with the participation of the union, state and municipalities. However, the advancement of these processes is slow and variant from one state to another⁷⁴. The zoning processes in the absence of PEGC follow other projects in force, for example

⁶⁹Source: <<https://www.mar.mil.br/secirm/publicacoes/gerco/gerco.pdf>> Accessed on 20 March 2017

⁷⁰The water cycle depends on both ocean and land evaporation-precipitation cycles that regulate regional temperatures. Given this fact, any human-led alteration the conditions in which those natural processes occur, for instance a change of sea density due to micro-plastics, plastics and pollution in the inland water bodies and oceans, could have unpredictable impact on the water cycle.

⁷¹The same report proposes the estuary regions as the intersection between the two systems.

⁷²Source: <http://www.mma.gov.br/images/arquivo/80033/PNGC_I.pdf> Accessed on 20 February 2019

⁷³Source: <<http://www2.ambiente.sp.gov.br/cpla/zoneamento/gerenciamento-costeiro/>> Accessed on 20 February 2019

⁷⁴The states of São Paulo (Law no. 10019/1998), Santa Catarina (law no. 14465/2008), Espírito Santo (Law no. 5816/1998), Ceará (law 13796/2006) and Rio Grande do Norte (law no 6950/1996) each succeeded in forming their PEGCs. However, Pernambuco (state law no. 14258/2010), and Ceará (law 13796/2006) constituted the state coastal management policy. On the contrary, in 2017, the State Attorney's Office investigated the absence of the PEGC in Amapá despite Law no. 1089/2007 and recommended the immediate acceleration of the Municipal Plans of the Coastal Zone of the state and elaboration of a multi-institutional management project by establishing a multidisciplinary

ZEEC or the Orla Project. Therefore, there is no consolidated information on the extent of impact on local traditional communities due to planning in coastal and marine CUs, as well as other territorial delimitations including hydrological basins and ZEECs.

5.2 TERRITORIAL MANAGEMENT IN NATURAL RESOURCES GOVERNANCE

Among the factors challenging the effectiveness of public environmental policies are the different uses and meanings of the territory, the high complexity of the institutional arrangements managing terrestrial and marine areas of ecological interest, and the overlapping or lack of demarcation of communal lands. This section explores the difficulty of integrating different territories from the perspective of public environmental policies in the case of coastal states.

5.2.1 Territorial divisions in environmental public policies

The CUs are the only public policy that formally and obligatorily have biodiversity-related objectives in their legal instruments in relation to other territorial planning strategies, such as mosaics and corridors (D'ARRIGO, 2014). According to Medeiros *et al.* (2007), although the federal CUs are reinforced, the rest types of CUs, such as legal reserves and APA that, in number, were mostly limited in the south and southeast axis of Brazil, have no precise data for integrated and effective management. According to Little (1992), the territorial unit defined by preservationism is a developmental and effectively questionable measure due to the lack of financial and human resources and necessary infrastructure (GURGEL *et al.*, 2009, MMA, 2011) for their effective management and the inability to actually measure the impact of the creation of “untouchable” areas in the lives of indigenous people, quilombolas and other traditional and extractive communities (MEDEIROS *et al.*, 2007).

Thus, according to the authors, the expansion of CUs is a limited strategy for the protection of biodiversity and should be complemented to include the social aspect. This conclusion is supported also from another perspective; the rigidly defined and classified territories of the biodiversity CUs, or else “hot spots”, neglect possible interactions with their marginal ecosystems that trigger the

participation. The state of Maranhão, in turn, only carried out in 2017 a technical workshop for the creation of PEGC and in the state of Piauí, points were discussed for an updated implementation of the PNGC at the municipal level. Also, in Sergipe, despite the previous contribution of the Orla Project in the elaboration of evaluations of some municipalities, meetings regarding the construction of PEGC occurred only in 2017. Similarly, in Alagoas after the creation of GERCO / AL to coordinate the PEGC, thematic evaluations and the creation of the exclusion zone, the state coordination of the Orla Project was only established in 2009. In Piauí the elaboration of the ZEEC began in 2010 complementary to the ZEE of Baixo Parnaíba.

evolutionary and adaptive procedures⁷⁵. Even more so, for the case of the Atlantic coastal flora, the high “ecological plasticity” of which may cause wider landscape alterations under different scenarios of global climate change (Scarano, 2002). Thus “hot spots”, are highly delimiting for not considering the dynamic evolution of the ecosystem in relation to the space/territory, nor the need for connectivity among different units of the biome. Nevertheless, there are institutionalized CU categories that strengthen the sustainability in socioecological systems including the Sustainable Development Reserve (Reserva de Desenvolvimento Sustentável, RDS), Environmental Protected Area (Área Protegida Ambiental, APA) and Extractive Reserve (Reserva Extrativista, RESEX) on land and sea. However, in spite of successful initiatives in Brazil, the creation and implementation of these units for sustainable use are still in many cases established without consulting the traditional local communities, thus marginalizing their contribution in the management planning process of these territories (TEIXEIRA *et al.*, 2016) which is yet to be initiated in many cases. As a result, most of the protected areas in Brazil still do not have an established management plan. Santos and Schiavetti (2014) underline the State's lack of local processes for the development of marine RESEX and assert the need for the Brazilian State to provide additional institutional support to these CUs. The authors evaluated the managers of 20 marine RESEX along the coast of Brazil that belong to the Larger Marine Ecosystem (LME's) of Brazil, and concluded that for most cases, the institutionalization of local processes is not yet adequate for the conservation objectives, or even less for the economic sustainability of local users.

Currently, two decades after the first Macrodiagnostic of the Coastal Zone of Brazil elaborated on the year 1996, the Ministry of Environment (Ministério do Meio Ambiente, MMA)⁷⁶ elaborates the second macrodiagnostic focused on the new processes of patronization and classification on the vulnerability and the geologic morphology and the coastal and marine habitat in a format of a digital platform as a guide for the public policies on the feasible and integrated management in the current scenario of climate change. The model of characterization and digital mapping of the macrodiagnostic of the coastal zone presents as descriptive subjects the coastal and marine habitats, the population, the economy and the structure for management, and as interpretative themes the compatibility of use and activities, environmental vulnerability, installed capacity for management and area of interest.

⁷⁵Scarano (2002) perceive Atlantic coastal flora to have a dual nature that entails both the forests and the neighboring open vegetation.

⁷⁶Source:<<http://www.mma.gov.br/component/k2/item/7562?Itemid=866#2--macrodiagn%C3%B3stico-da-zc>>

Accessed on 20 February 2019

In the first macro-diagnosis the indicators were focused on the fragility of ecosystems, environmental risks by the oil industry, as well as water, waste and sewage services considering population and urbanization trends. Such an initiative revealed the need for legal protection of coastal and marine ecosystems, the fundamental role of both municipalities, having the responsibility for implementation, and the central government, being a strategic actor, both of which would contribute to the realization of ecological-economic zoning (Zoneamento Ecológico Econômico, ZEE). It is an instrument which was established by Decree n° 4297/2002 to regulate the environmental zoning foreseen by PNAM according to Law n° 6938/1981. ZEE intended to order and map the state territories according to a set of criteria adjusted at the potentials and fragilities of the socio-economic and ecosystemic systems under its limits and conforming the legislative orientations.

Subsequently, Decrees n° 6288/2007 and n° 7378/2010 defined the scales of products resulting from the ZEE and established the criteria for uniformity, compatibility and integration of different administrative levels and territorial scales⁷⁷. Based on the results of the ZEE on the year 2006, the Southeast region seems to have the highest percentage of the federal government's public policy instruments for coastal management in Brazil, which indicates that the implementation was not homogeneous or is not in the same phase among different regions or even states of Brazil⁷⁸. In addition, the final report of the Court of Auditors of the Union (Tribunal de Contas da União, TCU) on the effectiveness of the ZEE on the year 2009⁷⁹, despite having a delimitation of scope especially for the Legal Amazon, revealed the lack of a single platform of systematized data and little institutional articulation within the Union.

Accordingly, the diagnostic and prognostic phase of the ZEE may present an opportunity or threat to indigenous communities, given that in spite of their rights to exclusive use of their land for artisanal production, hunting and fishing in accordance with environmental legislation, the state may interfere if it considers them buffer zones of CUs or corridors expanding roads and other public services, regardless of the manifestation of the communities or the absence of public policies that systematize improvements in their socioeconomic conditions. It should be added that, despite the

⁷⁷ Sources: <http://www.planalto.gov.br/ccivil_03/decreto/2002/d4297.htm> and <<http://www2.camara.leg.br/legin/fed/lei/1980-1987/lei-6938-31-agosto-1981-366135-publicacaooriginal-1-pl.html>> Both accessed on 20 February 2019

⁷⁸ In the case of ZEEC only the states of Santa Catarina, Paraná, Bahia, Piauí have the technical and instrumental basis for the elaboration of the instrument, while the states of Rio de Janeiro, Sergipe and Alagoas are more backward and only São Paulo has advanced moderately.

⁷⁹ Source:<http://www.mma.gov.br/images/arquivo/80032/Avaliacao_TCU/Relatorio%20final%20de%20avaliacao%20do%20PZEE%20TCU.pdf> Accessed on 20 February 2019

expectations of the government, the private sector and traditional communities, the internalisation of the territorial planning in the creation of CUs or environmental licensing was limited, resulting in the loss of credibility of the ZEE.

Likewise, the Annual Evaluation Report of the Multi-Annual Plan (Plano Plurianual, PPA) 2012-2015⁸⁰ identifies vulnerabilities arising from: (a) the discontinuation of the ZEE processes in some regions, despite advances in coastal states foreseen to be concluded in the PPA 2016-2019 and the obligation to complete the stages of the ZEE in five years; (b) the lack of an integrated territorial database and an in-depth link with other environmental and territorial planning instruments; and (c) weak participatory mechanisms in decision making. The low permeation of society in the dialogue and construction of the ZEE is attributed by macrodiagnosis in the lack of interest by society. Thus, macro-evaluation emphasizes decentralization and social participation as important forces for management, an aspect already recognized by the Coastal Management Law, the Orla project, the Executive Plans and Agenda21. The institutional design of the Projeto Orla⁸¹, a plan of the federal government for decentralized and integrated management of the coastal territory, is based on the municipal management and planning in collaboration with state agencies (Órgãos Estaduais de Meio Ambiente -OEMA) and local administrations (Superintendências do Patrimônio da União nos Estados)⁸² for intervention planning for activities within the territory or in the surrounding area of either the coastal zone⁸³, or each individual stretch of seashore. The necessity for an emphasis on the urban areas was already acknowledged in 2005 as preexisting deliberative forums, even with focus on urban issues, were inserted in the process of formation of local management committees for the project after certain requirements⁸⁴.

However, Menezes *et al.* (2016) through a case study evaluation highlights the difficulty from the part of representatives of the public power to accept the participation of society in shared management. Even more so, the southeastern region of Brazil always has the greatest appeal for

⁸⁰ Source: <<http://bibspi.planejamento.gov.br/bitstream/handle/iditem/709/relatorio-avaliacao-ppa-vol2-programas-tematicos.pdf?sequence=2&isAllowed=y>>

⁸¹ Source: <http://www.mma.gov.br/estruturas/PZEE/_arquivos/28_05122008111304.pdf>

⁸²Source:<http://www.mma.gov.br/estruturas/orla/_arquivos/relatorio_reuniao_dia_12_de_maio_cte_copa_projeto_orla_11.pdf> Accessed on 27 March 2017

⁸³Refers to the generic characterization of the municipality and allows for elaboration on the socio-economic structure, political and institutional structure, plans, projects, and legislation. Source: Fundamentals for the integrated management, 2006 <http://www.mma.gov.br/estruturas/orla/_arquivos/11_041220081112_38.pdf> Accessed on 27 March 2017

⁸⁴The creation of a technical chamber and participation to the capacitation workshops. Source: Guia de implementação, 2005 <http://www.planejamento.gov.br/secretarias/upload/arquivo/spu/publicacoes/_081021_pub_projorla_guiia.pdf> Accessed on 27 March 2017

economic development that facilitates the overlapping of power games and interests that are not exclusively socioenvironmental. In 2016, the process of elaboration of Management Plans (PM) of the Marine Environmental Protection Areas (APAM) of the Coast of the State of São Paulo, coordinated by the Forest-FF/SP Foundation (Fundação Florestal-FF/SP), had impasses related to the characterization of extractive and fishing activities of small-scale artisanal fisheries for which only secondary data are available, which may negatively impact the effective planning for the management of the artisanal fishing sector in this part of the coastal territory (CLAUZET, 2016).

Katsanevakis *et al.* (2011) criticize both pre-existing administrative units and APAMs created in certain areas, even if adjusted for local ecological conditions, for essentially ignoring the dynamic interdependence of ecosystem components. For adaptive management, the authors promote the emerging paradigm of Ecosystem Based Marine Spatial Management (EB-MSM) considering interactions in the ecosystem and human uses in time and space. Also, Elher (2018) among his suggestions for the optimization of marine spatial planning through integrated, long-term strategies and continuous adaptation, focused on the ecosystem, adds the parameter of territoriality in marine spaces, that is the focus to those marine spaces that local actors recognize, are concerned and are identified.

5.2.2 Scaling territorial units for harmonised environmental governance

Governance models based on different territorial configurations is a major challenge, especially in territories of coastal states where the complexity increases considerably due to their connection to the marine environment. The establishment of an ideal territorial unit is considered as a tool for environmental management to predict and/or resolve local and/or regional conflicts. Environmental policies with territorial rearrangements, which guarantee the permanence and use of land / sea / rivers by the users of the commons, is a key aspect for the construction of innovative public policies in the socio-environmental context, since the way of life of the traditional communities is very susceptible to the potential damages by external interventions in the territories they occupy (DIEGUES, 2001; SILVA, 2017). Territoriality is defined as a historical product of the collective effort of a social group to occupy, use, control and identify with a specific part of its biophysical environment that becomes territory or homeland (LITTLE, 2002; TEIXEIRA *et al.*, 2016). Moreover, Little (2002) also recognizes the sociocultural and political aspects that manifest in multiplicity depending on the regimes of property and the affective bonds of the groups occupying the territory. Teixeira *et al.*, (2016), for example, present the multiple dimensions of

territoriality, giving the example of the artisanal fishers: their cultural tradition encompasses all the different forms, that is, land, sky and sea in the notion of territory.

Each territorial division is constructed with different criteria and diverse extent, which is attributed in natural resources, physical geography, institutional arrangements shaped by social conventions, values and rules, as well as in the social organization of economic production (MARINI; DA SILVA, 2012). Inversely, as much as each territory depends on the natural resources and the actors that belong to or act in its physical space, it also carries its own organizational and institutional repercussions. Its boundary areas signal the point of friction, contrast and comparison with the "other" that generates interdependent processes of self-definition, despite the occurrence of common transforming historical events (DE SANTOS, 2005). FALÇÃO (2014) particularly observe a transformative duality in the marine territories that is defined either through the interaction of the users or the central governmental institutions:

“the sea is socially contiguous as a space of conflicts and constellations, as a scenario for interaction informed by territorialization processes that involve the generation of territories and the antagonistic identities. In this manner, the space has different norms and rules of behavior that are defined by the legal system of the fishers or the legal system of the state and its instances”.

This territorial heterogeneity hinders the harmonization of actions and creates conflicts on institutional decision-making and the attribution of responsibilities among actors, especially when multiple agents appropriate the territories informally or in an uncoordinated manner, without neglecting that the institutional overlap on territorial divisions implies several scales of importance. It should be added that mediation in view of territorial conflicts can not be fruitful if they do not establish the same legitimate territorial reference base to analyse the impact and importance of preservation and infrastructure for local development. These arguments that place the concept of the territory as the geophysical space in conversation with the economic, social and cultural dimensions (Da Silva, 2014) favor the abandonment of the rigid territorial-political-administrative limits and, simultaneously, the adoption of a socio-environmental macro vision that adapts better to the size of socio-ecological systems under the focus of the public policies. The political moment for the integration of environmental public policies in Brazil faces real challenges, such as manifested in the territorial overlaps between protected areas, basins, municipalities and lands of traditional and indigenous communities. The territorial definition with heterogeneous criteria, not only in the case of CUs and hydrographic basins, but also of the municipalities and states themselves, impacts the implementation and performance of public environmental policies in favor of sustainable

development in coastal areas. In these areas, environmental management, already undermined by the lack of a consolidated common database for all the institutions involved, is weakened by multiple institutional links, as they establish simultaneous protection statutes and territorial divisions for management with similar or even antagonistic purposes as defined by each public environmental policy (Medeiros and Garay, 2006). According to Medeiros *et al.* (2007), the cross-cutting articulation between different levels of government and between different territorial divisions for the protection, conservation and management of natural resources is necessary to reinforce integrated systems of environmental governance.

However, the current overlaps among different overlapping national, state and local institutionalised actors contributed in the actual divergence of the territorial cuts as adopted in public policies, and, thus, turning the process of integrating the territorial base units even more difficult, vague, contradictory and complex. Overall, it raises the question of the spatial compatibility of the environmental problems and the governmental structure resulting to inefficiencies and externalities that cannot be mitigated with traditional means of governance. Neither the federal nor state jurisdictional delimitation coincide necessarily with the geographical delimitations of the ecosystems (TABARELLI *et al.*, 2005). These actors influence governance and territorial management by formulating various strategies (PRESTRELO; VIANNA, 2016) according to the interests related to the use of the particular territories in question and, above all, of the different types of Conservation Units (CU), CU mosaics, ecological corridors, landscapes, and water bodies (including riverside parks or hydrographic basins). Consequently, environmental public policies intent to make configurations in territories of different types and geographical or political-administrative limitations⁸⁵.

D'Arrigo (2014) points out that this great variety of territories defined by considering environmental protection has a potential that can be exploited by creating networks of territorial units geared towards specific strategies. The author proposes the incorporation and systematic readjustment of legal instruments of a broader set of infra-legal areas for conservation purposes, as they appear in the management plans, which would improve the effectiveness of public policies. However, one of the challenges of the new territorial references would be the integrated governance and the adequate articulation of the institutions and the organizational structures involved in the base of directives and actions promoting the integration of territorial planning policies in the context of climate change (IWAMA *et al.* 2016). Such orientation complies with the UN Agenda 2030 for Sustainable Development promotes regional, national and local efforts to integrate natural resource

⁸⁵Scarano (2002) perceive Atlantic coastal flora to have a dual nature that entails both the forests and the neighboring open vegetation.

governance in a more holistic perspective that seeks to improve effectiveness through convergence while ensures human rights and meets the needs of the local population. Hence, in order to build a consensus on micro and meso regions, a new arrangement is needed integrating the different scales of governance, primarily at the subnational level, focusing, for example, on strengthening networks among municipalities and / or between municipalities.

From the perspective of the National Water Resources Policy (Política Nacional de Recursos Hídricos, PNRH) established by law nº 9433/1997⁸⁶, the territorial unit is considered to be the hydrographic basin. In the coastal territory, the administrative geographical delimitations appear to fragment the hydrographic basins, whose classification is derived from the natural configuration of the drainage system in several levels⁸⁷. In addition, the reports on the Water Resources in Brazil in the years 2013 and 2017⁸⁸, reveal the diverse distribution of the Brazilian biomes in relation to the territorial delimitations of the hydrographic basins. According to the reports, the creation of new CUs need to be considered since the environmental services especially at the head-streams for the production and conservation of groundwater and surface water resources. Preserving the remaining native vegetation reduces surface run-off and soil erosion, and also protects both the quantity and quality of the hydrological cycle of water bodies that are altered by the impact of climate change.

However, the reports indicate the relative consensus in the various levels of water resources governance regarding the need for effective integration with other sectoral public policies, especially in the area of environmental conservation in coastal areas, which could lead to new spatial configurations in the management, despite the explicit multidimensionality in the National Water Resources Plan that serves as a subsidy for such decision-making processes destined to address both environmental issues as well as specific gender and cultural issues. Alternatively, Maciel (2007), explores the role of mosaics, being the *“set of two or more nearby or juxtaposed conservation units with or without connectivity between them that are managed together, even partially”*, as a viable alternative strategy against land fragmentation and biodiversity loss based on landscape ecology and the consideration of the ecological services. According to the author, such mosaics, through the institutionalization of councils responsible for the management of the territory, could facilitate synergies as provided by the National Strategic Plan for Protected Areas (Plano

⁸⁶Source:< http://www.planalto.gov.br/ccivil_03/leis/19433.htm> Accessed on 20 February 2019

⁸⁷Source:<<http://portal1.snirh.gov.br/ana/apps/webappviewer/index.html?id=9cc5900ceb0d4c279305d43197980dd8>>
Accessed on 20 February 2019

⁸⁸Since 2009, the year of the first report of the Conjuntura Pleno (milestone), the annual reports update the following quadrennial report. To date, two more reports are published in 2013 and 2017 respectively. Source: <<http://www.snirh.gov.br/portal/snirh/centrais-de-conteudos/conjuntura-dos-recursos-hidricos>> Accessed on 20 February 2019

Estratégico Nacional de Áreas Protegidas, PNAP)⁸⁹. In those efforts, it is essential that socio-political factors be included in the determination of these services, as required by the article 26 of the SNUC law: “mosaics are constituted of a total of conservation units of different categories whose management must be integrated and participatory, considering the different conservation objectives, including the presence of biodiversity, the enhancement of social diversity and sustainable development in the regional context”⁹⁰.

The author suggests the institutionalization of the land management with the method of mosaics through councils, which could facilitate synergies between different actors as provisioned by the National Strategic Plan for the Protected Areas (Plano Estratégico Nacional de Áreas Protegidas – PNAP) of the Ministry of Environment that focuses on the consolidation of SNUC in the three spheres of government, harmonization with other sectoral territorial orders, and the integration of land and sea territories occupied by traditional communities securing their territorial rights. The assessment of the territorial management instruments themselves, including reserves, corridors, mosaics, river basins and coastal zones, in the light of conflicts, overlaps and social issues is explicitly one of PNAP's strategies. However, Freitas (2014) observes that the recent increase in the number of CUs in the Brazilian territory, in fact, do not reach the goal of sustainable development, since these CUs have been questioned by both civil society and a part of academia for their process of implementing a top-down model without participation of local communities. Similarly, Gurgel *et al.* (2009) mention that conservation actions are also foreseen in indigenous lands, even though they are not classified in the protected areas category within the SNUC, but are still considered protected territories as justified by the perspective of complementarity between conservation and sustainable development.

Even further, De Oliveira Faria (2016), in her dissertation embarks from the biome-level approach in her effort to address the adjustment problem with cross-scale and cross-level governance for the case of Mata Atlântica Biome. She suggested the use of specific and less hierarchic organizational structures including autonomous committees and agencies from socio-economic governmental and non-governmental actors that belong to social and ecological

⁸⁹ Established by the Decree 5758/2006 with a deadline for its implementation up to the year of 2015 in the framework of the national commitments derived from the adoption of the Working Program for Protected Areas of the Convention on Biological Diversity (CBD). Source: <http://www.mma.gov.br/estruturas/240/_arquivos/decreto_5758_2006_pnap_240.pdf> Accessed on 20 February 2019

⁹⁰ Original text: “*os mosaicos são constituídos pelo total de unidades de conservação de diferentes categorias cuja gestão deve ser de forma integrada e participativa, considerando os distintos objetivos de conservação, incluindo a presença de biodiversidade, a valorização da diversidade social e do desenvolvimento sustentável no contexto regional*”.

subsystems per biome to adaptively attune jurisdictional scale with the territorial dimensions of the biome. Under the green agenda that prioritizes biodiversity conservation, the author highlights the potential of the biome perspective to consolidate the model of environmental governance, more so than the hydrographic basin or region. Still, the proposed model, which the author names “Governance of Scales” lacks of an integrated consideration for the water resources and is proposed as a parallel mission-focused network configuration of the existing federal system to encourage dialogue and synergy. Yet, the dispersion of the Mata Atlântica Biome into so many states, including Rio de Janeiro state, renders such model to be particularly ambitious.

While overlaps between indigenous lands and UCs are not solved, leaving 3.7% of the so-called protected areas in dispute (MMA, 2011), the PNAP foresees the creation of integrated systems for the management of these territories with the representation of local communities, through the preparation and constant revision of the Management Plans. According to Foletto (2013) the Management Plan is a document that establishes the zoning and norms of the use and management of the natural resources of the territory, and can provide interventions to facilitate the general objectives of such uses and management, yet in reality they have few concrete operational elements (MMA, 2011). However, the participation and representativeness of the different local actors is weak and of limited interaction within the collective decision-making bodies in the elaboration of Management Plans, most of which are elaborated for the cases of CUs of strict protection. Cozzolino *et al.*, (2015) also observe the superficial or implicit form of the participatory processes foreseen in the PNAP, despite the adopted principles of deliberative democracy and the SNUC rigorous details for the deliberative processes in order to guarantee legitimacy. For the authors, the deliberative or advisory nature of the institutional bodies depends on the type of CU or remains undefined, limiting the public consultations to merely spaces of communicative confrontation between the actors, due to the lack of prevision for obligatory compliance with the strategies or actions that are potentially agreed upon.

5.2.3 Territorialisation traumas in Brazil

Historically on the Brazilian coast, the processes of territorialization were impacted by the expansion of the colonization by dominant social groups in juxtaposition to the territorial claims of indigenous peoples, quilombolas and other traditional communities including the extractive populations (LITTLE, 2002). Similarly, the contemporary nation-state reinforced by nationalism and the concept of sovereignty remains the basic ideological pillar for the formation of thought that contributes to territorial subdivision (LITTLE, 2002). The territory is present, directly or not, in public policies through which the state articulates its sovereign vision and creates the circumstances

that traditionally in Brazil favor more the scenarios of sustainable development within the hegemonic context of capitalism (DA SILVA, 2014). Emphatically the political-administrative territory predominated, and other types predominated, underestimating the importance of natural resources as a determining factor for a territorial unit or ignoring a long-term view that would effectively consider ecosystems, water bodies and resource use natural features common to populations within territorial boundaries. In the historical context of the formation of political-administrative territories in the case of Brazil, land-use planning neglected not only natural resources, but also marginalized vulnerable social groups as demonstrated by the long and conflictive process of official delineation of indigenous and quilombola lands, to which De Santos (2005) refers as "territorialisation traumas" perpetuated in many regions of the country to this day.

According to Little (2002), the notion of public lands is established while the social territories of traditional peoples are disputed, since they do not conform in the dominant dichotomy between the public and the private (DIEGUES, 2000), but depend on the "ecological ethnicities"⁹¹. Recognizing multiple impositions on indigenous populations in Brazil, not only by the civilizing and colonizing process, but also by the establishment of the state and the nationalization of territories, Da Silva (2005) notes the importance of active resistance of these populations to the manipulation of their ethnic identity, instead of external and generalized categorizations for administrative and political purposes. According to the author, such efforts should promote the recognition of their interethnic heterogeneity and cultural diversity as it has evolved historically. A dominant classification of rights, rules and uses in the territories of common natural resources simplifies a complex reality which is based on the different scales of property rights. Schlager and Ostrom (1992) describe the differences between the authorized user, beneficiary, owner to title holder as defined by access rights and settlement at the operational level, and management, exclusion and disposal at the level of collective choices. However, traditional communities understand and use their territory following a mixed notion of public-private, that Schlager and Ostrom (1992) recognize as *de facto* regimes. Despite their contribution in reducing the unsustainable use of resources and establishing legitimacy of public policies, are limited once confronted by *de jure* regimes that are institutionally established by law. Phenomena of disputed property, illiteracy and limited political power only exacerbate unfavourable and discriminatory

⁹¹ The term refers to indigenous people, peasants, fishers, seed producers, forest dwellers and nomadic pastoralists who have historical institutions and with varied agroecological worldviews and autonomous governance practices (PARAJULI, 2001). The notion rejects conventional categories based on social class, tribe, language, or even religion, but seeks to identify similarities among groups that depend directly on the regenerative and recycling characteristics of nature to ensure their livelihoods (BERRY; PARAJULI, 2001).

circumstances (DIEGUES, 2000) which perpetuate the drama of official identification or recognition of these traditional communities (DE SANTOS, 2005) that is yet to be overcome.

However, the physical, political and organizational dimensions of the territory as currently defined allow the perpetuation of disputes and conflicts that weaken the effectiveness of environmental public policies. The historical evolution of the institution of the territorial zones of environmental protection created such a system that generates conflicts on the use and appropriation of land and of their resources in areas of ecological interest in Brazil (MEDEIROS; GARAY, 2006). The elaboration of the law that established the National System of Conservation Units (Sistema Nacional de Unidades de Conservação, SNUC) has already revealed obstacles to human presence in protected areas, raising questions about the pertinence of integral protection, reinforced by disputes regarding the identification of traditional populations and their territories (MMA, 2011).

According to Silva (2017), the efforts to organize the territory are not promising or equitable, as long as the dominant actors, and especially the State, perceive the territory mainly as a commodity, or else, as an arena of production, consumption and performance by economic actors. Both the processes of deterritorialization and the normative environmental laws are criticized as ways of institutional initiatives to facilitate the reproduction of large capital by unfairly penalizing traditional communities by economic degradation and / or loss of local ecological knowledge and cultural references⁹². The author acknowledges the spatial segregation in various regions of Brazil appropriated by interest groups who benefit from the developmental view of the State imposed on vulnerable socio-economic groups. In this context, real estate speculation, the focal points of industrial investments, energy policies, the construction of hydroelectric dams, the expansion of agricultural frontiers and risk preventive environmental policies are added to the historical pressure factors on the space of ecosystems and local communities. Major developments such as hydroelectric power plants in the Amazon or uncontrolled real estate development in the coastal region of Mata Atlântica cause direct and indirect negative impacts on the local way of life and can accumulate and overflow their negative effects to neighbouring territories, reaching regional scales, national and global⁹³.

⁹² The environmental legislation study by Júlia Veloso dos Santos (2018) also affirms that conservationist measures are aimed at neutralizing impacts on the environment by capitalist advancement and entertaining urban populations to the detriment of the constitutional and infra-constitutional rights of traditional peoples and communities. Source: <<https://jus.com.br/artigos/67401/legislacao-ambiental-conservacionista-e-a-ameaca-a-direitos-dos-povos-e-comunidades-tradicionalis>> Accessed on 20 February 2019

⁹³ Such diffusion to other territories may also bring the beneficial effects if the effective management of the common goods related to blue energy promotes environmental conservation and the economic sustainability of local populations, as in the case of fish resources, being high ecological and economic value mobile resources, which

In addition, the evolution of the high-density urban agglomerations was favored by economic development in an opposite evolution to the territories of traditional communities and indigenous peoples. Also, CUs are created predominantly in the spaces that were historically occupied by these social groups, placing a disproportionate weight on their way of life for sustainable development. Hernández (2017) points to the multiple and overarching circumstances that trigger environmental studies or interventions in the territories without the active and informed participation of local communities. According to the author, its consequences are accumulated passively throughout history by these communities forbidding inclusion and personal fulfilment. These factors aggravate socio-economic conditions and indicate the urgent need to consider them in environmental public policy processes. Another argument is presented by Saquet (2007), who emphasizes the cause-effect relationships between the different dimensions of social construction in interaction with nature and the real processes of territorialization in contrast to the fragmented view of academia such as in the areas of philosophy, geography, economics or sociology among others. However, nowadays, within the same academic-scientific perspective more integrative lines of thought have been developed including human ecology, ecological economics, among others, that contemplate social and environmental issues within territorial management. Therefore, one-dimensional territoriality weakens both the effective protection of the environment, and of vulnerable social groups and minorities.

As stated by Medeiros and Garay (2006), one-dimensionality does not allow the integration of public environmental policies in the disputed territories, generating conflicts and tensions with traditional communities in relation to the management of those lands. For instance, given these circumstances, artisanal fishermen living in the natural space by housing and fishing activity have been excluded by bureaucratic institutional processes, such as the register of the artisanal fishers that allows the receipt of the financial aid for fishing suspension during the reproductive periods of some species, which discourages participation. In addition, they are being antagonized by spatial planning that favors modernization and large-scale production. Thus, both individual and collective ownership of terrestrial and/or marine territories, as well as intergenerational local ecological knowledge that is embedded in their oral memory and transmitted from one generation to another suffer from negative impacts (LITTLE, 1994; DA SILVA, 2014). The devaluation of this cultural and historical register and its corresponding rights favors the processes of industrialization and urbanization of space and expands inequality, thus urging the irregular occupation of space for survival and also leading to ecosystemic impacts and changes in the biological behavior of aquatic fauna (DA SILVA, 2014, TEIXEIRA *ET al.*, 2016).

tend to populate new habitats and expand niches when conserved on a local scale.

5.2.4 Democratic gap in territorial division

Brent *et al.* (2016) recognized growing injustice and democratic gaps on the governance of land, forests and fisheries in Latin America. Among the causes, the authors attribute such trends to the historic phenomenon of re-concentration, the expansion of monoculture practices of crops with multiple uses in the market, the return to the primary economic sector, and the invasive land-grabbing from large-scale national or foreign capital. Brazil was one of the pioneer countries of new land governance implementation practices triggering regional processes in Latin America by sharing experience and capacitating other MERCOSUR countries to coordinate their efforts for a human-rights based policy-making on the basis of the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security set by FAO on 2012 (HALL *et al.*, 2016, BRENT *et al.*, 2016). During 2015, FAO, in support of regional initiatives, and Brazil's Ministry of Social and Agrarian Development reinforced a joint commitment to progressive land governance and implementation of the Guideline in Latin America adopting the narrative on family scale activities, on linking socio-environmental development and a territorial approach that respects autonomous, small-scale economic development and the rights of indigenous peoples (HALL *et al.*, 2016, BRENT *et al.*, 2016). Also, in the directives of the current 2030 UN Agenda ⁹⁴:

“We recognize that the traditional knowledge, innovations and practices of indigenous peoples and local communities make an important contribution to the conservation and sustainable use of biodiversity, and their wider application can support social well-being and sustainable livelihoods. We further recognize that indigenous peoples and local communities are often the most directly dependent on biodiversity and ecosystems and thus are often the most immediately affected by their loss and degradation.”

Second, the more democratic negotiation processes in the territorial planning phase (D'ARRIGO, 2014) could reduce conflicts and tensions, but above all a vision-mission for the governance of natural resources is needed, so as to better equalize the different demands. Currently, the guarantee of access to socio-environmental services offered by territories of importance for the preservation and conservation of the environment is not sufficiently considered in territorial

⁹⁴ Source: <<https://sustainabledevelopment.un.org/index.php?page=view&type=2002&nr=12&menu=35>> Accessed on 20 February 2019

planning strategies or in the monitoring and implementation of public policies (D'ARRIGO, 2014). In this sense, the Brazilian government's mission as established by 2030 Agenda, committed to adopt a three-dimensional model of development that favors the balance between economy, environment and society, can influence and manage favorable conditions to institute integrated and socially just public policies that redefine the landmarks and territorial uses.

A process of deeper comprehension and recognition of existing territorialities can create the favourable conditions for the construction and implementation of public policies with high legitimation by the actors involved. Little (2002) already perceived a new wave of territorializations in progress that created "a new political space" with the objective of institutional recognition of the different forms of territoriality as they exist between different indigenous populations, quilombolas, rural black communities, and extractivists. Ruckert (2010) emphasizes the new regionalism, a European neodevelopmentalist approach, which inserted into Brazil's public policies new concepts and uses of the territory by multiple actors in multi-scale scenarios. Given that the uses of land, both as a means and as a condition, define the distribution of political and economic power (Ruckert, 2010), it is essential to ensure the sustainable and just development, empowerment of local communities (users) as managers of the processes of exploitation of natural resources in their territories supported by formal public and private institutions.

In this context, the commitments of the Government of Brazil under the Aichi Treaty since 2010, reinforced by the sustainable development objectives (ODS) 1, assume that territorial changes aiming at environmental protection need not only be integrated in the fight against climate change, survival of traditional coastal communities living off the exploitation of natural resources. Nevertheless, Brent *et al.* (2016) denote that Brazil lacks pro-poor state redistributive land reforms, and regard the market assisted land reforms for the protection of existing land rights as contradictory. The issue of territorial ownership stood out in various initiatives from the organized Brazilian civil society^{95,96}, as those territories, or even waters, where those fishers live and act, are usually of public domain and the rights of use are granted to public or the private sector for large scale activities. This social mobilization reveal the need for territorial regularization and alternative

⁹⁵Report presented in 2016 by the Pastoral Committee of the Fishers (*Conselho Pastoral dos Pescadores –CPP*) titled “Relatório sobre os Conflitos Socioambientais e Violações de Direitos Humanos em Territórios Tradicionais Pesqueiros no Brasil”. Source: <<http://www.cppnac.org.br/>> Accessed on 20 February 2019

⁹⁶The ongoing Campaign for the Regularization of the Territories is a joint civil society initiative since 2012 of the *Movimento de Pescadores e Pescadoras Artesanais* (MPP), churches and other social movements. Source <<http://caritas.org.br/movimento-dos-pescadores-pescadoras-artesanais-lanca-campanha-pelo-territorio-tradicional-pesqueiro-em-brasilia/>> Accessed on 20 February 2019

governmental regimes that would allow multidirectional exchange of information, in appreciation of local ecological knowledge.

Among the solutions for more equal and sustainable land tenure reforms in correspondence with the SSF Guidelines, Brent *et al.* (2016) urge for a more systematic elaboration of issues related to urban development and the vulnerable urban populations, while Hall *et al.* (2016) propose a combination of international framework for national laws, policies and practices. Despite the support of the international scene for integrated solutions, such as the UN Sustainable Development Goals (SGD) for the period 2015-2030⁹⁷, environmental public policies especially in the coastal areas of Brazil, confront many challenges that impede the establishment of integrated natural resource management processes. The territorial policies that guarantee the permanency and the use of the land/sea/rivers by the users of the commons, or else environmental policies that acknowledge “the territoriality of the commons”⁹⁸ (BEGOSSI *et al.*, 2011), is a key-aspect for the construction of the innovative public policies in the social-environmental context, particularly for those reaching traditional communities that are very susceptible to possible damage due to their restricted territory and limited mobility. Furthermore, since most of the fishing yield in the formal markets of Brazil is provided by artisanal fishers, the local management of the sector should pursuit the equal share of the benefits emerging from the value added of the product along the supply chain.

⁹⁷Process developed since 2012, after Rio +20 to restructure the SDGs previously set by the Millennium Development Goals (MDGs). In 2015, the current agenda for sustainable development was defined through the document "Transforming our worlds: the 2030 agenda for sustainable development". Source: <<https://sustainabledevelopment.un.org/post2015/transformingourworld>> Accessed on 20 February 2019

⁹⁸ The term "territoriality of commons" refers to the perception of the spatial dimension and the implications that space has on the management and governance of one or more cultural and natural resources. Geographical boundaries and the use of common goods are outlined by political, administrative, cultural and ecological rules and definitions respectively (BEGOSSI *et al.*, 2011). From the perspective of social constructivism, Moss (2014) uses the term "spatiality of the commons," also recognizing the intrinsic relationship of multiple emerging territories to social, economic, cultural, historical constructions, and biological and material conditions with common goods. According to the author, the different visions of the actors / users involved and the institutions interfere in the dynamics and spatial structures, and in parallel, the space determines the biophysical and socio-economic character of a place or region. Thus strategies for governance of common goods need to explore the configurations of contested, multiple, and dynamic geographies that are determined by the plural constructions of the notion of commons.

5.3 NATURAL RESOURCES AND FISHING COMMUNITIES

5.3.1 Identification of artisanal professional fishers in Rio de Janeiro

The fishing sector, which, according to the Brazilian federal law (BRAZIL, 2009), includes both the extraction of species and/or aquatic flora, and aquaculture, can be classified according to the purpose of the activity. The first category of non-commercial/non-professional fishing serves scientific, subsistence and leisure purposes in accordance with specific legislation and professional practices. The second category of commercial/ professional fishing, as its name implies, aims to commercialize the product extracted, and is classified, according to the scale of activities, economic relations and means of production, in (a) artisanal and (b) industrial or 'capitalistic fish production' (DIEGUES, 1983). For the latter case, the capitalist character of extractive production manifests itself along the vertical chain of production in which the fisher loses decision-making power or cannot appropriate the captured fish. Thus, the fishing activity becomes a commodity of products and a wage-earning employment (ANDREOLI, 2007).

According to the categorization of the General Register of Fishing Craft Activity as adopted at the article 2 of the Decree no. 8.425/2015 (BRAZIL, 2015), the capacity of the vessels of artisanal fishers to carry yield is limited to 20 gross registered tons. FREIRE *et al.* (2015) follows the latter classification to estimate the number of vessels and the capture of fishing in Brazil for the years 1950-2010, attributing only one dimension to the artisanal fishing activity. However, the classification is usually confusing in practice. More specifically, artisanal fishers seek access to local markets, but also attribute subsistence and cultural value to their activity. The small-scale fishing production, to which artisanal fishers are engaged individually or within a close group of relatives and/or comrades, namely "camaradas", is central for the livelihoods of poor fishers' communities being their main source of quality animal protein for private consumption, but also source of income from commercial activity at the local markets (WALTER; PETRERE, 2007, BEGOSSI *et al.*, 2011, CATARINO; CLAUZET, 2014).

Yet, artisanal fishers often explore other economic activities to gain complementary income that exclude them from the professional categorization. In Brazil professional artisanal fishers are recognized as such by the Federal Government only if they are exclusively occupied in fishing activity despite the fact that their mean income is still low and there is no significant difference between the groups as indicated for the case of the community of Praia Grande and surroundings in Paraty in Rio de Janeiro state (DE MESQUITA NORA *ET AL.* 2017). The verification of the exclusive exercise of the craft is validated by the registration of the artisanal fishers to the fishing colonies, or else, the institutionalized collective bodies of artisanal fishers per municipality, which

provide the primary financial or social care support for the individuals that exercise of the craft including the activation of *defeso* benefit for the period defined by decrees and normative instructions of IBAMA/ICMBio (CLAUZET, 2003; CLAUZET; BARRELLA, 2004) as established by the law no 10.779/2003.

Still, the use of relatively simple technologies by artisanal fishers distinguishes them from industrial fishing activities: they use smaller boats, cheaper materials, including waiting nets, lineages and weaker engines, which together limit their fishing territory coastal areas closer to the mainland. Walter and Petreire (2007) provide valuable insight into significant differences in commercialization (direct or through intermediaries), fishing equipment and strategies between communities in the same territory. The authors mention that despite the simple means of the artisanal fishers, individuals or communities even within the same territory develop a variety of techniques and strategies throughout the value chain of the fishing activity, including in the stage of commercialization (direct or through middlemen) or of equipment reparation, which ultimately has a profound cultural impact. The diversity of the species that sustain the non-selective technologies of the small-scale fishing, allow the consumption of an elevated diversity of fishes promoting the healthy consumption of fish. Indicatively, in São Paulo and Rio de Janeiro more than 100 different types of captured fish, consumed and locally commercialized (BEGOSSI; FIGUEIREDO, 1995, CLAUZET, 2014).

5.3.2 Institutional arrangements for the artisanal fishing activity in Brazil and impediments to sustainable development

During the last decade in Brazil, the federal public policies for the fishing sector were initially under the jurisdiction of the Ministry for Fisheries and Aquaculture (having been upgraded to ministerial status from a previous Division of IBAMA). The mandate passed in mid-2016 to the Advisory Committee on Fisheries and Aquaculture (CONAPE) and the Secretary of Fisheries and Aquaculture (SPA) of the Ministry of Agriculture, Livestock and Food Supply (MAPA) (BRAZIL, 2016). Different plans and actions had been programmed to promote sustainable development of Brazilian fishing activities, including the Plan for Fisheries and Aquaculture Zoning (PRONAF/Pesca) and Promotion of Fishery products in the International Market. More recently, in 2017, the management of fishing was reallocated once more to the Ministry of Industry and Foreign Trade through the Decree nº 9.004 (BRAZIL, 2017) which signals a prioritization of large scale industrial fishing activities. A year later, under the decree no 9.330 the Special Secretary of Aquiculture and Fisheries was transferred to the General Secretary of the Presidency of the Republic (BRAZIL, 2018).

Due to the orientation of public policies toward innovation at a large-scale fishing, or the lack of efficient and sustainable strategies for the fishery resources, which Begot and Vianna (2014) describe as hydrobiotic flora and fauna subject to exploitation and study by professional or amateur fishers and scientists respectively, FAO (2016) identify that 58.1% of the fish stocks have already being exploited to their maximum capacity and 31.5% are over-exploited in Brazil. Brazilian governmental institutions, despite directives that derive from current Brazilian commitments in international forums, often neglect the potential contribution of the fishing communities' activity on the food cycle of the local ecosystem, when properly regulated, allowing both professional activities and conservation of the ecosystems. Besides, since the greatest part of the commercialized fishery in the formal markets of Brazil, is provided by artisanal fishers, the local management of the sector should receive an equal share of the benefits from the value added of the commercialized product along the supply chain. Also vital for the fishing communities is the strategic provision in public policies for technological and financial support, but most importantly, the guarantee of their direct access, ownership and control over the territory where they act and live in contact with the natural resources.

On the contrary, artisanal fishing activity is not considered to be substantial for the national economy and consequently the artisanal fishers are marginalized from the commercial value chain management with great impact on local communities particularly in the Brazilian coastal territories that depend directly from artisanal fishing and, further, from the managing efforts to maintain the balance of the local marine ecosystems (CATARINO; CLAUZET, 2014). Their exclusion from the labour market and the low level of training or education in these communities make them highly vulnerable and dependent on public policies not only for fisheries but also for housing and other basic social needs.

For Gomide and Pires (2014) the intensification of the social and income distribution public policies, for instance, the Program *Bolsa Familia* and the *Brasil Sem Miséria* Plan, brought new tools and economic mechanisms for state intervention. Nevertheless, from an economic perspective, the management of fishing activities is especially difficult, due to the lack of integration of the population of non-industrial fishers in the national economy. Without adequate forms of market-related support of the fishing activities, it cannot be expected that the marine resources could match the rhythm of population growth and subsequently the demand that would result from such growth, especially in the poorest parts of the world. Been those challenges acknowledged, the support of artisanal fishing activity, by securing for the artisanal fishers to gain access to the marine resources and the markets, is seen as a strategic step towards the eradication hunger and poverty.

Hall *et al.* (2016) further adjoins as obstacles to sustainable development of the fishing communities, the various forms of corruption including excessive discretionary power among land administrators, parallel land regimes, overlapping institutions, privatization, and non-recognition of the established customary land rights. Such conditions, which are triggered by bribery, volatile market values of the land and unclear institutional frameworks, deprive vulnerable communities from having equal accessibility to urban and peripheral land (HALL *et al.*, 2016). Furthermore, illegal activity resists policy restrictions, though, as a side-effect, investments or stable partnerships among fishers are not incentivized, thus perpetuating precarious solutions for their activity. Their informal status leaves individuals and collectivities deprived from institutional channels that would provide them with more information and resources to conduct sustainable and secure practices, contributing to food security and combating poverty.

Besides, since the greatest part of the commercialized fishery in the formal markets of Brazil, is provided by artisanal fishers, the local management of the sector should perceive an equal share of the benefits from the value added of the commercialized product along the supply chain. Equally vital for the fishing communities is the strategic provision in public policies for technological and financial support, but most importantly, the guarantee of their direct access, ownership and control over the territory where they act and live in contact with the natural resources. Similarly, if the effective management of the common resources promotes simultaneously ecological conservation and the economic sustainability of local populations, the beneficial effects could be extended to larger scales, for instance, through the fishery resources that are of high ecological value as tend to populate new habitats and expand niches at a local scale.

Since 2011, the Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the context of Food Security and Poverty Eradication (SSF Guidelines) emerged as a contribution of FAO to the Millennium Development Goals (MDGs) (FAO, 2015) in an effort to support state and stakeholders' national, regional and international initiatives within the human rights-based sustainable development framework. Under the SSF Guidelines, the small-scale fishing activity was regarded as the engine for the protection of the oceans while securing jobs and reducing poverty for the most vulnerable populations. While enforcement of fisheries regulations is rather difficult in developing countries, capacity building and open direct participation of multiple stakeholders as formal requirement in the decision-making processes is considered by FAO (2018) to be beneficiary for the sector to reduce conflicts and enhance cooperation among fisheries, but also align fisheries management with other processes that focus in environmental and social protection within a single holistic framework. In Brazil, it was observed however limited range of participation in the

decision-making processes of the involved stakeholders throughout the supply chain, to which was attributed poor performance of the SSF Guidelines (FAO, 2015).

Some authors (CASTELLO, J.P., 2007; CASTELLO, L., 2008) argue that the conventional model of fisheries management, or else, a set of norms and actions that regulate the management of the fishing activity in a SES considering its biological, economic and social components as defined by the 2nd and 3rd article of the 11,959/2009 (BEGOT; VIANNA, 2014), is determined by top-down rules that are inadequate for Brazil. The author argues that the creation of models similar to those applied in Europe and North America, which were cases of moderate success (OSTERBLOM *et al.*, 2016), requires human resources and sufficient funding to reach the same reach, which is difficult due to the distance of reality between the developed countries and Brazil among other tropical countries. Costello *et al.* (2016) also highlight the need to prioritize a long-term framework in these models. Besides, the question of sustainability at national or global scales is a major impediment to fisheries reform, since international agreements are primarily focused on meeting the demands of large transnational corporations controlling the chains of global value and can not represent the national statistics and realities for the highly diversified artisanal coastal fishing sector along the Brazilian coast.

The urban expansion and the delimitation of economic and ecological zones, or Conservation Units as established by the SNUC⁹⁹, without considering the needs of those communities while seeking to regulate and protect environmental resources, can also become an obstacle to inclusive sustainable development. Exogenous policies, conceptualized without public consultation and legitimacy among local actors, result in strict environmental measures such as designation of marine and aquatic protected areas, zoning, legal restrictions and control that do not consider or underestimate the socioeconomic impact on these vulnerable communities that depend directly from the ecological services (WALTER; PETRERE, 2007, LOPES *et al.*, 2013a; LOPES *et al.*, 2013b; LOPES *et al.*, 2015) forcing fishing communities to choose between environmental conservation and subsistence objectives (BEGOSSI *et al.*, 2011).

The first emerging result is the lack of engagement of the users in compliance to the rules for conservation, nurturing a free-rider mentality of the fishers that generates problems in the implementation of public policies for both the fishing sector and natural resource protection. Begossi *et al.* (2011) propose Fishing Agreements (FA), a kind of stratification of stakeholders into

⁹⁹National System of the Conservation Units (SNUC - Law 9.985/2000) – together with the conservation units (UC_ federal, state and municipal. Is composed by 12 categories of UC, out of which 5 are categories of integral protection and 7 are of the sustainable use, whose specific objectives are differentiated from the form of protection and the permitted uses.

groups of direct interest in use and access of a specific territory under adaptable and realistic co-management regimes. The FA are based on already established local rules and pre-existing environmental policy: compensatory payments for environmental services (PES) for self-monitoring, or participatory monitoring, specifically a two-step approach in which recognizes the costs of the required capacity building (Hallwass *et al.*, 2011). The FA, which began informally in the 1960s in lakes in the Amazon region and to this day, are examples of successful co-management in some regions of Brazil. In the literature, there are studies demonstrating how the Amazonian riverine communities commit themselves to establishing and complying with the co-management rules established in these agreements (McGRATH *et al.*, 1993, CASTRO; MCGRATH, 2003; BEGOSSI; BROWN, 2003).

Meanwhile, the FA are still incipient in the marine environment and in most of the cases described, there is a lack of engagement of government institutions in this debate. In this perspective, the evaluations of the processes that generate the successful Fisheries Agreements in the Amazon region should be evaluated in the context of public environmental policies for the management of the coastal-marine territory. According to Begossi *et al.* (2011), funding could be secured either by adjusting the existing legal framework of *defeso*¹⁰⁰, which originally meant to compensate for fisheries closure during periods of fish reproduction, or by establishing public-private partnerships with local entrepreneurs.

5.3.3 The Local Ecological Knowledge (LEK) of artisanal fishers in the service of biodiversity conservation

The sustainable exploration of the fish resources demands for consideration of the local fishing communities for been directly associated with local SESs and for been able to suggest different solutions in face of the decrease of each target species (De MESQUITA NORA *et al.* 2017). Berkes *et al.*(2000) emphasizes Traditional Ecological Knowledge (TEK) of indigenous or tribes as the culturally and intergenerationally accumulated "library of information" on change in complex systems. The integration of TEK with scientific knowledge results in "ethnoecological knowledge" (MARQUES, 2001) that holistically studies the interactions of the ecosphere with humanity. In addition, Diegues (2008) highlights the variability and versatility of multi-purpose artisanal fisheries and technologies used, as well as the unofficial and informal collective use rights

¹⁰⁰*Defeso* is by national law 11.959/2009 a regulatory measure that sets a temporary prohibition of fishing, with some exceptions in the use of specific fishing tools or fish stocks, motivated by the need for reproduction and preservation of certain species or by critical natural phenomena or human induced environmental accidents. The seasons and specific normative restrictions are applied in accordance to the specific local characteristics or each ecosystem (BEGOT; VIANNA, 2016).

of fishing territories based on social networks and Local Ecological Knowledge (LEK) in juxtaposition to science or knowledge of non-traditional populations (BALEÉ, 1993).

Several authors (SILVANO; JORGENSEN, 2008, SILVANO; BEGOSSI, 2012) confirm the potential of LEK to provide new findings, basic information and even samples in the case of endemic species. Particularly, Clauzet (2009) has shown that the patterns in the popular classification system, even though they are predominantly generic, are similar with available scientific information including cognitive aspects and evidence of utility value. Also, Ramires *et al.* (2015), as well as Silvano and Begossi (2012) observe a systematic correspondence of LEK and scientific information regarding fishery resources, thus endorsing the potential of the application of the LEK as important information for management decisions based on systematic observations. According to Silvano and Jorgensen (2008) discrepancies may be due to differences in time and methodology between observations and scientific studies, but they reaffirm that one source of information can reinforce or complement the other.

The third national statistical report on extractive and aquaculture activities in marine and continental territories (BRAZIL, 2011) presented only partial data, due to the interruption or paralysis of interinstitutional agreements. According to Freire *et al.* (2015), data from fish captures in Brazil, a transitional economy, are unsatisfactory or have collapsed. The authors confirm that despite the National Fishery and Aquaculture Information System (SINPESQ), there is still no standard or online system for fisheries statistics processes, except for the states of Santa Catarina and São Paulo. Also noteworthy are the fragility of catch records by species, and the limited statistical models that only have as reference the years 2008-2011, also including the discontinuity of the statistical analyzes by the redefinition of the limits of the municipalities and the geographical regions by the administration.

The lack of statistical data evidenced the value of the LEK of the Brazilian fishers to improve the research and the management of the fisheries, since these data do not depend on the conventional statistical analysis. Such gaps also suggest the increasing importance of collaboration between managers, biologists and local fishers, who can provide faster and more reliable approaches for detailed comprehension of information on the seasonal and spatial distribution of specific commercial species and, thus, for the identification of risks and impacts of anthropogenic activities on the biological food chain and the balance of the local ecosystems (LOPES *et al.*, 2013^a, DA GAMA *et al.*, 2016b). The fieldwork conducted in the frames of this dissertation reaffirms through the registries of numerous complaints of the artisanal fishers about the regulation regarding the defeso period of the shrimps, the necessity to consider not only the academic and scientific data in the public policy decision making procedures, but also the LEK of the artisanal fishers. FAO

(2018) prioritizes the harmonization and coherent interpretation of data regarding the whole range of fisheries, through working groups, regional data framework to establish standards and support assessments in data-limited situations by improving and expanding existing empirical information in inland and marine small-scale fisheries. Traditional communities have a fundamental role in the protection of the biologic diversity as they have developed sustainable systems for the exploration of the natural resources adapted properly to the local ecological conditions (DA GAMA *et al.*, 2016a). Ruddle and Davis (2011) considering the inherent limitations of LEK, such as the insufficient description of the key ecosystem attributes or the particular focus on species of commercial interest, also argue strongly in favour of such synergies on the basis that would permit the insertion of more scientific evidence in decision making processes, capacitation and empowerment of the local stakeholders, access for the scientists of alternative information sources and space for more innovative research strategies to document and examine the LEK claims.

Once the LEK value of fishers is duly recognized, this source of knowledge can supplement or provide new biological information to formulate subsequent management and conservation measures that would be better understood and accepted by local fishing communities, as various other authors have pointed out (BERKES *et al.*, 2000, SILVANO; JORGENSEN, 2008). The context of this approach to the role of LEK in the protection of marine and aquatic life is dynamic despite the historical evolution of fishing practices, from the traditional ones to those reinforced by technology, industry and the over-capitalization of fishing resources, which indicates the tendency to be unsustainable when natural protection is unavailable (PAULY *et al.*, 2002). Considering the fact that the identity of the professional fishers is constructed by the intergenerational transmission of knowledge of the craft (PEDROSA *et al.*, 2013), there is still a window of opportunity in this regard for innovative solutions in management regimes, preserving and restoring these traditional bonds.

5.3.4 Urban communities of artisanal fishers

The urban coastal agglomerations are hubs of growing population, of economic development, but also centres of environmental deterioration in a key territorial locus, where the terrestrial and oceanic ecosystems are linked. Their unregulated expansion, particularly as witnessed in the developing countries of the Global South, challenge the attainment of the 2030 Agenda that promotes inclusive sustainable development, severely undermining opportunities for well-being and prosperity of the fishing communities. This study draws from a perspective that attributes a more

central role to the neglected fishing communities of the state of Rio de Janeiro within urban development strategies under the directives of the Sustainable Development Goals.

Walter and Petreire (2007) challenge the common perception that fishing communities are mainly rural. The authors shed light on specific cases in São Paulo and Rio de Janeiro states indicating a long-term tendency of rural or peri-urban fishing communities to be gradually incorporated within larger Brazilian urban agglomerations; a tendency confirmed by the demographic census of Brazil in 2010, according to which 84% of the Brazilian population live in urban areas (PEDROSA *et al.*, 2013). This gradual territorial transformation from rural to urban has weight on the fishing communities. The coastal urban agglomerations of both these states concentrate a great percentage of the national population of Brazil as they are poles for markets, innovation and industrial activity. Thus, the level of urbanization in the territory where a fishing community is installed, affects its activities, quality of life and characteristics in a twofold way. For instance, it may benefit fishers by access to markets, but it may also deteriorate the quality of the territory (PEDROSA *et al.*, 2013). As Diegues (2008) report, the dramatic internal immigration to urban centers, most of which are located along the coastline, attracted also state-sponsored tourism as well as heavy industries, such as in the oil and gas extraction sector which intensified anthropogenic impacts on the environment through degradation of the coastal zones owing to abrupt changes in the water bodies and fishery resources, sedimentation, erosion and waste (De GOUVEIA, 2009; ALEXANDRE *et al.*, 2010).

Moreover, there is a need for a fuller understanding the impact of the perpetuation of the current model of urban development in coastal territories on the local traditional communities which may result in cultural incorporations, or paradoxically, to identity reaffirmation (MARTINS, 2000) depending on the "adaptability" of these populations resulting from environmental changes in their territories or the penetration of market relations (BEGOSSI, 1998). Urban artisanal fishers tend to disassociate partially from traditional LEK in urban agglomerations, probably due to loss of land ownership, new livelihood opportunities, new technologies and changes in the way of life. According to Da Silva (2014), both the fragmentation and occupation of space by the antagonistic activities of the local actors, as well as the accelerated modernization of the metropolitan territory, destroy the material and symbolic bases of the collective life of artisanal fishers, thus contributing to their alienation of knowledge and cultural heritages. Moreover, past and current transformations in territorial and population development are guided by the contemporary lifestyle. The degree of invasion of this intervening culture to natural ecosystems and "traditional" ways of life defines the ability to respond to associated risks and substantive environmental changes. According to Chapin *et al* (2009), lifestyle is one of the main elements that prepare the scenario for sustainability,

resilience and adaptability of people to possible changes as experienced by past and present transformations in the urban and peri-urban landscapes.

Hallwass *et al* (2011) and Pedrosa *et al* (2013) exploring the differences among rural and urban fishing communities in the state of Pernambuco and along the Tapajós River, in the Amazon, found that both populations were significantly under-represented in official registrations due to lack of socio-economic data¹⁰¹ or inability of the individuals to comply with the requirements for the registration procedures. Their studies indicate, however, a relative advantage of the rural fishing communities in comparison to the urban fishers due to both the impacts of increasing urbanization and the 'new rural' phenomenon. Specifically, Wanderley (2000) defending the rural-urban dichotomy as pertinent and contrary to the predictions for further unplanned urbanization or desertification of rural areas, points to the rebirth of the rural territory, which is characterized by diversified socioeconomic dynamics due to economic decentralization, population growth and the appeal of the rural lifestyle. Also, Veiga (2006) emphasizes the birth of rural space in the post-industrial era, co-evolving with urban space by financial flows, productive chains and trade, as well as the re-evaluation of nature as a source of energy and biodiversity.

In this vein, Maia *et al.* (2009) characterize as the “new rural” the plural reconstruction of the rural territory by productive, cultural, social and political processes in relation to the use and appropriation of the natural resources originated by globalization and local initiatives. The transversal nature of the challenges that the Brazilian urban and peri-urban fishing communities experience, demand the integration of initiatives taken by local actors including city governments and organizations to protect urban coastal waterways, emphasizing the connection between marine pollution, climate resilience, social inclusion and sustainable development. Yet, data and information on the artisanal fishing is fragmented and/or often provided in aggregated numbers including the industrial fishing, though related activities within the value chain are yet to be fully acknowledged (FAO, 2016). Overall, the urban artisanal and small-scale commercial fisheries located in large urban agglomerations are often neglected in analysis of the fishing sector, despite their activity being of great socio-ecological importance. As Minte-Vera and Petreire Jr (2000) point out, vulnerabilities of such populations due to their exposure to pollution, sewage, environmental eutrophication and occasional oil spills, would be less impacting on fishing activity if properly regulated. The article 20 of the Habitat III adopted in 2017 by the UN General Assembly recognize that small-scale fishers among other groups suffered from discrimination and must be addressed.

¹⁰¹ Hallwass *et al.* (2011) studying for the fishing communities in the Amazon, denote that the Brazilian government encountered difficulties in gathering reliable data on small-scale fisheries.

Moreover, on the planning and managing the spatial development section, the article 95 in recognition of the rural-urban continuum and the scale variation of the cities, the Habitat III agenda prioritizes small and medium cities and towns promoting their role in food security and implementing polycentric, integrated and balanced territorial and development policies and plans focusing on enabling small-scale fishers to access markets¹⁰². Also, the Model Law on Artisanal or Small-Scale Fisheries of the Latin American Parliament (Parlatino) Commission on Livestock, Agriculture and Fisheries with the support of FAO and the Parliamentary Front against a Hunger in Latin America and the Caribbean, recognizes artisanal fishing in oceans, seas and inland water bodies both as a way of securing livelihood and nutritional food for the fishing communities and poor social groups, and a productive activity that contributes to the local and regional sustainable development¹⁰³.

¹⁰²Source: <<https://habitat3.org/the-new-urban-agenda> > Accessed on 20 February 2019

¹⁰³Source: <<http://www.fao.org/americas/noticias/ver/en/c/897054/> > Accessed on 26 July 2017

6 FINAL CONSIDERATIONS

In this section is presented the final conclusions as can be drawn by the obtained results and the discussion that followed through interdisciplinary approaches. This dissertation recognizes and highlights the need of to the re-evaluation of constructed scientific narratives, the recognition of the limitations of the competences of each discipline and the search for a mutual understanding between the disciplines for the defence of the environment, embracing the complexity in the interaction between humans and nature. Also, there are presented further considerations that need to be further examined and as well future research line that emerge from this dissertation.

In regards to the first hypothesis (H1), evidence indicate that the artisanal fishers have a significant presence in the highly urbanized coastal municipalities of Rio de Janeiro state. At both international and national level, artisanal fishers are recognized to be a highly relevant socio-economic group for the coastal ecosystems, as verified by the international guidelines of FAO and national legislation on territorial and environmental management in coastal ecosystems. Nevertheless, the artisanal fishers stay marginalized in public policy making procedures, despite having granted institutional access along with other civil society representatives through collective bodies. The existing institutional and legal framework of public policies in regards to environmental, territorial and fishing sectors as implemented at the coastal municipalities of Rio de Janeiro state, fail to address in an integrated manner the preservation and the conservation of coastal ecosystems while considering the cultural and socio-economic implications on the artisanal fishing communities.

Indicatively artisanal fishers are not included in national statistics (FREITE *et al.*, 2015), nor in public policies or management strategies (PAULY *et al.*, 2002). Synergies among different levels of governmental institutions and agents, as well as collective bodies that represent artisanal fishers, are also rather weak and circumstantial, if existed. Non-integration or limited articulation among institutions is one of the causes of the weak participation of representatives of artisanal fishers in meetings, forums and decision-making processes. Similarly, limited flexibility is exhibited by the bureaucratic institutions to accommodate the practical obstacles and uncertainties that emerge from the outdoor nature of the craft, which further undermines participation. In addition the various overlapping plans, programs, and policies distance and disperse, rather than engage and educate them. Yet, artisanal fishers are considered to be a vulnerable socio-economic group for various reasons including poverty and exposure to natural hazards and effects of the climate change impacts, pH, temperature and oxygen concentration among other, on coastal and marine ecosystems, on which local economies and lives depend. So, I argue that the lack of recognition of artisanal fishers is not the cause of inefficient, unjust or fragmented public policies related to natural

resources governance, but rather the historical trajectory of the Brazilian state that, despite significant institutional changes, continue to perpetuate “territorialisation traumas” by following hegemonic socio-economic development and governance models to the detriment of vulnerable socio-economic groups, among which are also included the artisanal fishers.

On the contrary, the second hypothesis (H2) is not verified through the research. On the contrary, there is lack of evidence of systematic efforts, particularly from colonies, and associations to incentivize participation and capacitate their members in order to participate in collective institutionalized bodies that decide upon common-pool resources for a more inclusive and sustainable management. Generally, the tendency for withdrawal from efforts to institutionally coordinate public policies prevails, in the absence of direct financial recompensation for the parties or of acknowledgement on the implications of lack of agency within the institutionalised forums. Institutional redesign and environmental interdisciplinary planning could incentivize a solution for the collective action problem and minimize the risks or uncertainties that derive from a wider participation of stakeholders towards the establishment of a democratic decentralization of public policies. The strengthening of the participatory structures needs to consider fundamental preconditions for the sustainability of this particular professional category which needs to be further updated and regarded separately from other sectors by the authorized institutions. Nevertheless, the lack of barriers or technological obstacles to entry the craft, the nature of extractive activities in coastal areas, the misleading duality of subsistence and commercial fishing; and the exhibited versatility of fishers to secure income makes it difficult to organize and plan the sector. The model of integrated and participatory coastal management (CASTELLO, 2008) is indispensable in order to reduce the pressure on fishing communities and, at the same time, to include them as allies in order to ensure the performance of urban sustainable development.

The available instruments for the sustainable development planning and management of the coastal zone does not provide with a realistic probability to involve a satisfying percentage of the local population, even less so in the mega urban centers, such as the metropolitan area of Rio de Janeiro state. Provisions or involvement of the artisanal fishing communities continue to be neglected from the public policies agenda as the overall mission of the government of Brazil still rather supports great value chains in the fishing industry. The institutional degradation of the Ministry of Aquaculture and Fishing to a secretary signalizes the priorities as set by the government. Such evidence, verify the third hypothesis (H3), that the lack of a clear strategic vision or mission for the small-scale fishery derives from the state and local governments the potential for institutional adaptation for an integrated and just natural resources governance in the coastal ecosystems. The lack of integrated macro policies that recognize the importance of artisanal

fisheries, and fishers is also reflected at the statistics for the sector, which are inherently undermined by discontinuities in data collection processes, and divergences in information dissemination. The implications for sustainable development of the current anachronistic management and governance system on the coastal artisanal fishing communities in Rio de Janeiro state, demonstrate that Brazil is not applying the necessary reforms as expected from the guidance of the international legal instruments with which Brazil abides. In this context, it is fundamental to identify the best arrangement for public environmental policies in the case of Brazil's coastal states that could reconcile aspects of nature and social, economic and political relations, diminishing inequalities and manifestations of power. In counterpoint of the maintenance of this antagonistic heterogeneity, stands the production of consensus on the territorial benchmarks through greater synergies among the various actors respecting and considering the territorialities as conceived and experienced in reality from various local actors and especially the traditional communities in the coastal regions.

Overall, this dissertation contributes in the elaboration of a new rationality of construction and deconstruction of the territory by the integration of the territorial representation between the administrative territories, the CUs and the hydrographic basins considering the territorialities of the traditional communities. In this sense, the institutional exploitation of existing territorialities, establishing a participatory method, can create the basis for mediation, since both the lack of synchronization in the implementation of public environmental policies at the federal, state and municipal levels respectively, as well as divergence and segregation of the terrestrial and marine territories that appear in the public environmental policies, hinder the efficiency of the institutional intervention in these territories. Therefore, I suggest the focus and prioritization of coastal zone planning as a transitional space between land and sea, while the set of environmental policies applied in these territories create integrated intervention scales. The example of wetlands that are defined as extremely vulnerable mixed areas, sets an important precedent for public environmental policies in transitional territories. The exploration of the methodology of the territorial delimitation of these areas could be valid for the integrated planning in the coastal states of Brazil. This perspective may guide a strategy to promote the right actions and movements that promote environmental justice for traditional communities and counter the current hegemonic model of environmental public policies.

6.1 FUTURE RESEARCH

This research focused on the perspective of the artisanal fishers themselves on issues regarding their participation and involvement in natural resource governance. The researcher as an

outsider to the local fishing communities need to establish niches of trust with the local communities and thus more time needs to be devoted in this process. Due to the limited time period of the fieldwork, I deliberately approached only artisanal fishers that exhibited willingness and openness to be interviewed and to follow the formal procedures, namely the consent form, as demanded from my department. More time spent in the field would permit me to observe in practice the manifestations of participative policy making procedures of each collective body, either internally or in conjunction with other agencies and institutions in the respective municipalities, and primarily facilitate interaction with the interviewees. Moreover, it is equally important to acquire the perception of the formal institutions and the lower instances of governance at local and municipal level on the participation and involvement of the artisanal fishers.

Further, the factual validation of the answers of the interviewees with actual formal documentation and registries including information on the income, the years of activity, proof of registration to the colony among other. The analysis was exclusively based on the perceptions of the artisanal fishers and the information that they were willing to disclose. More close collaboration and coordination with other researchers and organizations that act in the focus area, such as the Institute of Fisheries (Instituto de Pesca), and formal institutions with authority for access to relevant documentation could facilitate the process of cross-reference of such information. Such synergies, could avoid saturation of the target population that may occur when uncoordinated multiple research efforts, introduce further information in reinforcement of interdisciplinarity, and incorporate more variables in the analysis as identified by Ostrom (2009), more specifically: i) size of resource system, ii) productivity of the system, iii) number of users, iv) predictability of system dynamics, v) resource unit mobility.

Besides, the research could be expanded for a comparative analysis between the coastal and highly urbanised municipalities of Rio de Janeiro and São Paulo states, both of which concentrate the greatest number of federal, state and municipal conservation areas (Scherer *et al.*, 2009) belonging in the Mata Atlântica biome. The Santos municipality, which belongs to the metropolitan region of Baixada Santista of São Paulo state, instituted by the complementary state law no 815/1996¹⁰⁴, concentrates industrial complexes and shipping activities with considerable contribution to the national GDP per capita and high score at the Human Development Index at national level (CATARINO; CLAUZET, 2014). The socio-economic activities, settlements and portuary infrastructures brought the ecological degradation of the estuary area of Santos constituting

¹⁰⁴Source:<http://www.al.sp.gov.br/repositorio/legislacao/lei_complementar/1996/lei_complementar-815-30.07.1996.html>_Accessed on 20 February 2019

the protection of the mangrove of high-importance in the local agenda, though the water resources management issues remain less addressed (RESSURREIÇÃO *et al.*, 2012).

The strains of the coastal SESs in the São Paulo is expected to have an analogous impact on local artisanal fishing communities with those in the Rio de Janeiro state. Nevertheless, an initial elaboration of *defeso* benefit data in 2016 from the Transparency Portal of the Federal Government for the São Paulo (Graph 13 in Appendix A), demonstrate the striking majority of the fishers are active at municipalities in the interior municipalities of São Paulo state, a clear contrast to respective data for the Rio de Janeiro state (Graph 1). The clear difference between the ration of the total number of the coastal municipalities in relation to the inland municipalities in each state under study, is indicative, particularly of the different weights of the fishing activity in inland waters and the coasts respectively, and more broadly, the weights of socio-economic importance of the coasts for the whole state. In particular, the yield produced in Rio de Janeiro from fishing activities is principally by extraction in marine environments (BEGOT; VIANNA, 2016). In this context, both cases of the Rio de Janeiro and São Paulo states is offered for identification of differences and similarities in the evolution and nature of the socio-ecological issues that have emerged in regards to the coastal ecosystems within the territory of each state, the levels of institutional adaptability and responses to those challenges, as well as the nature, role and participation of local civil society and particularly the artisanal fishing communities in urbanized settings accordingly.

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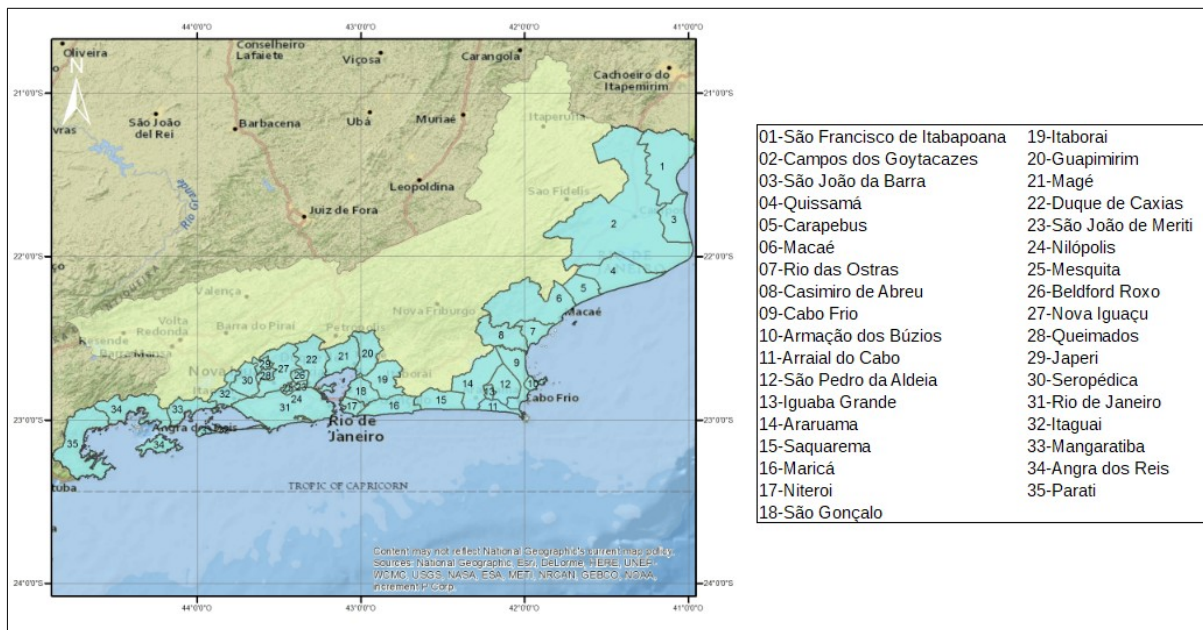
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ANNEX

Figure 1- Extract from the map of the coastal municipalities in Rio de Janeiro State



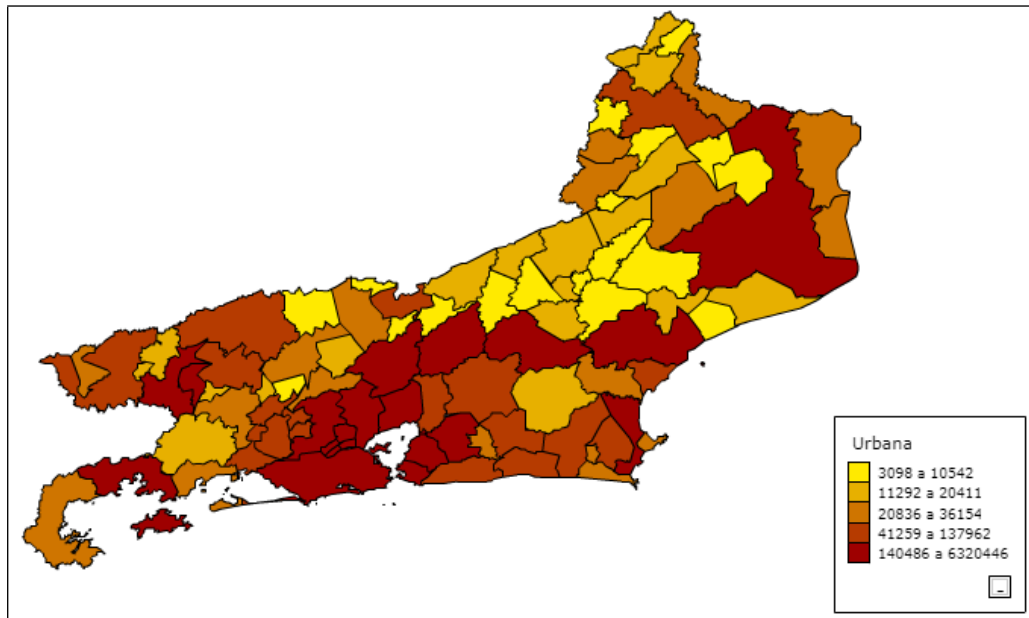
Source: Ministry of Environment of Brazil

Figure 2- Map for the regions of governance and municipalities of Rio de Janeiro State



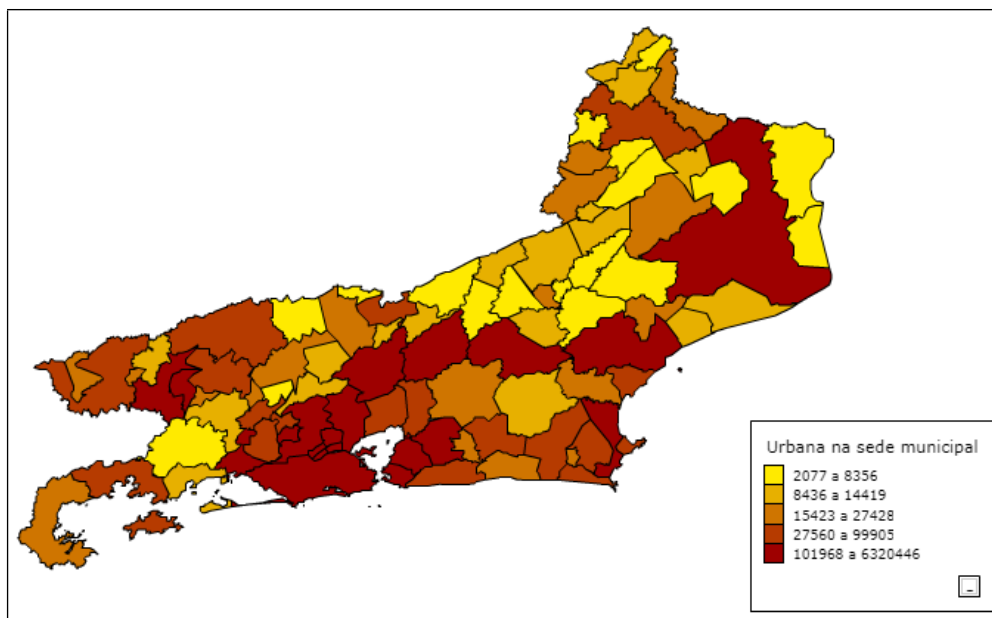
Source: CEPERJ (2014).

Figure 3– Map of urban population of each municipality in Rio de Janeiro



Source: Censo demografico IBGE 2010¹⁰⁵

Figure 4- Map of urban population at the urban capital of each municipality in Rio de Janeiro



Source: Censo demografico IBGE 2010¹⁰⁶

¹⁰⁵ Source: <<https://censo2010.ibge.gov.br/sinopse/index.php?uf=33&dados=29>>

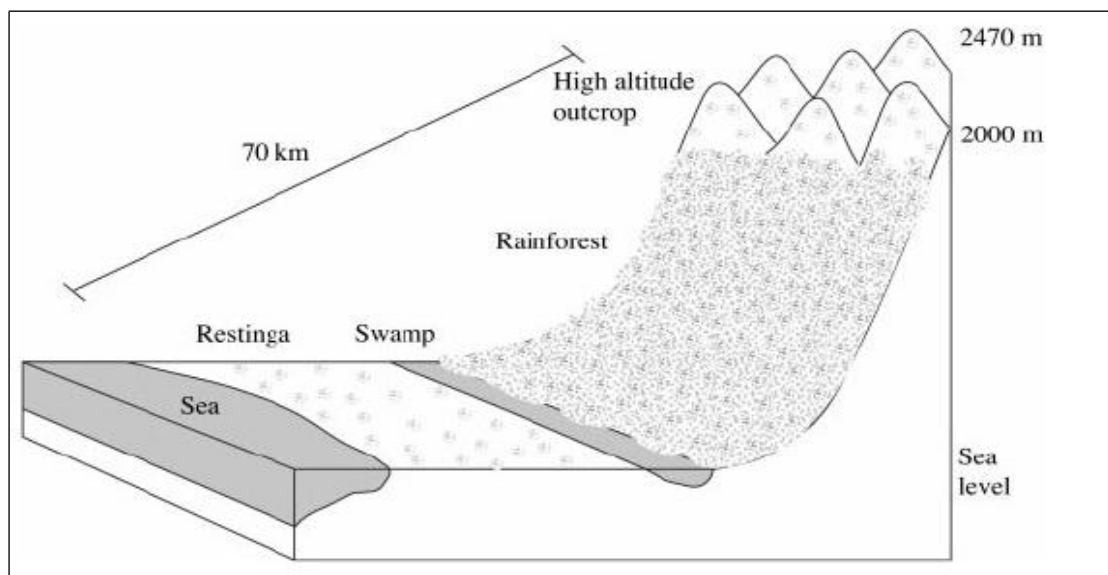
¹⁰⁶ Source: <<https://censo2010.ibge.gov.br/sinopse/index.php?uf=33&dados=29>>

Figure 5- Biogeographic sub-regions of the Atlantic Forest in Brazil characterized by the presence of endemic species



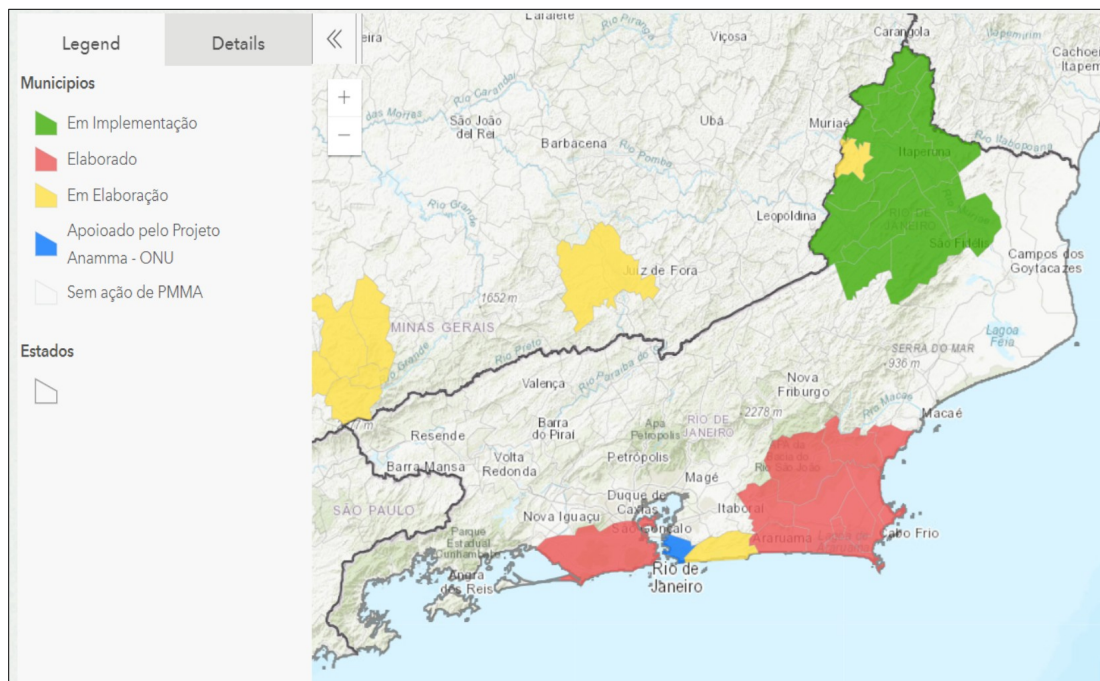
Source: Da Silva and Casteleti (2003)

Figure 6- Schematic representation of the Atlantic forest complex in the State of Rio de Janeiro.



Source: Scarano (2002)

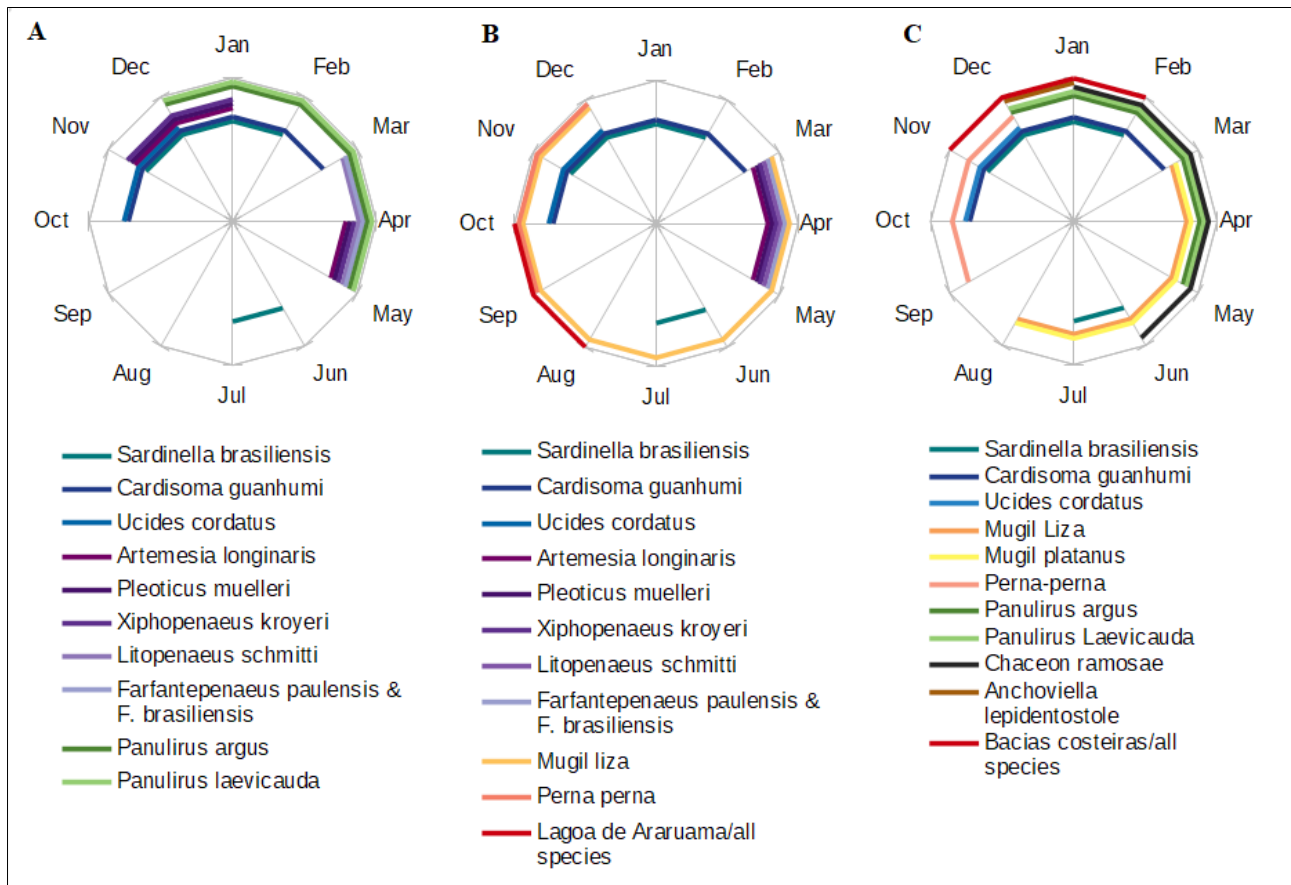
Figure 7- Part of the national map depicting the current stage of elaboration or implementation of PMMAs in the state of Rio de Janeiro.



Source: Information updated by the Observatory on 03/10/2018 <<http://pmma.etc.br/observatorio>> (accessed 17/11/2018)

APPENDIX A- COMPLEMENTARY QUANTITATIVE ANALYSIS

Graph 1: The months of *defeso* per protected species as regulated for the Rio de Janeiro state



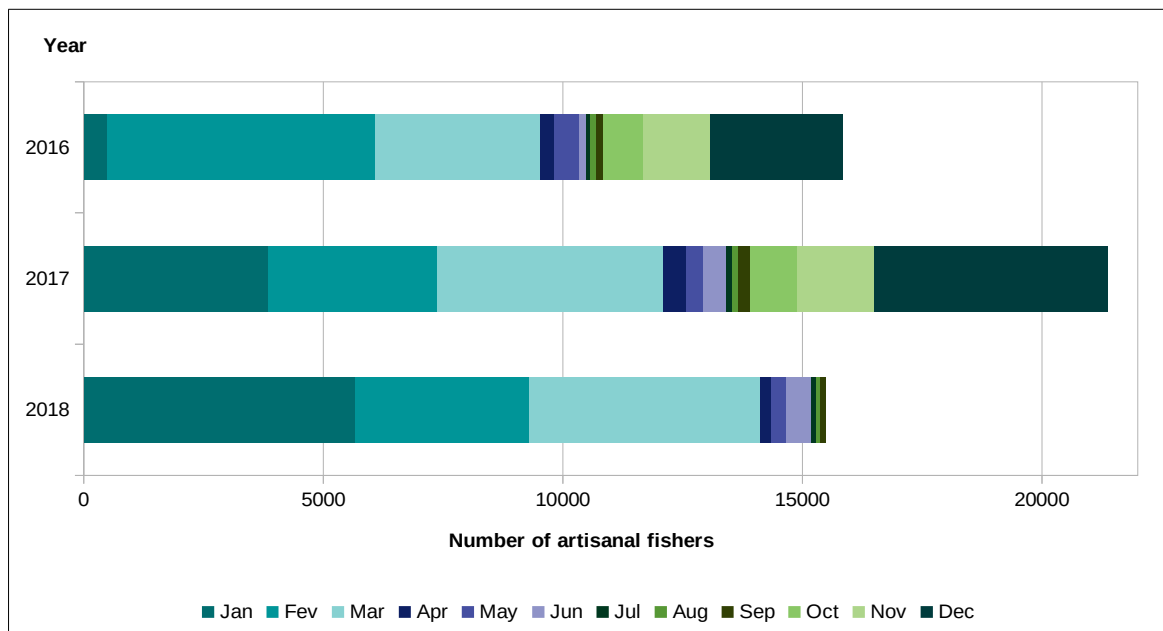
Source: Elaboration from the author data from (A) CEPSUL/ICMBio¹⁰⁷, (B) FIPERJ¹⁰⁸, (C) IBAMA¹⁰⁹.

¹⁰⁷ Source:<<http://www.icmbio.gov.br/cepsul/defesosmoratoria-periodos-de-pesca.html>> Accessed on 28 December 2018

¹⁰⁸ Source:<<http://www.fiperj.rj.gov.br/index.php/main/defeso>> Accessed on 28 December 2018

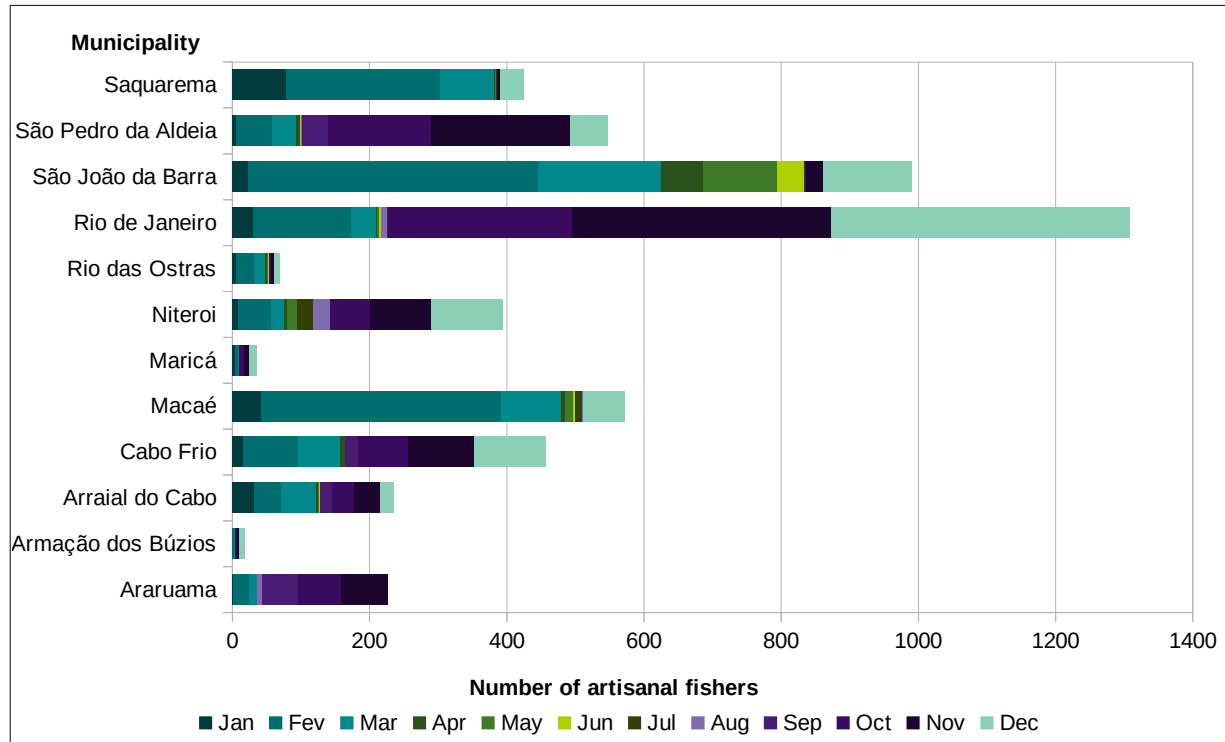
¹⁰⁹ Information updated on 8 March 2018. Source:<<http://www.ibama.gov.br/biodiversidade-aquatica/periodos-de-defeso/defesos-marinhos>> Accessed on 28 December 2018

Graph 2– Aggregated number of artisanal fishers that received *defeso* for all the municipalities in Rio de Janeiro state per month in 2016, 2017 and 2018.



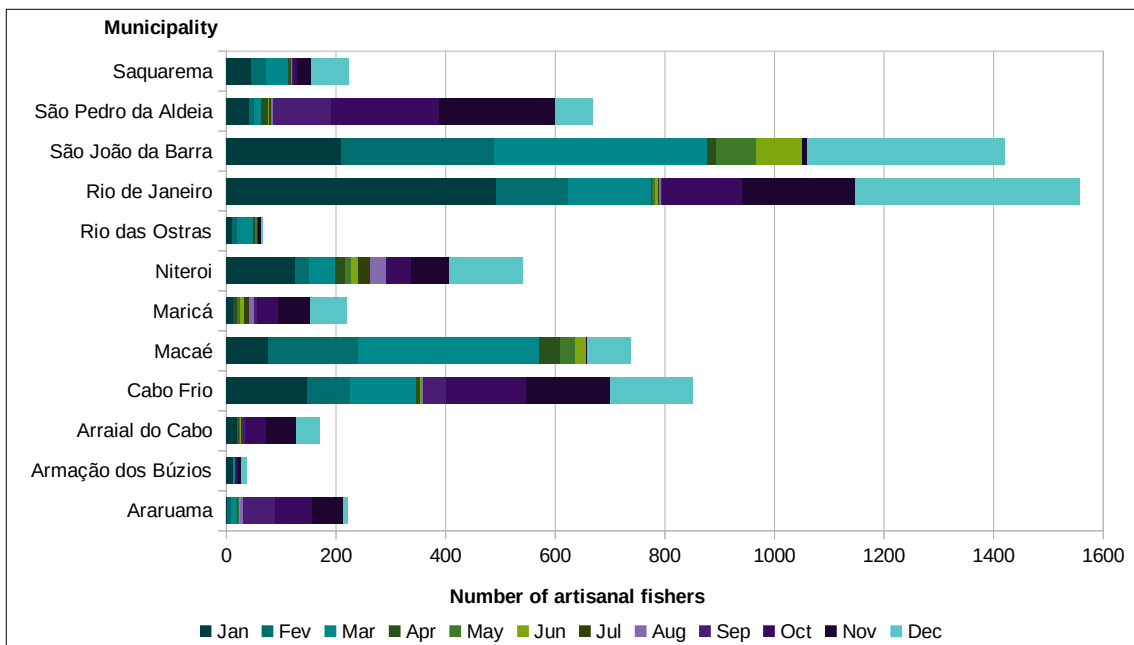
Source: Elaborated by the author.

Graph 3- Number of artisanal fishers that received *defeso* per municipality for the total of 12 municipalities visited during field work per month in 2016



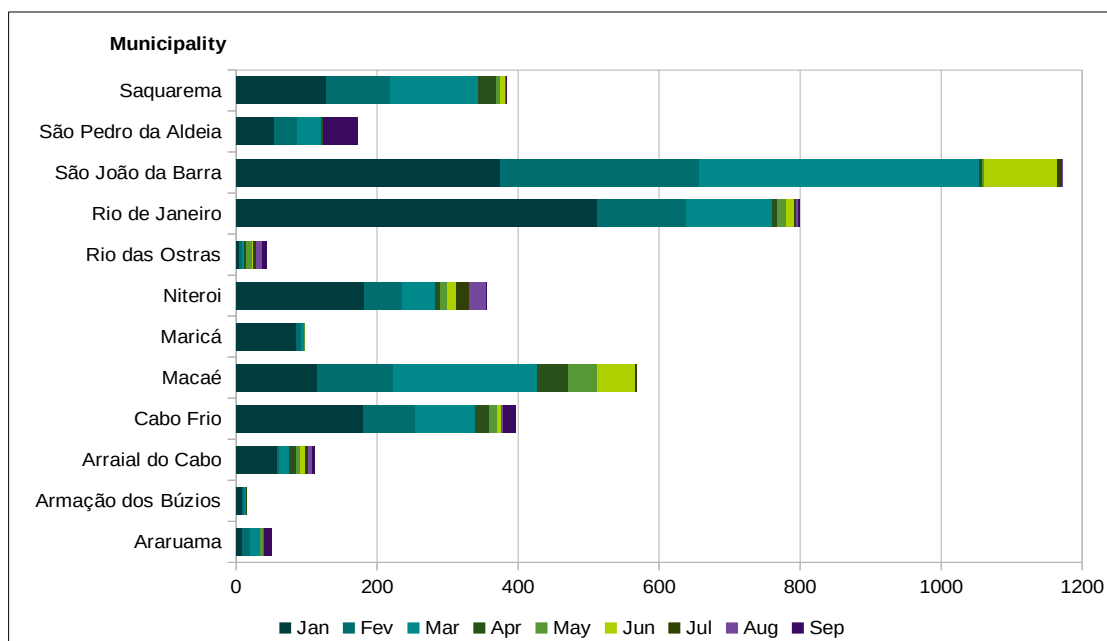
Source: Elaborated by the author.

Graph 4- Number of artisanal fishers that received *defeso* per municipality for the total of 12 municipalities visited during field work per month in 2017.



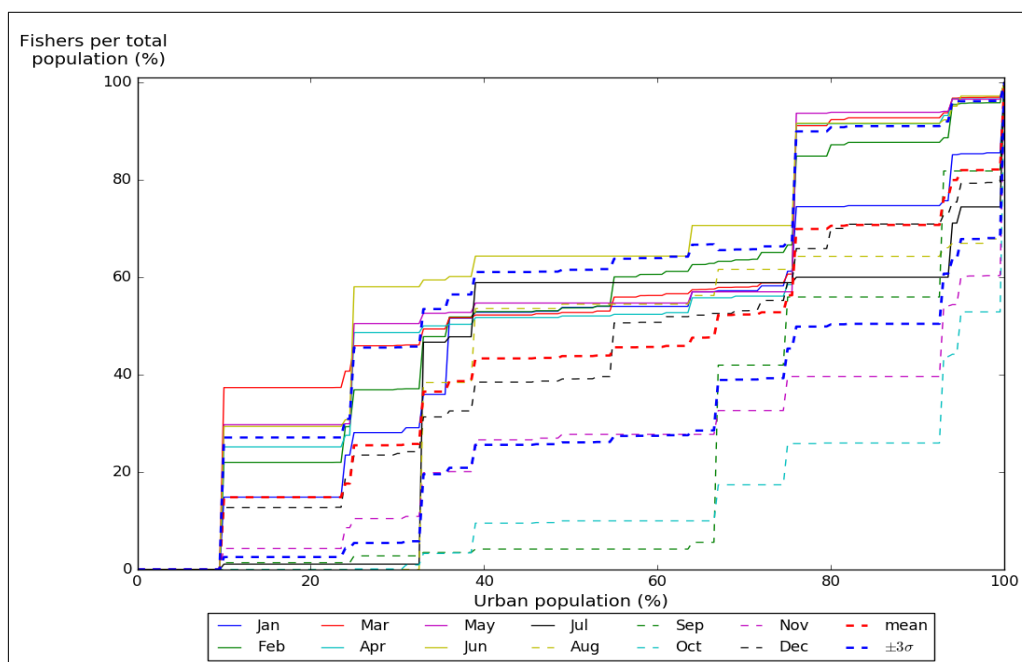
Source: Elaborated by the author.

Graph 5- Number of artisanal fishers that received *defeso* per municipality for the total of 12 municipalities visited during field work per month in 2018 only for the months from January to September.



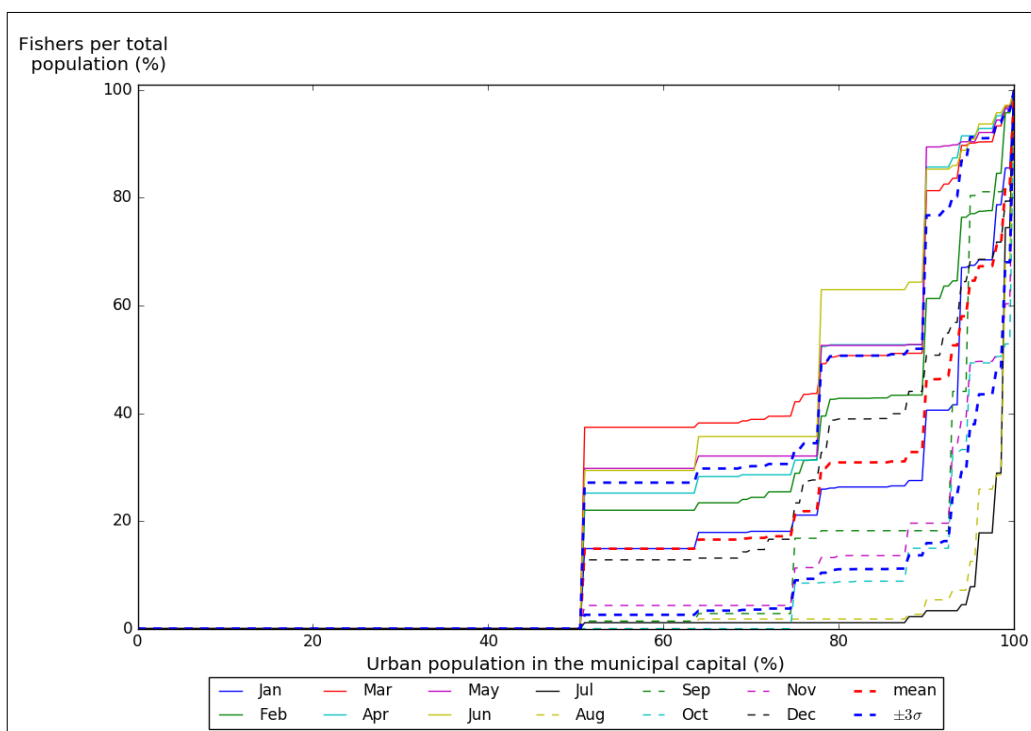
Source: Elaborated by the author.

Graph 6- Cumulative distribution of artisanal fishers per urban population in the municipalities of Rio de Janeiro state, per month in 2016



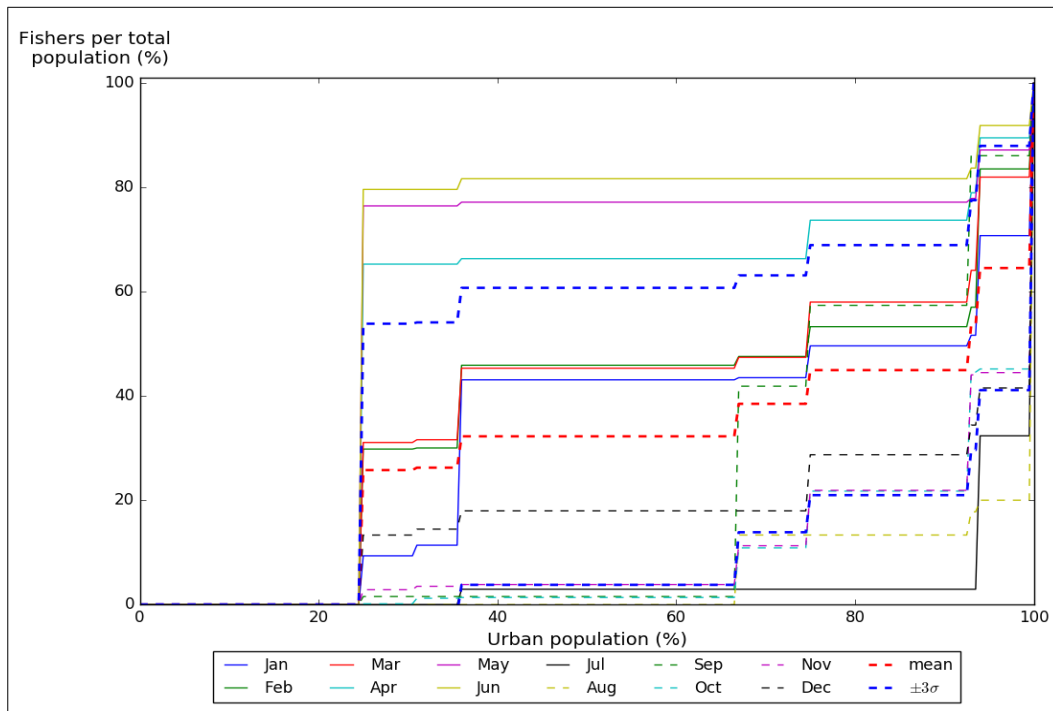
Source: Elaborated by the author.

Graph 7- Cumulative distribution of artisanal fishers per urban population in the respective municipal capitals in Rio de Janeiro state, per month in 2016



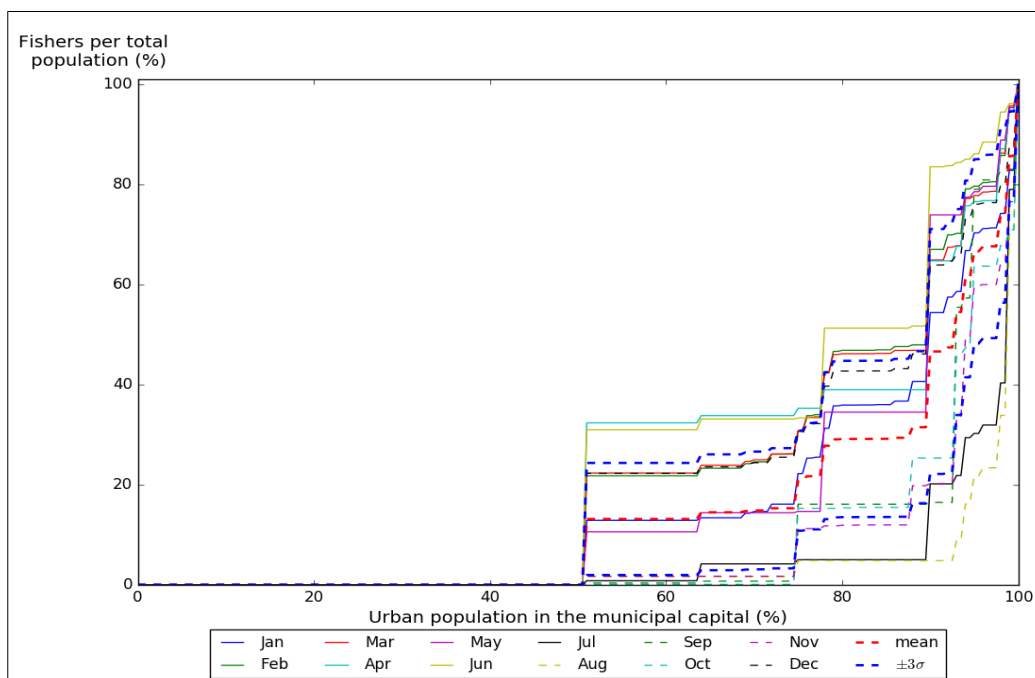
Source: Elaborated by the author.

Graph 8- Cumulative distribution of the artisanal fishers per percentage of urban population in 12 municipalities for the year 2016.



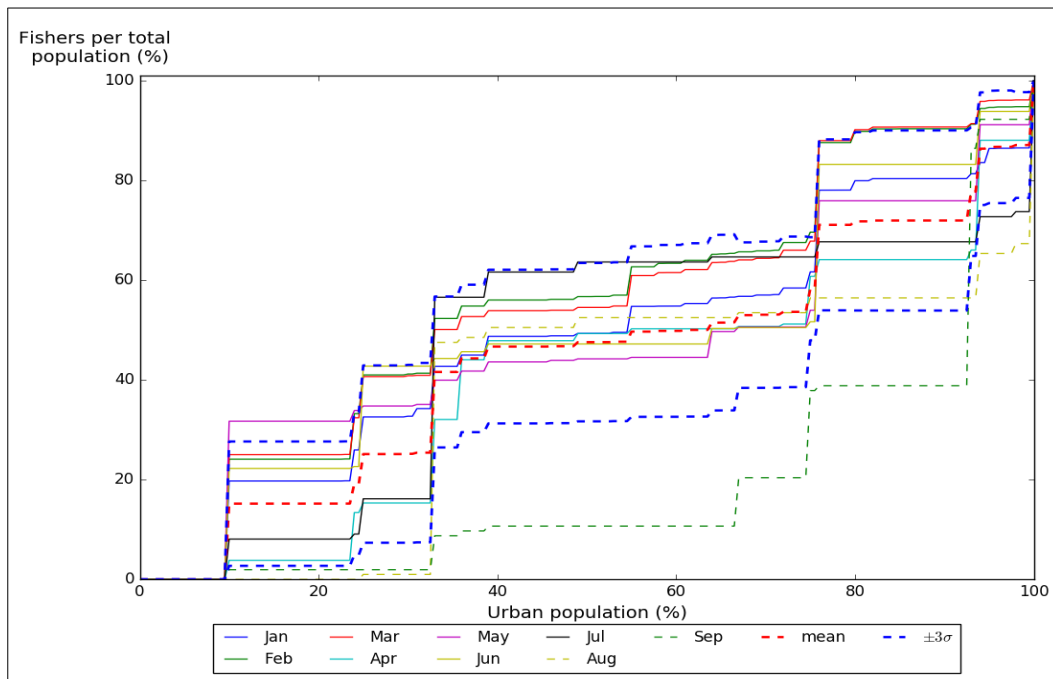
Source: Elaboration from the author.

Graph 9- Cumulative distribution of artisanal fishers per urban population in the respective municipal capitals in Rio de Janeiro state, per month in 2017



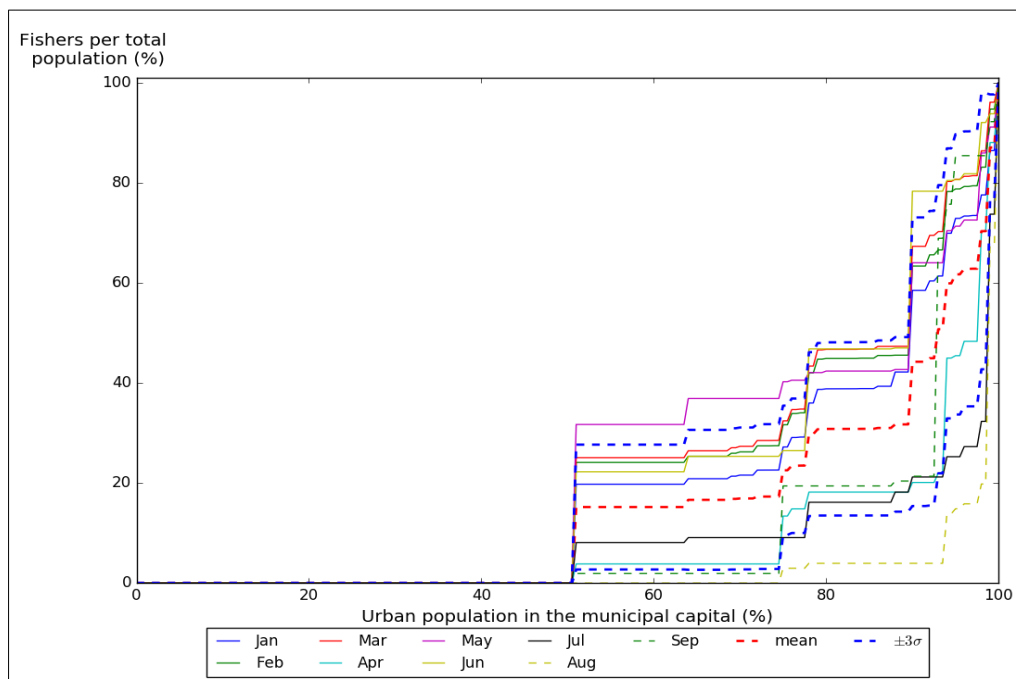
Source: Elaborated by the author.

Graph 10- Cumulative distribution of artisanal fishers per urban population in the respective municipaly in RJ, per month in 2018 only for the months from January to September.



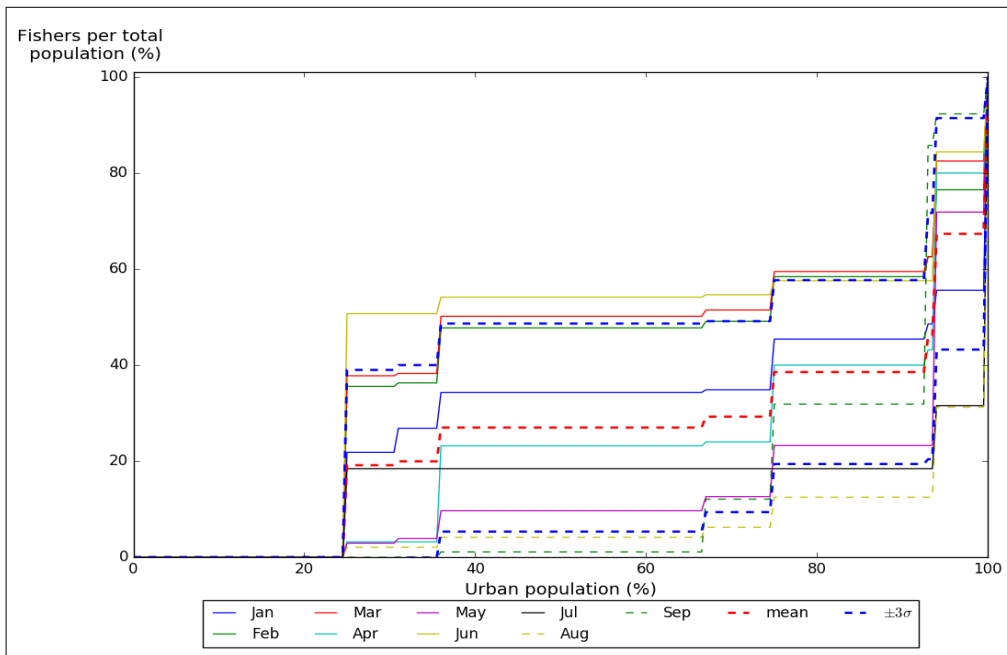
Source: Elaborated by the author.

Graph 11- Cumulative distribution of artisanal fishers per urban population in the respective municipal capitals in Rio de Janeiro state per month in 2018 only for the months from January to September



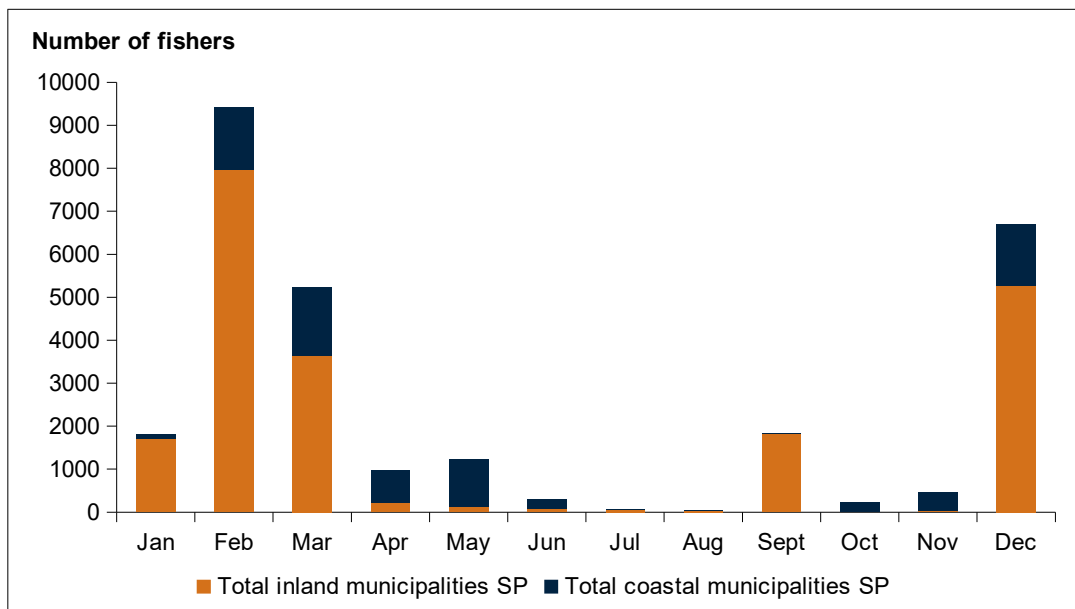
Source: Elaborated by the author.

Graph 12- Cumulative distribution of the artisanal fishers per percentage of urban population in 12 municipalities for the year 2018.



Source: Elaboration from the author.

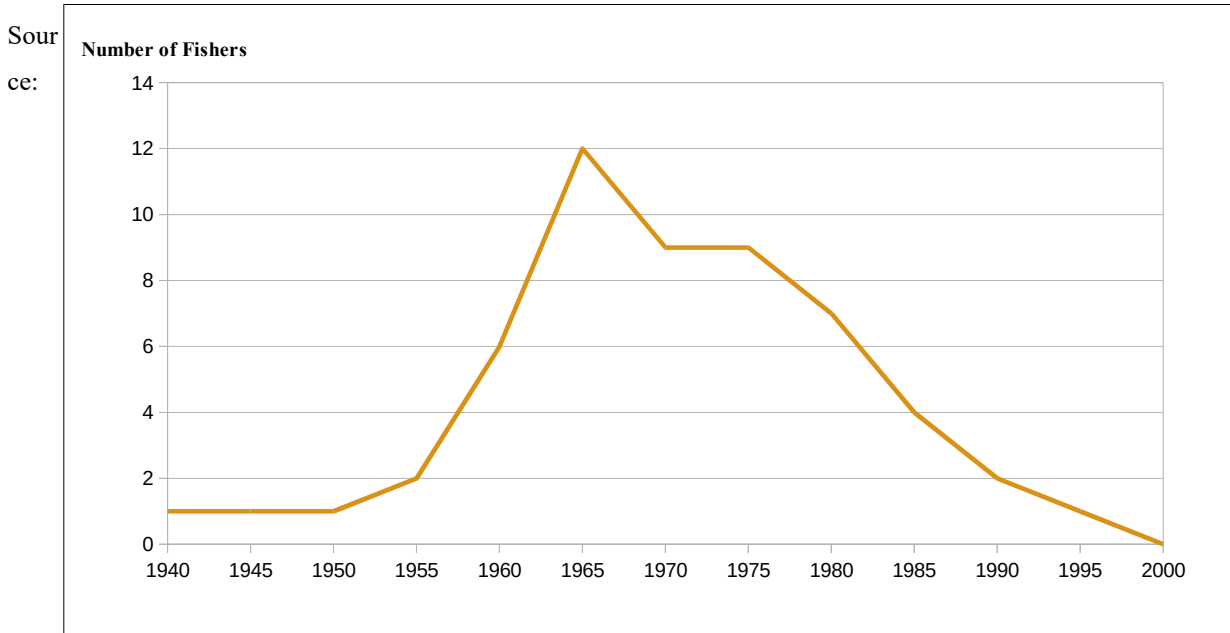
Graph 13- Total number of artisanal fishers receiving defeso per month & per group of municipalities (coastal or interior) in São Paulo state in 2016.



Source: Elaboration from the author.

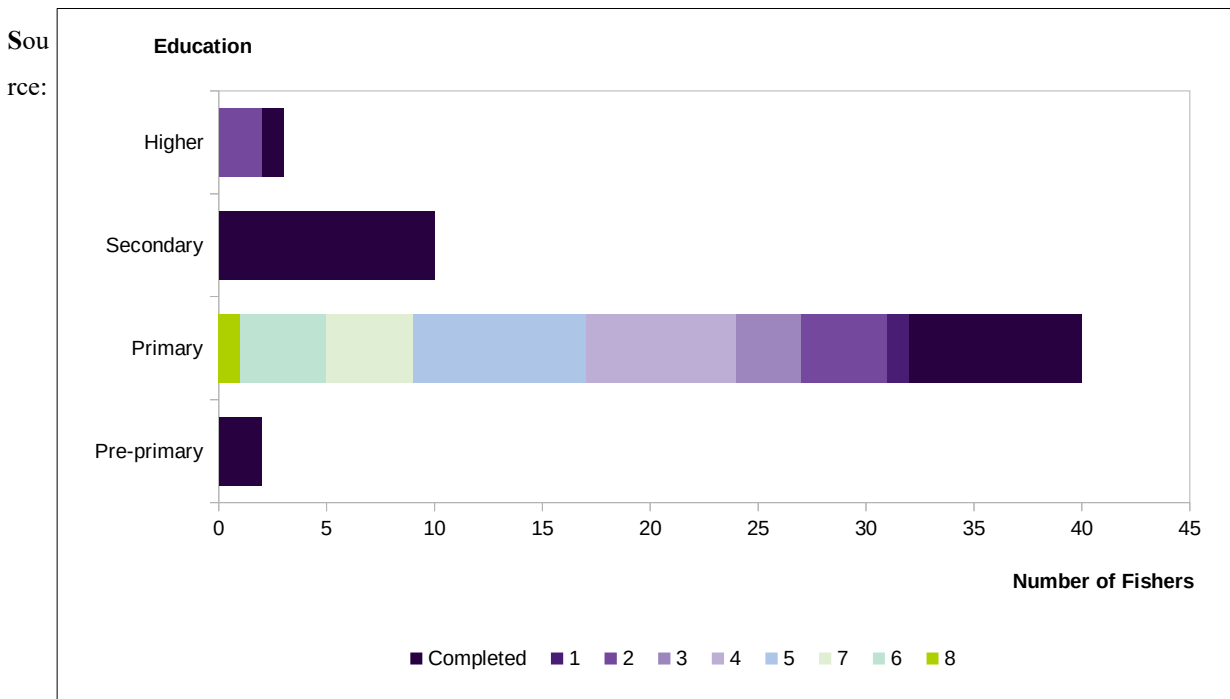
APPENDIX B- SOCIOECONOMIC PROFILE OF THE ARTISANAL FISHERS

Graph 1- Distribution of the year of birth of each of the 55 interviewees



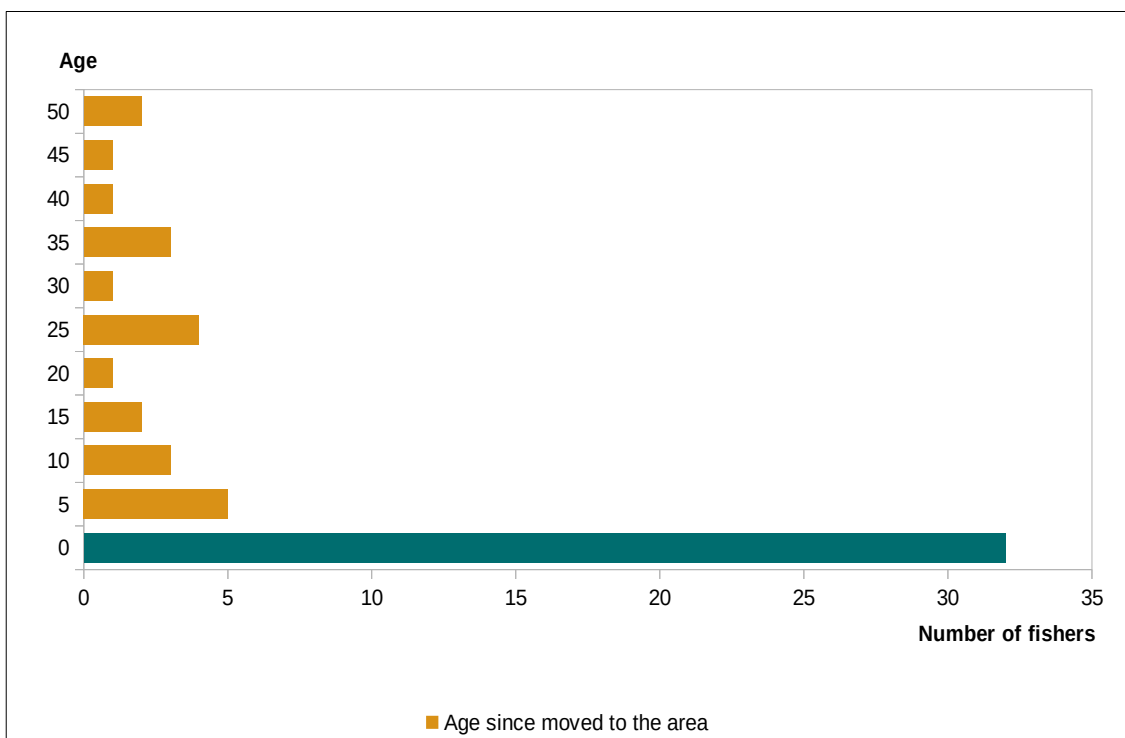
Elaborated by the author.

Graph 2- Education Levels of the 55 Interviewees



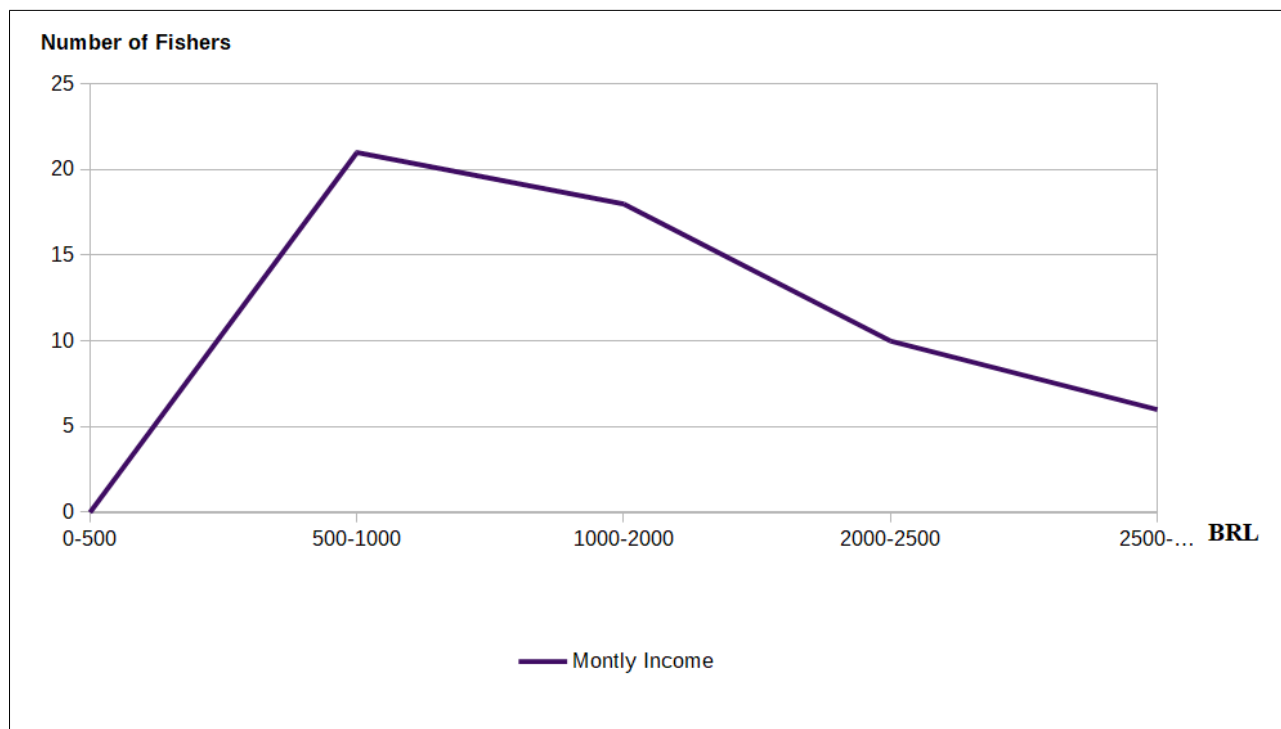
Elaborated by the author.

Graph 3- Years of residence in the area in comparison to date of birth of the fishers (base year 2018)



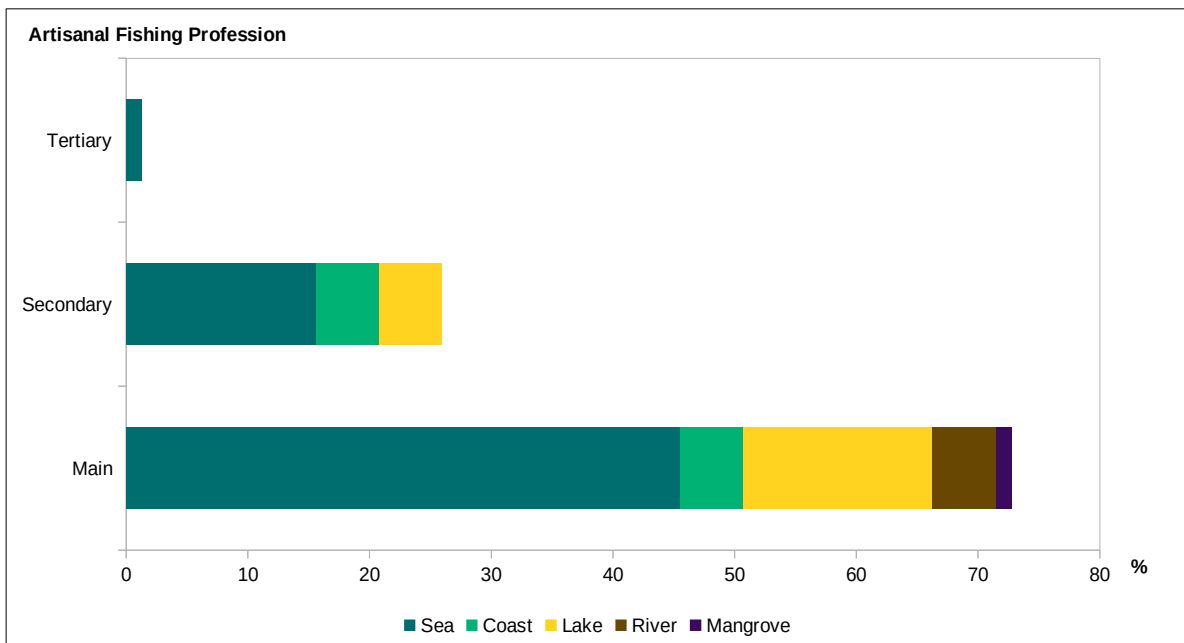
Source: Elaborated by the author.

Graph 4- Monthly Income of the all the interviewees in Reais (BRL)



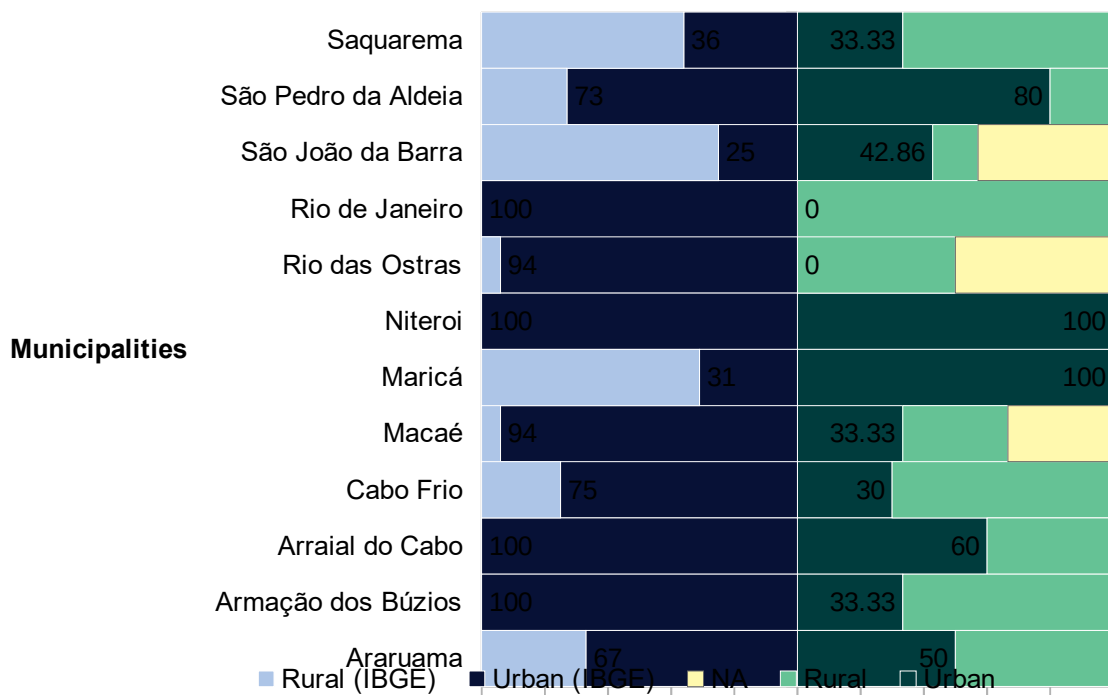
Source: Elaborated by the author.

Graph 5- Territory for the exercise of artisanal fishing as main, secondary or tertiary profession



Source: Elaborated by the author.

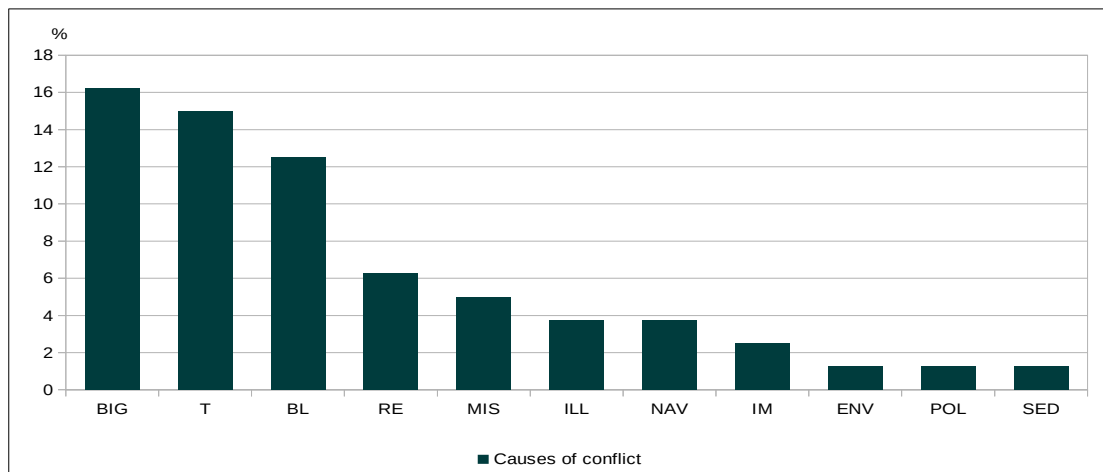
Graph 6- Distribution of urban and rural resident population per municipality (%) (Brazil, 2010) (left in blue colours) and registries from the field work (right in green colours) of the perception of the 55 artisanal fishers on being urban or rural per municipality (%)



Source:

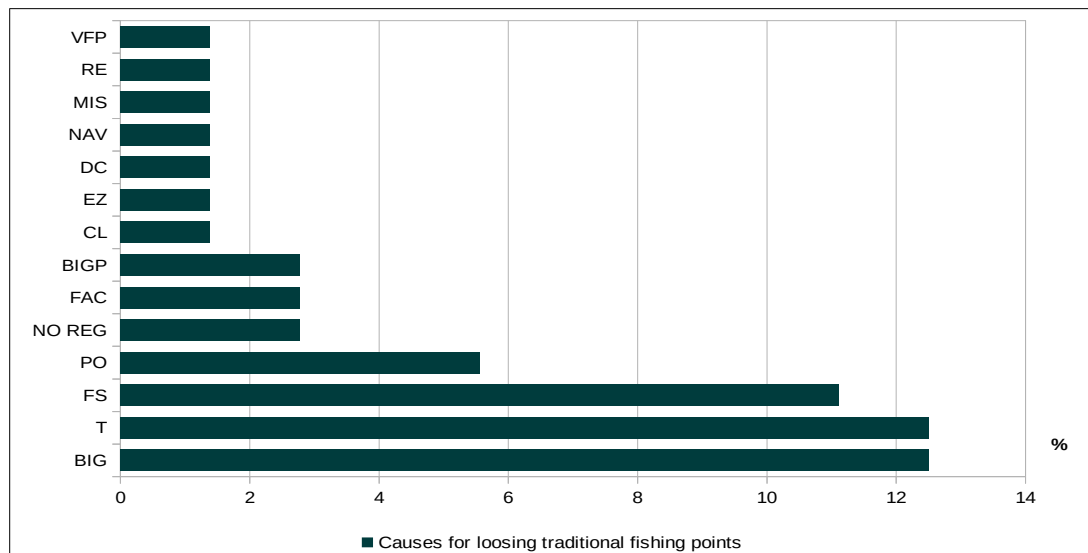
Elaborated by the author.

Graph 7- Distribution of the reported conflicts in the coastal municipalities of Rio de Janeiro.



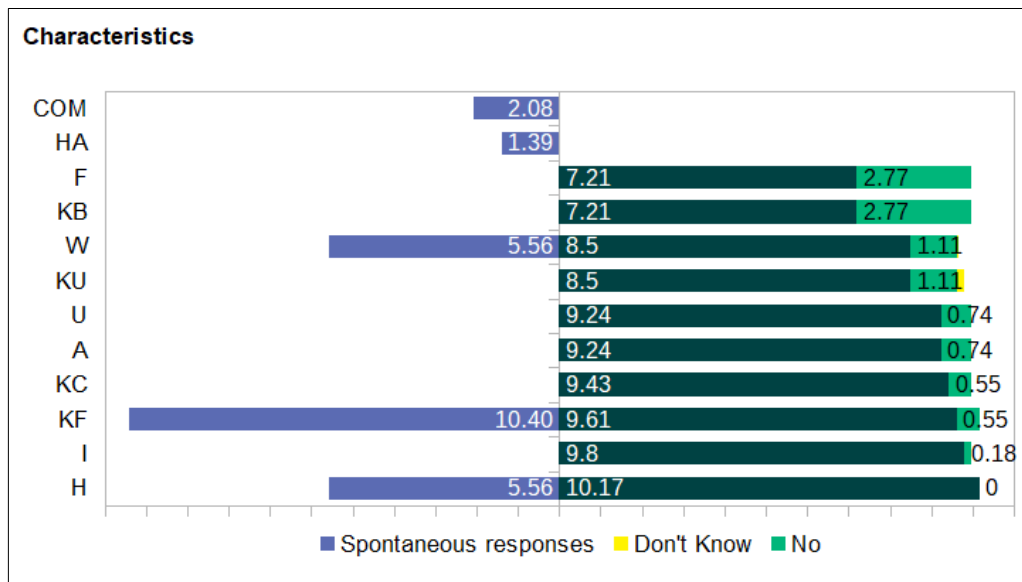
Note: (BIG) big scale industries acting in the sea, (T) tourism, (BL) fishing points blocked by other fishing points of local or outsider artisanal fishers, (RE) real estate expansion, (MIS) mismanagement of the available deck area among the local users, (ILL) illegal activity from outsiders, (NAV) territory that institutionally is claimed by the navy, (IM) internal migration, (ENV) augmented fishing activity due to environmental restrictions in neighbour fishing areas, (POL) transferred pollution for other territories, (SED) sedimentation. Source: Elaborated by the author.

Graph 8- Distribution of causes as presented by the interviewees for loosing traditional fishing points.



Note: (VFP) variability of fishing points, (RE) real estate expansion, (MIS) mismanagement of property of the colony, (NAV) exclusion from the Navy, (DC) dislocation of the colony, (EZ) ecological zoning, (CL) natural changes at the coastal landscape, (BIGP) big port infrastructure constructions, (FAC) artisanal fishers abandon the craft, (NO REG) no regularization of the territory used by the artisanal fishers, (PO) pollution, (FS) fish stock diminished, (T) tourism, (BIG) big scale industries acting in the sea. Source: Elaborated by the author.

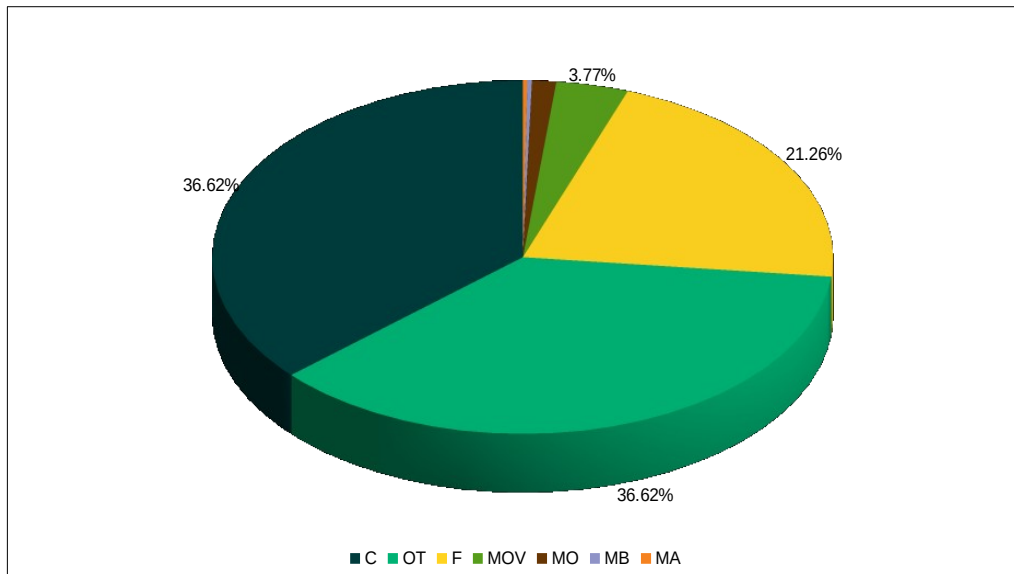
Graph 9- Parameters defining the traditional characteristics of the artisanal fishers' communities as spontaneously attributed by the interviewees Q21 (left) and in response to multiple choice close ended question by the researcher Q22 (right).



Note: (H) historical presence in the area, (I) individual or in small groups activity, (KF) knowledge of fishing activity from one generation to another, (KC) knowledge of climate phenomena and the water cycle in the area way of life, (A) autonomy in the fishing activity, (U) use of small boats and simple technology, (KU) knowledge of underwater topography, (W) customs linked directly with the nature and landscape of the area, (KB) knowledge of the behaviour of the species that inhabit the area, (F) fishing for both family consumption and trade, (HA) local handcraft art related to fishing activities, (COM) sense of belonging in the same community. Source: Elaborated by the author.

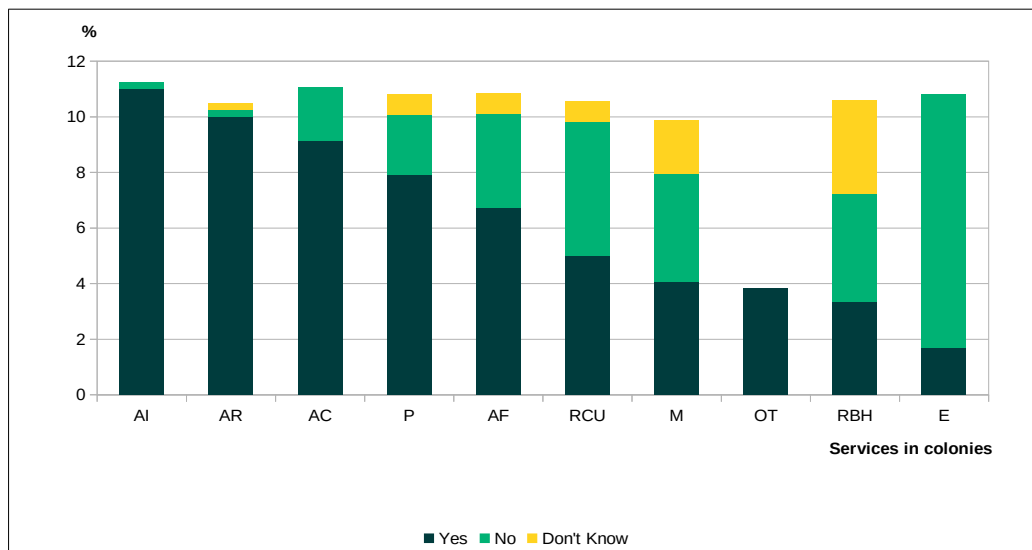
APPENDIX C- PARTICIPATION AND ENVIRONMENTAL AWARENESS OF THE ARTISANAL FISHERS

Graph 1- Reasons for membership in the colony of artisanal fishers.



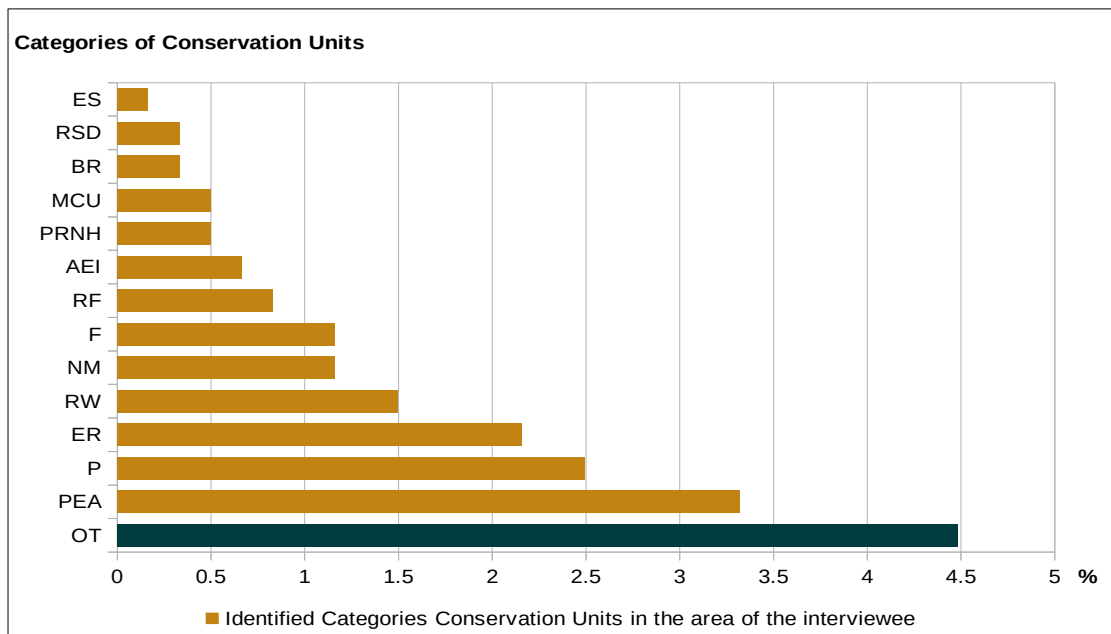
Note: (C) close to residence, (OT) other, (F) family members already registered, (MOV) moving from another municipality or city, (MO) more organized, (MB) more benefits, (MA) more available territory. Source: Elaborated by the author.

Graph 2- Services provided by colonies of artisanal fishers to their members.



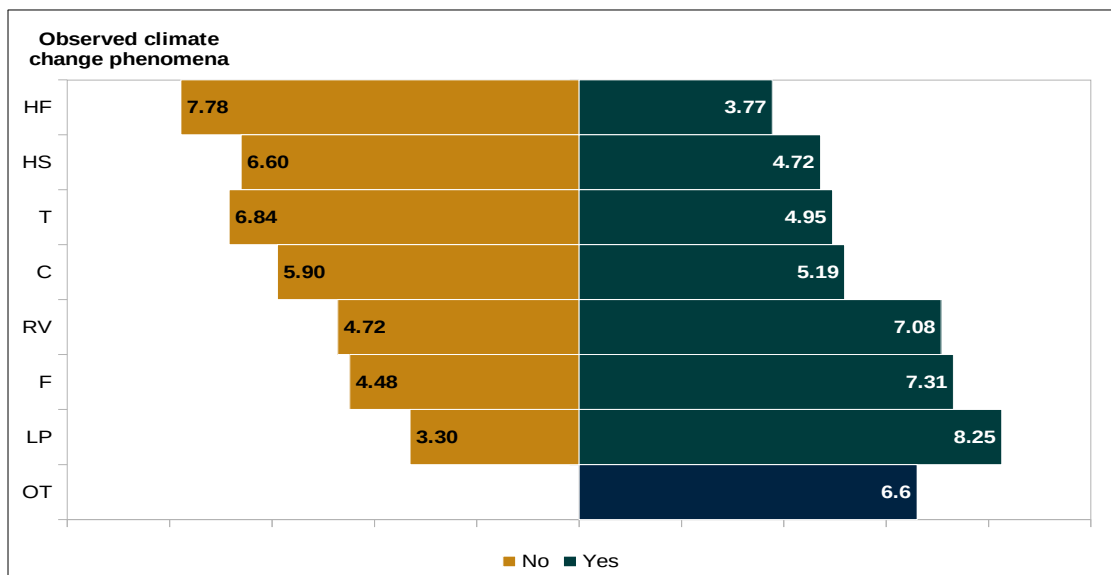
Note: (AI) Insurance benefits for seasonal closures, (AR) retirement pension, (AC) courses from navy, (P) permit for transportation in the open sea, (AF) Financing, (RCU) representation to the council of conservation units, (M) maternity leave, (OT) other, (RBH) representation to the committee of hydrographic basins, (E) equipment. Source: Elaborated by the author.

Graph 3- Distribution of the identified Conservation Units in the local area of the interviewees.



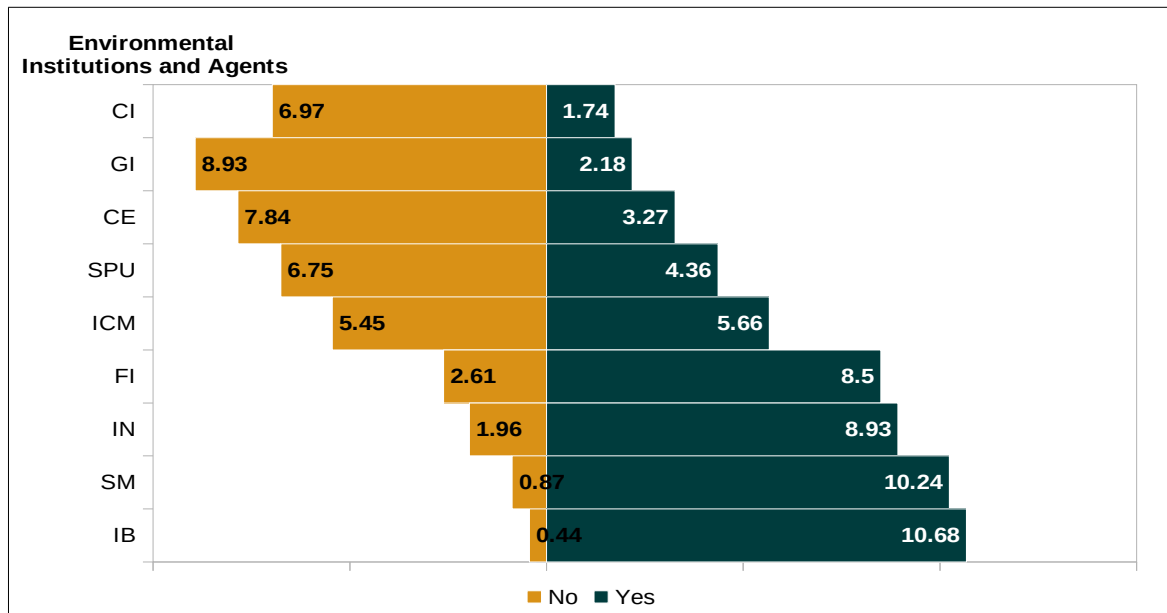
Note:(ES) Ecological Station, (RSD) Extrativist Reserve, (BR) Biological Reserve, (MCU) Mosaic of Conservation Units, (PRNH) Private Reserve of Natural Heritage, (AEI) Area of Ecological Interest, (RF) Reserve for Fauna, (F) Forest, (NM) Natural Monument, (RW) Refuge of Wild Life, (ER), (P) Park, (PEA) Protected Environmental Area, (OT) other. Source: Elaborated by the author.

Graph 4- Distribution of the responses of the interviewees in regards to the observed climate change phenomena.



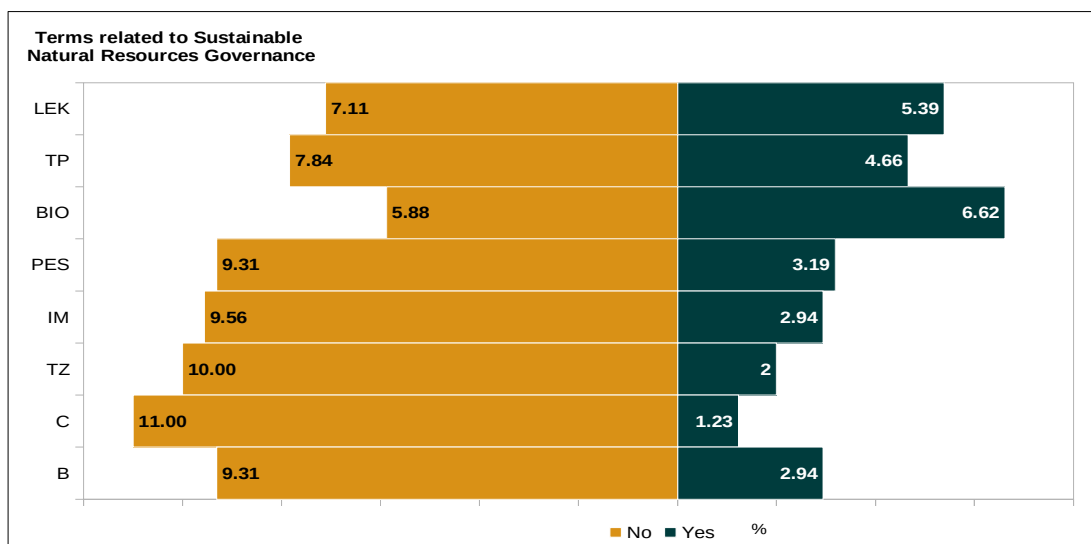
Note: (HF) higher frequency of high-intensity storms, (HS) higher sea level, (T) changes to the cycle of the tide, (C), (RV) reduced variety and quantity of marine species, (F) changes to the routes the fish follow during their different stages of life, (LP) longer periods of droughts, (OT) other. Source: Elaborated by the author.

Graph 5- Distribution (%) of the familiarity of the interviewees with environmental institutions and agents.



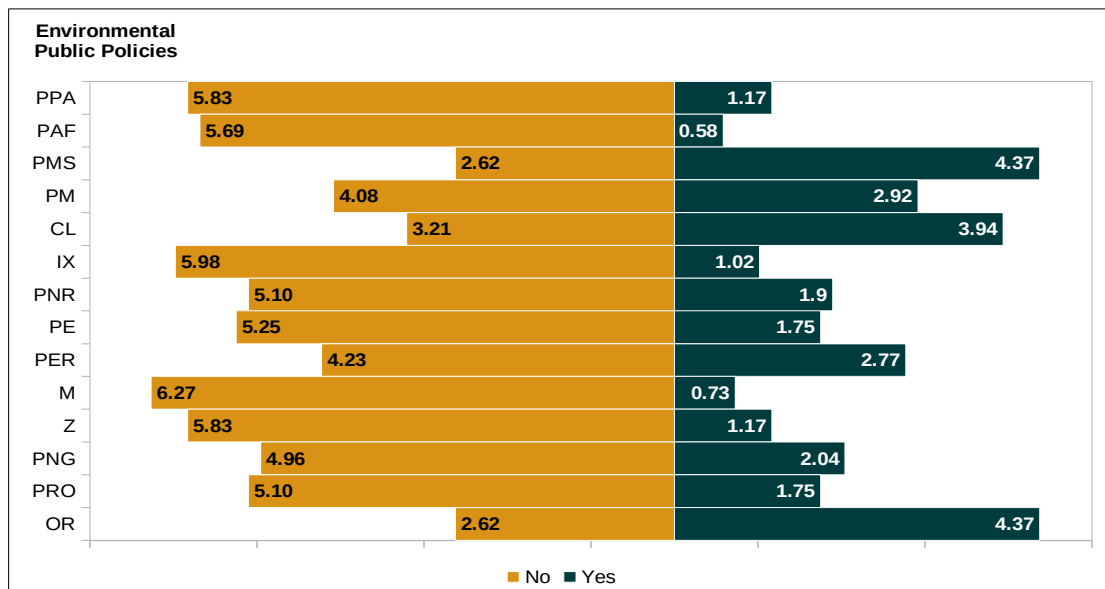
Note: (CI) CIRM , (GI) GI-GERCO, (SPU) Superintendency of the Patrimony of the Union in Rio de Janeiro, (ICM) ICMBio, (FI) FIPERJ, (IN) Inea, (SM) Municipal Secretary for the Environment, (IB) IBAMA. Source: Elaborated by the author.

Graph 6- Distribution (%) of the level of knowledge of the interviewees on terms related to sustainable natural resources governance.



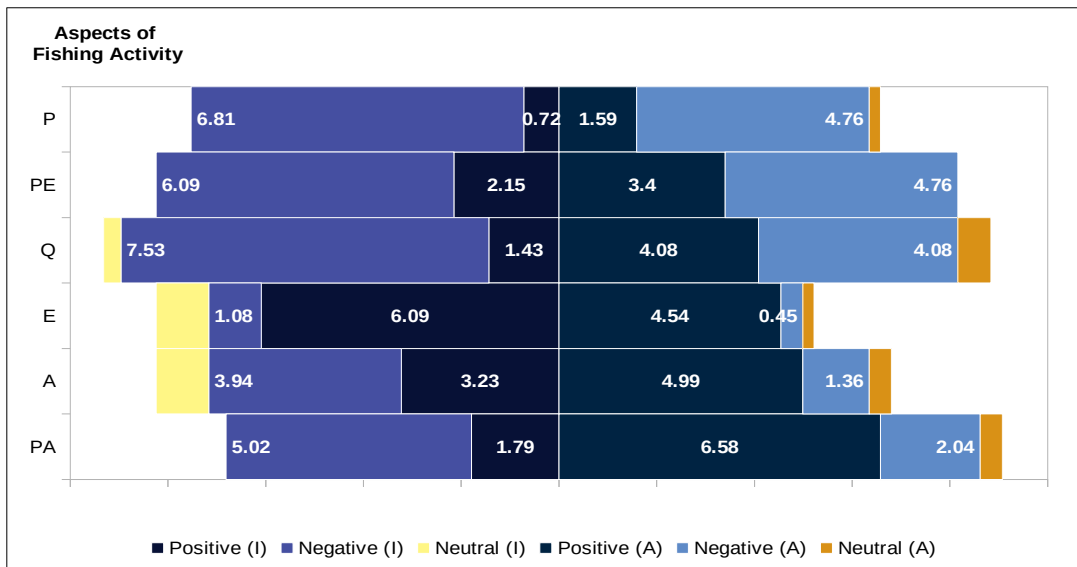
Note:(LEK) local ecological knowledge, (TP) territorial planning, (BIO) biodiversity, (PES) payments for environmental services, (IM) integrated management, (TZ) transition zone, (C) core area, (B) buffer zone. Source: Elaborated by the author.

Graph 7- Distribution of the interviewees' familiarity with environmental public policies.



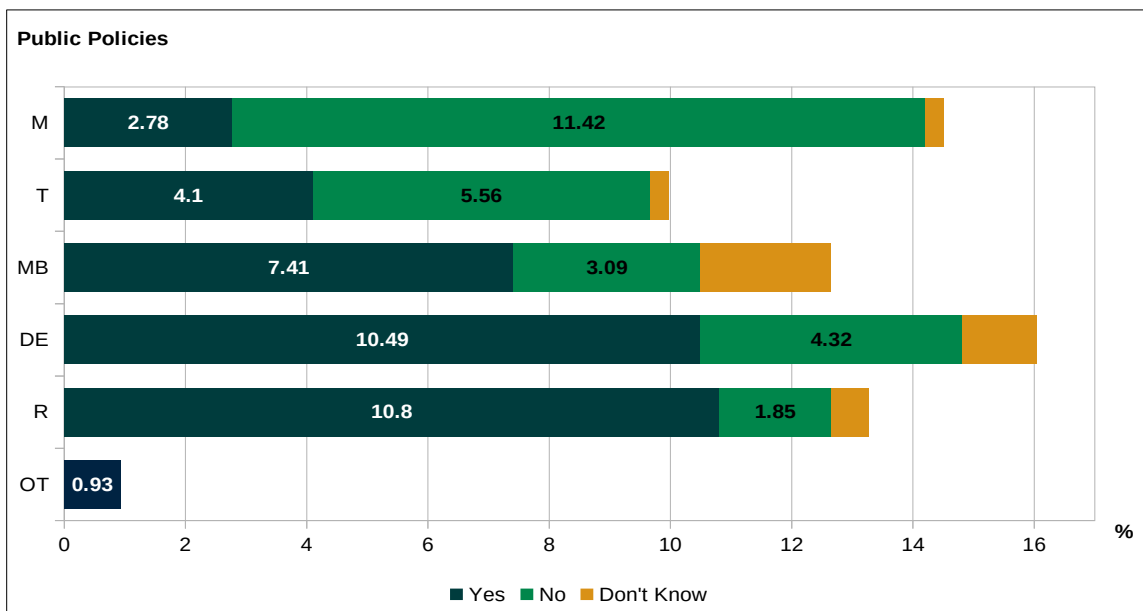
Note:(PPA) Plano Plurianual, (PAF) IV Plano de Ação Federal para a Zona Costeira , (PMS) Plano Municipal de Saneamento Básico, (PM) Programa de Monitoramento Ambiental dos Biomas Brasileiros, (CL) Combate Lixo ao Mar program, (IX) IX Sectoral Plan, (PNR) National Plan for Water Resources, (PE) State Plan for Coastal Management, (PER) Plano Estadual de Recursos Hídricos do Rio de Janeiro, (M) Macrodiagnostic, (Z) Environmental and Economic Zoning, (PNG) National Plan for Coastal Management, (PRO) Procosta, (OR) Orla Project. Source: Elaborated by the author.

Graph 8- Distribution of the environmental impact of industrial (I) and artisanal fishing (A) activity in combination of the responses of the interviewees to both questions Q94 and Q95 respectively.



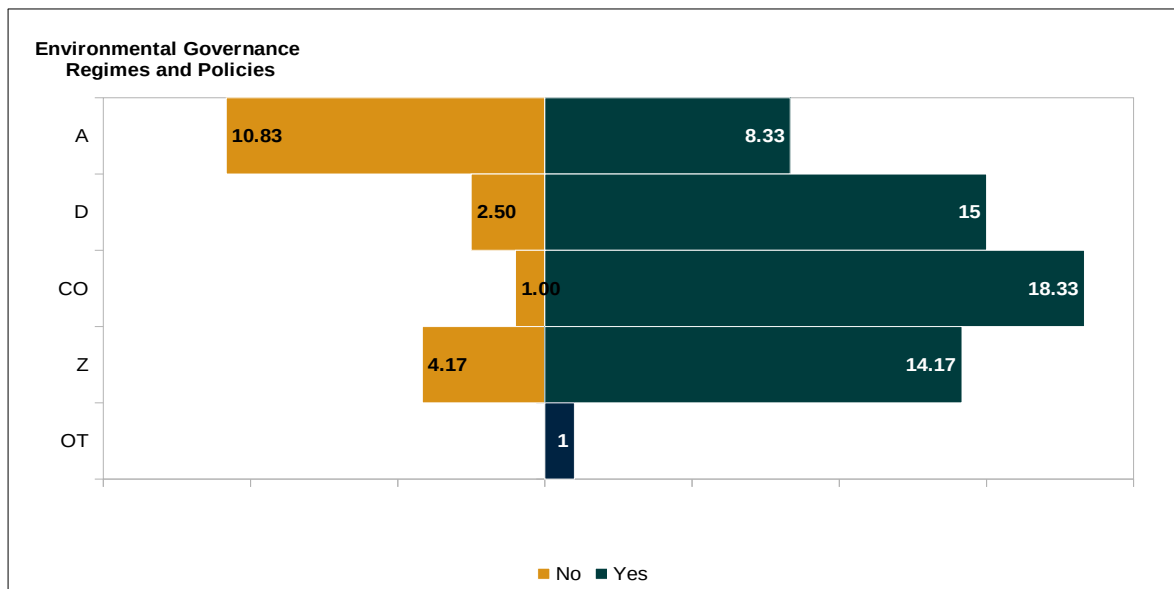
Note: (P) use of petrol derivatives, (PE) capture of prohibited species, (Q) quantities of captured fish, (E) employment, (A) alimentation, (PA) presence in the area. Source: Elaborated by the author.

Graph 9- Distribution (%) of the evaluation of the interviewees on environmental public policies as implemented in the corresponding area of the interviewees.



Note: (DE) defeso, (MB) expansion or institution of new protected areas, (R) restrictions in size and quantity of fishing nets, (M) monitoring, (T) territorial planning of the coastal areas, (OT) other. Source: Elaborated by the author.

Graph 10- Distribution (%) of the interviewees preferences on environmental governance regimes and policies.



Note: (A) Autonomy, (D) deliberate participation of the artisanal fishers' community to committees and councils related to natural resource management, (CO) co-management, (Z) zones per species, vessel or fishing equipment, (OT) other.
 Source: Elaborated by the author.

APPENDIX D- CALENDAR OR ATTENDED EVENTS

Date	Event	Type
29/03/17	Regular Meeting of the Watershed Committee of the Guanabara Bay (CBH-BG)	Presentations of the agenda, public discussion and voting procedures
07/04/17	Regular Meeting of the Western Sub-committee of the Watershed Committee of the Guanabara Bay (SC-Oeste CBH-BG)	Presentations of the agenda, public discussion and voting procedures
13/04/17	Seminário de Planejamento e Cooperação Municipal na Metrópole do Rio.	Technical public administration and monitoring on Agenda 2030, public professionals, basic sanitation, mobility, education, health, security
23/05/17	Internal meeting of CONEMA	Presentation of the agenda by experts on APA, financing reforestation
09/06/17	Painel da Virada sobre Águas, MAR	Expert panel on the water sustainability, access on basic sanitation and potable water, depollution of water bodies in Rio de Janeiro
24/06/17	Assembleia da Agua, Preparatory Meeting	Short presentations of the representatives of civil society groups, and working groups on: (a) management, uses and access, (b) risks and extreme events
16/07/17	Itinerant Forum: “Saneamento Ambiental e riscos ao Abastecimento Público da Ilha da Paqueta”	Panel of the invited speakers and power point presentations
21/07/17	Seminário A Baía do Amanhã, Museu do Amanhã	Presentations by experts on governance, the state of Guanabara, and waste management
28-30/08/17	Watershed Committees of the Rio de Janeiro state (VECOB -RJ)	Debates, case studies presentations, technical visits and sectoral reunions on: i) the interface of coastal and water resources management, ii) the relation of the decrease of flows in the rivers and salinity, and iii) dams, licensing and water security.

APPENDIX E- QUESTIONNAIRE



MUNICÍPIO: _____

LOCAL DE ENTREVISTA: _____

DATA: ____/____/____

PERFIL

1. Nome e Sobrenome: _____
2. Ano de Nascimento: ____/____/____
3. Gênero: **Masculino/ Feminino**
4. Você estudou? [Não /Sim]
5. Até que série?
[Educação infantil / Ensino fundamental (1-9 série) / Ensino Médio (1-3 colegial) / Educação de Jovens e Adultos / Ensino Superior]
6. Principal Profissão: _____

7. Secundária: _____

8. Outra: _____
[roça, plantio, criação de animais]
9. Renda mensal em BRL\$: [0-500, 500-1000, 1000-2000, 2000-2500, acima de 2500]

TERRITORIALIDADE

10. Lugar de nascimento: _____
11. Lugar de moradia: _____
12. A quanto tempo? _____ anos / meses
13. Casa própria / Alojamento / Aluguel
14. Tem *água encanada*, ou é *poço artesiano*?
15. Tem *sistema de esgoto*, ou *fossa séptica*, ou *nenhum dos dois*?
16. **Área do Principal trabalho:** mar/ costa/ rio/ mangue/ floresta/ outro: _____
17. Limites: _____
18. **Área do Trabalho Secundário:** mar/ costa/ rio/ mangue/ floresta/ outro: _____
19. Limites: _____

20. Você se identifica como pescador *rural* ou *urbano*?
21. Você considera sua comunidade como tradicional? [Sim- Não- Não Conheço].
22. Conta as características da comunidade: _____
23. Complementa resposta com as seguintes itens caso correspondem:

Modo de vida/ costumes ligada diretamente com a natureza e paisagem da área		Conhecimento dos fenômenos do clima e do ciclo da água na área	
Presença histórica na área da comunidade		Autonomia na atividade	
Conhecimento do comportamento das espécies que habitam a área		Atividade individual ou em pequenos grupos	
Pesca destinada tanto ao consumo familiar como ao comércio		Uso de barcos de pequeno tamanho e tecnologia simples	
Conhecimento da pesca de uma geração a outra		Conhecimento da topografia submarina	

24. Essa área que a comunidade usa é suficiente para vocês em relação ao número das embarcações? [Sim - Médio- Não]
25. Tem conflitos para o uso do território na sua área? [Sim-Não- Não Conheço]
26. Qual? _____
27. As áreas de pesca que ocupava tradicionalmente a colônia/ associação foram mantidos? [Sim-Não- Não Sei]
28. [caso não] porque? _____

ASSOCIAÇÃO e PARTICIPAÇÃO

29. Você está associado com a Colônia _____ de pesca/ Associação de Pescadores Artesanais? [Sim- Não]
30. Desde quando? ___/___/_____
31. Por que você cadastrou nessa? (marque os itens correspondentes):

Mais organizada		Mais benefícios	
Perto da moradia		Mais área disponível para pesca	
Membro da família já cadastrado		Outro:	
Mudança de outro município/cidade			

32. A colônia / associação oferece para você acesso a: [Sim-Não- Não Sei]

Equipamento		Aposentadoria	
Carteira aquaviário		Representação nos conselhos de UC	

Seguro Defeso		Representação nas comitês de BH	
Cursos da Marinha		Financiamento	
Licença Maternidade		Outro:	

33. Como é a condição financeira da colônia/associação? _____

34. De onde vem os recursos? _____

35. As colônias/associações têm diferenças de um território a outro?

36. Quantas vezes têm encontros e reuniões? _____/mês, ano

37. Quantas vezes você assista? [Muito – Bastante - Mais o menos -Pouco -Nunca]

38. Já propus um assunto e foi ouvido? [Sim / Não]

39. Qual? _____

40. Muitas pessoas da sua comunidade também participam? [Muito – Bastante - Mais o menos -Pouco -Nunca]

41. Desafios – parâmetros que impedem o pescador a participar

	SIM	MÉDIO	NÃO
Condições financeiras			
Muito ocupados (com trabalho, família, outras responsabilidades)			
Falta de informação, conhecimento de políticas públicas			
Nível educação			
Condições de saúde			
Falta de transporte, acessibilidade			
Questões sociais/raciais			
Falta de interesse			
Outros:			

42. Você está associado em outros coletivos:

43. Comitê de Bacia Hidrográfica: _____

44. Quantas vezes têm encontros e reuniões? _____/mês, ano

45. Quantas vezes você assista? [Muito – bastante - mais o menos -pouco -nunca]

46. Já propôs um assunto e foi ouvido? [Sim / Não]

47. Qual? _____

48. Muitas pessoas da sua comunidade também participam? [Muito – bastante - mais o menos -pouco -nunca]

49. Desafios – parâmetros que impedem o pescador a participar

	SIM	MÉDIO	NÃO
Condições financeiras			
Muito ocupados (com trabalho, família, outras responsabilidades)			
Falta de informação, conhecimento de políticas públicas			
Nível educação			
Condições de saúde			
Falta de transporte, acessibilidade			
Questões sociais/raciais			
Falta de interesse			
Outros? Quais ?			

50. Conselho Gestor de Unidade de Conservação: _____

51. Quantas vezes têm encontros e reuniões? _____/mês, ano

52. Quantas vezes você assista? [Muito – bastante - mais o menos -pouco -nunca]

53. Já propôs um assunto e foi ouvido? [Sim / Não]

54. Qual? _____

55. Muitas pessoas da sua comunidade também participam? [Muito – bastante - mais o menos -pouco -nunca]

56. Desafios – parâmetros que impedem o pescador a participar

	SIM	MÉDIO	NÃO
Condições financeiras			
Muito ocupados (com trabalho, família, outras responsabilidades)			
Falta de informação, conhecimento de políticas públicas			
Nível educação			
Condições de saúde			
Falta de transporte, acessibilidade			
Questões sociais/raciais			
Falta de interesse			
Outros? Quais ?			

57. Associação de Moradores: _____

58. Quantas vezes têm encontros e reuniões? _____/mês, ano

59. Quantas vezes você assista? [Muito – bastante - mais o menos -pouco -nunca]

60. Já propôs um assunto e foi ouvido? [Sim / Não]

61. Qual? _____

62. Muitas pessoas da sua comunidade também participam? [Muito – bastante - mais o menos -pouco -nunca]

63. Desafios – parâmetros que impedem o pescador a participar

	SIM	MÉDIO	NÃO
Condições financeiras			
Muito ocupados (com trabalho, família, outras responsabilidades)			
Falta de informação, conhecimento de políticas públicas			
Nível educação			
Condições de saúde			
Falta de transporte, acessibilidade			
Questões sociais/raciais			
Falta de interesse			
Outros? Quais?			

64. **Sindicato:** _____

65. Quantas vezes têm encontros e reuniões? _____/mês, ano

66. Quantas vezes você assista? [Muito – bastante - mais o menos -pouco -nunca]

67. Já propôs um assunto e foi ouvido? [Sim / Não]

68. Qual? _____

69. Muitas pessoas da sua comunidade também participam? [Muito – bastante - mais o menos -pouco -nunca]

70. Desafios – parâmetros que impedem o pescador a participar

	SIM	MÉDIO	NÃO
Condições financeiras			
Muito ocupados (com trabalho, família, outras responsabilidades)			
Falta de informação, conhecimento de políticas públicas			
Nível educação			
Condições de saúde			
Falta de transporte, acessibilidade			
Questões sociais/raciais			
Falta de interesse			
Outros? Quais?			

71. **Outro:** _____

72. Quantas vezes têm encontros e reuniões? _____/mês, ano

73. Quantas vezes você assista? [Muito – bastante - mais o menos -pouco -nunca]

74. Já propôs um assunto e foi ouvido? [Sim / Não]

75. Qual? _____

76. Muitas pessoas da sua comunidade também participam? [Muito – bastante - mais o menos -pouco -nunca]

77. Desafios – parâmetros que impedem o pescador a participar

	SIM	MÉDIO	NÃO
Condições financeiras			
Muito ocupados (com trabalho, família, outras responsabilidades)			
Falta de informação, conhecimento de políticas públicas			
Nível educação			
Condições de saúde			
Falta de transporte, acessibilidade			
Questões sociais/raciais			
Falta de interesse			
Outros? Quais ?			

78. Você tem receio de falar sobre isso (de mostrar que você participa)? [Sim - Médio- Não]

79. [Caso Sim/ Médio] Porque? _____

CONHECIMENTO SOBRE POLITICAS PUBLICAS AMBIENTAIS

80. Em sua região tem unidades de conservação (Nacional /Estadual/ Municipal) terrestres e /ou marinhas?

Area de Interesse Ecológico	(N / E / M)
Area Protegida Ambiental (APA)	(N / E / M)
Estação Ecológica (ESEC)	(N / E / M)
Floresta	(N / E / M)
Monumento Natural	(N / E / M)
Parque	(N / E / M)
Refugio da Vida Silvestre	(N / E / M)
Reserva Biológica	(N / E / M)
Reserva Extrativista (RESEX)	(N / E / M)
Reserva de Desenvolvimento Sustentável	(N / E / M)
Reserva de Fauna	(N / E / M)
Reserva Particular do Patrimônio Natural (RPPN)	(N / E / M)

Outro: (Mosaico das UCs) _____

81. Você acompanha as decisões para essas áreas de conservação ambiental **terrestres** [Sim- Não] e **marinhas** [Sim- Não]?

82. Como? _____

83. Você sabe qual a diferença entre as áreas de **proteção integral** e de **uso sustentável**?
[Sim- Não] Qual é?

84. Sua região esta inserida numa bacia hidrográfica ? [Sim-Não- Não Conheço]

85. (CASO SIM) Então Qual? _____

86. Conhece o termo mudança climática ? [Sim- Não]

87. o que é para você? _____ (é o aumento contínuo da temperatura media global próximo a 2°C ao longo dos anos por causa da atividade humana que se diferencia dos vários estados do tempo num momento e numa área)

88. Você observa mudanças climáticas no seu território?[Sim-Não- Não Conheço]

Rotas dos peixes		Variedade das espécies	
O ciclo da maré é diferente		Aumento do nível do mar	
Frequência e intensidade de tempestades		Mais longos períodos de seca	
As épocas do peixe ao longo dos anos (safras)		Outro:	

89. Conhece os seguintes agentes:[Sim-Não- Não Sei]

Instituto Chico Mendes de Conservação da Biodiversidade (ICMbio)		Comissão Interministerial para os Recursos do Mar (CIRM)	
Inea		Secretaria Municipal de Meio Ambiente - SMAC	
IBAMA		Fundação Instituto de Pesca do Rio de Janeiro (FIPERJ)	
Instituto Nacional de Florestas (IEF/ RJ)		Grupo de Integração do Gerenciamento Costeiro (GI-GERCO)	
Superintendência do Patrimônio da União no Rio de Janeiro		Conselho Estadual de Recursos Hídricos (CERHI-RJ)	

90. Conhece os seguintes termos? [Sim-Não- Não Conheço]

Zona de amortecimento (UC)		Pagamentos por Serviços ambientais (PSA)	
Zona núcleo (UC)		Biodiversidade	
Zona de transição (UC)		Ordenamento territorial	
Gestão integrada		Conhecimento Ecológico Local	

91. Você já participou em conversas que mencionaram as seguintes políticas públicas?

[Sim-Não- Não Conheço]

Projeto de Gestão Integrada da Orla Marítima (Orla)		Plano Estadual de Gestão Costeira	
Programa Procosta		Plano Nacional dos Recursos Hídricos	
Plano Nacional de Gestão Costeira		IX Plano Setorial para os Recursos do Mar (2016-2019)	
Zoneamento Ecológico-Econômico Costeiro (ZEEC)		Campanha institucional Combate ao Lixo no Mar	
Macrodiagnóstico		Programa de Monitoramento Ambiental dos Biomas Brasileiros (PMABB)	
Plano Estadual de Recursos Hídricos (PERHI) do Rio de Janeiro		Plano Municipal de Saneamento para os serviços de Abastecimento de Água e esgotamento sanitário (PMSB – AE)	
IV Plano de Ação Federal para a Zona Costeira (PAF-ZC) 2017-2019		Plano Plurianual (PPA)	

PRINCIPAIS PROBLEMAS AMBIENTAIS OBSERVADOS

92. Quais são os três principais problemas ambientais para a comunidade na sua região?

A.
B.
C.

93. Tem outros problemas ambientais que impactam sua pesca especificamente?

94. Quais os impactos positivos (+) e negativos (-) da pesca industrial no meio ambiente?

	+	-		+	-
Emprega indivíduos			Uso de tecnologia nova		
Fonte de alimentação principalmente destinado a exportação a vez do consumo local			Cadeia de produção grande (Infraestrutura portuária e industrial)		
Uso de petróleo para os motores			Uso dos estoques de pesca		
Presença diária na área (monitoramento e prevenção de risco ambientais)			Pesca de espécies proibidos		
Outro:					

95. Quais os impactos positivos (+) e negativos (-) da pesca artesanal no meio ambiente?
[Sim- Não]

	+	-		+	-
Emprega indivíduos			Presença diária na área (monitoramento e prevenção de risco ambientais)		
Fonte alimentação principalmente para locais (Segurança alimentar)			Uso dos estoques de pesca		
Pesca de espécies proibidos			Conhecimentos específicos sobre as espécies e da área (complementares a pesquisa científica)		
Uso de petróleo para os motores			Cadeia de produção pequena		
Outro:					

96. Você é engajado em atividades ambientais como voluntário? [Sim -Não]

97. Quais? _____

98. Você queria participar mais nas decisões sobre políticas ambientais na área? [Sim -Não]

99. Você acha que os pescadores artesanais podem contribuir mais para melhorar as condições ambientais (água/pesca/floresta) para a região? [Sim- Não- Não Conheço]

100. Como? _____

101. As seguintes políticas públicas ambientais têm impacto **negativo (-)** ou **positivo(+)** para os pescadores artesanais?

	+	-	PORQUE
Defeso			
Mais ou maiores áreas protegidas			
Restringem a quantidade e tamanho de rede			
Fiscalização			
Ordenamento das áreas costeiras			
Outro:			

102. O que pode ser feito para melhorar o impactos negativo das políticas públicas ambientais na pesca artesanal? Sugere praticas

zonas de pesca diferenciadas por embarcação, por aparelho, por espécie		pescadores decidem junto com município e estado (cogestão)	
pescadores decidem sobre a área com forma autônoma (autogestão)		Participação com poder deliberativo nos conselhos ou comitês	
		Outro:	

APPENDIX F- IMAGE REGISTRATION OF THE FIELD WORK

Figure 1- Headquarters of the colony Z-23 in Armação dos Búzios



Figure 2- Headquarters of the colony Z-04 in Arraial do Cabo



Figure 3- Pier for the artisanal fishers in Arraial do Cabo



Figure 4- Natural port for artisanal fishers and comercial point at Prainha, near Forte de São Mateus, Cabo Frio



Figure 5- Area for vessels of artisanal fishers in proximity of the fish market at the center of Cabo Frio



Figure 6- Area for vessels og the artisanal fishers in Pontal de Santo Antonio, Tamoios, Cabo frio



Figure 7- Central port for the vessels of artisanal fishers near the fish market of Macaé



Figure 8- Area for the vessels of the artisanal fishers in the neighbourhood Nova Holanda, Macaé



Figure 9- Pollution from oil products at the canal of Macaé



Figure 10- Association of artisanal fishers (ACCLAPEZ) in the neighbourhood Zacarias of Maricá



Figure 11- Association of artisanal fishers (AMORPEZ) in the neighbourhood Zacarias of Maricá



Figure 12- The administrative organization at the headquarters of colony Z-08 in Niteroi



Figure 13- Point of concentration of artisanal fishing vessels in Rio das Ostras



Figure 14- Headquarters of the colony Z-10 in Ilha do Governador (Rio de Janeiro)



Figure 15- Comercial point of the members of the colony Z-10 in Ilha do Governador (Rio de Janeiro)



Figure 16- Mangrove conditions near the local selling point in Ilha do Governador (Rio de Janeiro)



Figure 26- Public healthcare services hosted at the headquarters of colony Z-07 in Itaipu, Niteroi

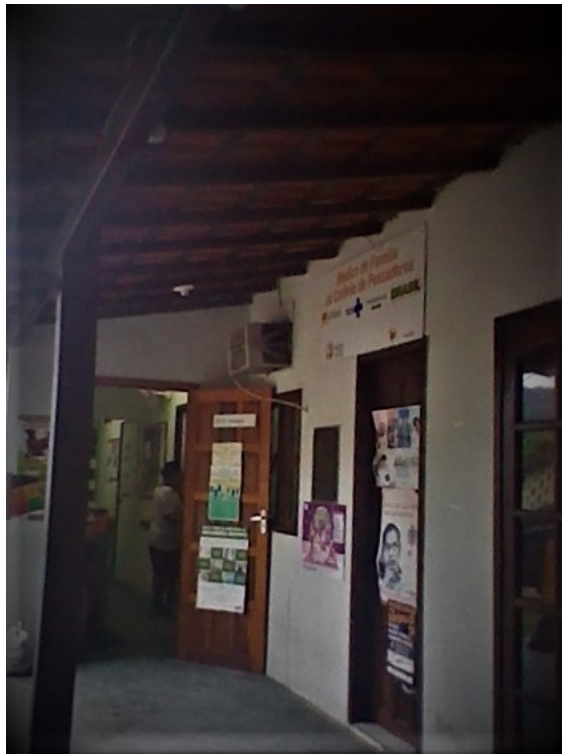


Figure 17- Elaboration of the captured fish for collective sales at the coast near colony Z-07 in Itaipu, Niteroi



Figure 18- Headquarters of colony Z-24 in Saquarema



Figure 19- Interior of the headquarters of the colony Z-24 in Saquarema



Figure 20- Headquarters of the colony Z-06 in São Pedro da Aldeia



Figure 21- Interior of the headquarters of the colony Z-06 in São Pedro da Aldeia

