


**SYSTEMIC PRACTICE IN ACTION: TRANSFORMING THE COMMUNITY
MANAGEMENT OF ARTISANAL FISHING IN CAMETÁ**

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ABSTRACT

The municipality of Cametá has a thriving economy based on artisanal fishing and açai extractivism. On the other hand, several social, economic and ecological problems are reported and experienced by residents. Among the main causes of these problems is the proximity to two major economic projects (Tucuruí Hydroelectric Power Plant and the Albras-Alunorte Complex). They are also about to suffer from the impacts of the implementation of the Tocantins-Araguaia Waterway, with the implosion of the Pedral do Lourenço and dredging of the Tocantins River. Conflicts are also issues present within the fishing territory of Espírito Santo and have been gaining prominence in recent decades, they refer to the struggles of traditional communities for the realization and recognition of their rights. In this context, with a state of crisis in the use of fishing resources and as a strategy for permanence in their spaces, communities are developing a new way of thinking, adapting to the new socio-environmental conditions imposed. The fisheries agreement appears to be one of the central elements in reducing the pressures on local fisheries resources. In order to understand that the community-based management of artisanal fisheries behaves as a complex and interconnected system, it is necessary to consider a systemic approach, based on the study and understanding of the interactions that occur between the different local social actors. To this end, the work seeks to understand how the fishing agreement can drive the systematic transformation in the community management of artisanal fishing in the municipality of Cametá to resist contemporary pressures and uncertainties and boost local development. As a result, it seeks to understand the current paradigm of governance, in order to define actions, for a systemic transformation, in favor of the development of a new systemically desirable, culturally viable and ethically defensible paradigm for the community management of artisanal fishing in the municipality of Cametá in the State of Pará.

Keywords: Systemic governance. Fisheries management. Fishing resources.

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INTRODUCTION

The municipality of Cametá-PA suffers the impacts of the large economic projects of the Tucuruí Hydroelectric Power Plant - HPP, in the Municipality of Tucuruí, and the Albras-Alunorte Complex, in the Municipality of Barcarena. It is also about to suffer the impacts generated by the implementation of the Tocantins-Araguaia Waterway, with the implosion of the Pedral do Lourenço and dredging of the Tocantins River.

Thus, serious problems are reported by fishermen: the significant disappearance of fish; predatory fishing and overfishing; excessive vessel traffic; excessive luminosity in the coastal region; pollution of water resources, among others (Maurício *et al.*, 2020).

In this context, Marrul Filho (2003) exposes that there is a state of crisis in the use of fishing resources. Numerous fisheries are overexploited and with great losses both to the environment and to the economy of several regions and entire countries.

So, as strategies for permanence in their spaces, fishing communities are developing a new way of thinking and managing their resources, adapting to the new socio-environmental conditions. The central element of this new strategy is the community-based management of fisheries through the fisheries agreement, which has been consolidated in several communities. For Bassols (2007), the agreement is a form of participatory management of natural resources and aims to reduce the pressures on them, but mainly on fishing, with the intention of increasing fishing productivity in the long term, ensuring the use and conservation of fish for future generations.

Thus, Ostrom (1990) states that the agents involved in a certain activity have no interest in the scarcity of their resources. In this way, bringing it to the riverside reality of Cameta, the agents involved with artisanal fishing would act cooperatively to avoid the depletion of this resource. Therefore, the riverside communities, through their own organization, would be more apt to produce a model of management of their territory and resources, based on respect for local culture and traditions.

To this end, community fisheries agreements seek to define rules whose main objective is to reduce fishing effort by limiting access and forms of use. Limiting access means restricting places where certain types of fishing practices cannot be carried out. The objective of these norms is to ensure the maintenance of the river's productivity (Almeida, 2006).

It is noteworthy that, in relation to aquatic resources and fisheries management, fishing agreements have been formalized since 1970 in the State of Pará, and there is a history of non-formal agreements or "mouth" agreements, as they do not have a formal apparatus and are validated by the word of the individuals involved (D'Almeida, 2006).



Thus, with the intention of offering legal support to fishing agreements, the Brazilian Institute of the Environment - IBAMA, in 2002, published Normative Instruction No. 29, legitimizing the agreements as a fishing planning device, which defined criteria for regulating them at the national level (Brasil, 2002).

In 2021, through State Decree No. 1,686, the criteria for the formalization of agreements in fishing communities within the State of Pará are established (Brasil, 2021). In 2024, the Cametaense fishing agreement was approved by the State Secretariat for the Environment and Sustainability – SEMAS, through SEMAS Ordinance No. 288/2024.

In the lower Tocantins region, there are many successful experiences with community management of artisanal fishing through fishing agreements (Holanda *et al.*, 2021). Experiences were reported on the island of Saracá, in the municipality of Limoeiro do Ajurú (Netherlands; Simões, 2007; Rodrigues; Carvalho, 2021) and on the islands of Jaracuera Grande (Simões; Dias, 2013), Jacaré Xingú (Simões *et al.*, 2014) and in the riverside community of Pacuí de Baixo (Tavares; Dias, 2014) in the municipality of Cametá.

The Z-16 fishing colony, in Cametá, cites the existence of 22 agreements in operation (Santana *et al.*, 2014). Vilhena (2017) points to a total of 76 agreements. However, the State Secretariat for the Environment and Sustainability recognized, through SEMAS Ordinance No. 288/2024, more than 60 signatory fishing communities in a territory with about 670 km² of coverage. Even so, this amount does not seem to meet the 522 communities distributed in 116 islands, which have fishing as a source of income and food.

Returning, it is essential to consider that the community management of artisanal fishing must be understood as a complex system and that there are multiple social and ecosystem interactions in it (Pasquotto; Miguel, 2004). Therefore, socio-ecological systems are heuristic and integrated systems of human beings with nature, which form sets that are impossible to separate and are characterized as complex and adaptive systems, in which different elements: cultural; political; social; economical; ecological and technological are interconnected (FARHAD, 2012).

In this context, the key characteristic for a socio-ecological system is the ability to cope with uncertainties, changes, and surprises through adaptation, learning, and self-organization (Buschbacher, 2014).

In this sense, resilience is the ability of the system to maintain its essential characteristics of structure and function, even after a collapse and reorganization. In a way, resilience is a synthesis between stability and dynamics, integrating the ideas of change and limits. Resilience is linked to responses and ways of coping with adverse situations (Folke *et al.*, 2005; Buschbacher, 2014; 2016).



In this way, those socio-ecological systems that develop the ability to adapt in the midst of unfavorable situations are resilient. Adaptive strategies developed as a thermometer of their resilience (Tompkins; Adger, 2004). Therefore, changes are also necessary events for transformations to occur in systems. Thus, switching to an alternative system means leaving an uncomfortable state, to changing oneself in order to act in different ways (Walker *et al.*, 2010).

For this reason, several authors have drawn attention to the fact that there is a growing awareness that traditional economic and ecological models and concepts are no longer satisfactory for dealing with complex problems (Hecht, 1989; Morin, 1997; Norgaard, 1989; Costa, 2000).

Therefore, systemic governance, also called adaptive governance (Folke *et al.*, 2005; Resilience Alliance, 2010), emerges as a new strategy for the transformations of the Anthropocene, characterized by the impact of man on the earth, and that this implies the urgent need to transform the way we think and act in relation to the governance of relations between humans and the environment.

The community-based management of artisanal fisheries through the fisheries agreement incorporates learning and change in the face of uncertainties, since, whether intentional or not, human activities produce effects that encompass varying degrees of organization or disorganization, control or lack of control, and certainty or uncertainty. Thus, for systemic governance, the question is to reach where the loss of control does not lead to fear, but to social learning and innovation (Ison; Grant; Bawden, 2014).

Thus, this work aims to identify how the fishing agreement can drive a systematic transformation in the community management of artisanal fishing in the municipality of Cametá to resist contemporary pressures and uncertainties and boost local development.

METHODOLOGY

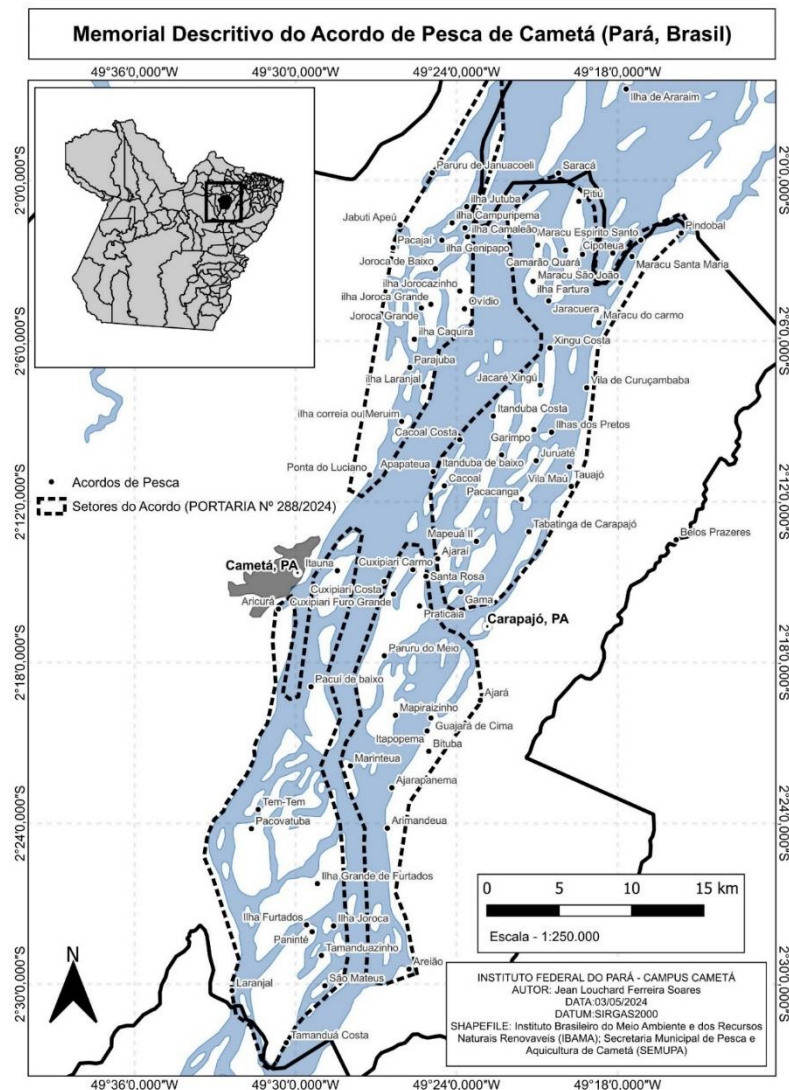
CHARACTERIZATION OF THE STUDY AREA

The municipality of Cametá is located in the northeast region of the State of Pará, in the Tocantins River Basin, in the lower Tocantins region. It has an area of 3,081km², equivalent to 0.03% of the national territory and 0.25% of the territory of Pará, has a current population of 134,184 inhabitants, corresponding to 0.06% of the national population and 1.65% of the population of the State of Pará. With a demographic density of 43.55 inhabitants/km² (IBGE, 2022).

The State of Pará, through SEMAS Ordinance No. 288, of February 28, 2024, recognizes the Fishing Agreement, delimits its coverage area and establishes rules for

fishing practices in the municipality of Cameté. The agreement is divided into four sectors of the Tocantins River extension (see Figure 1).

Figure 1: Descriptive memorial of the Cameté Fishing Agreement (Pará, Brazil).



Source: Organized by the authors (2023) in cooperation with the Laboratory of Environmental Analysis and Cartographic Representation (LARC), at the Federal University of Pará (UFPA).

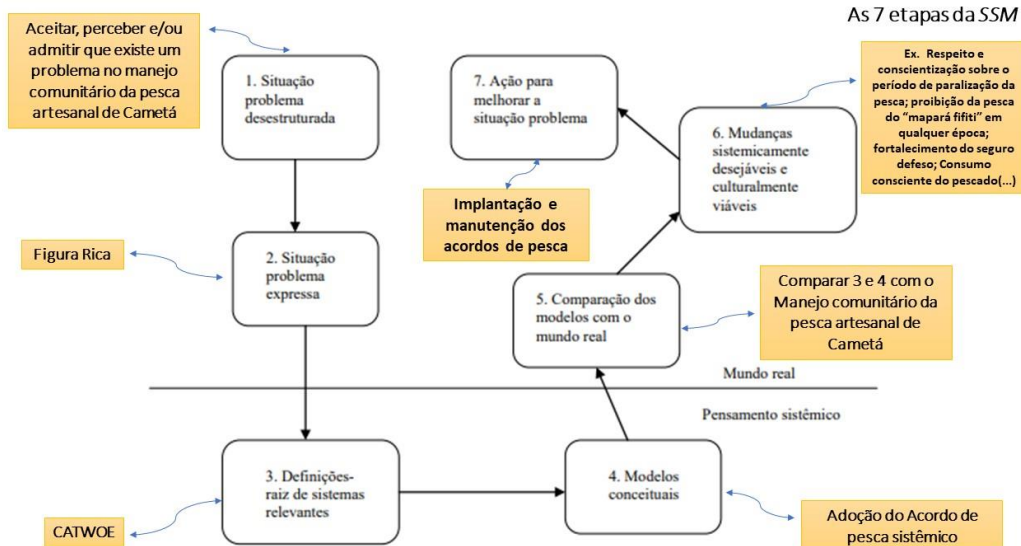
SOFT SYSTEM METHODOLOGY FOR THE COMMUNITY MANAGEMENT OF THE ARTISANAL FISH OF CAMETÁ

It is intended to facilitate an effective process of participation of local actors (*stakeholders*) in the identification of relationships and elements of the structural linkage between socio-ecological systems that need to be considered for adaptive governance.

In this case, the *Soft System Methodology* - SSM will be worked on, which consists of working with the environment and learning to analyze complex problems. It emphasizes the real world, in which people live and relate. Through debates with a group, they establish

which changes are possible and achievable (Checkland, 1981). SSM is a process consisting of seven stages (see Figure 2).

Figure 2: The seven stages of the Soft System Methodology - SSM for the community management of artisanal fishing in Cametá.



Source: Adapted from Gonçalves (2006) based on Checkland (1981, 1999, 2001).

This methodology was used to facilitate "interested and influential" stakeholders in appreciating and reflecting on the current governance situation in the community management of artisanal fisheries, with the intention of acting on it with a view to transforming it systemically.

RESULTS AND DISCUSSION

APPLICATION OF THE SEVEN STEPS OF THE SSM METHODOLOGY

Collection of information

To apply the seven steps of the methodology, the interactions of local social actors, interested in strengthening the Cametá fishing agreement, recorded at the I Cametá Fisheries and Aquaculture Forum, which took place on February 28, 2024, in the auditorium of IFPA – Cametá Campus; at the 1st Meeting of the Cooperation Network of the Cametá Fishing Agreement, which took place on March 7, 2024, at UFPA – Cametá Campus; and at the Meeting organized by the ECOGEO Research Group at UFPA, which took place on August 31, 2024 at the Rio Verde/Guajará restaurant.

Unstructured problematic situation

It was identified that there are problems in the community management of artisanal fishing in the municipality of Cametá. These problems involve the relations of fisheries

production at different levels, scales and permeate aspects of the social, economic and biophysical subsystems, especially the relationships that link the systemic elements to each other. Apparently there is no communication between the different social actors involved in the local fishing activity.

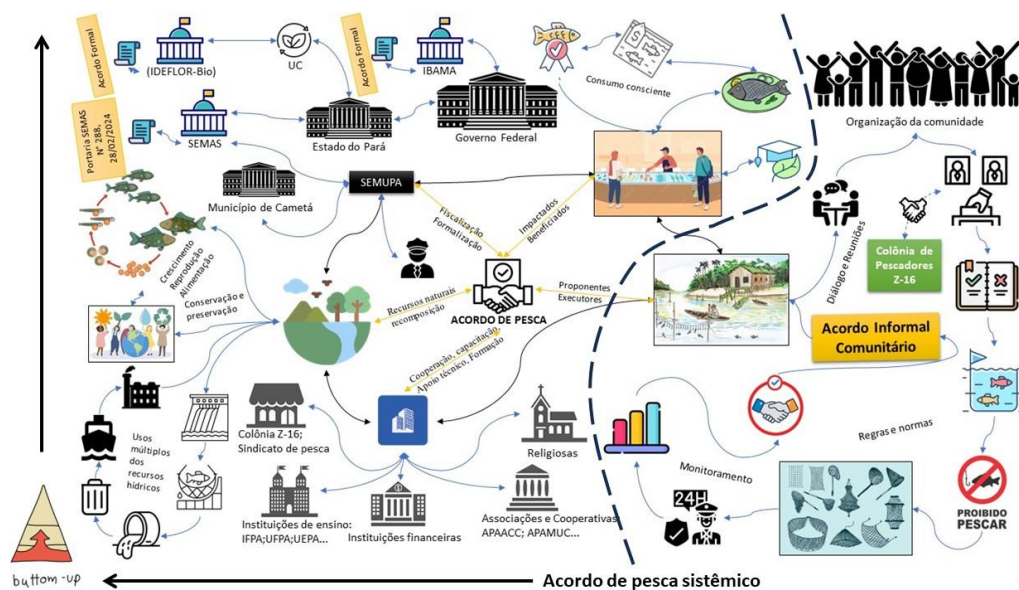
Rich figure: problem situation explained

In the rich figure (see Figure 3), the yellow arrows represent the participation of each compartment, the black arrows represent the continuous link between the compartments and the blue arrows represent the activities performed within each compartment for the elaboration of the Fisheries Agreement.

In this sense, local social actors are self-organized around the fisheries agreement, presenting decentralized and polycentric decision-making centers. However, the decisions arise from detailed information on the community management of artisanal fishing, acquired from the organization of community bases.

For Ostrom (2010), polycentric systems are characterized by multiple authorities governing at different scales. Thus, different units within the system can make norms and rules within their own specific domain (from families, communities, institutions, companies, governments and/or networks). An important aspect for polycentric analyses is their broad capacity to incorporate a variety of formal and/or informal aspects and state and/or non-state actors whose different power to decide and produce results varies in relation to different modes of governance.

Figure 3: Rich figure - problem-situation of the Cameté fishing agreement (Pará, Brazil).



Source: Prepared by the authors (2024).

CATWOE: formulation of the essential definitions in the system.

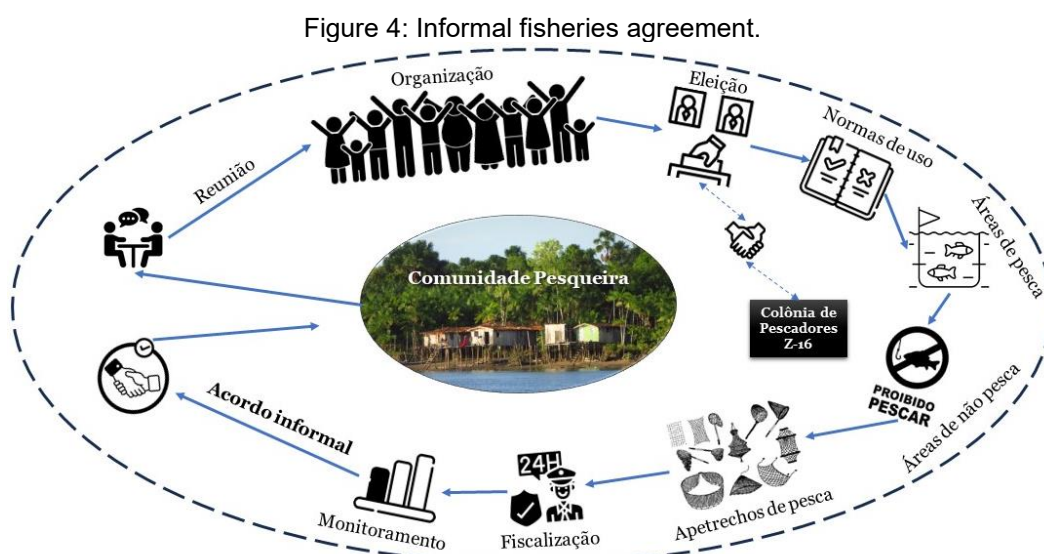
Checkland (1981, 1999, 2001) realized that the use of the CATWOE mnemonic could be useful in the definition and construction of the relevant models, in addition to verifying that the definitions are well formulated. CATWOE represents: customers, *actors*, transformations, worldviews, owners, and the *environment*.

Customers: fish consumers and the Cametaense community in general; Actors: local fishermen and fisherwomen; Transformations: transformations at the social, ecological, economic, political, cultural level, among others; Worldviews: it may intervene in social organization, conflicts, agitations, disturbances, infractions and even environmental crimes; Owners: State Secretariat for the Environment and Sustainability - SEMAS, Municipal Secretariat for Fisheries Aquaculture of Cametá - SEMUPA; Environment: it will serve to reduce the pressures on fishing resources and will help to recompose them in the face of new socio-ecological conditions.

Conceptual models

The first conceptual model (see Figure 4) presents the informal fishing agreement, often carried out by mouth, validated by the word of the individuals involved. Agreements of this type were and still are carried out by local community leaders with the aim of mediating conflicts and reducing pressures on fishing resources.

- 1st conceptual model - Informal fisheries agreement



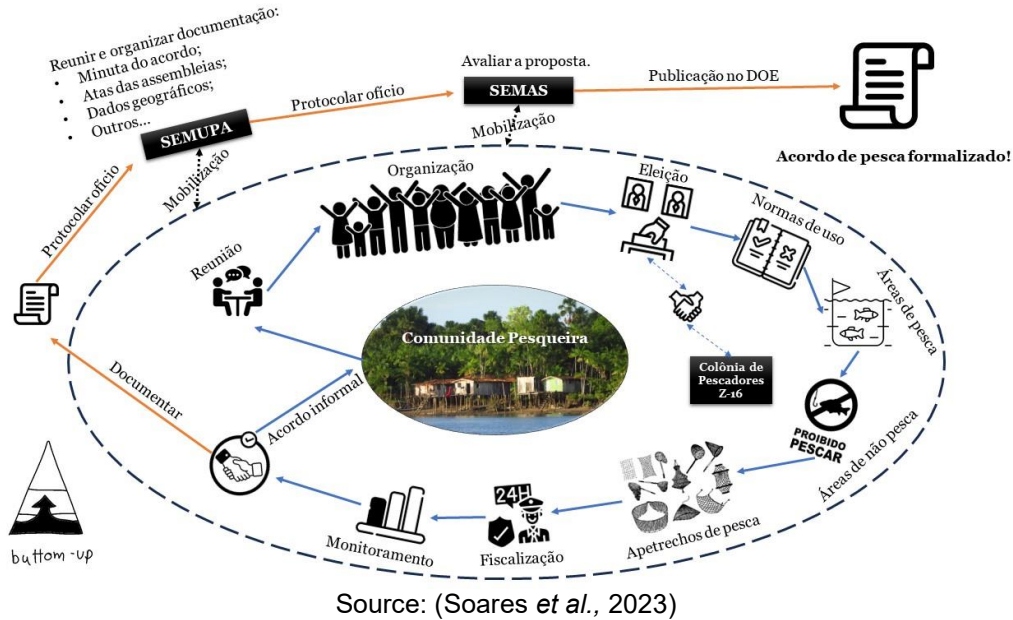
Source: Prepared by the authors (2024).

On the other hand, the second conceptual model addresses the process of formalizing the fishing agreement through State Decree No. 1,686/2021. In 2024, the

Cametaense fishing agreement was formalized by the State Secretariat for the Environment and Sustainability – SEMAS, through SEMAS Ordinance No. 288/2024 (see Figure 5).

- 2nd conceptual model - Formal fisheries agreement

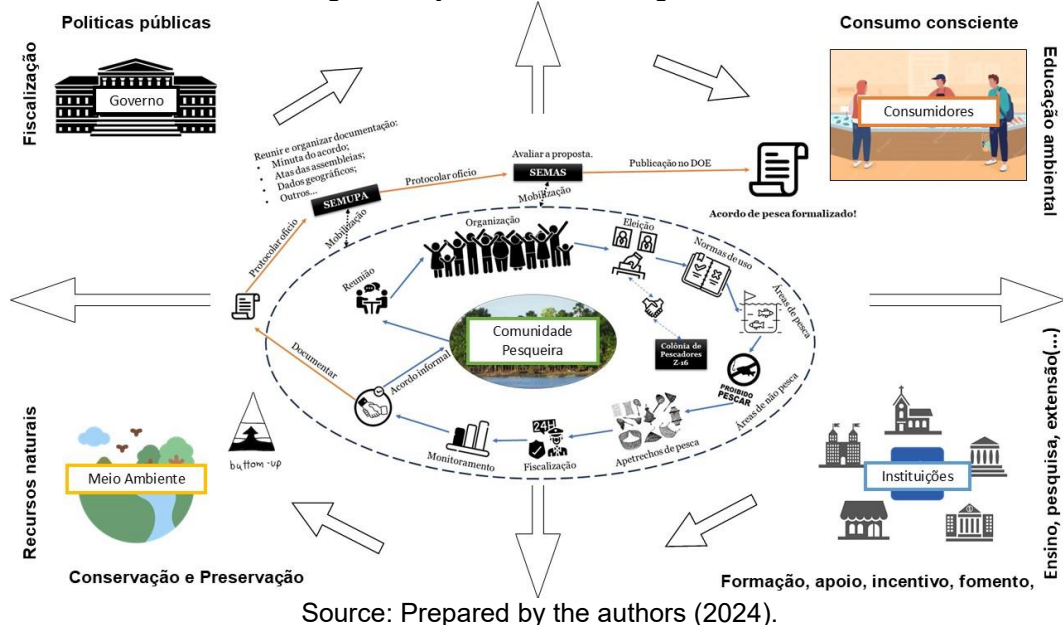
Figure 5: Procedures for formalizing the fisheries agreement (Decree No. 1,686/2021).



Finally, noting that community fisheries management should be considered as a complex system, in which there are multiple social and ecosystem interactions (Pasquotto; Miguel, 2004). The third conceptual model is presented, which encompasses the desirable systemic transformation for the fisheries agreement (see Figure 6).

- 3rd conceptual model - Systemic fisheries agreement

Figure 6: Systemic fisheries agreement.





Comparison of stages 4 and 2: conceptual vs. real

The community management of artisanal fishing in the municipality of Cametá is in a process of systematic transformation that aims to move from a reductionist, isolated and individualistic paradigm to a systemic, collective and collaborative paradigm. A detailed description of systemic investigation can be found in Ison (2017).

Systematically desirable and culturally feasible changes

It is believed that the Cametaense fishing agreement will be able to provide social, ecological, economic, political, cultural changes, among others to the users of the system. It will also be able to intervene in conflicts, agitations, disturbances, infractions, environmental crimes that cause damage to the system. Finally, the agreement will serve to reduce the pressures on fishing resources and will help to recompose them in the face of the new socio-ecological conditions.

Actions to improve the "problem situation"

Below is evidence of which actions should be implemented, in accordance with the discussions, to strengthen the Cametá fishing agreement (see Table 1).

Table 1 – Summary of actions to strengthen the Cametá fishing agreement.

What action should be implemented?	Who participates in the action?	What actions will be necessary?	Where will it take place?	When will it take place?
Strengthen the cooperation network of the Cametá fishing agreement	All stakeholders	Meetings, assemblies and public hearings	Municipality of Cametá	Quarterly
Strengthen the Municipal Forum and/or Conference on Fisheries and Aquaculture	Municipal Secretariat of Fisheries and Aquaculture of Cametá - SEMUPA	Forum	Municipality of Cametá	Annual
Create the observatory of the Cametá fisheries agreement	Federal Institute of Pará – IFPA Campus Cametá and other educational institutions	Teaching, Research, Extension, Education, Training	IFPA Campus Cametá Fisheries Laboratory	Intriguedly
Formalize and update the Cametá fishing agreement.	Organized local communities/Municipal Secretariat of Fisheries and Aquaculture of Cametá - SEMUPA/ State Secretariat of Environment and	Formalization and updating	Municipality of Cametá	Triennial



	Sustainability - SEMAS			
Monitor the actions of the Cametá fishing agreement	Cooperation network	Environmental education and conflict mediation	Municipality of Cametá	Intriguedly
To supervise and carry out the police power	Municipal Department of the Environment of Cametá - SEMMA/ Municipal Department of Fisheries and Aquaculture of Cametá SEMUPA/ Environmental Police Battalion - BPA	Inspect	State of Pará/Municipality of Cametá	Intriguedly
Monitor the area covered by the Cametá fishing agreement	Organized local community	Monitor	Local community	Intriguedly
Conduct an environmental education program	Cooperation network	Environmental education	Municipality of Cametá	Intriguedly

Source: Prepared by the authors (2024).

After the implementation of SSM, Checkland suggests the application of the methodology again so that a new problem-situation can be diagnosed, that is, it is believed that the value of this methodology is not in the result, but in the process to achieve it (GONÇALVES, 2006).

FINAL CONSIDERATIONS

The activities of this investigation do not constitute a recipe for how to engage, improve or promote the fisheries agreement, but rather characterize an intuitive process to facilitate the participants of this investigation to recognize their own situation to discover ways of managing it.

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