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Highlights

Prediction of Impacts on Public Health
Building Construction in Manacapuru-AM

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The Problems of Building Construction in Manacapuru-AM: The Correnteza and Terra Preta Neighborhoods

By Célia Regina Moretti Meirelles, Silvana Rodrigues de Oliveira, Rodrigo Carbajal Ballell, Thilo Gumbsch, Jair Antônio de Oliveira Junior, Maria Cristina Celuppi, João Paulo Assis Gobo, Flavio Marcondes, Silvio Sant'Anna, Lucas Fehr & Fabiane Ferreira Soares

Abstract- In Manacapuru, the region of Solimões River is one lowland, which is formed by fragile soil. Construction in these areas can be affected by several difficulties, such as building instability due to the force of waters during floods and rotting of pillars. Other aspects of the phenomena of nature, such as floods, rain, and moisture, require high maintenance expenses and a short life cycle in wooden buildings. These factors make this population more vulnerable, as well as the risk of losing their home, furniture and personal property. This region is undergoing significant transformations, so many parts of the territory are at risk of landslides and soil erosion. The method consisted of a case study, website visits, production of maps with QGIS and Google Earth, redesign of areas vulnerable to flooding and geological risk. The analysis concludes in the neighborhood Terra Preta the possibility of geological risk is high, but contained in the low-lying areas and the stream. The Correnteza neighborhood presents a greater risk of flooding because it has two influences from the Solimões River and the sandy surface river Areal. Most of the buildings are on wooden stilts, and there are more houses with instability and maintenance issues.

Keywords: *socio-environmental risks; geological risks; landslide risks; floodplain areas.*

GJHSS-B Classification: *LCC: TH3411*

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Keywords: socio-environmental risks; geological risks; landslide risks; floodplain areas.

I. Introduction

The environmental context in the Amazonian is very relevant for the world, such as hydrological forms, rivers, lakes, streams, beaches, and boreholes. The "flood planning presents a great diversity of morphology and reflection of soil deposits that are still active." Among them, the "flood plains" were installed on broad terraces with the "hydrographic basins of the Negro, Solimões and Amazonas rivers complex". Manacapuru is in this environment, as argued Dantas & Maia (2010, p.34).

Awareness of the region's watercourses and the phases throughout is crucial for the survival of native people, especially those who live in the area and survive fishing (Meirelles *et al.*, 2017).

Costa et al. (2018) observe how climate change and global warming have increased maximum flood levels and how this affects riverside populations and their habitats.

In the Amazon region, in many areas, the soil is fragile. Therefore, in addition to floods, there are "fallen lands" phenomena caused by the forces of "river water flow" by "removal of material from the marginal embankments of river channels." These factors occur in drought periods with the rupture of these walls (Lana *et al.*, 2021, p.12).

Alves (2006, p. 45) observes that social vulnerability is directly associated "with families in financial need who, when exposed to risks, present an inability to react and the difficulty of adapting to the materialization of risk".

Freitas & Cunha (2013) highlight that socio-environmental damage occurs when its inhabitants are subject to social vulnerability in line with risks such as extreme natural phenomena or pollution.

In urban areas, the lack of adequate drainage leads to rapid changes in the environment with high precipitation levels, which causes record floods. It is noteworthy that fragile soil causes different problems for these populations. These elements, associated with social vulnerability, make housing issues in the Amazon region complex. "Anthropogenic factors resulting from human action and without guidelines from city halls increase the risks for this population" (Meirelles *et al.*, 2019, p.96).

In the main cities of underdeveloped countries, impoverished migrants end up opting for housing in peripheral areas, as highlighted by Saunders (2013). Meirelles *et al.*, 2019, p. 96) reinforce that this "fact occurred in Manacapuru, in neighbourhoods such as Liberdade, Biribiri, São Francisco, and Correnteza."

Costa et al. (2018, p.9) analyzed the context associated with the term "social vulnerability" and emphasize that it encompasses multiple factors, including limited financial, inadequate education, health and safety concerns, besides living in areas lacking urban infrastructure, among others.

Given the environment's complexity, this research aims to evaluate the main conditions that promote socio-environmental vulnerability in the Correnteza neighborhood in Manacapuru compared to the Terra Preta district. In this work, the issues arising from climate change will be analyzed, but not limited to floods and landslides in buildings, as well as their repercussions on the daily lives of riverside dwellers.

II. Methodological Procedure

The methodological procedures apply the case study strategy, emphasizing the neighbourhoods

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of Correnteza and Terra Preta in Manacapuru, state of Amazonas, Brazil.

Phase 1: The literature review aimed to identify the concepts of socio-environmental vulnerability and the risks of geological accidents in the Amazon context.

Phase 2: Visits to the Manacapuru region

The first visit took place in 2016 by members of the Constructive Systems in Contemporary Architecture group of the FAU-Mackenzie Architecture School of São Paulo, Brazil, with support from the NGO — Amazon Vida. The second was in 2017, with the University of Amazonas-UFAM with the Interaction Group. The third field study was at the beginning of 2024 to collect data from the Terra Preta neighborhood. This study relates the internationalization program CAPES-PRINT of the Mackenzie Presbyterian University with the Escuela Técnica Superior de Arquitectura de la Universidad de Sevilla (ETSA_US).

Phase 3

Drawings of maps of the environment, the city and its neighborhoods, the equipment currently, the risk areas with Google Earth and the QGIS platform, and the characteristics of the city.

Phase 4

The analysis of case studies was performed with emphasis on the concepts of socio-environmental vulnerability presented in the article by Freitas & Cunha (2013), the concepts of socio-environmental and risk highlighted by Andrade *et al.* (2017), and Costa et al. (2018) arguments the risks of geological accidents through the publications of the Brazilian Geological Institute-SGB-CPRM, among other relevant authors. It is worth mentioning that in the IBGE census of 2022, only the total population of the cities is collected, however, the detailed survey as schooling, sex, residents by neighborhood, income, etc., is still from 2010 because, in 2020, the COVID-19 Pandemic occurred pandemic[1].

III. Results and Discussions

Farias & Mendonça (2022, p.6) notes that "the notion of risk applied to urban floods corresponds to an uncertain situation" directly connected "to an extreme hydrological event" affecting "an individual or a population, putting at risk the integrity of their tangible and intangible assets". The authors highlight that "tanger and social vulnerability".

Leite et al. (2024, p. 3) discuss that "he socio-environmental risks of flooding only occur in the simultaneous presence of a natural flooding model in medium-sized Brazilian cities" highlighting that the "risks of urban flooding" exist due to the "deficiency of urban infrastructure in containing the flow of rainwater". In the context of Amazonian cities, housing areas located in floodplains are naturally flooded areas.

When analyzing housing the risk of floods, this research applied the parameters established by Andrade *et al.* (2017, p.1). According to the authors, the occurrence of maximum flood levels increases the probability of damage to vulnerable structures,

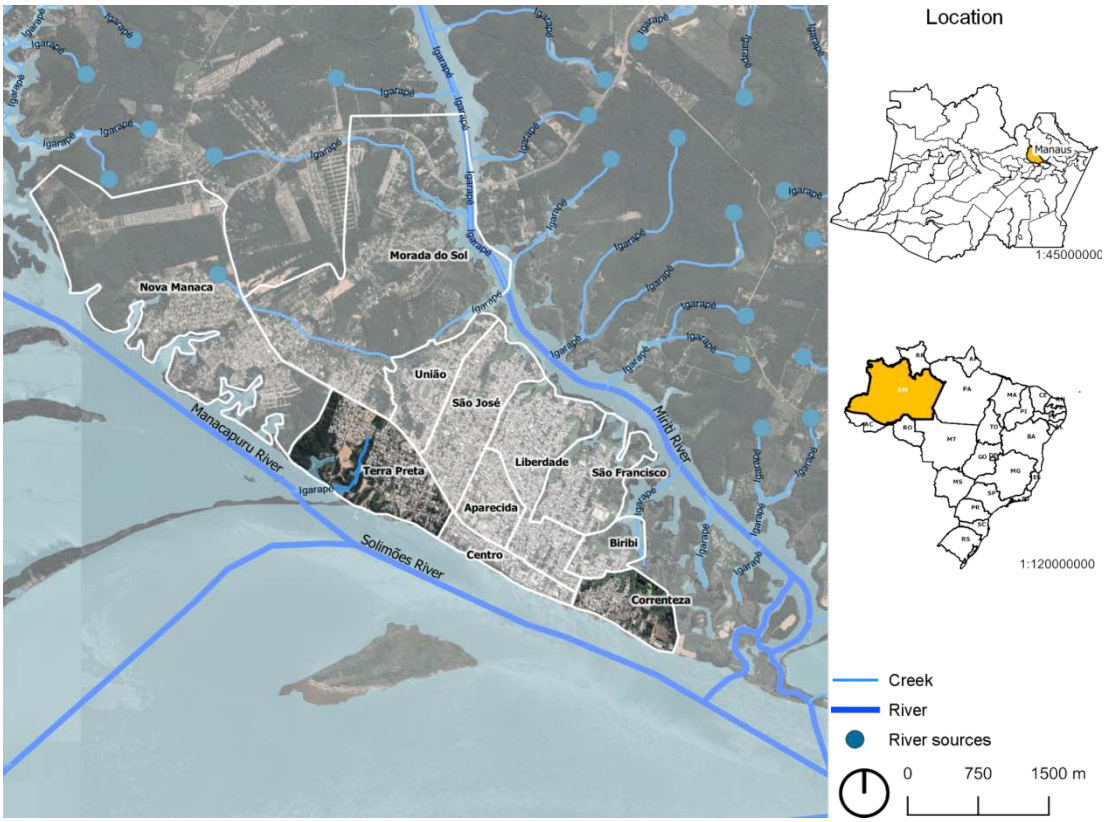
> …a very high-risk designation corresponds to drainage with a high frequency (at least three events in the last five years) of floods and a very high probability of damage due to the presence of vulnerable structures. High risk corresponds to drainage with a moderate frequency (at least one event in the last five years) of flooding and a high probability of damage due to the presence of vulnerable family structures. Moderate risk corresponds to a moderate frequency (at least one event in the last five years) and low susceptibility of structures to damage caused by floods. Low risk corresponds to the absence of flood events in the previous five years and the absence or presence of structures with low susceptibility to flood damage. (Andrade *et al.*, 2017, p.1)

In this sense, riverside residents are alert when the water exceeds historical maximum levels. This fact is recurrent in the region, presenting risk conditions near rivers, lakes, and streams. The CPRM text by authors Callegario & Ladeira (2018) reinforces that in 2013, five thousand people lived in risk areas in Manacapuru.

Analyzing the publication of Oliveira (2017) with data from ANA-National Water Agency, measurements carried out on the Solimões River in Manacapuru between 1972 and 2015 presented in Nogueira *et al.* (2015), the analyzed data indicated that it is observed that flood peaks had a longer temporal distance, with an average of 10 years. When analyzing current data, it is estimated that the historical maximum levels occurred in 2009, 2012, 2015, and 2021, with an average of five years between them. The water level reached 20.78 meters in 2015 and 20.86 meters in 2021. The levels in 2012 and 2013 were very close, and meteorologists did not consider the level in 2013 (Maciel *et al.*, 2023) (Matos *et al*., 2021).

Manacapuru is the third city in the state of Amazonia in terms of population, with a current population of 101,883 individuals. It is estimated that 60% of this population lives in urban areas, and the remainder are riverside communities (IBGE, 2022).

[1] Formal information received from the head of the IBGE agency in Manacapuru in January 2024.



Source: The authors, as compiled by QGis software. Data: Google Earth, ANA and IBGE

Figure 1: Maps of Manacapuru's situation and highlights of the two neighborhoods and the location in Brazil

In Figure 01, on the right, presents Brazil as the State of Amazonas, painted in yellow. The City of Manacapuru the case study are shown in Figure 01, on the left, with a focus on the areas around Correnteza, Terra Preta. And it is noticed that Bairro Correnteza is located in a strip of land between two watercourses. The City grows towards the Northwest. Above the city is the network of streams that make up the water network of the Miriti River. Terra Preta is located in the central area of the town.

Source: The authors with Google Earth.

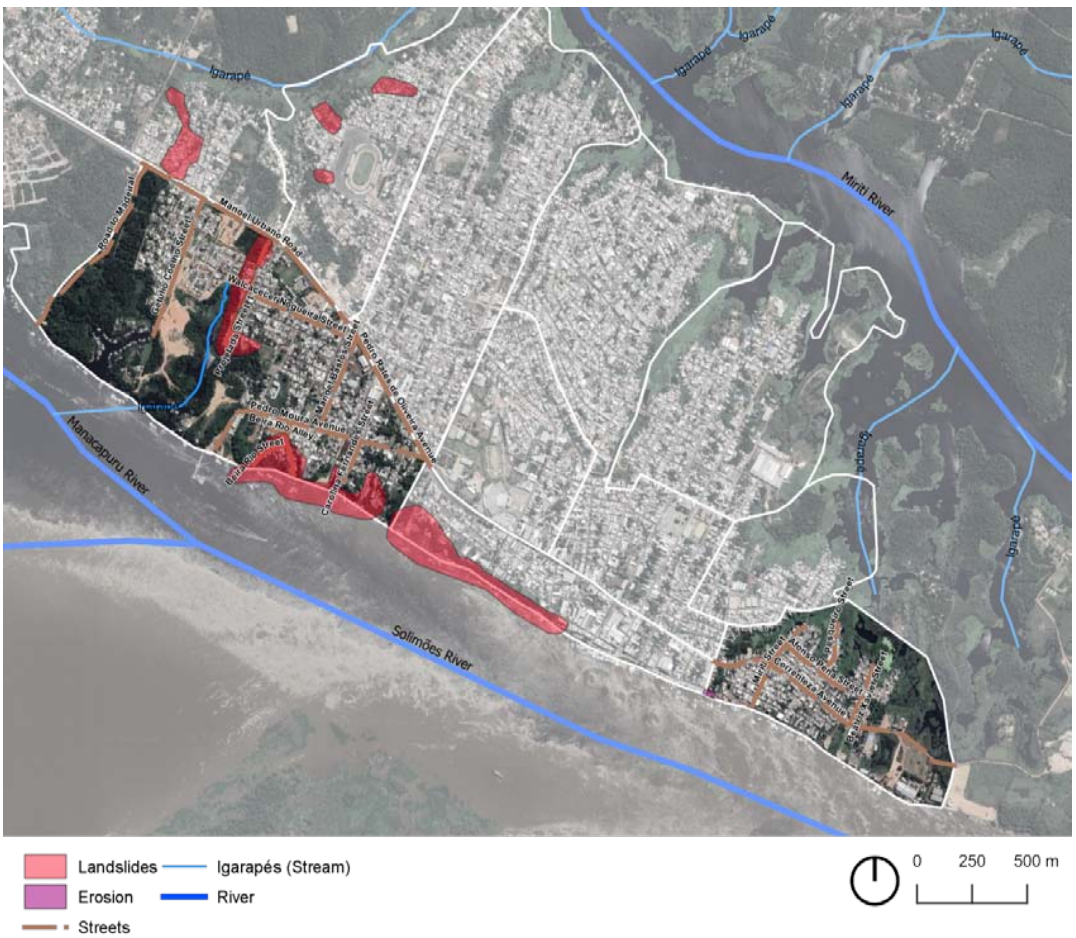
Figure 2: Map of the city and Amazon environment with hydrographic basin.

It is observed that "the municipality of Manacapuru–AM is delimited by two river basins, that of Solimões River and that of Manacapuru River" (Callegario & Ladeira, 2018). It is illustrated in Figure 02 that the city is delimited by several watercourses, such as the Solimões River and the Miriti, and that there is a wide variety of rivers and lakes, including Biribiri, Miriti, and Cabaliana lake. The meeting of the two takes place above the city, between the black waters of the Manacapuru River and the muddy waters of Solimões. On map 01, the blue of Solimões is imported from QGIS, however it is observed that the natural color of the Solimões River is muddy due to the "sediments that drain the eastern slope of the Andes mountain range". In black rivers, "it is due to the high concentration of iron sesquioxides" (Dantas & Maya, 2010, p.35).

a) Landslide Risks

As already noted, the Manacapuru region, in addition to the risks of flooding, has areas with tendencies to have landslides and erosion. On map 03, the risk of regions the landslides was highlighted in red. The Brazilian Geological Institute classifies geological hazard risk as "very low, low, high, and very high" (SGB, 2018, p.1).

The map shows the critical geological areas on the edge of Manacapuru and next to streams. Thus, the risk class is high due to the conditions for landslide processes, as well as the "significant presence of signs/ features/evidence of instability (cracks in the ground, slope steps, etc.)" so it is possible that "during heavy and prolonged rains the phenomenon occurs." (Lana *et al*., 2021, p.23).



Source: The authors, as compiled by QGis software. Data: Google Earth and Brazilian Geological Institute-SGB

Figure 3: Maps of geological risk areas in Manacapuru

b) Analysis of the Terra Preta Neighborhood

According to Amorim (2013, p.34), "Terra Preta is one of the oldest districts in the city". However, its formal constitution took place around 1930. This was one of the main places where the Mura people were established when they moved to Manacapuru. Figure 03 highlights the urban elements of the Terra Preta district. The image was created based on Google Earth and QGIS. Today, the neighborhood is home to the City Hall, two hotels, two state schools, a university, and the port of Manacapuru. According to IBGE (2010), 5389 people lived in the Terra Preta, data from 2010[2].

[2] Formal information received from José Carlos Santiago Magalhães, head of the IBGE agency in Manacapuru in January 2024.

Source: The Authors, as compiled by the QGis.cc software.

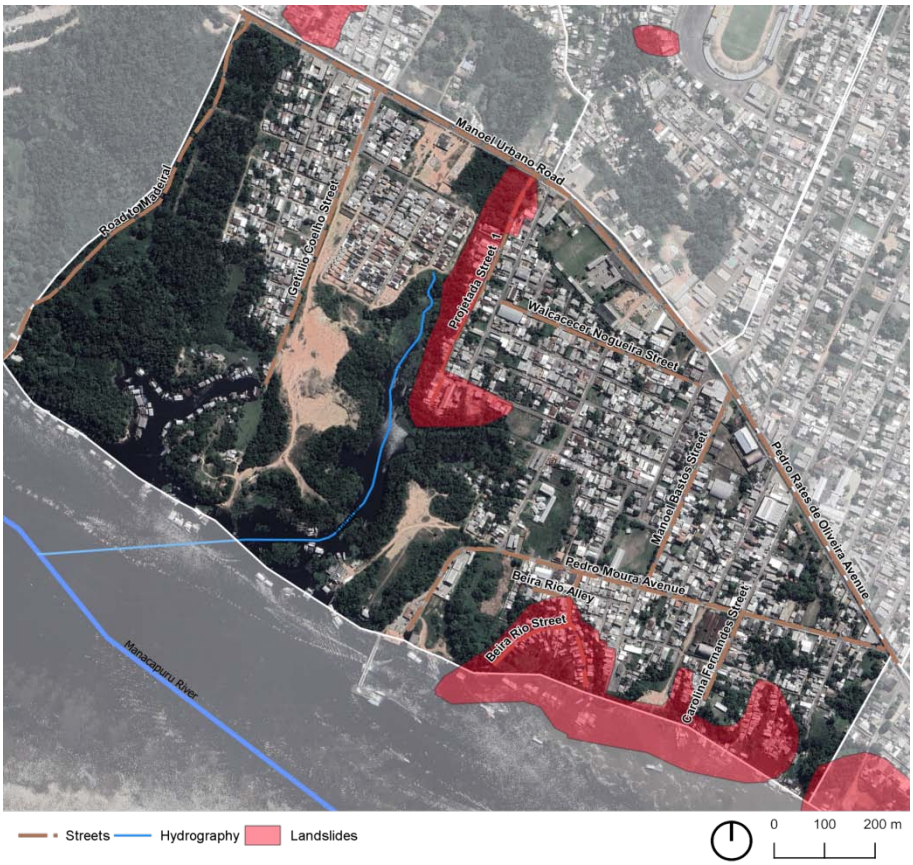
Figure 4: Map of urban elements and environmental composition in the Terra Preta neighborhood.

In terms of territory, the Terra Preta neighborhood occupies a large block with higher elevations than Correnteza. On the map above, the highest points in the area appear on Manoel Urbano Road, which is an extension of the Pedro Rates de Oliveira Avenue Boulevard. It can be seen that a long stream begins a little above the Manoel Urbano road and continues parallel to Projetada Street, the upper part of Figure 4. The lowest quotas are next to the Solimões River, like Beira-rio street, the shape of which represents the outline of a creek next to the Port of Manacapuru. The two red spots represent the risk of landslides, as shown in Figure 5.

Amorim (2013, p.37) notes, "Beira-Rio street is where riverside dwellers sell their production, coming from Santo Afonso beach, located in front of Manacapuru."

The author further emphasizes that in 2005 and 2010, the residents of the Beira-Rio street had already experienced hardships due to the fall of solo in the Terra Preta. According to him, "the danger is higher in the descent of waters during the dry period of the rivers". Many residents of the 2005 incident received homes in a housing complex built by the City Hall. However, several of them returned, as this region facilitates access to the river, and they need to be close to their livelihood and work.

On October 11, 2023, a new landslide occurred in the Terra Preta district, as highlighted in the BNC report "Manacapuru: landslides into the Solimões, dragging boats, and one person disappears." (BCN, 2023, p.1).



Source: The authors were prepared using QGis software. Data: Google Earth and Brazilian Geological Institute-SGB

Figure 5: Maps of geological risk areas in the Terra Preta neighborhood

Regarding the materiality of the buildings, it was observed that most buildings in the Terra Preta neighborhood are made of masonry with one floor or two. The areas close to Solimões are more vulnerable to flooding, the villas are made of wooden stilts. Figure 06 shows Walcace Nogueira Street, and in this area it observed the predominance of buildings built in masonry. Figure 07 shows houses on Beira-Rio Street with colors typical of riverside communities. On the left side, we can see houses made of wooden stilt and on the right side, masonry houses. Image 08 shows a house next to Solimões that is in a significantly deteriorated stage.

Source: The Authors

Figure 6: Walcace Nogueira houses

Source: The Authors

Figure 7: Beira-Rio houses

Source: The Authors

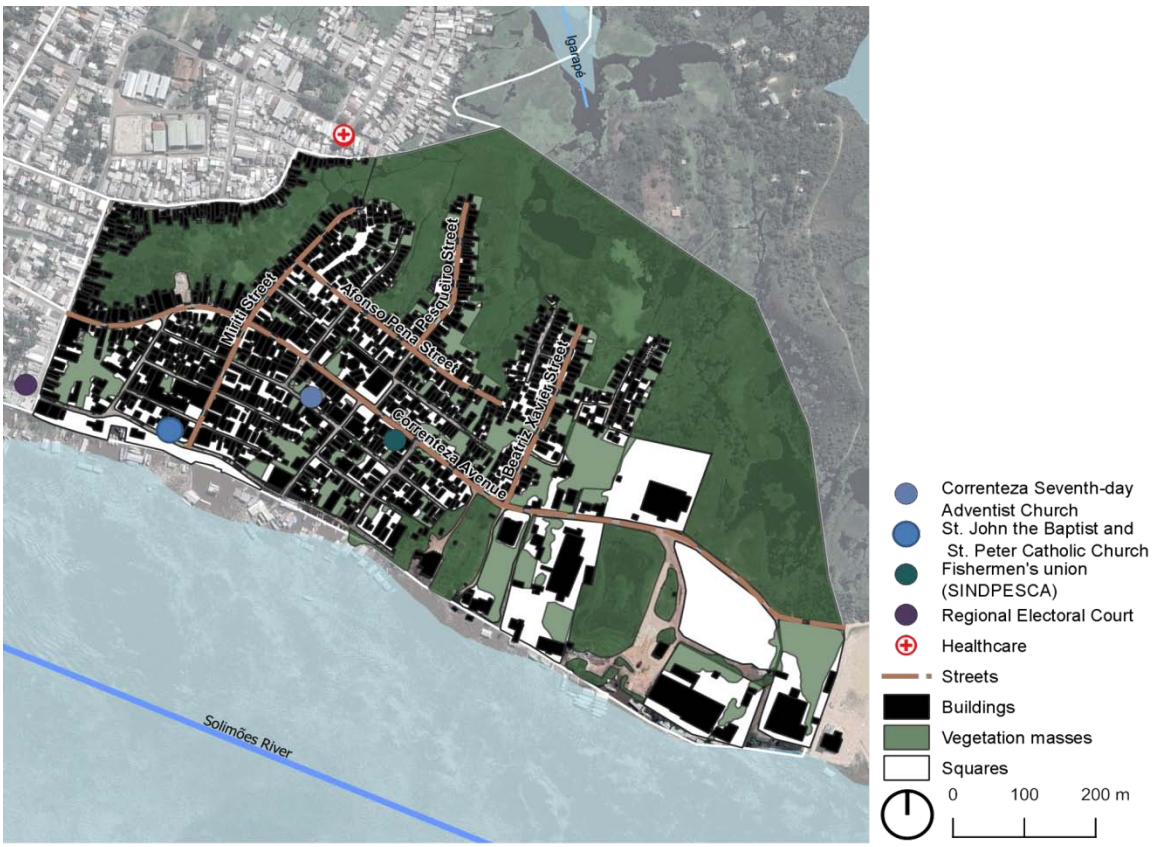
Figure 8: Houses in the Terra Preta neighborhood next to Solimões

c) The Correnteza neighborhood

The construction of small bridges over rivers and streams in Manacapuru in the 1970s promoted the appropriation of peripheral areas, such as the Correnteza neighborhoods (Lima, 2012). The illustration 09 depicts the urban setting of the Correnteza neighborhood, including residential structures, commercial activities, educational institutions, a church,

and the fishing sector. According to IBGE (2010), 4702 people lived in the Correnteza.

The Solimões River can be seen in front of the cities, and the green masses represent springs due to the shallowness of the soil and the ease with which water emerges. The main avenue of the neighborhood is the Avenue of the Correnteza. From the street Afonso Pena, water springs extend until the back of the city, at the time of the flood, forms a lake where residents park boats, as a fishermen's street.



Source: The authors were prepared using the QGis software.

Figure 9: Map of urban elements and environmental composition in the Correnteza neighborhood

The construction of stilts was applied by several peoples, with traditional technique passed down from father to son. Its application in general is in the regions of beach, mountains, and floodplain. Zhang Xu & Wang (2022, p.1), study the village of Tujia in China, which uses the construction system on wooden stilt, and the importance of "conservation and regeneration can keep traditional building systems alive and sustainable", with the first floor is raised from the ground to adapt to the "different terrains". In his sketches, it is noted that the main pillars support the elements of the roof, "wooden stakes in the under the building". The buildings in Manacapuru lost relevant elements to maintain the comfort of the buildings and extend their life cycle. The construction uses metal tiles, small eaves, no balconies around the house, etc. The majority of housing buildings in the Correnteza neighborhood are made of wooden stilts, on average 60% of them are wooden, and 40% are masonry. As shown in Figures 10 and 11:

Source: The authors

Figure 10: Houses made of stilts in Correnteza neighborhood

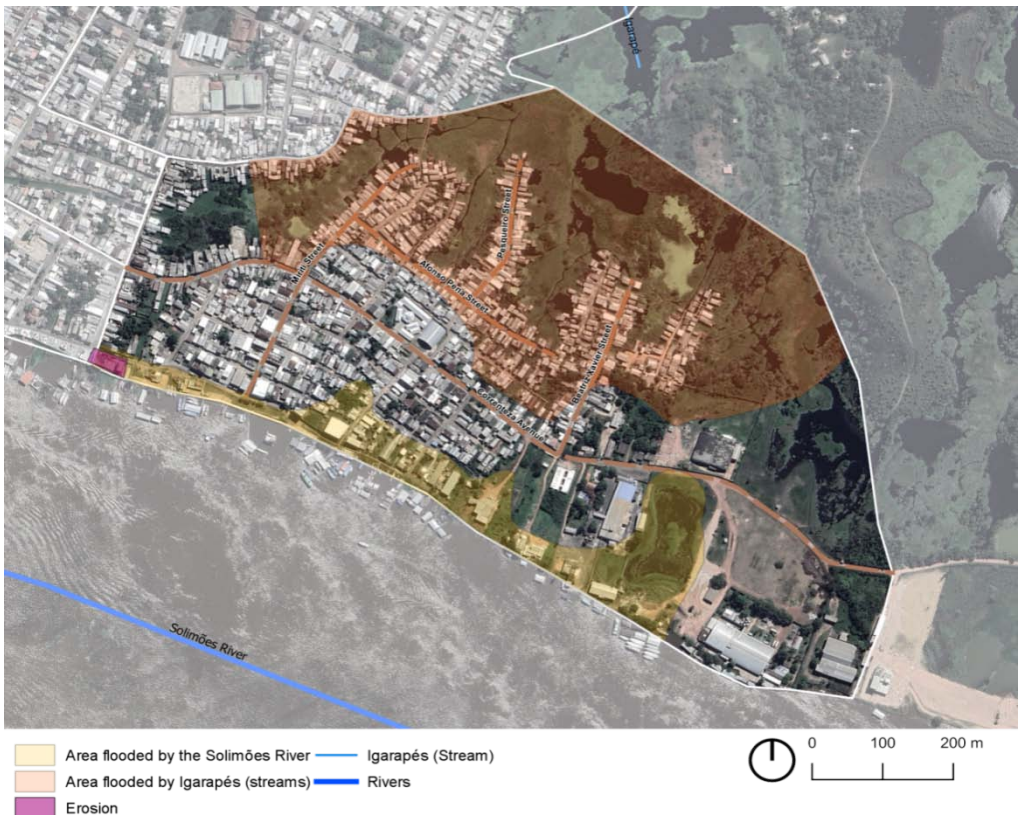
The Manacapuru City government implemented its master plan in 2006, establishing risk management strategies with the creation of the Civil Defense Secretariat (Municipal Government of Manacapuru, 2006). Currently, the plan is undergoing a new revision. During field visits, actions by the institution were observed, predicting future problems and identifying buildings at risk of collapse, shown in Figure 11, these were marked with the acronym MPU. However, between 2016 and 2017, several buildings lost their stability. Civil defense agents emphasized that the city government built a housing complex with financing from the "*Minha casa, minha vida* program". However, many residents of this region did not have the documents and conditions to prove their income to obtain financing.

The loss of equilibrium in riverside houses in the Manacapuru region is attributed to various factors, mainly to the weight of wooden posts on fragile soil. The second factor, "seasonal fluctuations between floods and dry" causes the wood to rot in the ground. The third characteristic that leads to the loss of overall stability of homes is "the lack of structural bracing elements in the buildings; these were applied during construction, but removed by builders at the end of the work." (Meirelles *et a*l., 2019, p.96).

Source: The Authors

Figure 11: Houses in the Afonso Pena Street—Correnteza neighborhood at risk

Meirelles et al. (2019, p.96) reinforce that in vulnerable situations, riverside residents do not have the time or financial conditions to rebuild their place of residence with dignity. A resident of the Correnteza neighborhood lost her house twice in a short period, once in 2012 and once in 2015. In 2015, "a total loss occurred." The building collapsed with the mother and children. The image in Figure 12 illustrates the Correnteza neighborhood, highlighting the areas most susceptible to flooding. The influence of internal streams was shaded in light pink, and the flood-prone area next to Solimões was shaded in light yellow. One point of risk to erosion stands out next to the Solimões River, but it can be seen that this is isolated. As shown in the image below, during floods, houses in low-lying areas, close to springs and stream networks, become isolated. This often happens on the streets of Afonso Pena, Miriti, Pesqueiro and Beatriz Xavier.



Source: The authors, based on SIPAM, ANA and Google Earth.

Figure 12: depicts the areas that are most susceptible to flooding in the Correnteza neighborhood and the associated geological hazards.

d) Problems of the population of the two neighborhoods

The social vulnerability can be expanded with extreme environmental conditions highlighted by Costa *et al.* (2018); the research shows the socio-environmental concepts highlighted by Andrade *et al.* (2017) occur in these two neighborhoods. In 2021, a maximum level occurred (historical quotas), highlighting that an event occurred in the past five years. In addition to these factors, there is a risk of the fragility of the buildings, as already discussed in the text of this article. Another severe problem is decrease in the recurrence time of the historical maximum levels and increasing the maintenance of buildings.

The wooden structures and walls of the houses as shown in figures 10 and 11 present conservation and maintenance issues. According to the civil defense of Manacapuru in the year 2024, the most vulnerable dwellings in the Correnteza neighborhood were listed as 610 dwellings, primarily affected by flooding.

There are 238 houses in the Terra Preta neighborhood, but in this area, the risk of landslides is increased, and the risk of flooding is lower, as discussed in the article's text. This fact can be observed in areas at risk of landslides, marked as figure 05 on Rua Projetada, which had 38 houses with problems. This fact can be observed in the landslide risk maps demarcated on map 05 in Projetada Street, which had 38 houses with issues.

Table 1

	Total Number of Residents	Total Number of Houses, An Average of 4 Residents	Number of Houses with Problems
Correnteza	4702	1175	610
Terra Preta	5389	1347	238

According to IBGE (2010), Manacapuru City has an average of 3.78 residents per household, was considered in the statistical analysis 4. It is observed that there is a higher probability of issues in the neighborhood of Correnteza around 51.3%, whereas Terra Preta has an average of 17.6%.

IV. Final Considerations

The present work demonstrates the complexity of the environment in the Amazon region due to the hydrographic and climatic regime with extreme precipitation levels and the constant transformation of floodplains, generating areas susceptible to flooding and geological risks.

Another aspect discussed in this paper is the influences of climate change in place, and how the increase in maximum flood levels and the reduction in recurrence time, these factors generate several problems for buildings and difficulties for their inhabitants. These elements reinforce the theory that areas subjected to flooding that exceed historical levels lead to a short life cycle for buildings and a high maintenance cost over time. These components make local inhabitants more vulnerable, in addition to the risks of loss of buildings, furniture, and personal property.

A relevant point is the fragility of soil formation in this region, which has already been mentioned in the text. In 2023, when a geological accident happened during a dry period. This is why maps of geological risks are important and can help predict issues.

In cities like Manacapuru, civil defense work is of great relevance in mapping and identifying risk areas and creating alert systems for isolated communities, with a support network between universities, research centers, and municipal governments.

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The Brussels Effect as a Mechanism for Promoting Global Sustainability: Analysis from a Governance Perspective

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Abstract- This study focuses on the Brussels Effect and how its influence can shape other countries and blocs regarding global sustainability. To examine the Brussels Effect as a mechanism, the parameter of governance at the legislative moment was used, as well as the principles of a high level of ecological protection, Leaving no one behind, European ecological responsibility, and non-retrogression. Sustainable policies in their legislative stages were studied through the dogmatic teleological methodology and the post-positivist application of NEPE. The proposed examination highlighted the EU's important role in environmental sustainability policies, as it aims to implement sustainable standards globally. However, side effects can arise if principles such as NEPE and Leave No One Behind are not recognised in legislative governance.

Keywords: ecological justice; principle of non-retrogression; principle of a high level of ecological protection; ecological responsibility of the EU.

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I. Introduction

The rise of climate emergencies has driven countries and economic blocs to seek measures to combat them. Among the main international drivers, some stand out on this journey, such as the European Union (EU), which has been creating trade, forestry, and climate sustainability policies. Through these policies, the EU aims to be a pioneer in meeting the Sustainable Development Goals (SDGs), according to elements expressly described in the EU's Communication, preamble to regulations, and intentions.

Once the SDGs have been implemented, they could be an example for third countries to follow and a "green" influence on the world. This influence is sometimes exerted through regulations, in which the EU Parliament and the Council establish normative texts with a sustainability bias so that not only member states but also third countries comply through sustainable trade policies.

Since the EU is one of the world's largest markets and one of the most attractive, creating trade regulations would go beyond the member states and affect third countries wishing to maintain trade relations with the EU. In other words, in the interests of third countries maintaining or establishing new trade relations with the EU, it is necessary to comply with the regulations imposed by the EU. This is how the EU's influence on sustainability reaches other countries outside its borders. This unilateral power of the EU is called the Brussels Effect. This effect can be an important coping mechanism in the search for mechanisms to deal with the climate emergency, helping third countries establish higher sustainability standards and preventing undesirable climate effects.

Nevertheless, certain principles must be respected to be considered an effective mechanism. The Principle of a High Level of Ecological Protection (NEPE), as described by Aragão (2006), is an important benchmark to be followed, as it must be considered at the time of primary legislation (juridification of a new fact) or secondary legislation (at the time of revision of a regulation). As the Brussels Effect necessarily goes through the legislative phase of establishing sustainable normative texts, protecting natural legal assets through the NEPE principle must be respected.

A further principle to be observed is that of Non-Retrogression. As the EU's influence will reach third countries, for this principle to be respected, it is necessary to prove that there was governance at the time of the legislation and that the possible risks were considered and mitigated.

Moreover, the EU's pursuit of environmental sustainability has consequences beyond its borders and, in the process, can "leave no one behind"[1], even though it did not intend to. In this context, the "Just Transition Fund" was created to support those affected by the transition to renewable energies, the circular economy, environmental restoration, and more sustainable agricultural production within the Member States.

As an offshoot of the abovementioned principles, the analysis of the Principle of European Ecological Responsibility is pertinent to the proposed study. This article aims to analyze the Brussels Effect as a legal mechanism for implementing global sustainability, looking at the principles of NEPE, European Ecological Responsibility and Non-Retrogression from the governance perspective.

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[1] "Leave no one behind" is a principle has been implemented by the EU's 2030 Agenda.

To this end, a dogmatic-teleological methodology will be used analyzing the legislative moment of EU sustainability policies. The study will be conducted from the post-positivist perspective of NEPE, a concept developed by Alexandra Aragão.

It is hoped that the Brussels Effect will prove important for the international community in combating the climate emergency, provided that the principles of NEPE, European Ecological Responsibility, and Non-Retrogression are observed in the governance process prior to the influential regulations.

II. The Brussels Effect Concepts, Elements and its Applicability as a Sustainability Mechanism

The Brussels Effect is a theory developed by author Anu Bradford, who 2012 published an article entitled The Brussels Effect and in 2020 published a book on the same subject. Bradford describes the Brussels Effect as "the unilateral power of the EU" to regulate the world market. The Brussels Effect, in other words, is a phenomenon in which the EU transports internal trade regulations beyond its borders[2] and it does so based on five elements. The first element is regulatory capacity, which establishes that the EU has the institutional capacity to develop normative texts with a global impact through the EU Parliament and Council. Regulatory capacity also translates the volitional element, i.e. the will that the EU has to structure normative texts that generate trans-territorial effects. As seen below, this will is based on principles and responsibilities assumed by the EU, which wants to be a global pioneer in sustainability and artificial intelligence regulations.

The second element is the size and attractiveness of the EU market, as it is the largest economy in the world, according to the European Commission's website (n.d.).

It is the economic bloc with the most trade relations with other countries. Its latent attractiveness makes the world's most diverse companies want to export their products to the EU.

Strict regulatory texts are the third element of the Brussels Effect. With each new EU regulation in trade terms, the rigidity in search of a more "fair and sustainable" market is elaborated.

Regarding inelastic targets, both products and producers must comply with European regulations if they want to trade with the EU. In other words, if a company intends to export its products to the EU, it must follow the regulatory texts adopted by the EU, with no room for flexibility - or elasticity.

Non-divisibility relates to the production line of a particular good and the unfeasibility of differentiating between the goods that will be exported. For example, suppose a company exports its products to regions such as Asia, Africa, the United States and the EU. Each area has a specific production method to meet the regulations. In that case, having four different production lines will be challenging. To solve this obstacle, the company will opt for a single production line that follows the strictest standards, often those coming from the EU.

Bradford believes all five elements are necessary for the Brussels Effect to exist. As a background to its existence, the EU has significant motivations to excel in sustainability. One of the main ones is the EU's desire to be a pioneer in implementing the Sustainable Development Goals (SDGs). The EU understands that if it is the leader in implementing the SDGs, the rest of the world will follow its standards, and it will have market preference. This is stated in the European Commission's Communication entitled Reflection Paper - Towards a Sustainable Europe by 2030[3] (2019a, p. 15), where it formalizes that " The EU can set the standards for the rest of the world if it takes the lead in the implementation of the SDGs and the transition to a sustainable economy ".

Therefore, the Brussels Effect is a tool by which the EU has to "export" beyond its borders its normative texts and, through them, its values and interests in the axiological context that is consistent with the wording of Article 3 (5) of the Treaty on European Union (TEU).[4] The leading role in the implementation of the SDGs has been essential for maintaining a sustainable environmental standard in the global order, and, as a result, the EU has built sustainable policies of great importance to the world. It is the pioneer in many matters of environmental sustainability, including tackling climate change, with the structuring of climate policies that serve as an example and impetus for other countries and blocs. Through the European Green Deal, the New EU Forest Strategy 2030 and the EU Biodiversity Strategy 2030, the EU has demonstrated that it is proactively moving towards implementing the SDGs while strengthening social standards for environmental sustainability at the global level.

However, this "export" can generate spillovers, which are side effects, in various areas because, by reflecting their sustainability values and interests worldwide, not all countries and regions will have sufficient structures to implement these regulations. In

[2] It can be conceptualized as spillover.

[3] Also referred to as COM(2019) 22 final.

[4] Article 3º (5) of the TEU: In its relations with the wider world, the Union shall uphold and promote its values and interests and contribute to the protection of its citizens. It shall contribute to peace, security, the sustainable development of the Earth, solidarity and mutual respect among peoples, free and fair trade, eradication of poverty and the protection of human rights, in particular the rights of the child, as well as to the strict observance and the development of international law, including respect for the principles of the United Nations Charter.

this context, the Leave No One Behind principle is necessary for a just transition for all those affected by the Brussels Effect, especially the countries of the Global South.

III. Basic Principles for Implementing the Global Sustainability Mechanism

To ensure that the Brussels Effect does not generate unwanted side effects, a set of principles is formulated below to be applied at the legislative moment when the text of the rule is created or reformulated.

The Principle of a High Level of Ecological Protection (NEPE) aims to protect emerging legal goods and "is a principle of ecological public order, which corresponds to an advanced civilizational level of defense of the human right to the environment, in which ecological protection is a collectively assumed imperative" (Aragão, 2006, p. 779). When drawing up new public policies, respect for this principle at the primary legislative stage is imperative for the legal protection of the environment, which the legislator has a duty to pursue. In the secondary legislative moment of revising normative texts, two other principles come into play: the Principle of No Ecological Retrogression, which would be the minimum degree of NEPE, and the Principle of Ecological Progress, which would be the maximum degree (Aragão, 2006, p. 782).

In other words, NEPE must be characterized at the legislative stage, with a view to ensuring that ecological goods are effectively and fairly protected in any policy created within the EU with an environmental bias. NEPE is linked to the cohesion objective set out in Article 3(3) of the TEU[5] and the Precautionary Principle aimed at protecting ecological goods for future generations.

Another critical point analyzed by Aragão is that there has been a change in the treatment of the perspectives that generate protective policies. Instead of reactive policies, they are becoming "anticipatory and integrated in managing material flows". Instead of policies being created in the face of a major catastrophe or damage that has occurred and is a measure to react to that fact, the shift towards the creation of anticipatory and integrated policies for the conservation of ecological goods is a measure linked to NEPE and is more effective and just.

This effectiveness is called legality, which is of essential importance for ecological goods.

[5] TEU, Article 3º (3): The Union shall establish an internal market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance.

The EU's Principle of Ecological Responsibility and the Leave No One Behind Principle are interconnected. The EU's ecological responsibility lies in its commitment to preserving and protecting ecological goods within its borders and in countries colonized in the past. Recognizing the ecological impacts caused centuries ago by the overexploitation of its colonies now translates into mitigating these negative impacts through ecological responsibility beyond its Member States. This is the quest for ecological and environmental justice.

This same quest for ecological and environmental justice is reflected in the Leave No One Behind Principle, which aims for sustainable development in the context of the 2030 Agenda of Sustainable Development Goals (SDGs). This principle aims not to cause even more inequality during the implementation of the SDGs, especially for vulnerable and marginalized groups. It is a process to be pursued inclusively and equitably by all countries without further exacerbating existing inequalities. The social aspect is essential so that "no one is left behind".

Even with a global and European framework on sustainable development, conceptualization and applicability are major challenges. Sustainable development is a multifaceted issue that encompasses several areas of knowledge and contains obstacles that are difficult to resolve. The obstacles include market failures, with environmental and social costs not being internalized, a lack of international cooperation that considers the particularities of developing countries, failures in popular participation by vulnerable populations, and various others.

Additionally, when the EU applies these principles, the concept and the interpretation of sustainable development will be carried out, considering its values and interests. This can influence external actors and disregard their particularities and distinct values. What the EU considers sustainable, other non-EU countries and blocs may not be due to cultural, economic, political, and social differences.

In this regard, the SDGs have been considered guiding principles for conceptualizing and directing global sustainability, and the EU uses them and aims to be a pioneer in their application (European Commission, 2019b). However, when analyzing the social and ecological dimensions of sustainable development and cooperation between different countries, the concept of cooperation continues to be an obstacle and a topic neglected about the ecological and economic dimensions (Haider et al., 2018). In the same vein, Lehtonen (2004) considers the social dimension the weakest in sustainable development, particularly regarding its analytical and theoretical foundations.

Indeed, when analyzing the conceptual part, even in the context of legal diplomas and the application of the social dimension, it is undeniable that the social aspect is neglected concerning the other dimensions,

especially the economic one.[6] A study on the EU bioeconomy found that the environmental and social dimensions do not prevail over the economic dimension (Ramcilovic-Suominen & Pülzl, 2018). This fact extends to sustainable development.

In addition, when structuring or reviewing a policy with an environmental bias, respect for the NEPE, Non-Retrogress, Ecological Progress, EU Ecological Responsibility, and Leave No One Behind principles need more attention, as will be analyzed in the section below.

IV. Governance for Fair Implementation

Ecological justice is conceptualized as the sphere of human and living rights. It aims at equity and a healthy environment that encompasses the differences between the Global North and South, focusing on the vulnerable and minorities (Jähnichen, 2022). From Aragão's (2006, p.28 and 266) perspective, ecological justice is understood "as the balanced, lasting and reasonably sustainable relationship between Man and Nature", likewise highlighting the geographical division of countries in the southern and northern hemispheres. Ecological justice is based more on natural goods and from a social perspective.

When considering the Global South and North's temporal, historical and cultural contexts, each of the three dimensions of sustainability (economic, social and environmental) will have its own developments, challenges and profiles. The asymmetries that exist in this division are latent. While the Global North comprises countries with developed industrial centers and social problems that are better addressed, the Global South faces the "tragedy of the commons", as they are countries that are overexploited in environmental and ecological terms and still pursue *commodity-based* economic activities. Many of the Global South's blemishes derive from colonization, and managing to break away from the "colonial" exploitation profile of its economy is a very complex mission, far removed from the reality of these countries.

Therefore, a country or bloc with influence outside its borders should prioritize sustainability and ecological justice proportional to the asymmetries between the global North and South when applying a single regulation.

That is because justice, which refers to the preservation of nature, is not only the responsibility of the "poor state, which is also in a *state of need*" that faces losses in the exploitation of its ecological goods but is a global problem,[7] because it has "much wider consequences" (Aragão, 2006, p. 276).

Since the EU is one of the major players in environmental matters, it must pay attention to ecological justice in favor of more equitable sustainable development and in such a way as to serve not only domestic interests but the whole, in a holistic ecocentric vision. Given all this complexity of values and interpretations, if this vision is not respected when drawing up and applying the policy mix, and if the subjective needs of all the parties involved in sustainable development policies are not considered, the result will certainly not achieve the primary objective of sustainability. Economic intentions can often precede social intentions since, in many cases, the arguments put forward by the populations involved in the policy are not considered or weighed up.

Although there is an intention to give effect to social rights, as was seen in the European Pillar of Social Rights initiative[8], in 2017, effective implementation is not yet a reality due to the lack of concrete measures and governance to include trade unions and civil societies on this stage (Rasnaca, 2019). This lack of prominence of the social dimension leads to the weakening of sustainable development, leading humanity into an era of Anthropocene emergency. The limits of the Earth's system are at significant risk of collapsing. It must be recognized that the substitution between economic capital and natural resources will not solve the problem (Jovovic et al., 2017), a factor that places sustainability on another level of synergy integrating the three dimensions of sustainable development in terms of political decision-making (United Nations, 2015). The social dimension is one of the interfaces of sustainable development that generates the most spillovers because, as well as being one of the most neglected elements within sustainable development, there is still the major obstacle of the latent issues that differentiate the Global South and North.

To combat spillovers, the EU has some tools, such as Impact Assessments, which study the possible impacts a certain policy may cause and form part of the legislative process. In this context, the principles analyzed in the previous section also serve as parameters for structuring environmental policies in the EU to prevent ecological and environmental injustices.

However, the Brussels Effect acting as a top-down mechanism and being discussed only at the European level, even with the normative Impact Assessment (European Commission, 2021), can affect other countries and blocs. If, during the prior phase of legislative debate, there is no governance towards the

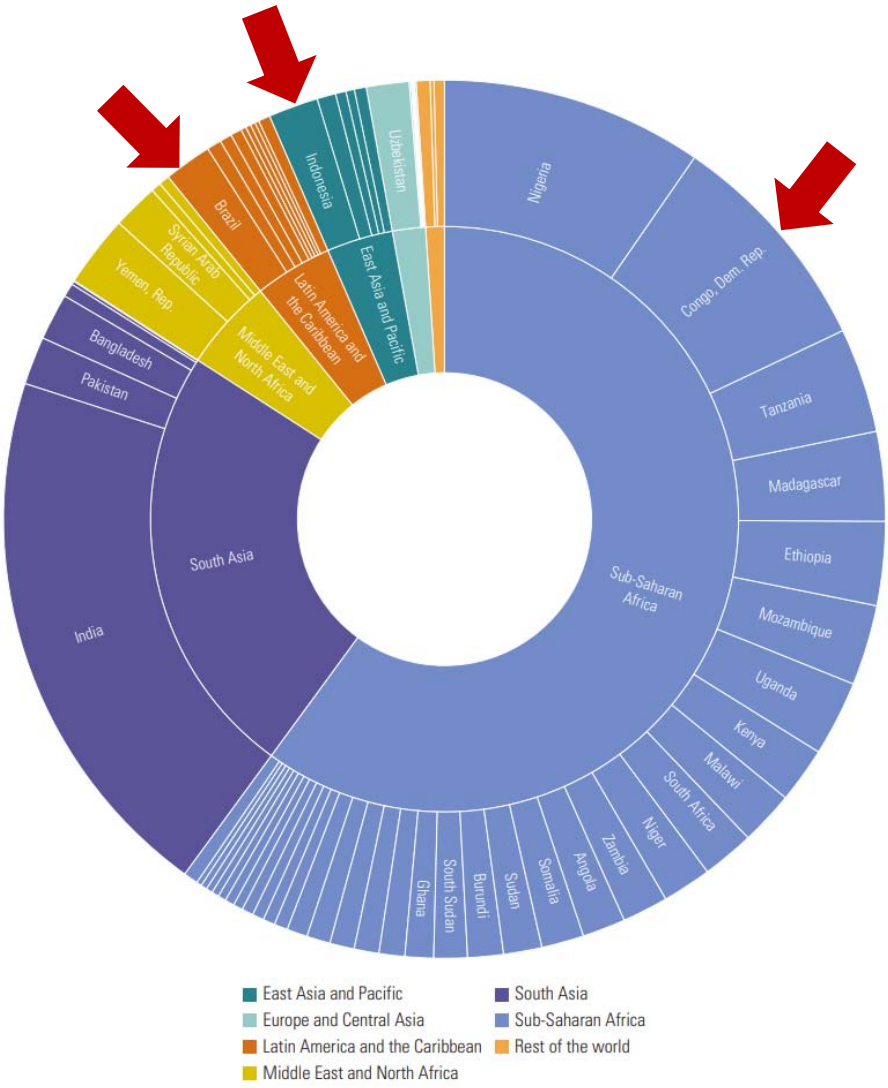
[6] On the subject, Soromenho-Marques describes that each of the three pillars of the sustainability triangle "has a specific nature, they are qualitatively different and cannot be amalgamated into a numerical equality, which would conflict with their particular essence". See: Marques, V. S. (2005). Metamorphoses: between collapse and sustainable development. Europa-América, Portugal.

[7] A possible approach to the issue is from the perspective of the principle of common but differentiated responsibility.

[8] Held at the Juncker Commission in 2017.

affected countries, there could be "Negative consequences of this influence include market uncertainty, trade disruptions due to new bureaucratic requirements, the displacement of non-certified forest products, exacerbation of the North-South disparity" (Trevizan, 2024, p. 20).

For example, when analyzing the case of the Regulation on Deforestation-free Products,[9] a forestry regulation that previously dealt only with wood, it was revised to include cattle, cocoa, soy, palm oil, coffee, rubber and derivatives and has been in force since June 2023. The countries most likely to be affected are Malaysia, Brazil, the Democratic Republic of Congo and Indonesia. According to World Bank data (pp. 64-65, 2022), these are the countries with the highest concentration of extreme poverty, as shown in the figure below:



Source: World Bank, Poverty and Inequality Platform, https://pip.worldbank.org.

Figure 1: Graph of global extreme poverty

The difference between the Global North, in the case of the EU, and the Global South lies here. There is no denying that extreme poverty is concentrated in a geographically delimited place, the Global South. It is made up of countries that face great economic inequalities, unemployment, serious problems in relation to hunger, health, education, lack of city structures, and the marginalization of the minority and vulnerable, who make up the majority within these societies.

In the Global North, there will be another group of challenges, such as immigration, the energy transition, and overconsumption. By replicating its values, if ecological and environmental justice is not taken into account, the EU could have terrible adverse effects, particularly in the social sphere, by affecting the

[9] Regulation (UE) 2023/1115: https://eur-lex.europa.eu/legal-content/PT/TXT/HTML/?uri=CELEX:32023R1115

basic economy of several cities and, consequently, the jobs that sustain that economy.

The figure above and the countries with the arrows, Brazil, Indonesia and Congo, are significant. All three have high levels of extreme poverty and are among the four countries that export the most native tropical timber (ITTO, 2024, p.24). This trade is already facing a reduction due to the new EU regulation (Regulation on Deforestation-Free Products). In fact, in both the Impact Assessment and the public consultation process (European Commission, 2021), there was no system of proactive governance in these countries, summoning them to debates on the problem of deforestation and environmental degradation. Furthermore, through the Brussels Effect, the EUDR will have the capacity to affect the economy of the Global South and cause unexpected spillovers.

V. Discussion

To address sustainable development's conceptual and applicability inaccuracies, it is necessary to strengthen sustainability by densifying its definition in the environmental and social dimensions and considering the biases arising from cultural differences and ecological justice (Ramcilovic-Suominen & Pülzl, 2018). It should also be noted that the EU's application of sustainable development in the legislative sphere has not yet achieved strong ecological and environmental justice sustainability, as it does not have inclusive governance.

The EUDR's example shows that governance has been fragmented. Despite following the prior rites of the Impact Assessment and public consultations (European Commission, 2021), no proactive diligence towards the countries that the EUDR will most impact was found in the reports and on the European Commission's websites.

Similarly, no documents were found that discussed forestry terms in each of these countries to understand the real problems of deforestation and forest degradation. It is important to note that each country has its complex forestry peculiarities, depending on the biomes and forestry guidelines that make them up.

The EU, in building a trade and forestry policy aimed at sustainable development and combating climate change while preserving forests, as in the case of the EUDR, could have given greater importance to the governance of the Global South. Firstly, given the Brussels Effect, the countries of the Global South would be the recipients of this normative text, and their economic bases eminently depend on the primary products provided by the EUDR. Secondly, because they are countries with different forestry systems and have the world's most extensive tropical forests, which suffer most from deforestation and forest degradation, they should be asked about the natural causes of these problems.

Not delving into the real causes of deforestation and forest degradation will make the regulation less effective. Governance based on the principles of NEPE, Non-Regression, Ecological Progress, EU Ecological Responsibility, and Leaving no one behind was not enough in this case.

VI. Conclusion

The existence of the EUDR is necessary to combat climate change, and the EU has been a leader in implementing an ambitious and sustainable agenda. The Brussels Effect as a mechanism for promoting sustainability internationally is a possible way forward.

However, for spillover effects to be reduced, compliance with the principles of NEPE, non-retrogress, ecological progress, and EU ecological responsibility, as well as leaving no one behind in the legislative phase of prior governance, is essential. Without these elements, the effectiveness of any EU regulation aimed at the environment could be tainted by distorted views of the problem to be tackled. This is because the reality faced in the Global South is different and more complex when the triple conjunction of "environmental, economic and social" is evaluated.

"Exporting" normative environmental texts through the Brussels Effect without considering the reality of each of the countries and blocs of the Global South will not achieve ecological and environmental justice. It will also lead to spillovers, exacerbating the differences between the Global North and disrespecting the abovementioned principles.

Consolidating a Committee within the EU structure that thoroughly assesses the Brussels Effect and its spillovers could be essential for enforcing the principles of NEPE, EU Ecological Responsibility and Leave No One Behind.

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Reflections on the Environment and the Way of Life of Brazilian Artisanal Fishermen

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Abstract- Extractive Reserves are territorial spaces in Brazil created by Law No. 9,985/2000 with the objective of protecting the livelihoods and culture of traditional Brazilian extractivist populations, as well as ensuring the sustainable use of natural resources in these areas. The recipients of this protection are artisanal fishermen, who inhabit the Brazilian coast and depend on fishing resources to survive. It so happens that this protection is questioned, given the problems that threaten these populations, such as disorderly fishing, pollution, tourism, in addition to the absence of public policies for them. In order to analyze the Jequiá Lagoon Marine Extractive Reserve as a form of protection for artisanal fishermen, a descriptive and exploratory study was developed, of a qualitative nature, with the artisanal fishermen of this conservation unit.

Keywords: jequiá lagoon marine; extractive reserve; artisanal fishermen; law protection; public policies.

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Reflections on the Environment and the Way of Life of Brazilian Artisanal Fishermen

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I. Introduction

It can be seen that Brazilian artisanal fishing has numerous and complex specificities and considers social, political, institutional, economic and environmental factors intrinsic to each region of Brazil, and its users use various means of production such as petrels, boats and strategies to capture resources that are generally not very abundant, in a constantly changing environment (DIEGUES, 1983) and with conflicting social relations.

Although Brazilian artisanal fishermen have their own characteristics that differentiate them depending on the region of the country in which they live, it is possible to identify common characteristics that are not limited to the capture of fish, such as the existence of social cooperation, the sustainable management of the environment, the traditional way in which knowledge of fishing activity is passed from generation to generation (DIEGUES; ARRUDA, 2001).

In addition, they have in common, difficulties resulting from impacts caused by anthropic elements that constantly threaten their way of life, coming mainly from the conflicts generated in the environment in which they live and that comprise aspects related to nature, economy, social relations and politics, hence why the study of a given fishing community can reveal common difficulties experienced by it and by artisanal fishermen from other fishing communities, and contribute to the elimination or alleviation of such difficulties.

Artisanal fishing is also considered an indicator of environmental quality, being an important strategy for the conservation of fishery resources (CATELLA et al., 2012), which demonstrates its importance for the preservation of the natural environment in which they are located.

The data related to artisanal fishing are estimated and may not reflect the current fishing situation, because the programs for collecting and systematizing statistical data have been paralyzed since 2009, and the last two Statistical Bulletins of national fisheries were published in 2010 and 2011 from data inferred through statistical imputation models to circumvent the existing gaps. The last estimate was made in 2012, so that, to date, Brazil has not presented any more fish production bulletins, and the national fisheries statistics have since then been based on estimates derived from historical averages that have been more than a decade behind (ZAMBONI; DAYS; IWANICKI, 2020; ISHIZAKI, 2021).

Despite the lack of recent official data on fishing, there are data contained in studies developed by researchers and made available by the General Fisheries Registry (RGP), as well as reports developed by non-governmental organizations, which allow us to assess its social, economic and environmental importance.

Vasconcellos, Diegues and Kalikoski (2011) present data from the late 2000s indicating the existence of approximately 800,000 fishermen, stating that in 2011 this number would have increased to 993,000, of which 99.2% would come from artisanal fishing. This information corroborates the data from the RGP in 2015, which indicated the existence of approximately one million fishermen in Brazil, mostly concentrated in the states of Pará, Bahia and Santa Catarina.

As for the number of vessels, the 2017 RGP indicates a fleet of more than 24,000 vessels distributed along the coast, of which 21,000 are classified as artisanal, operating in areas close to the coast, mainly in the capture of shrimp, lobsters and demersal fish, with the states of Santa Catarina, Rio de Janeiro and Ceará concentrating most of the artisanal fleet. which demonstrates the great relevance of artisanal fishing in

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the national socioeconomic context (ZAMBONI; DAYS; IWANICKI, 2020).

In a recently published study, it was found that artisanal fishermen in the Brazilian coastal zone, who have artisanal fishing as their main livelihood, or part of it, are involved in environmental conflicts that are mainly related to tourism, industrial fishing and shrimp farming activities in the north and northeast regions, and to the oil and gas chemical industry. shipyards and ports, in the south and southeast regions (HÜBNER et al., 2021).

Vieira (2003) reports that they face challenges related to vulnerable ecosystems impacted by intensive and disorderly urban-industrial activity, real estate speculation, predatory fishing and mass tourism models supported by large resorts and luxury condominiums.

Corrêa et al. (2018), when referring to fishing activity in the northern region, bring in their research allegations from fishermen that the reduction of fish stocks and the main difficulties to carry out their activity are related to the pollution of lakes, disorderly fishing, the lack of inspection and support from environmental agencies and studies of the historical impacts caused by the action of fishing on these bodies of water, the lack of security (theft of equipment and canoes), structural disorganization of the sector, problems and disputes between fishermen for fishing areas, lack of infrastructure for conservation, landing and local commercialization, in addition to the prohibition of some residents preventing passage and access to the lakes.

Capellesso and Cazella (2011), in a research carried out in the municipalities of Garopaba and Imbituba in the state of Santa Catarina, found that artisanal fishing has as important causes the problems of management of fishing resources and environmental impacts, forcing the use of pluriactivity, especially due to the excessive effort of catching industrial fishing, the use of meshes and gear prohibited by artisanal fishermen in the lagoons, the low salinization resulting from the closure of natural dams and excessive rainfall and the impacts of the release of water from rice cultivation areas near the Rio d'Una represent the main causes of the drop in fishing production.

Knox and Trigueiro (2015), in a research carried out on the coast of Espírito Santo, bring the testimony of an artisanal fisherman in the region that translates the impact on their activities:

> That's it, we've got too many problems, see? The first problem is that we have some trawlers here that come from Santa Catarina and are putting an end to our fishing here, [...] fishing that you can do in years, a lifetime of fishing, in one day they can do all this fish [...] (KNOX; TRIGUEIRO, 2015, p.4).

Correia and Sovierzoski (2005), when referring to artisanal fishing in the state of Alagoas, state that it is the target of environmental impacts that reflect the lack of environmental awareness of users and the absence of ecologically correct administrative policies, citing what happens to reef ecosystems, such as: inadequate navigation causing mechanical impacts; the use of corals and other invertebrates in the manufacture of artifacts for commercialization; sale of fish considered to be ornamental animals; predatory fishing, especially of species of high economic value, such as lobster and octopus, and disorderly tourism.

Throughout history, it has been noted that the treatment given by the State to artisanal fishermen had objectives other than to provide protection to their traditional way of life, privileging mercantile interests over fishing, to the detriment of the social, economic and environmental conditions in which they have always been inserted.

The legislation itself and the implementation of the rules of the Executive Branch are in the sense of establishing formal conditions such as: the requirement of personal documents, registration in the social registries of the Federal Government and affiliation to a Fishermen's Colony as requirements for their recognition as artisanal fishermen, which allows us to infer that they are on the margins of the interests of the State and private capital. they are victims of the harmful exploitation of the natural environment on which they depend.

Even the action of the state, through environmental agencies, generates conflicts with fishermen if it is not carried out correctly. This occurred during IBAMA's tenure, which led to conflicts with artisanal fishermen, since, by prohibiting fishing for certain periods, it generated dissatisfaction, fear and revolt on their part. Dias Neto (2010, p.80), in a work developed in the interior of Rio de Janeiro, brings statements by fishermen who portray this situation:

> I've gone into hiding several times (laughs). It's listening to the noise of IBAMA's engine and going straight to the boards! Wait for them to pass and go back to work. Because I'm working, I'm not doing anything wrong. Wrong is stealing! I'm a fisherman! Everyone is afraid. But you can't just sit at home.
>
> Suddenly, someone arrives shouting in Ponta Grossa "the IBAMBAS are in the Lagoon" Then the women are all desperate, thinking that their husbands are going to be caught or arrested (...). A fisherman who is a fisherman even faces the devil, how can he not face IBAMA?

In the same vein, Knox and Trigueiro (2013) bring results of research developed in fishing communities on the metropolitan coast and north of Espírito Santo.

> The sea was good for catching lobster, then they arrived [IBAMA], and oh, you can't and so on (...) people forbid us, low-income fishermen, for example, the trawler goes out there and catches at least 1000 kg (...) but they don't prohibit trawlers, they only prohibit us (KNOX; TRIGUEIRO, 2015, p. 49).

Knox (2009) also presents a work on fishing activity, this time on Pitangui Beach, in the municipality of Extremoz, in Rio Grande do Norte, in which he also notes the conflict between artisanal fishermen and IBAMA:

> The complaints are many. According to Mr. Neco, president of the Colony, the wife of a fisherman who owned a boat in this situation of conflict with IBAMA even wrote a letter to the President of the Republic, because in the way that the seizures and fines were made to her husband's boat, he ended up bankrupt and had to sell the boat (KNOX, 2009, p.117).

In addition to the conflicts generated with artisanal fishermen, the management of fishing by IBAMA caused dissatisfaction on the part of investors in industrial fishing, causing them to pressure the federal government to resume the economy of the sector, which led to the creation of the Executive Group of the Fishing Sector (GESPE) in 1995, through Decree 1697/95. which was composed of ministerial members and representatives of public and private institutions, such as fishing companies (CYRINO, 2018).

In addition, the fishermen's colonies, whose purpose is to represent the fishermen and defend their interests, have not been committed to the interests of artisanal fishermen, often being managed by people unrelated to their needs.

It can be said, then, that Brazilian artisanal fishermen have several points in common, starting from their origin coming from the miscegenation of knowledge, of blacks, Indians and Portuguese, passing through the traditional ways in which they carry out fishing activity and transmit knowledge from generation to generation, in addition to the difficulties reflected by environmental factors, the exploitation of fishing by the fishing industry, disorderly tourism, pollution, overfishing and the very treatment meted out by public authorities that hinder access to their rights.

II. The Protection of Artisanal Fishermen through Marine Extractive Reserves

Limitations of the Resex in protecting these communities and the environment in which they live were found, in addition to several conflicts that compromise their survival. In this context, there is the difficulty in its management, the lack of support from the state, the absence of data on the environmental impact caused by artisanal fishing and the absence of detailed biological studies on the marine species exploited.

In addition, there was a lack of clarity regarding the right of use established by Law 9.985/2000, given the difficulties related to the limitation of the common use of the marine areas covered by the Resex to a specific part of the traditional fishing populations, mainly because this limitation may lead to the exclusion of other users who are not members of this population (MILANO, 2011).

In fact, the management model of the Resex transferred to the coastal and marine environment encounters difficulties, especially because establishing public ownership and domain in these areas involves a complexity that can generate conflicts of rights between artisanal fishermen and the non-fishing community, as reported by Santos and Schiavetti (2013, p.1):

> The conflict is due to the impediment of access to resources in the areas delimited as a reserve by citizens not designated as a traditional population. This restriction of access has no basis in Brazilian law and may generate conflicts between beneficiaries and excluded persons.

In addition, there is a contradiction between the environmental legislation that governs the Resex, and certain rules for the use of fishery resources formulated by the co-management regime in the Marine Extractive Reserves, as in the case involving the use of wood taken from mangrove regions that is prohibited by federal legislation but considered necessary and legitimate by users (GLASER; OLIVEIRA, 2004).

On the other hand, the Resex Legislation does not clearly define sustainability[1], which generates uncertainty in the regulation of the norm for the protection of fishermen's rights, since its concept covers several aspects, namely: ecological, environmental, economic, social, cultural and political.

One point that creates an obstacle to the protection of Brazilian artisanal fishermen concerns the requirement of their registration in the General Fisheries Registry (RGP) to have access to benefits such as Pronaf, closed season insurance and social security benefits.

This Registry is provided for in the legislation that establishes the National Fisheries Policy in Brazil, which understands the artisanal fisherman as one who carries out a professional activity, autonomously or in a family economy regime, with his own means of production or through a partnership contract, landed, being able to use small vessels, including those that carry out work of making and repairing fishing gear and

[1] According to Freitas (2011), sustainability involves 5 dimensions that are intertwined, namely: a) the social dimension, related to health, education, security, which need to be universalized effectively and efficiently, otherwise the management model will be autophagic; (b)the environmental dimension, linked to concern for the destruction of nature and the finiteness of its resources; c) economic dimension, which defends the balance between efficiency and equity, advocating the restructured consumption and production and a vision of nature not restricted to simple capital; d) the ethical dimension, in the sense that all beings have an intersubjective and natural connection, imposing solidarity as a universalizable duty-pleasure, imposing on those who achieve greater self-awareness the duty to safeguard the integrity of all beings as much as possible, so as not to cause unjust damage by action or omission; and e) legal and political dimension, in the sense that the search for sustainability is a right and finding it is an inalienable and intangible constitutional duty to recognize the freedom of each citizen (FREITAS, 2011).

equipment, the repairs carried out on small vessels (with a gross tonnage of less than or equal to 20[2]) and the processing of artisanal fishing products (BRASIL, 2021a).

Currently, the RGP is regulated by Ordinance 265, of June 29, 2021, of the Secretariat of Aquaculture and Fisheries (SAP) (BRASIL, 2021a), linked to the Ministry of Agriculture and Livestock and Supply (MAPA), which establishes the following requirements for obtaining the registration of artisanal fishers:

> a) filling out an application in the Computerized System of the General Registry of Fishing Activity – SisRGP, by filling out the Electronic Application Form for the Professional Fisherman's License", available on the official website of the Ministry of Agriculture, Livestock and Supply;
> b) clear and up-to-date 3x4 photo;
> c) copy of official photo identification;
> d) copy of registration in the Registry of Individuals in good standing;
> e) copy of proof of residence or declaration according to the model available in Annex II of the Ordinance;
> f) copy of proof of enrollment in the Social Integration Program (PIS) or the Public Servant Heritage Training Program (PASEP) or the Worker's Registration Number (NIT) or Social Identification Number (NIS);
> g) copy of the sheets of the Registration and Registration Booklet – CIR valid with the personal data of the interested party, in the case of a professional fisherman or fisherwoman on board; and
> h) declaration of affiliation, in the case of fishermen and fisherwomen affiliated to any entity linked to the fishing activity, duly signed, according to the model available in Annex III of the Ordinance.

The requirements described above demonstrate that, to be properly recognized as an artisanal fisherman, there must be the presentation of documents and obedience to bureaucratic procedures. In addition, they allow us to conclude that any person who presents such documents and manages to comply with the bureaucratic procedures is considered to be an artisanal fisherman.

Despite the norm described above, article 3 of Decree 6.040/2007 states that artisanal fishermen constitute a social group belonging to traditional populations, not making any type of formal requirement, other than their own recognition as such based on their social, cultural, religious and economic reproduction and the territories they occupy:

> culturally differentiated groups that recognize themselves as such, that have their own forms of social organization, that occupy and use territories and natural resources as a condition for their cultural, social, religious, ancestral and economic reproduction, using knowledge, innovations and practices generated and transmitted by tradition (BRASIL, 2007).

The requirement of the RGP recently caused a difficulty in the recognition of thousands of artisanal fishermen in Brazil, since it served as a justification for canceling thousands of registrations of artisanal fishermen on the grounds that many of them did not exclusively carry out the fishing activity and that there was a lot of fraud in their concession, as reported by the Office of the Comptroller General of the Union (CGU). which assessed that 66% of the inspected fishermen who received the closed season insurance did not obtain income exclusively from fishing, and access to the benefit was undue, which would have represented an expense of about 2 billion reais to the Federal Government in 2015 alone, as shown in part of the excerpt from the report:

> In view of what was found in this report, we conclude that the fisherman's registration is not effective, because the information recorded is not reliable to revert to benefits for fisheries management, and is inherent at an intolerable level, to justify the maintenance of public policy in the face of the aforementioned percentage of losses reflected in the closed insurance, an irregularity that is aggravated by the lack of inspection by MAPA and the lack of penalties for the colonies and other entities representatives who present unreliable documentation for registration by the Ministry (CGU, 2017, p. 55).

It is observed that this evaluation did not consider the economic, social and environmental situation of artisanal fishermen, especially with regard to the low income they earn, which, even though it consists exclusively of fishing, is insufficient for their maintenance. In addition, it demonstrates a lack of knowledge of the social conditions in which they are inserted, which demands, for their livelihood and that of their families, the performance of other activities to guarantee a minimum income.

Thus, there is a conflict between the two main norms of the Federal Executive Branch, which generates legal uncertainty that prevents the recognition of artisanal fishermen and, consequently, is reflected in the guarantee of their material rights (social benefits, social security benefits, granting of credit for the development of their activities).

It is also noted that most of the Marine Extractive Reserves do not yet have data on the sustainability of extractivism carried out within their boundaries and the literature on management within their scope is still scarce, and the few results available are not sufficient for a conclusion. In this regard, Seixase Kalicoski (2009) found in a study carried out in the Marine Resex of Arraial do Cabo/RJ, that the increase in fish capture in the first years of its institution could be related to the conservation of local habitats as well as to a response to the relocation of industrial fishing that had to abandon the place.

[2] Gross tonnage is the sum of all the volumes of the covered spaces, permanently closed and watertight that are not under pressure. Its calculation is made using the formula AB=K1V, in which V is the total volume of all enclosed spaces of the vessel expressed in cubic meters and K1=0.2+0.02log10V (BRAZILIAN NAVY, 2021).

In the same sense, Lopes, Silvano and Begossi (2011) point out the lack of improvement in fish capture in the perception of artisanal fishermen after nine years of existence of the Marine Resex of Corumbau/BA.

Regarding the environmental impacts caused by artisanal fishing, it has recently been noted that the coast of the Northeast and Southeast regions of Brazil was hit by the largest environmental disaster caused by an oil spill in the country's history, which affected beaches in all northeastern states and the states of Rio de Janeiro and Espírito Santo.

In the Southeast Region, the accident mainly affected the community of Grussaí, in the municipality of São João da Barra, in the state of Rio de Janeiro (SILVA; SHRIKE; CALIL, 2020).

The first oil slick was recorded on August 30, 2019 in the state of Paraíba, and spread to more than 70% of the 3,300 kilometers of coastline in the other states of the Northeast, reaching almost 500 locations by the beginning of November.

In Bahia, the oil slick reached the beaches of Trancoso, Arraial D'Ajuda (in Porto Seguro), the Abrolhos Archipelago – in which one of the most diverse areas in Brazil is located – and, in total, 31 cities in Bahia were affected, which led the State Government to declare an emergency situation (G1 BA, 2019).

Along the entire northeastern coast, artisanal fishermen were severely affected, since the oil contaminated the marine fauna to the point of compromising the commercialization of the fish.

On the coast of Ceará, for example, the Ceará State Department of the Environment, based on data provided by IBAMA, notified until November 10, 2019, 25 beaches affected by the oil in 14 municipalities, namely: Aracati, São Gonçalo do Amarante, Caucaia, Icapuí, Paracuru, Barroquinha, Fortaleza, Aquiraz, Fortim, Jijoca de Jericoacara, Cascavel, Paraipaba, and Trairi, in addition to 28 records of affected fishing colonies (BRUNO, 2019).

On the coast of Pernambuco, as in other northeastern locations, there were reports of serious damage to fishing, especially in economic, social and environmental aspects, as reported in Ramalho in a survey carried out shortly after the occurrence of the disaster:

> Fishing communities are no longer able to sell shellfish, oysters, mussels and crabs. Through interviews and meetings, 51 people were interviewed, including fishermen (17 women and 18 men), 6 middlemen and 10 fish market stallholders in affected municipalities (São José da Coroa Grande, Tamandaré, Rio Formoso and Cabo de Santo Agostinho) and non-affected municipalities (Goiana, Itapissuma, Olinda and Recife, which were also suffering the negative repercussions of the oil). Between the second half of October and the first week of November, the sale of these products plummeted between 80% and 100% in Pernambuco. The sale of open-sea fish (mackerel, snapper and dorado) was also affected, decreasing by at least 60%, as well as farmed species (salmon, shrimp), by around 50% compared to market prices before the spill. Although the fishing sector has been affected as a whole, the fishermen themselves have been hit the hardest, as they fish for shellfish, oysters and mussels (RAMALHO, 2019, p. 1).

In this regard, Araújo, Ramalho and Melo (2020) report statements by fishermen from Pernambuco who show concern about their livelihood, as a result of the consequences of the accident:

> What are we going to eat?! Beef, chicken, salad?! The salmon thing? This is the stuff of rich people, of granfino, people with money. We have always eaten what comes from our waters, and it is free, the fruit of our work, it is a gift from God to be a fisherman, and we suffer from the fish suffering from all this [the oil spill] (crab fisherman from Carne de Vaca beach) (ARAÚJO; BRANCH; MELO, 2020, p.3-4).

Despite the complexity in which Brazilian artisanal fishermen are inserted and the difficulties they face, it is possible to affirm that the Marine Extractive Reserve constitutes an important instrument for the protection of their environment and their livelihoods, as it establishes specific rules within their area, considering the peculiarities of the populations and the environment of each one of them.

As the objective of the thesis involves the protective role that the Jequiá Extractive Reserve gives to artisanal fishermen in relation to their livelihoods, culture and natural resources, before analyzing their narratives, the conditions that this conservation unit offers are exposed.

III. General Aspects of the Protection of the Livelihoods, Culture and use of Natural Resources of Artisanal Fishermen in the Lagoa de Jequiá Marine Extractive Reserve

In the state of Alagoas, the practice of artisanal fishing occurs mainly in lagoon regions, especially in the Mundaú, Manguaba, Roteiro and Jequiá da Praia lagoons, the latter being protected by the Jequiá Extractive Reserve, as reported by Chagas et al. (2021). The objective of the reserve is to ensure the sustainable use and conservation of renewable natural resources, protecting the livelihoods and culture of the local extractivist population (ICMBIO, 2023), which is composed mostly of artisanal fishermen.

In 2014, in order to mitigate prohibited fishing and reduce conflicts in the region, a fishing agreement was signed between ICMBio and the fishermen of the Jequiá Extractive Reserve (ICMBIO, 2014a), which established the minimum mesh sizes of the nets and reinforced the prohibition of the use of trawling and waiting fishing techniques.

That same year, Ordinance No. 78 (ICMBIO, 2014b) was published, approving the profile of the beneficiary family of the Lagoa do Jequiá Marine

Extractive Reserve, establishing requirements, without which they cannot have access to the resources offered by it. Such requirements include: a) being born in the communities immediately surrounding the conservation unit or married to people who are natural from that area and live in the communities; b) be residents of the communities in the immediate vicinity of the RESEX whose main productive activity is artisanal fishing or occupations linked to fishing by-products; c) be residents of the communities of the conservation unit that aim at conservation and depend on the natural resources of the Resex for the maintenance of their traditional way of life.

In 2018, an ICMBio ordinance detailed some of the fishing equipment used in the Resex and disciplined various aquatic activities in the unit, to regulate the exploitation of resources (ICMBIO, 2018).

Despite having been legally created for the protection of artisanal fishermen who live in its surroundings and who use its natural resources, the Jequiá Resex has problems arising from environmental impacts that affect this extractivist population, threatening their way of life and culture.

In a study carried out in the Resex of Jequiá by Palmeira (2007), problems related to urban occupation and tourism were observed, including the lack of public policies and that

> there is a need to control the use and occupation of the land, especially in the villages of Lagoa Azeda and Barra do Jequiá, in which the configuration of the buildings has been made without taking into account the natural characteristics of the area, such as: advance of the sea, lagoon margin, slopes, cliffs, restinga vegetation and mangroves (...). The analyses suggest that the existing tourism activities in the study area have possible positive and negative impacts of tourism, as well as deficiencies in the implementation of infrastructure, and have not corresponded to a socio-spatial development as it has excluded some essential participants in this process, namely the fishermen and the population in general. (...). When talking about tourism activity and especially when it is intended to develop tourism in a sustainable way, one should not forget the importance of infrastructure for the functioning of the city, both for the population and for tourists (PALMEIRA, 2007, p.118).

The main tourist attraction of the Municipality of Jequiá da Praia is in the vicinity of the mouth of the Jequiá River (Figure 1), and in its surroundings there is a complex that includes a bar, restaurant and the availability of boat trips (Figure 2) throughout the Resex, in addition to a resort that is being built.

Source: SANTOS (2020)

Figure 1: Aerial view of the mouth of the Jequiá River and the tourist resort "Dunas de Marapé" (on the upper right) and street vendors (on the left), where most of the tourists who frequent the Jequiá Extractive Reserve are concentrated.

Source: Author (2021).

Figure 2: Vessel used in the tour of tourists through the Resex of Jequiá.

There is a private tourist enterprise that does not have environmental licensing, existing at the mouth of the Jequiá River, which receives most tourists. Tourism activity is not orderly, awaiting regulations that contemplate the most suitable places for visitation, the carrying capacity of the environments and the participation of the beneficiary population in the exploitation of community-based tourism (ICMBIO, 2017).

Silva et al. (2015) found problems related to the disposal of solid waste in the Jequiá Extractive Reserve that are now inappropriately disposed of, causing significant impacts on the environment because they contain toxic substances, warning that such substances, exposed directly, incorrectly, will cause serious problems related to public health and degradation of natural resources in the area.

In addition, in the Jequiá Extractive Reserve, predatory fishing and the introduction of fish species that are foreign to the natural environment and kill native species, this generates a serious ecological imbalance and directly reflects on the fishermen's way of life, as it affects the number of species they capture to maintain their livelihood. and there are several testimonies to the effect that fish is increasingly reduced (GOMES; RODRIGUES, 2018).

In this regard, Chagas et al. (2021) state, in a survey carried out between 2016 and 2017, that 90% of artisanal fishermen in the Resex reported a decrease in the amount of fish – especially the carapeba (*Diapterus sp.*) and the camurim (*Centropomusundecimalis* and *C. paralleluess*) – and the disappearance of the mandim (*Cathoropsspixii*) and the yam (*Geophagus sp.*).

In the same research, the authors found two main causes to which fishermen attribute the decrease and disappearance of fish in the lagoon portion of the Resex: prohibited fishing (although none of them reported that they practiced illegal fishing) and divine punishment, but in addition to these the introduction of exotic fish species responsible for the predation of native species is identified. As the report below demonstrates:

> Prohibited fishing, combined with a "divine punishment" was pointed out by fishermen as the two main causes, both in the decrease and in the local disappearance of ethnospecies, but none of the eighty fishermen interviewed reported making use of equipment or techniques known to be illegal that may have led to the collapse of local stocks of these species. According to the fishermen themselves, the "divine punishment" would have occurred as a result of the enormous amount of fish, especially the mandim, which in the past were left to rot in the nets due to their abundance during fishing. The ethnoknowledge of the fishermen corroborates with the scientific knowledge by pointing out the anthropic action as being the main responsible for the decline and disappearance of ethnospecies in the lagoon. Among these actions, the introduction of exotic species is considered by several studies as the most impactful action on the aquatic system, as it causes the reduction or extinction of native species, through changes in their habitats, competition for resources or predation, transmission of pathogens and parasites and genetic degradation. In the Jequiá lagoon region, two exotic species were mentioned, tilapia (Oreochromis niloticus) and peacock bass (Cichla ocellaris), which, according to fishermen, were introduced approximately two decades ago and have possibly caused disturbances in the region since their introduction (CHAGAS et al., 2021, p.102).

Lopes (2020) found several environmental impacts due to anthropic action, highlighting the decrease in plant biodiversity, erosion, decrease in family income, occurrence of waterborne diseases in the population, alteration of the quality of the water body and disturbance of the ichthyofauna, as reported by the author:

> Although there are villages in a large part of the surroundings of the Lagoon, through satellite imagery, it is possible to observe that the urban area is found in the center of the municipality, where the Jequiá River is located. The agglomeration exerts enormous pressure on the surroundings of the Resex, together with the overexploitation of its natural resources, generates an ecological imbalance, reducing the biodiversity of the local fauna and flora. The part most affected by urban pressure, caused mainly by the agglomeration found in the center of the municipality, is the Jequiá River. The practices of suppression of vegetation and discharge of sanitary effluents take place, mainly in the stretch of the reserve. These agglomerations that develop in a disorderly way generate an environment of conflict. The suppression of vegetation is a practice prior to the establishment of the area as a conservation unit and has intensified according to urban growth and the consequent pressure on the Resex. Through satellite images, it is possible to observe that, from 2009 to 2019, the change in the natural landscape is strongly associated with agriculture and livestock, and it is possible to identify special characteristics of these activities, such as well-defined and homogeneous delimitation patterns.

> In view of the above, even though there is a formal protection directed by the Brazilian legal system through the REM Lagoa do Jequiá, the artisanal fishermen who live in it have compromised their existence, especially with regard to their livelihood, their culture and their environment, raising the question of whether it effectively achieves its purpose as a way to preserve the fishing resources on which they depend (LOPES, 2020, p. 42).

In relation to vegetation, the mangrove[3], which makes up most of the surroundings of the reserve, was the one that suffered the most degradation.

As this vegetation constitutes *habitats for several species*[4], its decrease generates serious consequences, such as the difficulty of reproduction and the development of more vulnerable species, with 90% of fish and 95% of all food from the sea depending on the mangrove area (CNUC, 2022).

In turn, the decrease in species has an impact on the lives of artisanal fishermen, since they depend on their capture to survive from the commercialization or even from their own consumption of the fish.

In addition to the decrease in fish due to the degradation of mangroves, it results from predatory fishing carried out by the fishermen themselves, according to a report brought by Lopes (2020, p. 53):

> In the past, we were afraid to go near there so as not to be fined. You could catch big fish, 15 kg, 20 kg. Whoever sees it today, it seems that it is a lie. What I fished, I could eat, I could sell and I even gave it to my neighbors. Nowadays, everyone goes back and forth, fishing here. No one respects it anymore. We fish while still innocent (cub). Those who have a conscience give back, but not everyone does that. They catch fish like this (small), brand new shrimp, which doesn't give them time to grow. Today, you can barely get enough to eat for the day.

In addition to the suppression of vegetation, it was found that the municipality of Jequiá da Praia does not have active sewage connections or volume of sewage collected and treated, and the houses have rudimentary septic tanks, which are holes in the soil made by the residents themselves and where the desires generated by the toilets go (PERFIL MUNICIPAL DE JEQUIÁ DA PRAIA, 2018), which leads to the irregular discharge of more than 95% of domestic effluents without prior treatment into the Jequiá River (CNUC, 2022).

Lopes (2020) developed studies on three main points of the Resex, having reached the important conclusion about the risk of diseases to the local population in this sense, reporting:

> In the Center region alone, a total of 21 sewage discharge points were identified, and this value is an estimate due to the fact that there may be other unidentified submerged points and the existence of new points after the field trip (...). Some of the main restaurants in Jequiá da Praia are located on Duas Barras Beach and is also a place of great tourist and leisure activity, with two effluent points identified. In Prainha, where the Jequiá River is located, there is the highest concentration of irregular discharge of sanitary effluent, with an estimated amount of twenty-one points of discharge of sanitary effluents directly into the water body (...). There is an association between exposure to contaminated water and the development of waterborne diseases and the amount of symptoms related to transmission for the group of exposed people in relation to the non-exposed group are the main results that support this hypothesis. The low knowledge about waterborne diseases shows, in addition to the failure of the education system, a low quality or absence of awareness programs among the population of Jequiá da Praia, an important intervention for the promotion of public health (LOPES, 2020, p. 79 and 100).

Despite these problems, it is possible to perceive positive initiatives in the Jequiá Resex that can contribute to improving the lives of artisanal fishermen, such as the recent publication of its Management Plan (PM)[5] (BRASIL, 2023), and the presence of the Jequiá da Praia Women in Action Association (AMAJE).[6]

The Management Plan of the Jequiá Extractive Reserve not only verifies the current situation of the natural resources existing in the unit and of the artisanal fishermen, establishing rules and suggesting a series of measures aimed at achieving the objectives set forth in Law 9985/2000, especially those related to the

[3] The mangrove is a coastal ecosystem of transition between two environments: terrestrial and marine, characteristic of tropical and subtropical regions and subject to the tidal regime. Its development takes place in areas such as estuaries, bays and lagoons, and is of essential importance for its ecological function, as it provides food, protection and reproduction for several animal species (BERNINI et al., 2006).

[4] There are several native species in the Jequiá Extractive Reserve, including fish, shellfish and crustaceans popularly known in the region as: Oyster, Sururu, Maçunim, Aruá, Spider Crab, Maria Fumaça Crab, Xié, Uçá Crab, Guaiamum Crab, Mangrove Krab, Painted Lobster, Pink Shrimp, White Shrimp, Hake, Curimã, Carapeba and Agulhinha.

[5] According to article 2 of Law 9.985/2000, the management plan is a technical document through which, based on the general objectives of a conservation unit, its zoning and the rules that should govern the use of the area and the management of natural resources are established, including the implementation of the physical structures necessary for the management of the unit (BRASIL, 2000). It provides general indicators for the conservation, zoning and uses of environmental space in 3 different dimensions: spatial, establishing what should be done in a given time frame, establishing when it should be done; and methodological, establishing how it should be done (MARUTHI, 2006).

[6] The Association of Women in Action of Jequiá da Praia (AMAJE), registered in the National Registry of Legal Entities under No. 46.220.652/0001-32, was created on 04.12.2022 (https://solucoes.receita.fazenda.gov.br/Servicos/cnpjreva/Cnpjreva_Comprovante.asp), with the objective of bringing together women fishermen on the shore of the Jequiá Lagoon and thus making this category a political voice. There are more than 50 women involved who articulate a sustainable enterprise aimed at improving the quality of life of fishermen, shellfish gatherers and artisans in riverside communities, one of their activities being the reuse of crab waste, which promotes food security and has become a source of income and reference in the municipality. The project also contributes to depolluting the Jequiá Lagoon (UNITED NATIONS BRAZIL, 2022).

protection of natural resources, livelihoods and culture of artisanal fishermen.

With regard to the measures provided for in the PM, the normative components that establish the zoning and the general rules that should govern the use of the Resex and the management of its natural resources are highlighted, delimiting six areas, each of them with greater or lesser restrictions, namely: a) conservation zone; b) restricted use zone; c) communal use area; d) infrastructure zone; e) environmental suitability zone; f) zone of different public interests (BRASIL, 2023; ICMBIO, 2023a).

The Conservation Zone contains natural environments of relevant ecological, scientific and landscape interest, including a fish and crustacean nursery area, where there has been little human intervention, in which the direct use of natural resources is not allowed. Its objective is to maintain the environment in the most natural way possible and at the same time to provide primitive conditions for conducting research and visitation with a low degree of intervention[7]. Fishing, gathering, or direct use of fishing resources is not allowed (ICMBIO, 2023a).

The Restricted Use Zone contains natural environments of relevant ecological, scientific and landscape interest, where there has been little human intervention, admitting areas in medium and advanced degree of regeneration, allowing the direct use of low impact of natural resources, such as small-scale fishing. Its general objective is the maintenance of a natural environment and the reconciliation with the direct use of low impact of natural resources and carrying out research and visitation activities with a low degree of intervention (ICMBIO, 2023a).

The Community Use Zone is the largest area of the Resex, comprising the entire length of the lagoon, the channel and the sea (with the exception of the other zones), consisting of natural areas, which may present anthropogenic changes, where natural resources are already traditionally used by the beneficiary population or that have the potential to manage them. This area aims to maintain an environment as close as possible to the natural one, reconciled with the integration of the social and economic dynamics of the user population in the Resex, through the use of moderate impact on natural resources, in addition to carrying out research activities and visitation of a medium degree of intervention[8]. The exploitation of fishery resources is allowed as long as it is regulated in specific plans, in accordance with current legislation (ICMBIO, 2023a).

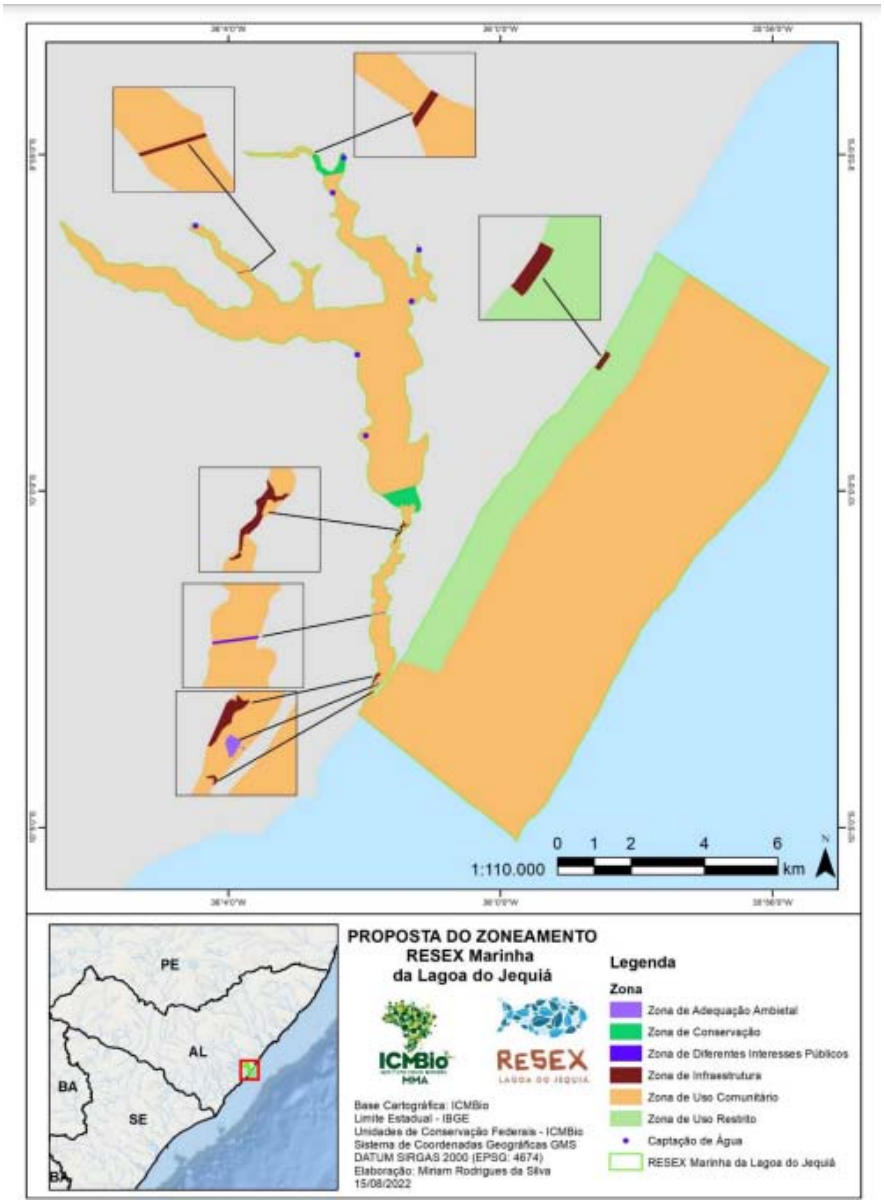
The Infrastructure Zone consists of natural environments or significantly anthropized areas, in which a high degree of intervention in the environment is tolerated, spatially concentrating the impacts of activities and infrastructures in small areas (ICMBIO, 2023a).

The Environmental Suitability Zone contains considerably anthropized areas or enterprises that are not of public interest, where it will be necessary to adopt management actions to halt the degradation of natural resources and promote the recovery of the environment, and where exotic species must be eradicated or controlled. It is provisional and, once recovered, will be incorporated into one of the permanent zones. Its objective is to halt the degradation of natural resources and, when possible, recompose the area, prioritizing the natural recovery of degraded ecosystems. It comprises the mangrove island and pedestrian bridge located at the mouth of the Jequiá River and currently used by the Dunas de Marapé project, supported by a Conduct Adjustment Agreement signed with ICMBio and the Federal Court. It has an area of 0.85 hectares (ICMBIO, 2023a).

The Zone of Different Public Interests contains areas occupied by projects of public interest or national sovereignty, whose uses and purposes are incompatible with its objectives of creating the Resex, with the general objective of reconciling the different public interests existing in the area, establishing procedures that minimize the impacts on the UC and the achievement of its objectives.

[7] Low-intervention visitation corresponds to primitive forms of visitation and recreation that occur in areas with a high degree of conservation, allowing the visitor to experience some level of challenge, loneliness, and risk. Encounters with other groups of visitors are unlikely or occasional. The infrastructure, when it exists, is minimal and aims to protect natural resources and the safety of visitors, and the presence of roads or motorized activities is uncommon (ICMBIO, 2023a).

[8] In the visitation of medium degree of intervention it is possible to experience a high degree of naturalness of the environment, however, it is already possible to detect some level of environmental alteration or evidence of human activities. Access to these areas can be achieved by motor vehicles. In terrestrial environments, roads are generally unpaved. Encounters with other visitors are more common, and there may be the presence of isolated residents, making it possible to experience the local way of life. The infrastructure is minimal or moderate, with the objective, in addition to safety and protection of natural resources, to improve the experience and provide convenience to the visitor, such as: bridges, small buildings, viewpoints, stairs, *decks, campsites, shelters, bathrooms, roads with permeable coating. (ICMBIO, 2023*)



Source: ICMBIO (2023a).

Figure 3: Zoning proposal for the Jequiá Marine Extractive Reserve, provided for in the Management Plan that was published in March 2023.

AMAJE comprises the women fishermen/ shellfish gatherers who live in the villages located along the lagoon portion of the Jequiá Extractive Reserve, which has played a relevant role in the construction of a protagonism that makes them come out of invisibility, based on initiatives aimed at the sustainable use of fishing resources, to the extent that the processing of crab shells provides the removal of waste that is discarded by the fishermen themselves.

Despite the short period of existence, the Women in Action Association of Jequiá da Praia has been standing out in the development of actions aimed at the empowerment of the fishermen of the RESEX of Jequiá, including obtaining important achievements, such as the 1st place in the "I Rural Women Award – Spain Recognizes", promoted by the Spanish embassy with the representations in Brazil. the Inter-American Institute for Cooperation in Agriculture, and UN Women (UNITED NATIONS BRAZIL, 2022).

The organization in association is observed in other fishing communities in Brazil and helps the work they do, making it more collective and structured, creating the possibility of inserting women in the political discussion and helping to recognize fishing as decent work, due to the work with other women in the fishing industry who are engaged in the associations and in the women's network (OAK; PEREZ, 2019), influencing public policies in the sector (GOES; CORDEIRO, 2018).

AMAJE stands out in the collection of crab shells discarded in the Jequiá Lagoon and in its

transformation into fertilizer that is supplied to a Sugar Mill located near the Resex and sold in small quantities to people interested in using the product. This initiative has brought hope to improve the livelihoods of the fisherwomen of the Resex.

Although AMAJE was created a little over a year ago, its performance has provided its members with the opportunity for political participation in the Management Council of the Jequiá Resex and the realization of actions that give protagonism to the members in the defense of artisanal fishing activity, including the realization of joint efforts for the cleaning of the Jequiá Lagoon and the development of a project that aims to transform crab waste into organic fertilizer. which is supplied to the Sinimbu Mill and uses it as an input for the cultivation of sugarcane.

AMAJE has its own building in which it established its headquarters (Figure 4) and a vessel that is used by the members to transport to the communities in which they live and which are in the surroundings of the Jequiá Lagoon (Figure 5).

Source: EMBRAPA, 2023.

Figure 4: AMAJE headquarters located in a shed donated by the Municipality of Jequiá da Praia.

Source: Author (2022).

Figure 5: Vessel acquired by the Association of Women in Action of Jequiá da Praia-AL and four associates.

The process of transforming crab shells to make handicrafts involves the following steps: 1) the collection of crab shells (of the genera *Callinetis, Cronius, Portunus*) discarded in the lagoon after evisceration and/or those that will be discarded in the garbage; 2) the rejected shells are subjected to a dehydration process in an oven; 3) through manufacturing developed by shellfish gatherers, the handmade pencil holder is built with the dehydrated shell, along with material from "PET bottles", palm trees/straws and varnish; 4) the shellfish gatherers sell handmade pencil holders at the value of R$ 20.00 each; 5) there is also the manufacture of baskets sold in the amount of R$180.00 each, in addition to the supply of bark for the manufacture of fertilizers that are sold in retail and wholesale to the Caeté Plant[9].

The crab shells collected are stored at the association's headquarters (figure 4) and transported in its own vessel (figure 5) to land provided by the Caeté Plant, which is close to one of the communities, where they are stored (figure 6), subjected to drying (figure 7) and then crushed (for transformation into fertilizer, figure 9) or taken for the production of handicrafts (figure 8).

As a result of these actions, the crab shells rejected after evisceration, instead of being thrown into the Jequiá Lagoon, are reused, preventing the shellfish gatherers and fishermen of the Lagoon from being injured during the fishing and leisure activity in the lagoon, as well as the entire community that makes use of the Lagoon.

The project currently benefits 124 associated shellfish gatherers, non-associated shellfish gatherers from the communities surrounding the Jequiá Extractive Reserve (estimated at 500), in addition to fishermen who use the lagoon to survive (more than 2,000 are registered), the non-fishing community of Jequiá that uses the lagoon for leisure and other activities, the local environment. In addition, it allows shellfish gatherers and other members of the community to engage in an artisanal activity linked to fishing, allowing the strengthening of their identity as members of a traditional community, also contributing to the mental health of members of the fishing community who are no longer able to fish, but can develop artisanal activity.

AMAJE's initiative reveals the ability of fisherwomen to seek solutions to social and environmental problems that have a positive impact on their livelihoods and that of the entire community that depends on the Jequiá Lagoon, involving the development of simple and sustainable technological processes that generate products (handicrafts and organic fertilizer) that provide social innovation[10] as they create an effective and sustainable solution to a problem that does not only affect them (lagoon pollution), obtaining an income from its commercialization, contributing to their survival and benefiting the community, in addition to being able to be extended to Brazilian Marine Extractive Reserves that have realities similar to those of the Jequiá Extractive Reserve.

It is important to emphasize that an improvement is necessary to better meet the objectives of the Project, given that the way it develops is very rudimentary, not having an adequate structure for storage, transport and instruments necessary for the processing of crab waste (since this is being done on open-air land provided by a Sugar Mill located in the vicinity of the Resex and devoid of basic infrastructure), nor offering protection to their health, as they do not have sufficient resources to pay for protective equipment such as gloves, boots, and appropriate clothing, as can be seen in Figures 6 and 7.

[9] Data collected by the author during a visit to AMAJE's headquarters, in Jequiá da Praia-AL, in October 2022, when the interviews were conducted.

[10] The concept of social innovation is used, which understands it as "a new solution to a social problem, which is more effective, efficient, sustainable or fair than existing solutions, and by which the value created reverts mainly to society in particular" (PHILLS JR; DEIGLMEIER; MILLER, 2008, p. 34).

Source: Author (2022).

Figure 6: Crab waste collected and placed on the land provided by the Caeté Plant (in an open place and without adequate structure) to carry out the beginning of the drying process.

Source: The author, 2022.

Figure 7: Drying process of crab waste for the manufacture of fertilizer. In the background, a fisherwoman can be seen spreading crab waste without using adequate protective instruments.

Source: Author (2022).

Figure 8: Handmade product (pencil holder) produced by AMAJE fishermen, from crab bark, wooden sticks and coconut palm straw.

Source: Author (2022).

Figure 9: Fertilizers produced from crab waste, bagged for retail sale.

It is also important to highlight that, despite the rudimentary way in which they are developing the project and all the difficulties faced, the fishermen's initiative earned them "1st place in the Rural Women Award – Spain Recognizes", promoted by the Embassy in Spain with the representations in Brazil of the Inter-American Institute for Cooperation on Agriculture (IICA), the Food and Agriculture Organization of the United Nations (FAO) and the UN and Women[11], which demonstrates the potential of the project and the importance of the creation of the association.

This fact has consequences, not only for the natural resources of the reserve, but also for the health of the surrounding population, as sewage is discharged untreated into the lagoon and canal and brings risks of infectious diseases transmitted through contaminated water, such as cholera, leptospirosis, worms, generating symptoms such as fever, weakness, diarrhea, headache, and loss of appetite, as shown in a study by Lopes (2020). Thus, it can be seen that the Jequiá Extractive Reserve is inserted in an environment composed of elements (human, animal and vegetable) that form a network, whose survival depends on the balance between them, so that the impact caused in one of them affects the entire system, threatening its existence, even if there is legal protection.

The creation of AMAJE can be seen as an initiative that takes them out of invisibility, giving them a voice in the deliberative council of the Conservation Unit, but also providing autonomy in relation to male fishermen and a perspective of developing a project involving the sustainability of the communities in which they live.

In addition, the women's initiative can encourage the creation of other innovative projects involving the sustainability of artisanal fishermen, their environment and their culture, contributing to their maintenance as members of traditional populations.

The example of AMAJE, as well as other associations created within the scope of Brazilian artisanal fishing, shows that associativism has been constituted as a path to the autonomy of fishermen, as it unites those most interested in the preservation of their way of life, their environment and the natural resources offered by them. It happened in the Chilean case.

In Chile, a fishing legal regime was created that grants territorial use rights to artisanal fishermen's associations, with the adoption of a policy that, for 25 years, has been providing for the sustainability of biodiversity in marine areas (GELCICH, 2019).

This regime, known by the English acronym TURF's (*Territorial Use Rights in Fisheries*), adopts a model in which fishermen assume primary responsibility for the management, collection and maintenance of fishery resources, under a legal framework and with permanent government supervision (NEHER; ARNASON; MOLLETT, 1988; SHOTTON 2000; SWARTHY; RAVENGA, 2014).

The implementation of TURFs has enabled Chilean fishermen to take effective control of their fishing

[11] The objective of the contest is to highlight experiences that encourage the economic autonomy of rural women to promote gender equality, increase their visibility and value diversity as a matrix of economic, social and cultural development.

decisions within their management areas (GELCICH; EDWARDS-JONES; KAISER, 2007), particularly with regard to the size and location of the territories; the number of species they intend to capture or allow others to capture; the methods and/or arts they use; the timing of the collection and the allocation of fishing quotas for each fisherman (subject to the officially designated harvest season, minimum harvest sizes and approved TACs); the potential prices accepted for its resources; to the buyers to whom they will sell; and the distribution of income obtained from sales among the associated fishermen (GELCICH et al., 2006; GELCICH; EDWARDS-JONES; KAISER, 2007).

It should be noted that the exercise of effective control of decisions by fishermen in the TURFs does not exclude the participation of the State and scientists, which are important for the maintenance of the regime to the extent that State supervision is a fundamental element for its success (SCHUMANN, 2007; CASTILLA; GELCICH, 2008) and that scientists establish a high degree of cooperation, as they develop analyses and management plans based on the data provided by fishermen, acting as bridges between them and the state (SCHUMANN, 2007, 2010).

One of the most important and powerful legacies of the TURF system is the requirement, support and incentives for fishers to come together in formal fisheries associations, which provides them with more voice and legitimate power in decision-making, helping them to become active stewards of fishery resources, as well as encouraging interaction between scientists, fishermen and the government, allowing them to learn from each other (MORENO; RAVENGA, 2014).

These associations are responsible for organizing resource management, imposing strict local rules for resource extraction (GELCICH et al., 2010; ORENSANZ; PARMA, 2010), which are, in some cases, stricter than those established in official regulations (MELTZOFF et al., 2002); allowing fishermen to sell their catch exclusively on legal markets and to get a better and fairer price for the product (ORENSANZ; PARMA, 2010), collaborating with other associations to generate collective actions to create innovative business initiatives[12] (CASTILLA; GELCICH, 2008), demonstrating that the TURF policy encouraged self-empowerment and bottom-up governance to manage fisheries in Chile (MORENO; RAVENGA, 2014).

It is not possible to affirm that the Chilean model fully applies to the Brazilian Marine Extractive Reserves, but, to the extent that it gives protagonism to fishermen in the management of fisheries in their territories through associations, with a bottom-up governance system – in which the State exercises more of a supervisory and supervisory role and scientists act as technical consultants – it can be a reference to improve the co-management model of these fishing units. conservation. It is possible to give protagonism to artisanal fishermen in the Marine Extractive Reserve through the promotion of associations, in order to provide governance, where the State would act more in the supervision than in the decision within the scope of these conservation units.

Although Brazil has not reached the same level as Chile in terms of the organization of artisanal fishermen, there are examples of artisanal fishermen's associations throughout the national territory in addition to AMAJE, which demonstrate the importance of these entities for the protagonism of these peoples, such as the Women's Network in the Resex of Canavieiras in Bahia (CARVALHO; PEREZ, 2019), Institutional Arrangements and Implementation of the Canavieiras Extractive Reserve/BA, that of the Caminho de Berbigão Association/ACB[13], in the Pirajubaé Resex in Santa Catarina; as well as in fishing communities in Amapá (SANTOS et al., 2018).

In this context, despite the fact that Brazilian environmental legislation is considered one of the most advanced in the world, its effectiveness is insufficient to the extent that "there is a procedural, organizational and structural deficit with regard to environmental protection agencies and the means available to properly exercise their attributions" (SARLET; FENSTERSEIFER, 2013, p.36), and it can be said that this statement is applicable to the legislation that regulates the Marine Extractive Reserves.

IV. Final Considerations

As a way of protecting the livelihoods and culture of Brazilian artisanal fishermen, as well as the sustainable use of their natural resources, the Marine Extractive Reserves are important because they delimit marine and lagoon areas that contain ecological elements essential for the survival of several species of fish, establishing a set of rules that aim to organize their territory. in the sense of conserving the natural resources on which they depend, and conserving their traditions that have been passed down from generation to generation since the colonial period.

However, there are limitations of this protection due to the difficulties faced by its management, the lack of support from the State and the lack of detailed studies on the species exploited and on the impacts caused by fishing activity, revealing that the rules established in the legislation and other normative

[12] For example, cooperatives and companies were founded to find new markets for benthic resources (CASTILLA; GELCICH; DEFEO, 2007; CASTILLA; GELCICH, 2008), and/or collectively sell resources from various associations, adding value to their fishery products.

[13] ACB holds the Contract for the Concession of Real Right of Use (CCDRU), which is the legal instrument that establishes the rights and duties of the State and the Community for the management of the RESEX (BRASIL, 2000).

instruments alone are not capable of protecting this population. because they can become innocuous if there is no initiative from public authorities, society, and the fishermen themselves in order to create social, economic, environmental, and cultural conditions suitable for their survival.

One of the difficulties in the management of the Marine Extractive Reserve is that they are located in marine and lagoon areas that are subject to the use of the general population, so that establishing public ownership and domain in them is a difficult task, especially because it is not possible to delimit them in the same way as areas on land, where barriers are placed that control access.

In addition, the lack of human and financial resources allocated to these conservation units has repercussions on the way ICMBio operates within its limits, as its large extensions require sufficient personnel to supervise and develop activities to support fishermen, as well as vessels, motor vehicles and equipment that assist in monitoring occurrences within its limits. and without them, your task is impaired.

The State's participation, in turn, is timid, because in addition to not guaranteeing sufficient resources for ICMBio to promote its support and inspection activities, it does not promote the formulation of specific public policies for the artisanal fishermen who reside in them, especially with regard to subsidies for the development of their activity, in order to enable the purchase of petrechos. vessels, fuel and support structures, being limited only to the granting of social benefits such as closed season insurance and social aid that are insufficient for the continuity of fishing activity.

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Environmental Economics: Addressing Global Environmental Challenges Through Policy

By Tanish Singh

Abstract- Environmental issues have become increasingly complex and interconnected, posing significant challenges on a global scale. The international community has recognized the urgency of addressing these challenges, leading tothe development of various environmental laws and initiatives at both the international and national levels. Efforts have focused on key areas such as the relationship between environmental protection and economic development, transboundary pollution, global environmental phenomena, and industrial emergencies. While gaps remain in legally binding agreements, governments and non-governmental organizations have collaborated to promote environmental awareness, strengthen international cooperation, and develop scientific means of environmental protection. To effectively address these environmental challenges, a comprehensive and coordinated approach is necessary, involving governments, businesses, civil society, and the general public working in tandem to strike a delicate balance between economic progress and environmental sustainability. Moreover, this research paper examines the various national level initiatives undertaken to address pressing global environmental issues.

Keywords: environmental/ecological economics, sustainable economics, climate change, environmental policy, international environmental law, sustainable development, biodiversity conservation, greenhouse gas emissions, ecological footprint.

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Keywords: environmental/ecological economics, sustainable economics, climate change, environmental policy, international environmental law, sustainable development, biodiversity conservation, greenhouse gas emissions, ecological footprint.

I. Desertification

Desertification is a type of process by which a fertile land changes itself into a desert by losing its flora and fauna, this can be caused by drought, deforestation, climate change, human activity, or improper agriculture. Land degradation affects almost 2 billion ha of land worldwide, every year, 24 billion tons of fertile soils are lost due to erosion; and 12 million ha of land are degraded each year which is 23 ha per minute. The effects of desertification are far-reaching and can impact both the environment and human society. The loss of fertile land can lead to reduced crop yields which can in turn lead to food shortages and famine. Desertification can also lead to the displacement of populations as people are forced to migrate. Furthermore, desertification can harm bio-diversity and increase the risk of natural disasters like dust storms several solutions can help mitigate and reduce the effects of desertification these include sustainable land use practices such as conservation agriculture and agroforestry, reforestation, and afforestation projects can help to restore degraded land and prevent further desertification better water management practices including rainwater harvesting can also help to conserve water and prevent drought finally education and awareness raising campaigns can help to promote sustainable land use practices and reduce the impact of desertification. However, the question arises what initiatives have national and international organizations taken? Firstly, we have to discuss The United Nations Convention to Combat Desertification (UNCCD) drafted in 1994 and adopted in 1996. The United Nations Convention to Combat Desertification in those Countries experiencing serious drought and/or desertification, particularly in Africa is a convention to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership agreements. It is the only legally binding framework set up to address the problem of desertification. The convention is based on the principles of participation, partnership, and decentralization-the backbone of good governance and sustainable development. It has 197 parties, making it near universal in reach. To help publicize the Convention, 2006 was declared "International Year of Deserts and Desertification" but debates have ensued regarding how effective the International Year was in practice. Another ambitious project was started by the African Union known as "The Great Green Wall" The project was adopted by the African Union in 2007, initially conceived as a way to combat desertification in the Sahel Region and hold back expansion of the Sahara Desert, by planting a wall of trees stretching across the Sahel Region from Djibouti to Dakar, Senegal. The original dimensions of the wall were to be 15km and 7,775 km long, but the program expanded to encompass nations in both Northern and Western Africa however, only 4% of the target for this project was achieved due to not enough funding. The Food and Agriculture Organization of the United Nations.

Passed "The Combat Desertification of Law 2009" this law consists of 25 articles divided into five sections aimed at; establishing competent authorities, at the national and local levels, to achieve: elimination or mitigation of desertification; achieving development of

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material and human capabilities; creating a successful environment to achieve the intended goals; and coordinating between them through a mechanism of supervision and follow up. To reach these objectives established: the National Council to Combat Desertification; General Secretariat;

State Council to Combat Desertification; and National Fund to Combat Desertification. The National Council is the competent authority to supervise the National Program to Combat Desertification and the enforcement of the United Nations Convention to Combat.

Desertification. It is competent for policy planning at the national level. The General Secretariat is created by the National Council and follows up on the law's implementation on a national level. The state councils are established in each state. The National Fund to Combat Desertification, under the National Council supervision, provides support and funding for Projects of the National Action Program and other governmental activities related to the National Action Program.

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India has undertaken a similar project the Great Green Wall building a 1500 km long wall to stop the Thar Desert from expanding to the east a statistic showed that the desert from 2005 to 2020 took up 14 million hectares of land before the Aravali Mountains naturally stopped this desertification but the deforestation did in the past 50 years and illegal mining as well hence, it has become quite tough for the Aravali's to prevent. To deal with this problem India launched the Aravali Green Wall project on 25th March 2022 where a 1500 km wall will be built with trees spanning from Haryana to Gujarat. India has taken many other initiatives to deal with desertification around 30% of India's land is being affected by land degradation to deal with this many schemes have been launched such as Pradhan Mantri Fasal Bima Yojana (PMFBY), Soil Health Card Scheme, Soil Health Management Scheme, Pradhan Mantri Krishi Sinchayee Yojana (PKSY), Per Drop More Crop, Afforestation Program, Green India Mission, etc. These schemes have helped reduce land degradation in India. There have also been significant actions taken on an international level by foreign countries for instance Kuwait where the Kuwait Academy of Sciences and Environmental Protection issues in Kuwait. Desertification policies are also present in Israel for example the 1950 Vegetation Protection Law (Black Goat Law) aimed at stopping vegetation destruction caused by overgrazing. Management of human activities was the main tool for controlling desertification, and laws and regulations were used to regulate people's behavior. Because grazing goats have a severe impact on bushes growing close to the ground, the Back Goat Law was implemented to reduce the number of goats, thus reducing grazing pressure on natural bushes and soil erosion. In China, the development of policies and regulations to combat desertification was slow to start. Although the National Desertification Leading Group and the Chinese Academy of Sciences combating desertification team were established earlier, they were in stagnation between 1969 and 1976. The rapid development of environmental protection in Kuwait began with the promulgation of the new Decree No 62 in 1980. It is a comprehensive regulation of environmental protection and overall environmental protection policies It contains 13 legal provisions. In Israel "Every day is a tree planting festival" was the slogan during the development project which lasted 20 years. In 2015 Kuwait began implementing the Green Belt to mitigate the effects of desertification and sandstorms. In 2002, China promulgated the Law of Prevention and Control of Desertification, which marked the start of desertification laws. This is a special law that focuses on desertification control and addresses issues of scope, planning, legislative guarantees, measures, and legal responsibility. The fifth national desertification monitoring program was completed program was completed between 2013 and 2015. Results show remarkable improvement in overall containment, continuous reduction, and enhanced functions since 2009. China is also actively participating in the international dialogue and cooperation on combating desertification.

Table1 Statistical result of desertification in central Asia in 1995

Country	Desertification area $10^5 km^2$	Potential extent (%)	Slight (%)	Moderate (%)	Severe (%)	Very severe (%)
Kazakhstan	1.78	65.33	18.1	26.1	12.4	8.7
Uzbekistan	3.16	70.74	5.6	7.0	27.2	30.9
Turkmenistan	4.44	91.04	3.8	13.8	43.4	30.1
kirghizstan	0.51	25.75	7.4	10.3	3.9	4.1
Tajikistan	0.47	39.49	7.2	10.9	8.5	12.9

II. Global Warming

Global warming refers to the phenomenon of gradual temperature rise of atmosphere, soil, water, and vegetative cover on Earth's surface year by year, a major cause of which is the "greenhouse effect" due to emission of such greenhouse gases (GHG) as carbon dioxide, methane, and nitrous oxide. On one hand, GHG absorbs the outward long-wave radiation emitted by Earth; it has no resistance against the inward shortwave radiation from the sun on the other, which causes temperature rises on Earth's surface and the lower atmosphere and results in global warming. Among the GHG carbon dioxide makes over 50% contribution to global warming. According to a report by the World Health Organization (WHO) 3.6 billion people already live in areas highly susceptible to climate change. Between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year, from undernutrition, malaria, diarrhoea, and heat stress alone. Nasa confirmed that July 2023 was the hottest month on Earth ever recorded. It is quite clear that global warming is a pressing issue hence, many organizations and governments around the world have been trying to reduce the effects of global warming. Firstly, let's start by discussing some initiatives taken on the international level to prevent the exacerbation of global warming there have been many conferences to deal with this issue firstly, there is the Paris Climate Conference which is an international treaty that was adopted in 2015. Where 195 countries agreed to limit the rise in global temperature to 2 Celsius. European Union (EU) will cut carbon dioxide emissions by 40% by 2030, the USA by 28% by 2025, and China agreed that their emissions will peak in 2030. Countries will meet every 5 years to discuss progress. Another initiative taken was the Copenhagen Conference which was done in 2009 where MEDCs and LEDCs agreed to limit greenhouse gas emissions. To assist LEDCs with the reduction, $30 Billion was offered as aid by MEDCs, increasing to 100 billion by 2020. However, not legally binding. The Gothenburg Protocol is another example the protocol was signed in 1999 it aimed to reduce pollutants and levels of acid rain and tropospheric ozone. Another example is the Montreal Protocol which was a global agreement signed in 1987 where countries agreed to either ban or have a controlled use of CFCs to slow down ozone depletion. The Kyoto Protocol is another agreement aimed at combating global warming the protocol was signed in 1997 signed by over 100 countries to cut carbon dioxide emissions by 5%, compared with 1990 levels. Each MEDC was allocated a target for emission reductions. Some LEDCs such as China were given targets and allowed to increase emissions. Global warming can also lead to wildfires one instance of that happening was the 2019-2020 Australian bushfires which were catastrophic in both scale and impact- both for people and for nature. Up to 19 million hectares were burnt, with 12.6 million hectares primarily forests and woodlands. Nearly 3 billion animals were impacted by the blazes. It can be said that one of the factors causing Australia to have the worst mammal extinction rate in the world is global warming as that leads to wildfires. In the last three decades alone Australia has lost three native species. Hundreds more were already on the brink of extinction before the bushfires broke out. However, the question arises what is Australia doing to deal with this issue? Well, The Australian Government launched the Environmental Protection and Biodiversity Conservation Act (EPBC) is supposed to protect the homes and habitats of threatened species. However, in the last 20 years since the laws came into force, more than 7.6 million hectares of threatened species of habitat have been destroyed. Another issue global warming has caused in the nation of Australia is land clearing. Australia has lost billions of trees due to land clearing which has affected wildlife terribly. However, Australia has started working on planting 150,000 trees in the right places these trees can reconnect islands of vegetation so they can once again function as large forests, allowing Koalas and other animals to safely move through the landscape. In that context, the environmental value of 150,000 trees can be immense, particularly when combined with other habitat restoration works. That's the aim of Cores, Corridors, and Koalas, a project led by the Great Eastern Ranges (GER) In partnership with the World-Wide Fund for Nature-Australia formed in response to the 2019-2020 bushfires. The United Nations has also taken action on this matter through the United Nations Framework Convention on Climate Change. The convention's main objective was the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic [i.e., human-caused] interference with the climate system. There have also been initiatives taken in Europe such as the European Union Climate Change Programme and the European Climate Initiative. In the United States of America, an agreement was signed between the US states of Washington, Oregon, and California it is known as West Coast Governors' Global Warming Initiative. A similar initiative was taken by the Midwestern states known as the Midwestern Greenhouse Gas Reduction Accord. The Regional Greenhouse Gas Initiative is another such instance signed between the Northeast and Mid-Atlantic states in the USA. The state of California in the USA LAUNCHED Global Warming Solutions Act. Global warming has also affected other animals as well, for instance, Polar Bears. The Arctic is warming about twice as fast as the global average, causing the ice that polar bears depend on to melt away. Loss of sea ice also threatens the polar bear's main prey the seals, which need ice to raise their young children. India has also taken some initiatives to combat

global warming these include the National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Water Mission, National Mission for Sustaining the Himalayan Eco-system, and many more.

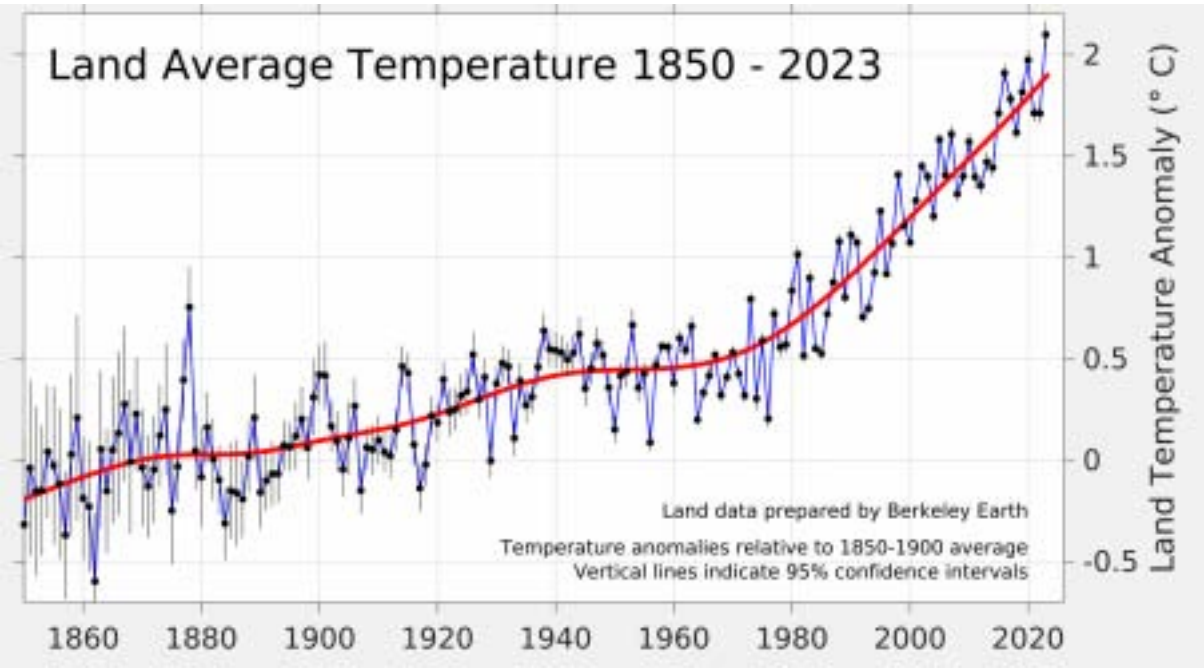

Figure 1

III. Biodiversity and Wildlife Loss

The past 50 years have seen rapid growth in human consumption, population, global trade, and urbanization, resulting in humanity using more of the Earth's resources than it can replenish naturally. A 2020 World Wide Fund (WWF) report found that the population size of mammals, fish, birds, reptiles, and amphibians has experienced a decline of an average of 68% between 1970 and 2016. The report attributes this biodiversity loss to a variety of factors, but mainly land-use change, particularly the conversion of habitats, like forests, grasslands, and mangroves, into agricultural systems. Animals such as pangolins, sharks, and seahorses are significantly affected by the illegal wildlife trade, and pangolins are critically endangered because of it. More broadly, a recent analysis has found sixth mass extinction of wildlife on Earth is accelerating. More than 500 species of land animals are on the brink of extinction and are likely to be lost within 20 years; the same number were lost over the whole of the last century. The scientists say that without the human destruction of nature, this rate of loss would have taken thousands of years.

In Antarctica, climate change-triggered melting of sea ice is taking a heavy toll on emperor penguins and could wipe out the entire population as early as 2100, according to 2023 research. Now let's discuss some initiatives taken on an international level to counter this issue. Firstly, there is the United Nations Convention on Biological Diversity (UNCBD) which is a UN treaty that is responsible for the conservation of Biological Diversity around the world. The UNCBD is one of the important parts of international environment conventions and protocols. It is a multilateral treaty opened for signature at the Earth Summit in Rio De Janeiro in 1992. It is a key document regarding sustainable development. It comes under the United Nations Environment Programme (UNEP). 196 countries are a party to the CBD India is also a party to the convention India ratified in 1994. To implement the provisions of the Act, the government established the National Biodiversity Authority (NBA) in 2003. The NBA is a statutory body. The goals of the UNCBD include:

- Conservation of biological diversity
- Sustainable use of the components of biodiversity.
- Fair and equitable sharing of benefits arising from genetic resources.

Another such example of protecting biodiversity and wildlife is the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) it is an international agreement between governments with the objective of the preservation of the planet's plants and animals by ensuring that the international trade in their specimens does not threaten their survival. It was adopted in 1963 and entered into force in 1975. India has been a CITES party since 1976. Due to its extreme diversity, India is recognized all over the world for harboring up to 7-8% of all the species recorded by CITES. Out of all the 34 global biodiversity hotspots in the world, India has 4 of them: Western Ghats,

Sunderland, Himalayas, and Indo-Burma region. As an active CITES member, India prohibits the international trade of endangered wild species. This is done by regulating the trade by export certificates and import permits.

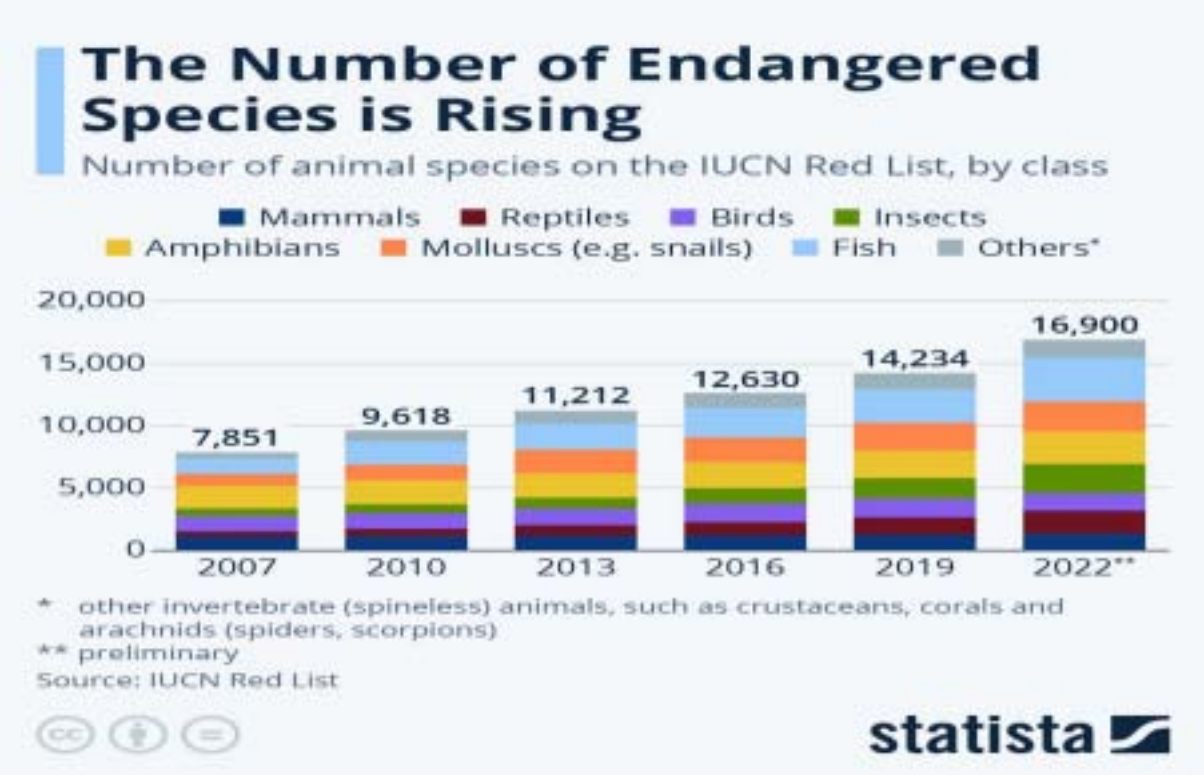

Figure 2

IV. Deforestation

Deforestation is the process of significantly and deliberately removing trees and vegetation from a specific area. This phenomenon occurs due to human activities such as logging for timber, expansion of agriculture, construction of infrastructure, and exploitation of natural resources. Deforestation has negative consequences for the environment and life on Earth, as forests are vital habitats for many species, regulate the climate, and play an important role in capturing carbon dioxide and mitigating climate change. Globally humans deforest around ten million hectares of forest every year. That is an area the size of Portugal every year. Around half of this deforestation is offset by regrowing forests, so overall, we lose around five million hectares each year. Nearly 95% of this deforestation occurs in the tropics. Time and time again, we see examples of countries that have lost massive amounts of forests before reaching a turning point where deforestation not only slows but forests return.

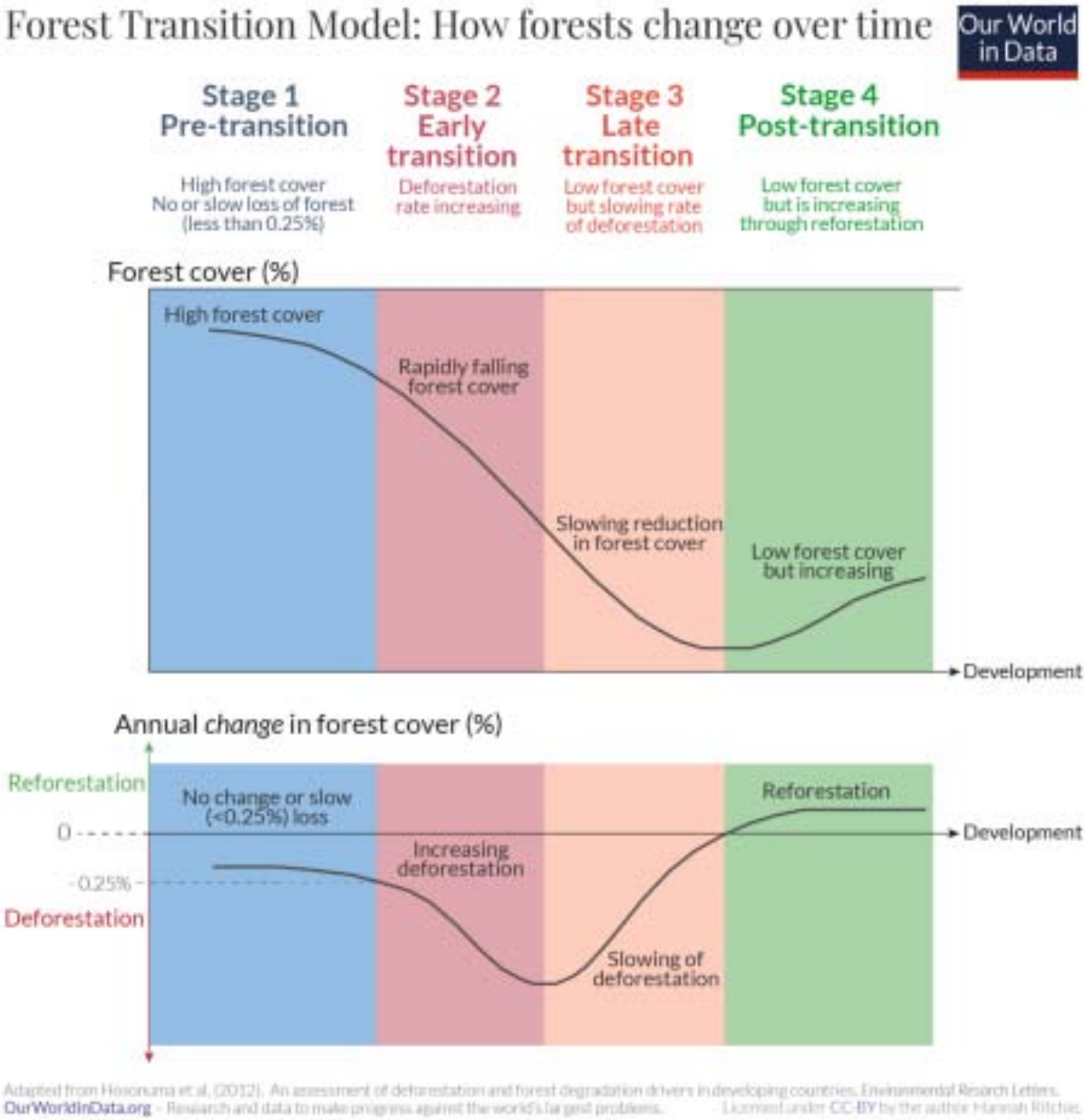

Figure 3

Between 2015 and 2019, at least 100 million hectares of healthy and productive land were degraded every year, impacting the lives of 1.3 billion people. Globally, one-fifth of the Earth's land area is degraded, an area nearly the size of India and the Russian Federation combined. It is conspicuous that deforestation is quite a big issue so now let's discuss some initiatives taken to combat this issue both on a national as well as an international level. Firstly, let's start with discussing laws in India against deforestation. The first law is the Indian Forest Act, of 1927 it was framed to manage timber and other forest resources. It provides for state governments to notify any forest land they own as reserved or protected forests. All land rights in such land are subject to the provision of the Act. The Forest (Conservation) Act 1980, was enacted to prevent large-scale deforestation. It requires the central government's approval for any diversion of forest land for non-forest purposes. India has also committed to creating an additional carbon sink of 2.5-3 billion tonnes of CO2 equivalent through additional forest and tree cover. This means increasing its forest cover from the current 25% to 33% and restoring 26 million hectares of land by 2030. There have also been many schemes such as GIM, CAMPA, and MGNREGA. These schemes have received much funding for instance in the case of GIM so far Rs. 690.39 Crores has been released to the States since 2015. In the case of CAMPA, Rs. 51,768.76 Crores has been released to the States/UTs since 2019. There are also many laws and acts preventing deforestation on an international level as well for instance the FOREST Act by the (WWF) Worldwide

Fund for Nature. The Act is critical to tackling global deforestation, nature loss, international crime, and climate change. The bill helps companies and governments meet their deforestation-free commitments and promote good governance and transparent and accountable global supply chains. The bill stops agricultural products from illegally deforested lands from entering the US. It requires companies to be responsible for their sourcing and show they are taking credible action to remove illegality and abuses from their supply chains. The bill also brings together stakeholders to improve laws, monitoring, assistance, and enforcement in countries experiencing illegal deforestation, fostering collaboration between governments and businesses. The (SDG) Sustainable Development Goal 15: Life on land also protects and restores terrestrial ecosystems, sustainably manages forests, combat desertification, and halts and reverses land degradation and stops biodiversity loss.

V. Food Waste

A third of the food intended for human consumption – around 1.3 billion tons – is wasted or lost. This is enough to feed 3 billion people. Food waste and loss account for approximately one-quarter of greenhouse gas emissions annually; if it were a country food waste would be the third-largest emitter of greenhouse gases, behind China and the US.

Figure 4

Food waste and loss occur at different stages in developing and developed countries; in developing countries, 40% of food waste occurs at the post harvest and processing levels, while in developed countries, 40% of food waste occurs at the retail and consumer levels. At the retail level, a shocking amount of food is wasted because of aesthetic reasons; in the US, more than 50% of all produce thrown away is done so because it is deemed to be "too ugly" to be sold to consumers- this amounts to about 60 million tons of fruits and vegetables. This leads to food insecurity, another one of the biggest environmental problems. 1.3 metric gigatons of food is wasted every year and at least 795 million people are undernourished worldwide. More than a third of all the food that's produced on our planet never reaches a table. Now, let's discuss some initiatives taken on a national level by the Indian government firstly, there is the "Indian Food Sharing Alliance" (IFSA) which has been formed by the Food Safety and Standards Authority of India (FSSAI) to help solve India's food waste and hunger crisis by working with various partner organizations, Food Recovery Agencies and NGO's. The Indian government has even launched several campaigns to create awareness about food waste such as the 'Anna Daata Sukhi Bhava' campaign, which aims to create awareness about the importance of not wasting food. Additionally, the government has established the Indian Food Banking Network, which collects surplus food from hotels, restaurants, and other food establishments and distributes it to the needy. Numerous non-profit organizations in India are also working towards reducing food waste. For example, Feeding India is an NGO that has established a network of volunteers who collect excess food from various sources and distribute it to those in need. Similarly, the Robin Hood Army is another NGO that has established a network of volunteers who collect excess food from various sources and distribute it to the homeless and underprivileged individuals. In recent years there has also been an increase in the number of startups working towards reducing food in India. Companies like Too Good to Go, Zomato, Feeding India, and Khaana Chahiye are some examples of startups that are working towards reducing food waste by providing a platform for restaurants and hotels to sell excess food at

discounted rates. Overall, food waste management in India is still a work in progress, but various initiatives and organizations are working towards reducing the amount of food wasted and ensuring that it is used to feed the needy. Now let's discuss some initiatives taken on an international level firstly, the United Nations has started the Sustainable Food Systems Programme under the United Nations Environment Programme (UNEP) the UNEP is implementing this program through three main focus areas:

- National Roundtables on Sustainable Food Systems
- Climate Change, Urbanization and Food Systems
- Sustainable Food System Thinking (interconnected policy making on food and agriculture

This program comes under Sustainable Development Goal 12 which seeks to ensure sustainable consumption and production patterns.

Figure 5

The visual above is from the United States Environmental Protection Agency and can be implemented by the readers in their day-to-day lives to help prevent food wastage. Another initiative is the 'Save Food' initiative backed by the Food and Agricultural Organization of the United Nations because the causes of food loss and waste vary in different parts of the world, the Save Food initiative takes a regional approach, developing strategies adjusted to the specific needs of regions, subregions, and countries. Collaboration with regional partners is essential

The Save Food regions are:

- The European Union
- North America and Australia
- Japan and the Republic of Korea
- Eastern Europe and Central Asia
- North Africa and the Near East
- Sub-Saharan Africa
- South and East Asia and the Pacific
- Latin America and the Caribbean

There have also been many initiatives taken by Individuals for instance the DC Central Kitchen founded in 1999 by Robert Egger in 2011 the community kitchen recovered 370,131 kilograms (816,000 pounds) of food. From the food, it recovered DC Kitchen provided almost 2 million meals to those in need in the DC area. In addition to recovering food from organizations and restaurants, DC Central also offers local farmers fair

prices for their produce, helping to contribute to the local economy. There is also the Food Recovery Network founded by enterprising students at the University of Maryland who decided to take action and launch this initiative to deliver cafeteria leftovers to local food shelters. It has since expanded to 11 chapters on campus across the US Students involved in the Food Recovery Network visit their campus and dining halls nightly to rescue leftover food and deliver it to local shelters and food pantries. Close to 55,000 kilograms (121,000 pounds) of food have been rescued by the Network since 2011.

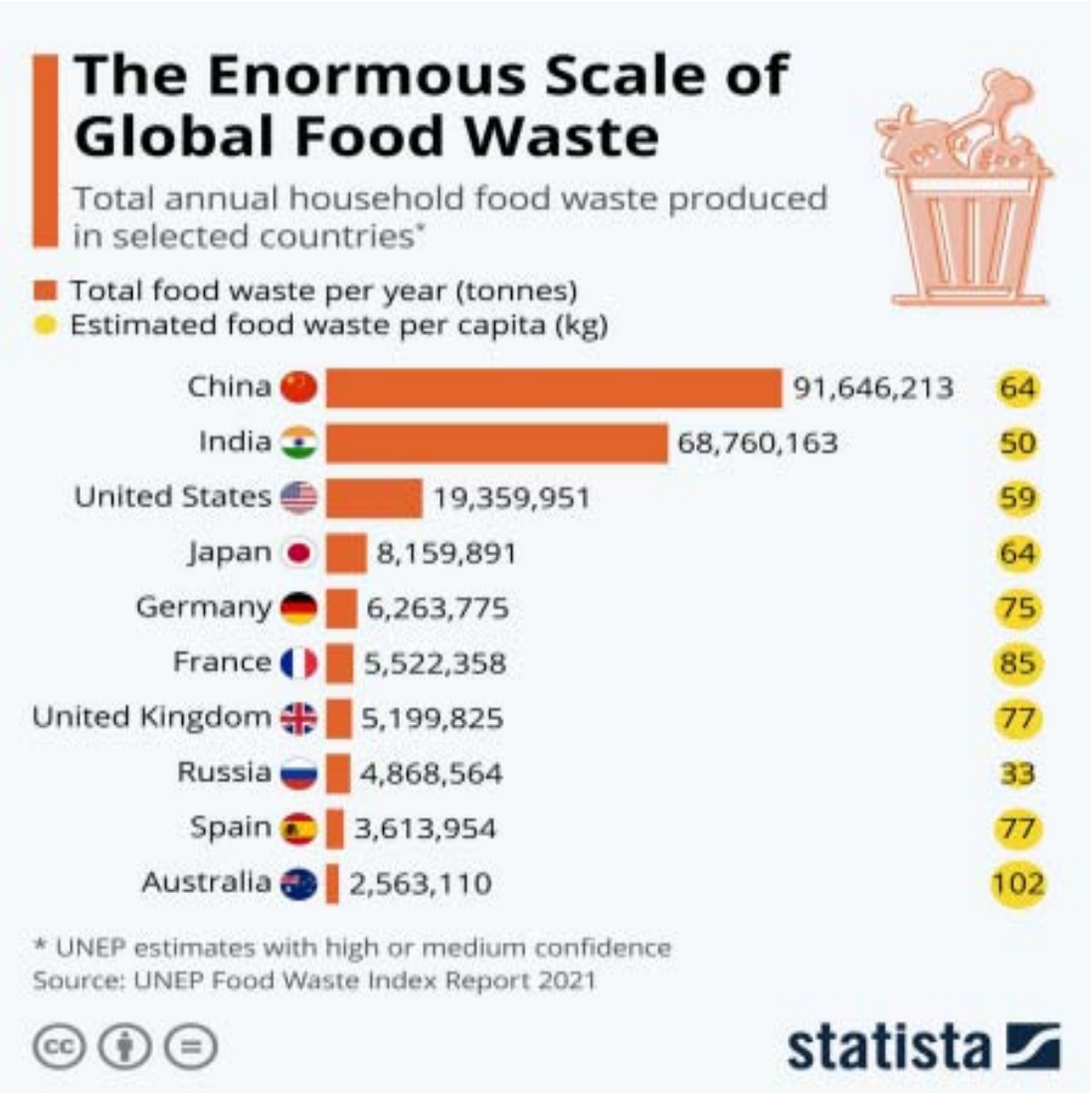

Figure 6

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Prediction of Impacts on Public Health: Analysis of Environmental Impact Reports Submitted to Ibama[1] (2012-2022)

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Abstract- This article, of an analytical and exploratory nature, aimed to evaluate the frequency of the "impacts on public health" component in the Environmental Impact Reports (EIR) submitted to the Brazilian Institute of the Environment (IBAMA) to obtain environmental licenses. To meet this objective, we made a random selection of RIMA submitted to IBAMA to obtain environmental licensing between the years 2012 and 2022, regardless of the type of project, totaling 10 RIMA analyzed. When reviewing the RIMA, the documents were read in full. We then sought to identify in the RIMA (1) the inclusion of "Impacts on Public Health" and associated risks, (2) the adoption of some type of methodological tool for health impact assessment (AIS) and (3) the incorporation of a health professional in the technical team that prepared the RIMA. The results point to (1) a pattern of absence of health impact assessment methodologies clearly identified in the RIMA, (2) the Terms of Reference themselves are vague regarding the criteria involving impacts on human health that guide the EIA-RIMA, (3) there is a systematic absence of professionals in the areas of Health Sciences in teams that produce EIA-RIMA.

Keywords: health impact assessment, environmental licensing, public health.

GJHSS-B Classification: LCC: RA566, TD194.6

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Keywords: health impact assessment, environmental licensing, public health.

I. Introduction

Any economic activity has an impact on its biophysical and anthropic environment, especially the impacts on public health. The institutionalization of the Impact Assessment in Brazil was carried out by the regulations of the National Council for the Environment (CONAMA), which issued Resolution No. 001 of 1986 and Resolution No. 237 of 1997, which established the Environmental Impact Assessment (EIA) as a tool for carrying out environmental licensing and the criteria for both environmental licensing and environmental studies[1,2]. As for the "public health" component, only CONAMA Resolution No. 286/2001 established the need for specific malaria studies for enterprises located in the Legal Amazon[3].

Resolutions No. 01/86 and 237/97 of CONAMA require the private or public entrepreneur who may demand the installation of a project to prepare an Environmental Impact Study, called EIA, and its respective Environmental Impact Report, the RIMA. As the main instrument for communicating the impacts of the project, the RIMA must be objective and accessible to anyone, especially to those affected by the project [1,2].

Since 2008, AIS has advanced in knowledge in Brazil, with systematized guidelines regarding AIS procedures in licensing. Illustrative of this advance is the publication of the guide "Health Impact Assessment – AIS Methodology adapted for application in Brazil", published by the Ministry of Health in 2014. The absence or ineffectiveness in identifying and predicting health impacts is parallel to the lack of health professionals in the technical teams and the absence of Health Impact Assessment methodologies of the EIA-RIMA [4].

To evaluate this scenario of scarcity of identified and predicted impacts on health, a random selection of RIMA submitted to IBAMA to obtain environmental licensing in the last ten years was carried out, regardless of the type of enterprise, totaling 10 RIMA analyzed. When reviewing the RIMA, the documents were read in full. We then sought to identify whether there was clearly (1) the "Public Health Impacts" identification, (2) whether any type of health impact assessment tool was adopted, and (3) whether the profile of the technical team that prepared the RIMA had any health professionals involved.

II. Environmental Licensing as a Public Management Instrument

Environmental licensing, derived from the National Environmental Policy, is a public management instrument that is characterized by marked

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[1] IBAMA is the Brazilian Institute of the Environment, the agency responsible for environmental licensing at the federal level in Brazil.

transversality, contemplating both social and environmental aspects that may be affected by projects whose activities may produce environmental degradation and may impact local communities (RODRIGUES, et al., 2021; SILVEIRA, M. et al., 2014). In this way, through the regulation instrumentalized by the Terms of Reference, the public administration guides applicants for environmental licenses who submit the Environmental Impact Studies and Environmental Impact Report to identify, predict and evaluate the risks that the respective projects would cause, potentially or effectively, in the indicated locations.

The concept of environmental impact in Brazil is described by CONAMA Resolution 001/86 as any physical, chemical and biological alteration of the environment caused by human activities that directly or indirectly affect the health, safety and well-being, whether of the population, socioeconomic activities or the aesthetic and sanitary conditions of the environment, in addition to the environmental quality of the place. To this end, the Environmental Impact Assessment appears as an evaluation tool before any decision is taken[5].

Every process involving environmental licensing demands technical and scientific responsibilities on the part of both the requester and the issuer. It is in the issuance of the Term of Reference that the criteria and technical parameters to guide the environmental impact study are established, in addition to the definition of the scope and methods to be used for each type of project to be evaluated. This occurs through the measurement and communication of risks, advantages and disadvantages, as well as the alternatives and mitigation measures envisaged [6].

Resolution 001/86 – CONAMA exemplifies situations in which the EIA is necessary, making it mandatory for the activities described in its article 2, as it considers them to cause possible significant environmental impacts[1]. Thus, the EIA regulation itself exemplifies activities that cause significant environmental impact [7].

To perform EIA, the most common methods identified in the specialized literature are: Ad *Hoc*, Checklist, Interaction Matrices, Interaction Networks and Simulation. As previously noted, however, these methods are aimed at identifying and predicting impacts of a biophysical and anthropic nature, but although they have the capacity to assist in the identification and prediction of health impacts, these tools are underutilized for this purpose, with more prominence, as is usual to detect in RIMA documents, the use of these tools to assess positive anthropogenic impacts. classified in terms such as "social progress" and "local and regional development", although the projects that cause them produce negative and significant socio-environmental impacts.

In Brazil, the "public health" component is still identified in an incipient way during the environmental licensing processes of large enterprises, despite the provisions related to human health described in the environmental legislation according to the National Environmental Policy (PNMA) and CONAMA Resolution No. 001/86, which write on the basic criteria and general guidelines for environmental impact assessment[1,8]. What is the reason for this incipient character? One of the hypotheses we worked on is the lack of standardization regarding the health impact assessment (SIA) process in environmental licensing, especially regarding the methodologies used for the collection of epidemiological data, for example. This lack of standardization, we believe, will result in the absence or reduction in the identification and prediction of public health impacts.

Understanding that most of the environmental resources are limited, it is perceived that the degradation provided by the economic system on the ecological sphere can have as a consequence both its own joint deterioration and the affect of the populations that are part of it. Regarding the health aspect of the EIA and RIMA, the approach is more restricted to the generalized environmental and socioeconomic consequences, consequently leaving components such as the health of groups of individuals missing. In addition, there are shortcomings in the process of considering the interactions between the project to be analyzed and other existing anthropogenic activities [9].

In this context, the ISA is evidenced as a mechanism for balancing environmental preservation and socioeconomic development, and environmental management is important to minimize the impacts arising from large projects[7, 10]. The environmental agencies responsible for environmental licensing do not have direct attribution to analyze health aspects. To add to this scenario, health agencies are formally absent from the environmental licensing process for infrastructure projects, for example, unlike other agencies such as ICMBio (Chico Mendes Institute of Biodiversity) or IPHAN (National Institute of Historical and Artistic Heritage) that are formally consulted (and with veto power in the authorization or not of any project) in these cases involving infrastructure projects that cause high-magnitude impacts.

In order to reduce the limitations related to health in environmental licensing, the General Coordination of Environmental Health Surveillance was created in 1999 and the National Subsystem of Environmental Health Surveillance was constituted, a health surveillance tool of the Unified Health System (SUS) whose main objective is to prevent and control health problems of populations exposed to the impacts of polluting enterprises. In 2001, the Ministry of Health established a Technical Cooperation Agreement with the Ministry of the Environment for the operationalization of integrated health and environmental actions, which established a national agenda for Environmental Health,

with the identification of priority areas for cooperation. In 2008, Interministerial Ordinance 882 was signed between the Ministries of Health and the Environment, establishing guidelines for integration through the implementation of common actions and a bilateral agenda [11].

III. The Adoption of AIS Methods to Correct Flaws in Environmental Licensing

According to the World Health Organization (WHO), HIA combines methodologies as well as procedures and tools to assess potential health impacts of economic endeavors. Its purpose is to provide politicians and other decision-makers with information about the likely health and welfare effects of a particular proposal. In addition to supporting this information with suggestions on how the proposal can be modified to optimize health gain through health protection, improved health, and reduction of health inequalities, working with the principle of equity. It acts as a way to integrate health concerns and considerations at the community, member state, and regional levels, acting as a mechanism to allow health implications to be taken into account during the process of developing policies and projects [12].

On the other hand, for Sicily and Purroy[13], the main objective of ACN is to maximize health benefits and reduce inequalities and negative impacts as much as possible. It is fundamental as a tool that establishes strategies for application in future actions, and therefore its execution should ideally occur in the planning phase, before the implementation of policies, programs and projects.

Among the AIS methodologies, some procedures should be highlighted.
Screening: Determine whether an SIA is necessary and justified;

1) *Scope:* Identify potential health impacts and target groups;
2) *Evaluation:* Assess the significance of health impacts, qualify and quantify the potential costs and benefits between different populations and any alternatives;
3) *Reporting:* Engage all relevant stakeholders and recommend preventive and mitigation actions to deliver the greatest possible health gain;
4) *Monitoring and Evaluation:* Include indicators and mechanisms, and establish processes and resources for the local authority and/or with the planning applicant to carry out and act on the results of regular monitoring.
5) Quality assurance step – those responsible for agreeing to the recommendations of an ISA (the local planning and/or public health team) review the quality of the final ISA submitted as part of the planning request.

Initially, in Screening, the need to perform an SIA should be evaluated in the face of an intervention proposal, evaluating the ability to answer a series of questions related to the possible impact. Then, in the definition of the scope and design of the process, the terms of reference and the plan prepared by those involved in the constitution of the AIS will be defined. In the Identification, the profile of the population and the environment should be constructed, highlighting the aspects that are important for the problems identified during the definition of the scope. Situational Analysis, on the other hand, synthesizes and critically evaluates the information collected, making a diagnosis and prognosis of the potential impacts on health, through qualitative and/or quantitative methodologies. Finally, in Evaluation and Monitoring, the impacts on the health of the community are considered based on pre-established indicators, creating a follow-up process for continuous development [4, 13].

From a legal point of view, the Federal Constitution, in its article 200 in item VIII, attributes the participation of the SUS in collaboration in the protection of the environment. This openness allows for greater institutional inclusivity in environmental licensing, which was reinforced in the Organic Law of the SUS itself (No. 8,080, of September 19, 1990) and through Conama Resolution No. 237 of 1997 and Conama Resolution No. 286, of August 30, 2001. [14, 15, 2, 3]

The institutionalization of public health in environmental licensing advanced, in an illustrative and operational way within the competences of IBAMA, in the consolidation of the Interfederative Committee and the Technical Chamber of Health (CT-Saúde). In this case, the various technical guidelines for establishing the basis for epidemiological and toxicological studies of the population directly and indirectly affected by the mining disasters that hit the states of Minas Gerais and Espírito Santo are highlighted, and it is valid to take this institutionalization as an indicator of the importance of public health as a component of the environmental impact assessment [16, 17].

Governments, health agencies and other users of the evaluation emphasize different aspects in their methodological process. Thus, there is currently no consensus on the specific definition and legislation regarding ISA, with the exception of malaria-endemic areas and settlement and agrarian reform projects [8.] In this way, the evidence produced by AIS plays a fundamental role in the definition of complex strategies and decision-making, thus strengthening the process of transparent information and scientifically based recommendations, providing an opportunity to build professional learning.

For Green (2021), the interaction between AIS expert leaders and staff (policy researchers, health professionals, and the community) in this construction represents a real gem, since it improves the understanding of the method, its component parts, evidence, and necessary data, in addition to mitigating the negative impacts identified beforehand [12].

As previously contemplated, in Brazil, although environmental licensing and EIA instruments of the National Environmental Policy represent an advance for the prevention and control of environmental impacts resulting from development, there is still a need for a systematic structuring of the participation of the health sector in this process, through instruments that contribute to encourage companies to mitigate and compensate for their impacts on the health of the population. The Ministry of Health has already established the need for specific regulations for the participation of the health sector in environmental licensing processes, however, currently only CONAMA Resolution 286/2001 presents the direct participation of the health sector specifically in the regulation of the licensing of enterprises in malaria-endemic regions [3,11].

In the next topic, we will seek to observe to what extent the "Impacts on Public Health" component was incorporated (or not) in the demands for Brazilian federal environmental licensing, whether there was the adoption of AIS methodological tools and how this communication took place through the RIMA of the projects selected for this study.

a) What about Health in Environmental Impact Reports (EIR)? 10 Cases Selected for Exploratory Analysis

When we evaluate the "Impacts on Public Health" component, we can identify both positive and negative impacts from the installation, implementation and operation (and decommissioning) of a project such as a thermoelectric or wind power plant, for example. Such impacts are distributed throughout the implementation phases of the project. Among the negative ones, those described in Table 1 4 can be listed.

Table 1: Overview of types of Medium and high Magnitude Impacts Related to Health Involving Projects that Require Environmental Licensing

Pre-installation Phase	Installation Phase	Construction Phase	Operation Phase
Migration (disorderly occupation in the cities and towns near the development.	Displacement of populations (stress, reduction in sanitation and housing conditions, exposure to diseases and risks in resettlement areas).	Increased pressure of grievances in the areas surrounding the project (alcohol and drug use, violence, sexual exploitation).	Change in the dynamics and perennialization of breeding sites of vectors and disease hosts.
Epidemiological pressure on the local population).	Possible increase in health problems in areas without major disruptions due to migration.	Possible increase in health problems in areas where there were no problems due to migration to other municipalities and other states.	Permanence of the population agglomerations related to the project.
Increased demand on the current health service.	Increased risk of accidents to the workers of the enterprise.	Increase in the number of workers with infections and avitaminosis, limiting their ability to work and socialize.	Reduction of concern with control measures on the part of the entrepreneur.
Increase in the number of people susceptible to disease.	Increased risk of accidents with the community related to the transportation and movement of vehicles.	Increase in STIs.	Increased demand for health services.
Insufficient structure of health services.	Increase in demand for the current health service.	Change in the dynamics and perennialization of breeding sites of vectors and disease hosts.	Increase in diseases related to exposure to atmospheric emissions, effluents and waste disposal.

Source: Ministry of Health (2014)[4]

This classification above is proposed to be generalist, extending from infrastructural impacts (such as the insufficiency of infrastructure to provide health services) or epidemiological impacts (such as the increase in STIs in the communities that will be directly affected by the project). However, it is an important starting point to begin the identification of health impacts invariably described in the RIMA (here analyzed only those under IBAMA's responsibility, as previously highlighted), as well as to ascertain the variation in the classifications involving what we characterize as "Public Health Impacts" [4, 22].

Rodrigues *et al* (2021) note that every EIA-RIMA should, in some way, explain the criteria adopted in

attributing the importance of the expected impacts[6]. Which results in two questions: how to define the importance of a health impact? Could it be that impact that exceeds environmental standards?

The answers to both questions lie in the subjectivity of the process of assessing the importance of impacts. In addition to CONAMA Resolution No. 01/1986, we have other regulations that deal with health as a component of impact assessment, such as CONAMA Resolution No. 465/2014 as well as CONAMA Resolution No. 237/97, which seek to guide the protection of human health or the integrity of ecosystems, establishing norms for certain standards for the protection of human and environmental health that should guide methodological procedures to identify and predict health impacts. Around this orientation, Barbosa, Giongo and Mendes (2022) observe that the continuous implementation of projects involving hydroelectric plants, which produce high environmental impacts, did not reinforce the importance of the impacts on public health and did not highlight the need for the insertion of multidisciplinary teams with health professionals [1,18,2,19].

The specificity of the type of project may incorporate other impacts specific to the type of project proposed to obtain bidding. We believe that this aspect is the difference in the inclusion of AIS methodologies in the preparation of EIAs and in the quality of RIMA communication, which fundamentally involve the entrepreneur's ability to identify and predict impacts on those who live in the areas directly affected or areas of direct and indirect influence of the project under licensing. Therefore, AIS methodologies can determine a greater scope in the identification and prediction of impacts on public health, as well as methodologically refine the risks to public health involving the types of enterprises evaluated [18].

For this analytical-exploratory exercise, we seek to restrict the RIMA only to those related to environmental licensing, under the responsibility of IBAMA. The reason for this restriction of cases is supported by Complementary Law No. 140/11, article 7, item XIV and Decree No. 8,437/15, which guides IBAMA's especially exclusive competences in environmental licensing. When reviewing the 10 selected RIMA, the full readings of the documents were performed. We then sought to identify whether there was clearly (1) the identification of "Impacts on Public Health" and associated risks, (2) whether any type of methodological tool for health impact assessment was adopted, and (3) whether the profile of the technical team that prepared the RIMA included any health professional involved [16, 20, 21].

We understand the descriptor "Impacts on Public Health" as the expected result of public health conditions in the municipalities of the area of direct and indirect influence after the installation of a project, identified through indicators of hospital morbidity, hospitalizations and diseases by compulsory notification, for example. As can be seen in Table 2, the selected RIMA included the following types of projects: mining, transmission lines, port infrastructure, energy (wind, thermoelectric and hydroelectric plants). Based on the reading of the RIMA, we classified all the projects within a category of "producers of medium and high magnitude impacts in the anthropic environment", which we understand would indicate the significance of impacts foreseen and described in the RIMA involving public health [22].

Table 2: Typification of Projects and Identification of Health Impacts and the Adoption of AIS Methodologies in RIMA Presented to IBAMA to Obtain an Environmental license

Type of Venture	Project Name	Public Health Impacts Identified/Predicted in the RIMA	Adoption of AIS Methodology in EIA-RIMA	Presence of Health Professionals in the Technical Team	Health Risks Identified in the RIMA
Hydroelectric Power Plant	AHE TABAJARA	YES	NO	NO	YES
Mining	Canga Southeast PDE Project to be implemented at the Conceição Mine	NO	NO	NO	NO
Renewable energy	Bojuru Wind Generation Complex	NO	NO	NO	NO
Mining	Project N1 and N2: iron ore extraction/current Carajás Iron Mining Complex	YES	NO	NO	YES

Renewable energy	Dom Inocêncio Sul Wind Complex Ventos de Santa Rosa Energias Renováveis S.A	NO	NO	NO	NO
Energy	Thermoelectric Power Plant (UTE) PAMPA SUL	YES	NO	YES	YES
Port infrastructure	Braskem's Private Use Terminal Project	YES	NO	NO	NO
Transmission Line	230 kV Transmission Lines Oriximiná - Juruti, CD, C1 and C2 / Juruti - Parintins, CD, C1 and C2 / Associated Substations	YES	NO	NO	NO
Mining	Minas-Rio Pipeline	YES	NO	YES	NO
Port infrastructure	Paraguaçu Shipyard, Bahia	YES	NO	NO	YES

Source: IBAMA (2022) [22]

By observing the set of health impacts foreseen in the 10 selected RIMA, we identified that there is a pattern of absence or reduced participation of professionals in the areas of Health Sciences in teams that produce EIA-RIMA. According to the Article 7 of CONAMA Resolution No. 1, On January 23, 1986, the teams should be multidisciplinary, however, there were only two (02) health professionals in the RIMA (Minas-Rio pipeline and PAMPA SUL Thermoelectric Power Plant). Although there is no legal provision for the inclusion of health professionals in the technical teams that produce the EIA-RIMA, this absence presumably directly interferes with the ability to identify and predict impacts on public health [22].

Another point that drew attention was that there is a pattern of absence of methodologies for assessing the impact on health clearly identified in the RIMA. The most common EIA methodologies were those identified in the documents as the adoption of *ad-hoc*, spatial analysis using satellite imagery and superimposition of charts, *Check-list*, use of Leopold's matrix with the adoption of an attribute scale for the evaluation of the criteria established for the evaluation of impacts. However, none of the 10 selected RIMA provided any methodological explanation of the partial or total use of any AIS method for the identification and prediction of impacts on public health [22].

In common in the identification of "Impacts on Public Health" are also the risks of occupational health and safety and, for all the RIMA analyzed, the risks involving accidents with third parties on construction sites and fronts. In projects that have in their areas directly affected or in their areas of direct and indirect influence, there is a pattern of identification of waterborne diseases associated with urban areas, especially due to the living conditions in the poorest neighborhoods, without adequate sanitary infrastructure, strongly associated with the infant mortality rates of the localities, potentiating their increase if mitigation measures are not adopted. Also noteworthy are infrastructural projects that require significant environmental changes and the incorporation of workers from other locations without clear parameters for identifying health impacts [4, 22].

In the RIMA analyzed, risks associated with the increase in the number of possible carriers of infectious diseases, such as STIs (HIV, hepatitis B, herpes, syphilis, gonorrhea and candidiasis), viruses and parasites, were identified due to the greater presence of migrants during the works. In addition to the increase in the number of cases of contracting endemic diseases (malaria, dengue and leishmaniasis), identified only in the case of environmental licensing involving a hydroelectric plant. However, for the spread of infectious diseases, such as STIs, other types of projects classified as "Hydroelectric Power Plants", "Port Infrastructure" or "Mining" also involve the greater presence of migrants during the works, but there is no identification or prediction of this type of impact on public health in any of the RIMA analyzed [22].

In the case of the identification of "Impacts on Public Health" involving hydroelectric power plants, in

addition to diseases transmitted by biological vectors (zoonoses), such as malaria, yellow fever, dengue, leishmaniasis, filariasis (all by mosquitoes), schistosomiasis (freshwater snail), Chagas disease ("kissing bug") and spotted fever (tick), there was also the identification of diseases transmitted by ingestion of water and food contaminated by etiological agents, such as worms, amoebiasis, dysentery, typhoid, hepatitis and poliomyelitis, or by contact with contaminated water and soil, such as leptospirosis and hookworm [22].

Only in the RIMA of the AHE TABAJARA project were epidemic risks specifically identified. We believe that this greater care in identifying and predicting impacts is due to CONAMA Resolution 286/2001, which guides EIA-RIMA projects involving projects in malaria-endemic areas. It is important to highlight this aspect due to the fact that licensing is tripartite, which implies the request and obtaining of three environmental licenses without, however, ceasing to occur health impacts regardless of the phase of operation. Epidemics can be categorized as follows: (1) explosive or (2) progressive. As for the first, the epidemic was characterized by its rapid spread and decline, while the second epidemic was characterized by a slower speed in its dissemination. The latter portrayed an enterprise in the phase of obtaining the installation license, given that the region where the TABAJARA AHE is installed is qualified by recurrent epidemics of malaria [3, 22].

An important absence among the impacts foreseen in the RIMA analyzed is related to the displacement of the populations affected by the projects, especially in cases of significant socio-environmental impacts of mining or the installation of hydroelectric plants. The literature confirms this reduction in the importance of displacement in the production of impacts on public health by not considering that the losses due to this displacement outweigh the changes in the territory. There is a loss of family and community affective ties, with the loss of their homes, churches, workplaces and shared leisure spaces [23].

However, the lack of identification and prediction of impacts on public health predominated in the RIMA, in addition to the limited perspective of interaction between physical and biotic impacts in the promotion of anthropogenic impacts, especially on public health. In this sense, we highlight that both the RIMA of the "Canga Southeast PDE Project to be implemented in the Conceição Mine" and the RIMA of the "Minas-Rio Pipeline" foresaw "alteration of air quality" as a negative and significant impact in the implementation phase of the project without, however, implying the identification and prediction of impacts on public health [22].

In the RIMA of the Pampa Sul Thermoelectric Power Plant (UTE) project, there is the identification of impacts on public health such as respiratory diseases, in addition to nuisance due to noise and vibrations, however in its RIMA the physical impacts such as "Contamination of surface water due to the discharge of effluents and solid waste", "Changes in surface water quality" or "Noise emission" are not associated with specific impacts on human health. Although the impacts are identified, there is no prediction or risk assessment specifically focused on human health involving these impacts, although there is the presence of a medical professional in the technical team that produced the EIA-RIMA. Health impacts are included within an umbrella called "public health" without discriminating the specific types of impacts resulting from the enterprise's activity [22].

The absence of the interaction effects of biotic and physical impacts on public health, for example, occurs both in enterprises involving activities such as mining and hydroelectric plants. The risks of contamination of waterways are predicted, however, there is no prediction of how these impacts affecting the ichthyofauna result in human health. It is one of the most serious flaws identified when thinking about the systemic and interdependent nature of environmental impacts on public health.

In another of the RIMA analyzed, involving the Private Use Terminal of Braskem in the municipality of Candeias in Bahia, there is only a description of an impact on public health that would involve pressure on urban services, but none involving fishermen and riverside dwellers affected by the project. Impacts of a biophysical nature are not associated with impacts on health, maintaining the standard of the RIMA analyzed. For example, "Reduced fishing production" is not associated with any impact on mental health due to changes in habits, livelihoods, and loss of income [22, 24].

The impact is described, but its mitigation does not incorporate the effects that this reduction in fishing production can result in, such as an increase in anxiety disorder or depression among fishermen and/or shellfish gatherers in a directly affected area or under an area of direct influence, which is identified as recurrent in the specialized literature [24] Impacts on mental health, invariably among the 10 RIMA, they are invisible.

The results corroborate the conclusion of Silveira and Araújo [25] who evaluated 22 projects with 36 environmental studies analyzed, of which only 18 incorporated some condition involving public health in the environmental licensing, attributing this low absorption of public health components to the reduced orientation of the TR to aspects involving impacts on public health. In common with all 10 RIMA analyzed are the proposition of environmental management or education programs, social communication or monitoring programs.

There is a pattern of underreporting of public health impacts in the RIMA that, due to the nature of

publicity and accessible language to those affected, should discriminate the impacts on health. In general, the exceptions involve the impacts related to hydroelectric plants in the field of health and occur, especially, due to the epidemiological control of arboviruses. By not identifying the systemic and interdependent characteristics of the impacts (and their respective orders of magnitude and temporality, for example), the forecasts and risks involving the activities of the projects potentiate the underreporting of health impacts, which will result in reactive and non-preventive measures detailed in the EIA-RIMA [22] themselves.

Also in common in the Terms of Reference themselves is the character of vague guidelines regarding the criteria involving impacts on human health that guide the EIA-RIMA analyzed, (as a kind of "copy and paste" in the use of measures such as the creation of programs to mitigate impacts on health in the midst of other types of impacts). The physical or biological impacts described in the RIMA are not associated as potential risks in the development of impacts on public health, which ends up generating the invisibility of the effects of biophysical impacts to the anthropic environment, especially including public health.

Thus, we are faced with an increasing degree of institutionalization of health in environmental licensing, as previously observed. However, if, on the one hand, there is a greater institutionalization of this demand for the "public health" component in environmental licensing, there is no correspondence of this "agenda" on the part of the applicants for environmental licenses that do not incorporate the AIS tools and do not even identify and predict the epidemiological or toxicological impacts of the projects to be licensed, reinforcing a pattern of future underreporting of diseases and health problems derived from the activities involving the stages of prior licensing, installation and operation of the licensed works.

IV. Final Considerations

We consider that by not identifying the impacts (and their respective orders of magnitude and temporality), the forecasts and risks involving the project's activities potentiate the underreporting of health impacts, which will result in reactive and non-preventive measures detailed in the EIA-RIMA itself.All the projects whose RIMA were analyzed in this study were characterized as "producers of medium and high magnitude impacts in the anthropic environment", and therefore the significance of impacts foreseen and described in the RIMA involving public health was expected. However, the results point to (1) a pattern of absence of health impact assessment methodologies clearly identified in the RIMA, (2) the Terms of Reference themselves are vague regarding the criteria involving impacts on human health that guide the EIA-RIMA, (3) there is a systematic absence of professionals from the areas of Health Sciences in teams that produce EIA-RIMA.

According to the WHO, health impacts should be considered within the legislation in which the Environmental Impact Assessment applies. In Brazil, despite the provisions related to human health described in the environmental legislation according to the National Environmental Policy (PNMA) and CONAMA Resolution No. 001/86, there is still no legislation that standardizes the Health Impact Assessment, and only in Conama Resolution No. 286/2001 did the need for malaria studies for enterprises in the Legal Amazon establish.

The lack of legislation and standardization of effective institutional and technical mechanisms for the systematization of the health component in the environmental licensing processes of enterprises was evident in the present study. Several countries have incorporated the Health Impact Assessment with the objective of introducing the health perspective in the elaboration of public policies, proposing to meet the needs that we have highlighted.

Once the impacts were properly identified, the risks foreseen and described, the Unified Health System (SUS) could carry out its task of promoting actions to improve the quality of life, reducing the vulnerabilities and health risks linked to large enterprises.

Given the magnitude of impacts caused by large works and the relevance of such projects for the socioeconomic development of the country, it is of paramount importance that the discussion of regulatory changes be on the agenda of government agendas aimed at socio-environmental sustainability.

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Safe Landscape: Evaluating Crime Prevention through Urban Morphology and Natural Surveillance Metrics

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Abstract- Urban morphological dynamics play a leading role in influencing the occurrence of criminal activities. The spatial configuration of public spaces can either amplify or mitigate the incidence of offenses in specific locations, as well as impact perceptions of insecurity and fear. Within the context of Brazilian cities, the rise in crime generates significant harm, affecting various sectors of society. Therefore, the objective is to evaluate urban landscape morphology and visual dynamics related to crime incidence in the central neighborhood of the municipality of São José dos Pinhais, Paraná, Brazil. Using a mixed-method approach, criminal data was geocoded through heat maps to identify urban spaces for analysis. The evaluation procedures, grounded solely in crime prevention through environmental design (CPTED) and defensible space principles of natural surveillance, were developed to assess Google Street View images. The Delphi Technique was applied to establish the weighting of criteria related to visual permeability. Spatialization and critical assessment of results were followed. The study found that despite favorable morphological conditions for natural surveillance and visual permeability in the city center, crime rates remained high.

Keywords: urban landscape. crime incidence. morphological aspects. visual permeability. natural surveillance. São José dos Pinhais, Paraná.

GJHSS-B Classification: NA9053.S6

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Safe Landscape: Evaluating Crime Prevention through Urban Morphology and Natural Surveillance Metrics

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Abstract- Urban morphological dynamics play a leading role in influencing the occurrence of criminal activities. The spatial configuration of public spaces can either amplify or mitigate the incidence of offenses in specific locations, as well as impact perceptions of insecurity and fear. Within the context of Brazilian cities, the rise in crime generates significant harm, affecting various sectors of society. Therefore, the objective is to evaluate urban landscape morphology and visual dynamics related to crime incidence in the central neighborhood of the municipality of São José dos Pinhais, Paraná, Brazil. Using a mixed-method approach, criminal data was geocoded through heat maps to identify urban spaces for analysis. The evaluation procedures, grounded solely in crime prevention through environmental design (CPTED) and defensible space principles of natural surveillance, were developed to assess Google Street View images. The Delphi Technique was applied to establish the weighting of criteria related to visual permeability. Spatialization and critical assessment of results were followed. The study found that despite favorable morphological conditions for natural surveillance and visual permeability in the city center, crime rates remained high. Key contributions include developing an online methodology for urban analysis enabling fast and effective city diagnostics for researchers and urban planners, which was chosen over i*n loco* pictures for temporal comparability, access to sensitive areas, and data quality consistency. Beyond, the prioritization of visual landscape criteria provides a singular element analysis that expands on environmental criminology research. These findings suggest that natural surveillance alone does not account for the elevated incidence of street thefts and robberies, highlighting the need for a holistic framework that considers socioeconomic, cultural, and spatial factors. It is recommended further methodological refinement beyond exploratory approaches, adaptations to specific Brazilian and Global South contexts, and a broader inclusion of relevant variables.

Keywords: urban landscape. crime incidence. morphological aspects. visual permeability. natural surveillance. São José dos Pinhais, Paraná.

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I. Introduction

As cities worldwide grapple with crime in public spaces, Brazilian urban centers stand out for the convergence of violence, crime, and inequality, impacting how society engages with these environments (Ceccato, 2021; Ceccato & Nalla, 2020; Harroff-Tavel, 2010; Pfanner, 2010; Ramos *et al.*, 2024). As an example of how susceptible individuals are, the most recent victimization study from the Nacional Household Sample Survey (*Pesquisa Nacional por Amostra de Domicílios* – PNAD) showed that 4% of the total private households in Brazil had at least one person that suffered from a crime of robbery or theft in the last year, amounting for a close of 2,9 million houses (IBGE, 2021). To give a perspective, a similar study in the US showed that only 2,6% of the households had robbery victims in 2023 (Tapp & Coen, 2024).

In this scenario, opportunity and property crimes have a particular connection to public spaces and their morphological dynamics, human behavior, and environmental conditions (Ceccato & Nalla, 2020). Architectural, urban, and landscape characteristics—particularly those influencing visual perception and the permeability between interior and exterior spaces—can either foster or mitigate theft and robbery (Bondaruk, 2016[2007]).

The urban landscape shapes the environmental configuration, impacting the incidence, nature, and context of property crimes, as well as affecting perceptions of insecurity, risk assessment, and the roles of various agents in crime deterrence (Chen *et al.*, 2024). Patterns in landscape morphology, especially those that reduce visual permeability and natural surveillance, correlate with higher crime rates in urban spaces. This is strongly supported by theories such as those from Jacobs (2011[1961]) and environmental criminology, who emphasize users' spatial control in city spaces and is further deepened by environmental criminology, which suggests that less dense, visually permeable areas with diverse uses create safer urban conditions (Ceccato & Ioannidis, 2024; Cozens & Love; 2017; Fennelly & Perry, 2018).

Based on these theories of crime in the public space, the objective of this study is to evaluate urban landscape morphology and visual dynamics related to

crime incidence in the central neighborhood of the municipality of São José dos Pinhais, Paraná, Brazil. Records show this to be one of the most criminally relevant cities in this federative district. In 2024 alone, it was in second place (23,271 offenses) in the number of property crime occurrences, losing only to Curitiba (48,827), which is the state capital (SESP-PR, 2024). When taking the population number into account, São José dos Pinhais (estimate of 345,644 inhabitants – IBGE, 2024) has 6,733 offenses per 100,000 persons, while Curitiba (estimate of 1,829,225 inhabitants – IBGE, 2024) has 2,669 for the same situation.

This study addresses three main gaps in current literature. First, it expands the scope of research on crime and landscape, building on studies like Lima (2020), Lima *et al.* (2023)—which examine urban landscape vitality and morphology—and Jabareen *et al.* (2019), which investigates perceptions of fear and security. Second, there is a lack of empirical evidence on criminology approaches, especially defensible space, and crime prevention through environmental design (CPTED), which are in most cases non-conclusive about their effectiveness, and this investigation works towards empirical evidence on the subject (Özaşçılar, 2022). Third, focusing on the visual characteristics of landscapes, this research uniquely examines natural surveillance dynamics in isolation, which verifies the importance of visual-based approaches to criminology. Therefore, the results focus on answering the investigative question: what are the relationships between urban landscape morphology and visual dynamics on specific types of crime within city environments?

The next section outlines the theoretical framework of the article, rooted in environmental criminology, with a specific focus on defensible space theory and CPTED. It will also explore the significance of natural surveillance and its visual permeability concerning landscape dynamics and interpersonal prevention. Following this, a methodological approach will be presented, detailing the analysis of urban morphological metrics used to evaluate natural surveillance levels in crime-relevant public spaces. The criteria measured will be examined across various morphological environments, establishing connections between visual permeability and crime incidence. Finally, the discussion will address the scope of the results obtained and provide suggestions for future research aimed at refining this exploratory methodology.

II. Conceptual Framework

Understanding the functioning and occupation of urban territory is essential for the formation of spaces with adequate degrees of security (Khaliji & Ghalehteimouri, 2024). Therefore, the study of the design of these places of passage and permanence, as well as their landscapes, provides insight into numerous social phenomena.

Pressures related to urbanization lead to an increase in violence that results in conditions of insecurity, while violence shapes the way the environment is experienced, relating its spatial configuration to the incidence of crimes (Adel *et al.,* 2016). The concept of "eyes on the street" (Jacobs, 2011[1961]) is not the only relevant in terms of paradigms for interpreting violence from an urban morphology perspective.

a) Defensible Space

This Newman's (1972; 1996[1966]) theory is an approach focused on residential environment design strategies done by inhabitants to minimize criminal activity and enhance security. It brought discussions from the sphere of social and behavioral sciences to present the concept of defensible space which is aimed at residential communities and involves more significant inputs from the population than of the government itself (Crowe, 2013[1991]; Marzukhi *et al.*, 2018). This concept emphasizes the actions of individuals with their homes, minimizing the State's role in security, and directs itself to measures for the private environment. It operates exclusively on the premise that certain conditions of the shape of internal and external places facilitate criminal occurrence (Reynald & Elffers, 2009).

Newman (1972; 1996[1966]) identifies four elements that contribute to the defensibility of a space: territoriality, referring to the residents' sense of ownership over their home and neighborhood, which reinforces the presence of invested individuals; access control, where physical barriers restrict entry to private areas, thereby deterring potential offenders; image and maintenance, which signal active care of the environment, influencing perceptions of safety and deterring criminal activity; and natural surveillance, enabling residents to monitor their surroundings, which discourages potential incidents by increasing the likelihood of observation. According to the author, these elements contribute to a defensible space by fostering a secure, well-maintained environment that limits opportunities for crime.

This approach is centered on United States housing projects from the 1970s, classifying space based on the applicability of "defensible elements" according to a public-private spectrum. This classification includes private spaces, primarily residential units; semi-private spaces, which refer to shared areas within buildings, such as corridors and stairwells; semi-public spaces, like building setbacks and other interfaces with sidewalks; and public spaces, encompassing streets, sidewalks, and open areas (*e.g.*, parks and squares). Each category's position along the public-private continuum influences the effectiveness of defensible space principles in enhancing security.

In this context, effective crime prevention necessitates civil society's active role in spatial configuration, upkeep, and environmental surveillance. Defensible space theory, which emphasizes spatial design's roles in deterring transgression, is particularly relevant. Similarly, there are other approaches aimed at reducing criminal occurrences through strategic modifications, highlighting the importance of promoting safer spaces.

b) Crime Prevention through Environmental Design

CPTED is a set of strategies aimed at reducing crime by influencing the design and management of the built environment (Cozens & Love, 2017). Also in the 1970s, Jeffery (1976; 1977[1971]) addressed factors of origin and occurrence of criminal violence, considering psychological and social factors and linking them to the physical environment as a way of explaining the incidence of offenses, defining an innovative approach to environmental criminology (Cozens & Love, 2015; 2017; Li *et al.*, 2024; Mihinjac & Saville, 2019).

CPTED seeks to interpret the relationships between the shape of the environment and the presence of crime, aiming to reduce its incidence. Studies based on these principles have taken specific approaches and can be categorized into three generations. The first comprises the initial theoretical and empirical strategies and involves the application of environmental design guidance in countering crime, based on seven elements. Natural surveillance, access control, territoriality, and image management closely align with Newman's defensible space theory. The additional concepts include legitimate activity support, which involves promoting certain accepted practices and behaviors over others; target hardening, aiming to increase the effort and reduce the potential reward associated with committing a crime; and geographical juxtaposition, referring to the influence of surrounding spaces on the security of adjacent areas, often related to broader factors such as land use and environmental characteristics (Cozens & Love, 2015; 2018; Fennelly & Perry, 2018).

In this context, Cozens and Love (2015; 2017) summarize that first-generation CPTED aims to enhance the image of a place through the design and monitoring of space, optimizing surveillance and reducing criminal incidence. In this scenario, offenders are more visible and exposed to risk. The first-generation, therefore, seeks to create spatial configurations that allow greater surveillance of so-called "legitimate users", who do not commit crimes, and generate a specific setting in which the defined territory is well maintained. In other words, designing space is essential to achieve these goals.

Other generations of CPTED are relatively detached from environmental morphology. Also called "Community or Social CPTED", the second focuses on psychosocial approaches to crime locations, demonstrating cultural and population connectivity issues. At the same time, the third emphasizes sustainability, aiming to improve living standards and local image, transforming it into a safer, welcoming environment through participation and intelligent, technological, and efficient use of resources (Cozens & Love, 2015; 2017; Fennelly & Perry, 2018; Mihinjac & Saville, 2019). The value of this approach diverges from morphology as the main object, working on a different urban scale.

Each generation of CPTED produces a vast range of content with unique perspectives for environmental criminology studies. For this study, the first-generation CPTED stands out as applying to the morphological aspects of cities. This continuity of the work of Jeffery (1976; 1977[1971]) and Newman (1972; 1996[1966]) is invariably linked to the built environment and its association with crime, with the constant presence of the visual permeability required for users' vigilance in space. This is a crucial debate concerning landscape morphology within the precepts established here.

c) Natural Surveillance

Based on prior discussions, this type of spatial monitoring is the ability to maximize through design visibility and encourage positive activities to allow the presence of people to oversee the environment (Fennelly & Perry, 2018). Returning to the basis proclaimed by Jacobs (2011[1961]), the existence of individuals on the streets, enjoying both open spaces and commercial areas, together with permeability in the relationships between public and private environments, are aspects that directly affect a location's crime rates and security levels. In this locals, natural surveillance is essential, as the organic action of supervising a place through citizens' daily experience (Jacobs & Cherbonneau, 2019).

This interpersonal prevention is characterized by formal agents, such as police and private agents, and informal ones, such as friends, acquaintances, or any other citizen, and the possibility of observation by non-human devices such as surveillance cameras (Alexandrie, 2017; Yang *et al.*, 2024). Protection of these spaces is enhanced by appropriate morphology, combined with elements of urban landscape and infrastructure design that make criminal actions visible.

Visibility works in two ways, enabling prevention through natural surveillance and offering the potential offender a sight of the target individual or object. In specific terms of the public open space, "occupant surveillance" defines the possible observation of the external environment from the private space. Then, it is determined by the visibility of buildings openings, such as doors and windows.

d) Conceptual Synthesis

The three concepts discussed—defensible space, CPTED, and natural surveillance—are rooted in spatial determinism. Critiques of these theories often focus on their tendency to overemphasize environmental influences on human behavior, resulting in reductionist interpretations of criminal causation that overlook social factors such as power dynamics, age, gender, race, sexuality, and class, as well as individual influences. Additionally, criticisms include their limited attention to psychological dimensions, failure to address underlying socioeconomic issues, and lack of robust empirical evidence for effectiveness, which the results are often inconsistent or context-based (Atkinson & Millington, 2019; Özaşçılar, 2022; Wikström & Kroneberg, 2022).

While robust empirical evidence remains limited, some context-specific studies have addressed this issue. For example, Marzbali *et al.* (2016) examined the impact of environmental crime prevention measures on burglary rates, focusing on key dimensions—surveillance, access control, territoriality, and maintenance. The study assessed households' levels of CPTED elements and conducted a victimization survey to determine if households had experienced burglary. Findings indicated a negative correlation between the presence of these CPTED elements and burglary victimization rates, suggesting their effectiveness in reducing crime under certain conditions.

Kondo *et al.* (2017) conducted a study examining the relationship between urban trees and crime rates, finding that a tree removal project in Cincinnati was associated with an increase in property crimes. The authors suggest that the loss of trees may have led to a neglected appearance and reduced space usage, creating an environment more conducive to crime. The study indicates that maintaining healthy trees could help deter criminal activity by fostering a sense of care and encouraging active use of public spaces.

Crime prevention measures also impact more than just offense rates. Alias *et al.* (2023), in a case study conducted in Sabah, Malaysia, found that effective CPTED implementation in low-income areas positively influenced residents' perceptions of safety and overall quality of life. The authors suggest that these measures contribute to a safer environment by enhancing residents' satisfaction through increasing human activity, and the fostering of a more engaged community.

In this context, morphological, environmental, and natural-surveillance factors, associated with the configuration of the urban setting are aimed at focusing on the restriction and prevention of crime in cities. Defensible space theory and CPTED both advocate for environmental strategies aimed at reducing opportunities for crime. The primary distinction lies in defensible space's focus on property owners and the immediate property, while CPTED adopts a broader, community-based approach, accounting for the surrounding geographical context. Ultimately, both frameworks emphasize individual and private actions and prioritize natural surveillance, with clear sightlines and occupancy as crime prevention factors.

The theoretical framework was developed to address two primary aspects of the methodological procedures. The first involves morphological strategies rooted in defensible space theory and CPTED, focusing on natural surveillance as a foundational element for the parameter variables under analysis. The second aspect pertains to spatial categorization, utilizing the defensible space spectrum of public-to-private spaces as a basis for dividing the analysis and distinguishing structural elements within buildings, lots, sidewalks, and street configurations. These components serve as key variables for assessing how specific visual aspects of urban landscape morphology relate to criminal occurrences.

III. Methodological Procedures

Using an exploratory, descriptive, and synthetic-analytic mixed-method approach, this study evaluates the urban landscape form at a local scale by examining two key variable sets: the incidence of property crime (robbery and theft) in public spaces and the morphological characteristics of the city environment. The experimental facet uncovers patterns and trends in the data, while the descriptive component systematically organizes key variables. Finally, the synthetic-analytic dimension phase fuses these insights, offering a comprehensive view of how urban features might relate to crime patterns, reinforcing the utility of a multi-layered analysis.

This approach is particularly suited for this research because it integrates quantitative crime data with qualiquantitative information on public space forms, allowing for a nuanced analysis of urban landscape morphology, visual dynamics, and property crimes in city environments. Property crimes were chosen due to their potential for mitigation through natural surveillance (Fennelly & Perry, 2018), which enables targeted analysis of high-relevance locations in São José dos Pinhais. To assess the propensity for natural surveillance in these spaces, morphological criteria were selected to establish the evaluation metrics. A complementary Delphi analysis (Varndell *et al.*, 2021) was then conducted to assign weights to these parameters, ensuring a structured and expert-informed assessment. Consequently, a synthetic-analytic comparison of crime data with natural surveillance levels revealed associations between high-crime rate areas and levels of propensity through natural surveillance morphological characteristics of the urban landscape.

Methods employed include the selection of locations based on the spatial distribution of crime occurrences, identified through geographically located

active points. Crime incidents were mapped using heat maps generated by Kernel Density Estimation (Hart & Zandbergen, 2014; Hu *et al.*, 2018), utilizing data provided by the São José dos Pinhais Municipal Guard (GM-SJP, 2015-2018). The offenses analyzed were based on incident reports recorded via phone calls to the police, which were compiled into an electronic spreadsheet. While specific collection protocols were not detailed, it was established that officers verified and confirmed each occurrence both before and after reporting. This verification process defined the nature of crime incidents.

This framework for crime data was chosen for its ease of access and the quality of the information. However, there are conceptual issues related to the differences between phone call reports (administrative records) and official crime statistics. Phone call reports can include occurrences that are not fully processed or do not result in criminal charges. Conversely, official statistics compiled by the state military police may lack the local context necessary for thorough analysis. The administrative records from the São José dos Pinhais Municipal Guard, on the other hand, offer detailed descriptions of incidents, as officers are mandated to respond and investigate. This level of detail is essential for accurately assessing the nature of crime in the area. Therefore, phone call data was selected for mapping purposes.

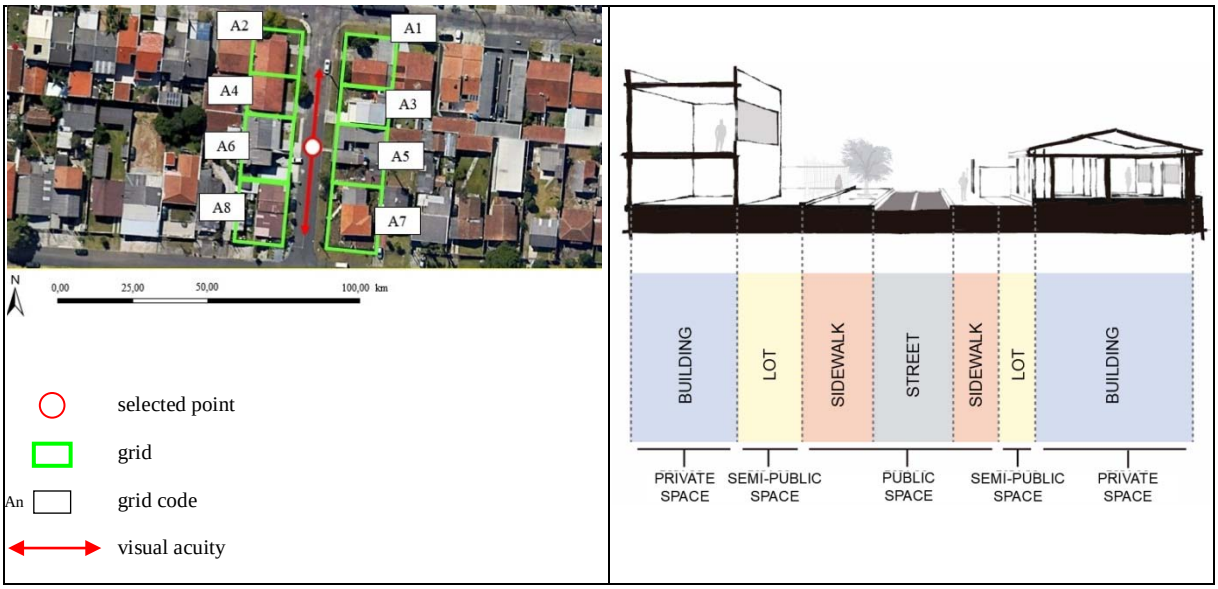
The data were reviewed to exclude criminal types that were not relevant in the context of this research (*e.g.*, prank calls, traffic violations, homicides, and drug trafficking) and other forms of non-essential details, leaving only information about theft and robbery and geographical location (street name and number) in public spaces. Data containing inaccurate insights or location descriptions were excluded. The raw set of data had initially n= 47.488, and after the exclusion processes ended with n= 455 occurrences. Crime incidents in a 100 m radius (approximately 328 ft) for each selected location were counted to verify their association with landscape morphology assessment.

Analyzed areas were determined by identifying intersections between geo-localized concentration spots and public street spaces within the city center neighborhood of São José dos Pinhais, which is the place in the municipality with most occurrences of property offenses. These selected areas are important to the study as they illustrate the urban context in which criminal incidents have been reported.

Assessment metrics grounded on the natural surveillance principles of CPTED and defensible space. This highly relevant concept links the organic monitoring of the city to the presence of people passing by or being able to observe public areas, through visual permeability from the built environment to the street (Asten *et al.*, 2023; Jacobs, 2011[1961]).

Established from the perspective of natural surveillance, it used Gehl's (2010) definition of human visual acuity. Thus, a range of 25 m (approximately 82 ft) was stipulated in each direction. Therefore, the environmental analysis was limited to 50 m (approximately 164 ft).

The next step involved the assessment of each evaluation location, into three environmental groups with four spatial categories. They are the private group, with the building category that verifies structure in the architectural elements (*e.g.,* windows and elements attached to the facade); semi-public, which relates to the lot category that verifies structures present in the lot (*e.g.,* trees, bushes, and walls); and public spaces, that has the sidewalk category (*e.g.,* signs, trees, and benches) and the street category (*e.g.,* if it has a linear perspective or if the road has curves that block the view) (Cozens & Love, 2015; 2017; Fennelly & Perry, 2018; Newman, 1972; 1996[1966]). Figure 1 provides a structured approach to collecting urban morphology data across spatial analytical groups and categories. This systematic approach for acquiring evaluation metrics was essential to classify distinct locations by their urban form characteristics.



Sources: Based on Google Earth (2024) and principles reported by Cozens & Love (2015; 2017), Fennelly & Perry (2018), Gehl (2010) and Newman (1972; 1996[1966]).

Figure 1: Schematic Representations of Division of Public Space into Units of Analysis for Evaluation of Landscape-Morphology Aspects (Left) and of Urban Space into Categories (Right)

Because the objects of study are explicitly interpreted by the landscape morphology of areas of community use, the spatial division proposed by Newman (1972; 1996[1966]) was adapted, merging semi-public and privative categories into one (private space), since the only effect considered is the morphological aspect of the external environment, in this case, the building facade. It is worth mentioning that the initial study by that author was developed in housing complexes, where transitional locations are relevant because the spaces in front of the residences (apartments) serve as reception and horizontal and vertical circulation, ordinary in that context. Therefore, the theory is socio-geographically adapted for the case study. This approach was used to promote observations coherent with the study aim, based on hierarchies of defensible space.

Environmental metrics related to the perspective of natural surveillance were developed through multiple stages. First, Brazilian work conditions guidelines were used to determine parameters for walkable sidewalks or the ideal height for visual blocking elements. Additionally, when those standards were not available, supplementary measurements relied on other sources.

Aerial and oblique images from Google Earth (2024) and Google Street View (2024) were used to identify landscape-morphology elements, following Bondaruk's (2016[2007]) assessments of those that foster crime and other references that mention morphological parameters. The imaging analysis involved indicating the existence or absence of certain components.

A comparative relationship with the human scale was established as an approximation parameter for minimum and maximum evaluations of specific conditions. This analysis model was chosen due to the need to develop remotely applicable experimentation procedures, given the economical and practical nature of the test methodology. The criteria for analyzing components of the public space according to spatial categories for evaluating the landscape-morphology aspects of the selected points are summarized in the valuation system shown in Table 1.

Table 1: System of Evaluation of Components According to Spatial Categories of the Landscape-Morphology Aspects of Selected Points

Space	Criteria and Justification	Specific Parameter	Unit of Measure (Reference Limits)	Grade	Final Score
Public Spaces					
Street	*Visual Cone:* Sudden angulation of the street interferes with the continuity of its visualization (Bondaruk, 2016[2007]).	When the axis of the studied street has inclination or curvature before the 25 m defined from each point in opposite directions (visual acuity – Gehl, 2010), the rating is cancelled by the character of vision blocking (Bondaruk, 2016[2007]).	Slope or curvature within 25 m of visual distance: absence = 2.00 presence = 0.00	0.00 or 2.00	4.00
	Street Shape: Characteristic of bridge, viaduct, ditches, underground passages, or the like, without exit or small size, among others, generating areas of low visibility and conducive to illicit acts (Mascaró, 2005[2003]).	Several morphological characteristics of streets are detrimental to proper occupation of the street (Bondaruk, 2016[2007]). The ideal bordering dimensions for urban axis streets are: minimum width of 5 m (Brasil, 1979) and blocks with a maximum length of 100 m (Mascaró, 2005[2003]). Exclusively pedestrian streets provide natural surveillance (Jacobs, 2011 [1961]), which qualifies this configuration as positive.	Existence of any of the characteristics mentioned: positive = 2.00 negative = 0.00	0.00 or 2.00	
Sidewalk	*Ground Irregularities:* These surface characteristics of pedestrian areas reduce the flow of people (Bondaruk, 2016[2007]). In contrast, fluidity of human movement adds to natural vigilance (ATR, 2014).	According to criteria standardized by the Brazilian Association of Technical Standards (ABNT, 2020[1994]), sidewalks should have no steps or obstructions nor any conditions causing falls. Certain types of paving with irregularities (*e.g.*, stone blocks, among others) are considered not to prevent fluidity of pedestrian movement.	Any type of irregularity makes walking difficult: absence = 2.00 presence = 0.00 Sidewalk parallel to the street: absence = 0.00	0.00 or 2.00	8.00
	Dimensions: Reduced sidewalk widths make it difficult for people to pass, including obstacles to pedestrian movement (Bondaruk, 2016[2007]).	The minimum dimension for sidewalk width is 1 m, with an ideal of t 1.20 m (ABNT, 2020[1994]).	Width size of free sidewalk: greater than 1 m = 2.00 less than 1 m or ride non-existence = 0.00	0.00 or 2.00	
	Visual Obstruction Element : Any physical structures that cause visual blockage to the passerby (Fennelly; Perry, 2018).	If you have any visual obstruction element measuring 0.90 m in height and 0.70 m in width (Fennelly; Perry, 2018).	Presence of some physical element of visual blockage. non-existence = score of 2.00 existence = score of 0.00 Ephemeral elements (*e.g.*, buildings, buckets) = score of 0.00	0.00 or 2.00	
	Permanence Furniture: physical elements that lead to the permanence of people on site (Bondaruk, 2016 [2007]).	Presence of furniture (Bondaruk, 2016 [2007]).	Any type of urban furniture that allows permanence: presence = 2.00 absence = 0.00	0.00 or 2.00	
Semi-Public Spaces					
LOT	*Physical Element:* fences in or near building alignment (such as walls, for example) prevent intervisibility between public and private spaces (Bondaruk, 2016[2007]).	The morphology of the dividing element between sidewalk space and lot maximizes visual permeability and prevents hidden areas (Bondaruk, 2016[2007]; Fennelly & Perry , 2018).	Transparent material or limited height: presence = 2.00 Grid or other elements relatively permeable to the view: presence = 1.00 Fenced front wall in building alignment = 0.00	0.00 or 1.00 or 2.00	4.00

Space	Criteria and Justification	Specific Parameter	Unit of Measure (Reference Limits)	Grade	Final Score
Public Spaces					
	Visual Barrier: Elements within the lot that prevent intervisibility are a hindrance to "eyes on the street" (Jacobs, 2011 [1961]).	Measures bordering the lot that partially or fully obstruct sight of the building facade: 0.90 m high (including vegetation) and above 2.40 m for tree branches (Fennelly & Perry, 2018).	Visual barrier: absence = 2.00 presence = 0.00	0.00 or 2.00	
Private Spaces					
Building	*Visibility Openings:* Facade elements that allow visibility between the internal and external environment (Bondaruk, 2016[2007].	Building and other elements should allow visual permeability of the external environment, especially views of the street, and vice versa (Fennelly & Perry, 2018).	Facade mostly of transparent material or open = 2.00 Facade with some windows = 1.00 Blind gable = 0.00	0.00 or 1.00 or 2.00	4.00
	Visual Obstruction Elements: Fixed building components obstruct potential visual permeability (Bondaruk, 2016[2007]).	Static obstruction of visually permeable components, especially related to the visual clarity of the windows, identified as blocking line of sight (Bondaruk, 2016[2007] ; Fennelly & Perry, 2018).	Visual obstruction: absence = 2,00 presence = 0.00	0.00 or 2.00	

Source: Based on the adopted procedures and the cited references.

Previous tests for verifying the methodology discovered a lack of information and similar investigation of differentiation between categories of natural-surveillance morphology. Therefore, interviews were conducted using the Delphi Technique (Linstone & Turoff, 2002[1975]; Varndell *et al.*, 2021) to define a weighting system for each aspect.

A straightforward analysis with fifteen urban management and security specialists was applied to define the category weightings. The questions aimed to identify morphology criteria that are relevant for visual permeability and natural surveillance concerning the incidence of crime in the public spaces (Jajoriya & Singh, 2023).

Each aspect was initially rated according to the respondent's assessment of importance, followed by an evaluation of the other requirements. Questionnaires were applied in person and on paper. The criteria were divided into four relevance categories: low, medium-low, medium-high, and high, corresponding to ratings from 1 to 4.

The weighting for the specific criterion was determined from the sum for each category, and its average was linked to the score for the criteria for the study point. Results from the Delphi Technique applied the weightings and potential variation of the variables according to the provisions of Table 2.

Table 2: Illustrative Scheme for Distribution of Criteria in the Specialists' Questionnaire for Proposing Weightings for VIsual Permeability and Natural Surveillance

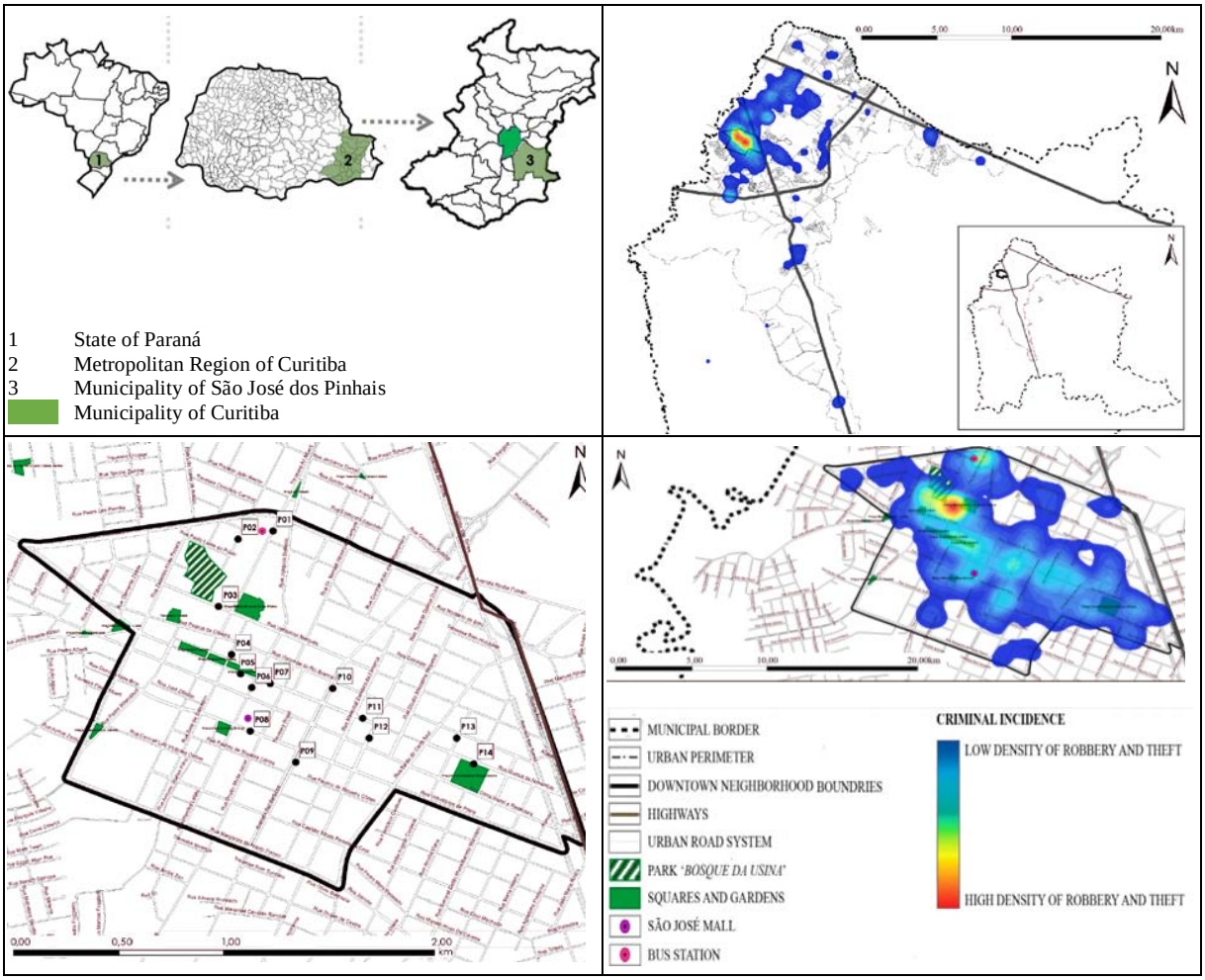
Space	Criteria	Grade	Weight	Low Potential	Medium-Low Potential	Medium-High Potential	High Potential
Street	Visual Cone	• 0,00 • 2,00	3,00*	0,00 – 3,00	3,01 – 6,00	6,01 – 9,00	9,01 – 12,00
	Street Shape	• 0,00 • 2,00	3,00*				
Sidewalk	Ground Irregularities	• 0,00 • 2,00	2,80*	0,00 – 7,30	7,31 – 14,60	14,61 – 21,90	21,91 – 29,20
	Dimensions	• 0,00 • 2,00	3,20*				
	Visual Obstruction Element	• 0,00 • 2,00	3,50*				
	Permanence Furniture	• 0,00 • 2,00	5,10*				
LOT	Physical Element	• 0,00 • 1,00 • 2,00	3,30*	0,00 – 3,20	3,21 – 6,40	6,41 – 9,60	9,61 – 12,80
	Visual Barrier	• 0,00 • 2,00	3,10*				
Building	Visibility Openings	• 0,00 • 1,00 • 2,00	4,80*	0,00 – 4,40	4,41 – 8,80	8,81 – 13,20	13,21 – 17,60
	Visual Obstruction Element	• 0,00 • 2,00	4,00*				
Average Per Point				0,00 – 5,00	5,01 – 10,00	10,01 – 15,00	15,01 – 20,00
Final Average				0,00 – 17,90	17,91 – 35,80	35,81 – 53,70	53,71 – 71,60

Sources: Based on the criteria established.
Notes: Weight determined by the sum of the results linked to the multiplier factor:
Weight = [(low votes).1 + (medium-low votes).2 + (medium-high votes).3 + (high votes).4]/10

Finally, the results were obtained and spatialized, and the information critically gauged according to quantifications from the scores and patterns found, using a graph to summarize the relationships between ratings and crime figures for the place studied. This set of methodological procedures allows for the evaluation of the research findings.

IV. Analytical Results

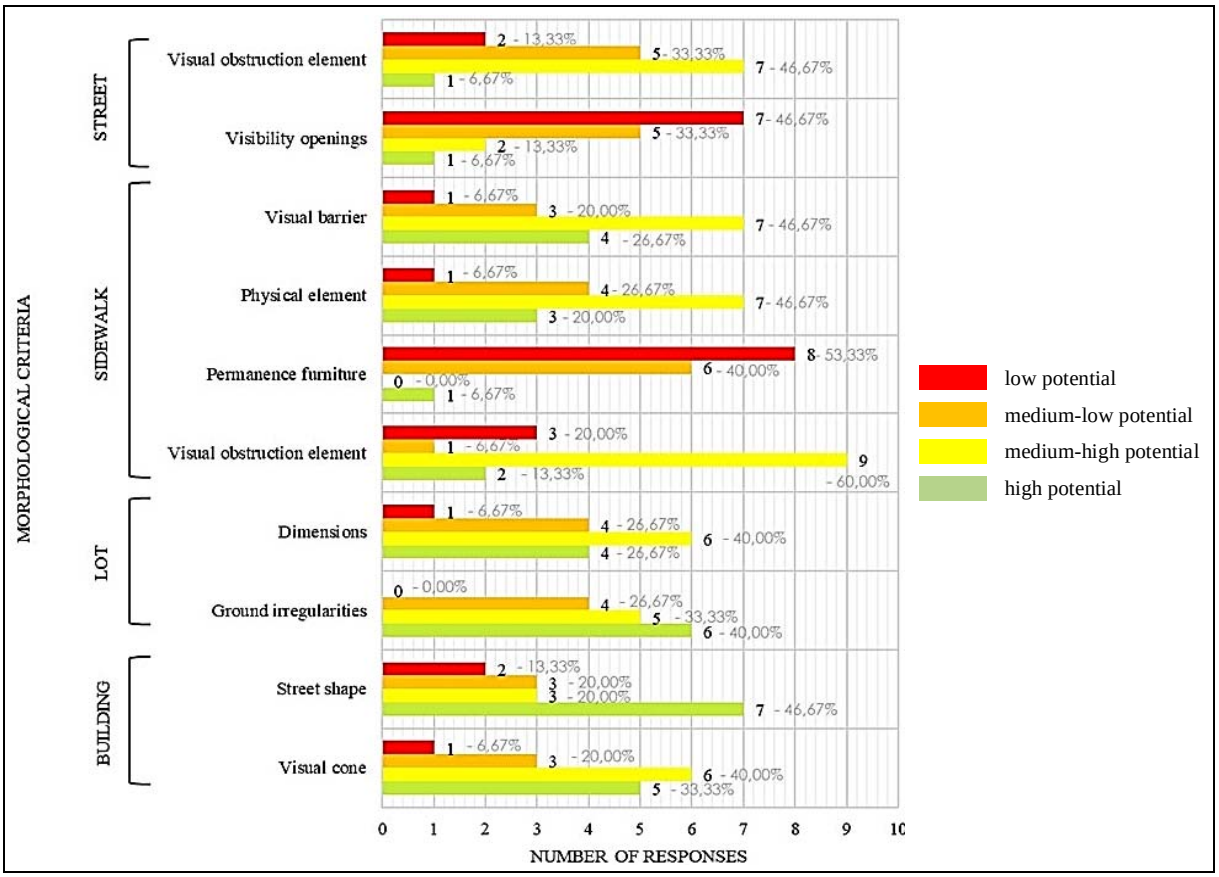
The municipality of São José dos Pinhais is in the Southern Region of Brazil and integrates the Metropolitan Region of Curitiba (Figure 2). According to population estimates, it is home to 345,644 inhabitants in a territory of 946.43 km^2, approximately 10% corresponding to its urbanized area (IBGE, 2024). Analysis locations were determined by mapping crime incidents in its central neighborhood, which was initially selected as the place with the highest incidence of public-space robbery and theft. Fourteen locations were selected based on the heat map with the number of incidents per location.



Sources: Prepared from GM-SJP (2015-2018) and PM-SJP (2024).

Figure 2: Maps of the Location of the Study Area (Top Left) and of the Crime Incidence in the City (Top Right) and in the Central Neighborhood of São José dos Pinhais (Bottom Right), and of the Selected Points of Robbery and Theft (Bottom Left)

Weightings for the landscape-morphology categories were determined from questionnaires based on the Delphi Technique, which separated criteria according to relevance. Figure 3 shows the raw and proportional numbers of these responses.



Source: Based on responses to the Delphi Technique questionnaire.

Figure 3: Quantitative and Proportionality Graph of Responses of Specialists from the Fields of Public Safety and Urban Management for Determining the Importance of Landscape-Morphology Variables

Permanence furniture on sidewalks and *visibility openings* in buildings achieved higher ratings. The most relevant results align directly with the main questions concerning natural surveillance, namely, the possibility of sight (morphological permeability) and the presence of individuals in public places with suitable furniture.

Both criteria conform to one of the most established theories in the field of urban studies, related to "eyes on the street" and the natural surveillance precepts of Jacobs (2011[1961]), considering that permanence furniture allows the effective presence of people and promotes indirect monitoring, while buildings with street-level openings enable interaction between the private and the public space.

The relevance of furniture may be associated with other interpretations that resemble natural surveillance but in different directions. Visibility openings, meaning elements of building permeability such as windows and doors, present clear possibilities for spontaneous monitoring (Amiri *et al.*, 2019).

The criteria linked to *visual obstruction elements* of buildings, such as pillars and awnings, directly associated with visibility openings, are rated at medium-high to medium-low level, as they impede complete surveillance from the private environment. Physical boundary elements such as walls or railings are also noteworthy because, depending on configuration, extensive walled areas can create feelings of insecurity, often generating the "fortress effect". According to Bondaruk (2016[2007]), protection of private property through large walls preventing visual permeability to public spaces produces the opposite effect, encouraging crime due to an inability to monitor (Chen & Biljecki, 2023).

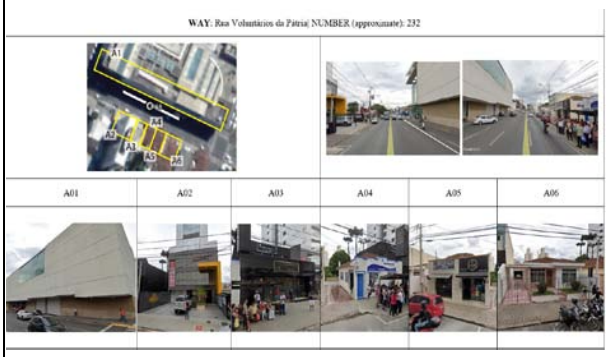
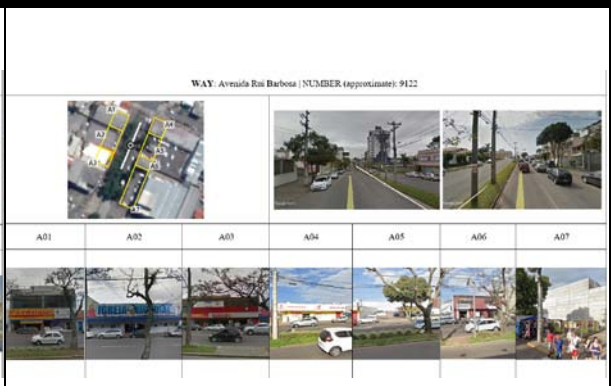
The other listed criteria are mainly rated between low and medium-low levels. Elements of visual obstruction on the sidewalk are rated medium-low, which pertains to any type of morphological barrier, such as bushes, signs, posts, or others obstructing complete visibility of the street (Fennelly & Perry, 2018). Street shape was predominantly categorized as low quality due to its line of sight and is less relevant to the context of this study. The weightings for each morphology criterion are identified in Table 3.

Table 3: Classification of Public Safety and Urban Management Specialists' Responses based on the Delphi Technique with Weightings for Landscape-Morphology Variables

Space	Criteria	Low Potential (Weight = 1)	Medium-Low Potential (Weight = 2)	Medium-High Potential (Weight = 3)	High Potential (Weight = 4)	Final Weight
Street	Visual cone	5,00	6,00	3,00	1,00	3,00
	Street shape	7,00	3,00	3,00	2,00	3,00
Sidewalk	Ground irregularities	6,00	5,00	4,00	0,00	2,80
	Dimensions	4,00	6,00	4,00	1,00	3,20
	Visual obstruction element	2,00	9,00	1,00	3,00	3,50
	Permanence furniture	1,00	0,00	6,00	8,00	5,10
LOT	Physical element	3,00	7,00	4,00	1,00	3,30
	Visual barrier	4,00	7,00	3,00	1,00	3,10
Building	Visibility openings	1,00	2,00	5,00	7,00	4,80
	Visual obstruction element	1,00	7,00	5,00	2,00	3,80

Source: According to questionnaire responses based on the Delphi Technique.
Notes: Weight determined from the sum of the results linked to the multiplier factor
Weight = [(low votes).1 + (medium-LOW votes).2 + (medium-high votes).3 + (high votes).4]/10

The quantity of crime incidents by point within the defined ranges is then related to mapping of crime types near the analysis points in terms of optical distance (25 m radius – Gehl, 2010) and standard block distance (100 m radius – Mascaró, 2005[2003]) (Figure 4). The synthesis of results for all landscape-morphology evaluation locations is presented in Table 4.

POINT 05	POINT 06
	
POINT 07	**POINT 08**
	
POINT 09	**POINT 10**
	

Sources: Based on Google Earth (2024), Google Street View (2024), GM-SJP (2015-2018) and PM-SJP (2024).

Figure 4: Maps of Theft and Robbery and Aerial and Oblique Images of the Analysis Points

Table 4: General Values Attributed to Analysis Points According to Spaces for Landscape-Morphology Assessment

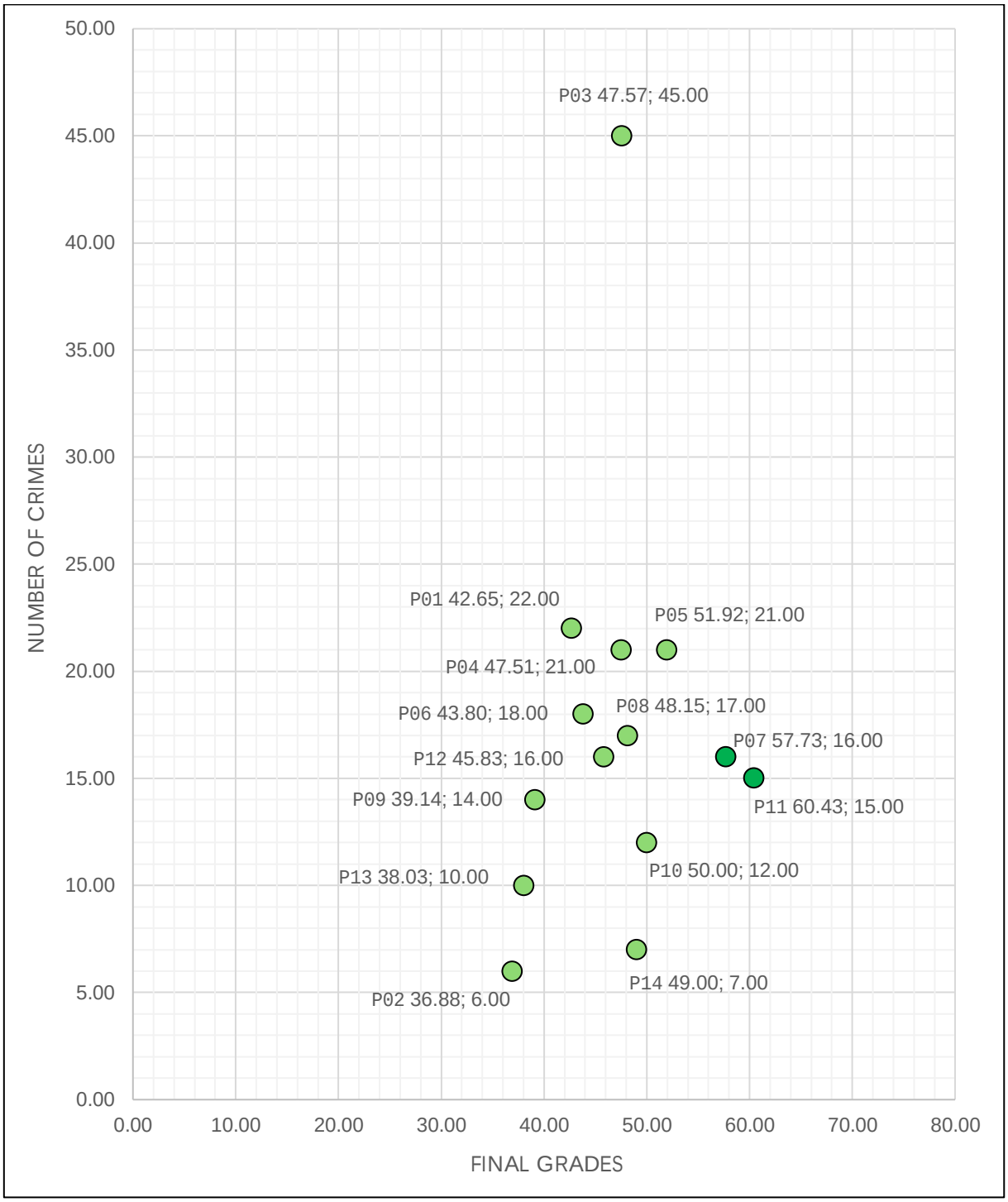
Point	Space				Final Grade
	Street	Sidewalk	LOT	Building	
P01	12,00	16,90	6,95	6,80	42,65
P02	12,00	11,40	2,60	10,88	36,88
P03	12,00	15,50	8,55	11,52	47,57
P04	12,00	13,33	10,79	11,40	47,51
P05	12,00	22,23	0,00	17,60	51,92
P06	12,00	16,26	1,83	13,71	43,80
P07	12,00	29,20	0,00	16,53	57,73
P08	12,00	13,17	10,18	12,80	48,15
P09	12,00	14,33	6,06	6,76	39,14
P10	12,00	17,00	11,86	9,14	50,00
P11	12,00	21,23	12,80	14,40	60,43
P12	12,00	19,00	0,83	14,00	45,83
P13	12,00	14,33	7,43	4,27	38,03
P14	12,00	19,00	9,60	8,40	49,00
Average	12,00	17,35	6,39	11,30	47,05

Source: Based on the specific results of the places.

Legend:

= high potential
= medium-high potential
= medium-low potential
= low potential

The final grade ratings are generally stable in higher quality ranges (medium-high and high), with a minimum value of 36.88 and a maximum of 60.43, referring to the highest-ranking regarding safety and landscape-morphology characteristics. In other words, the results indicate the opportunities for natural surveillance on the violent streets evaluated, suggesting that, in theory, they should not have such high crime rates. This situation is supported by Figure 5, which lists the crime position for each point with respective valuations.



Source: Based on the Specific Results of the Places.

Figure 5: Dispersion Graph of the General Levels of Landscape-Morphology Evaluation Ratings for the Analysis Points in Relation to Crime Position

Legend:

= high quality
= medium-high quality

The graph can be interpreted to show that the discrepancy of crime incidence, as seen in previous items, prevents establishment of a clear relationship between ratings and crime numbers. The places with the worst ratings (P07 and P11) indicate an agglomeration between 15 and 16 records, but without allowing verification of a clear pattern.

The variation of medium-high level between 6 and 22 crimes at almost every place, except P03 (with 45 incidents), is a mismatch within the study. The results demonstrate that, when focusing only on aspects of visual permeability and natural surveillance based on the established methodological options, the morphology of the central neighborhood is conducive to safety, despite being understood as a hazardous area within São José dos Pinhais.

Some considerations can be made about these findings. Firstly, regarding the aspects mentioned, the characteristics do not fully reflect the incidence of crimes of opportunity in the central neighborhood of the city analyzed. Although there is an emphasis on theory and practice linked to landscape morphology and criminality occurrence (Bondaruk, 2016[2007]; Cozens & Love, 2015; 2017; Jacobs, 2011[1961]; Wikström & Kroneberg, 2022), the results indicate that visual aspects are less important in the general context of safety.

Crime itself occurs due to a combination of socioeconomic and cultural conditions (Pavoni & Tulumello, 2018; Ribeiro & Morais, 2021), including the urban form. However, these findings primarily suggest that the elements affecting visual capacity and natural surveillance may not fully account for the relationships between criminal incidence and spatial structure, at least in the case of the central area of São José dos Pinhais.

The morphological approach needs to be considered from other scenarios defined by the theories of defensible space and CPTED to flow and access restriction, territorial reinforcement, site maintenance, aesthetic conditions, potential use, and geographical situation (Cozens & Love, 2015; 2017; Fennely & Perry, 2018; Heath-Kelly & Shanaáh, 2022; Lynch & Barrett, 2017), rather than focusing on individual elements. It is also important to point out that the evaluation techniques could have been directed differently, given the employment of digital platforms and categorization of natural surveillance aspects (Jajoriya & Singh, 2023).

Methodological changes should be incorporated in future investigations related to the interpretation of criminality as a multifaceted theme. A deeper analysis of the dynamics between morphology and safety is needed, as well as other spatial characteristics, such as maintenance and state of conservation of places, forms associated with ergonomics, public and private lighting, and socioeconomic aspects.

It is also necessary to consider that the methods, techniques, precepts, and concepts from CPTED and defensible space used in this study were developed and applied in countries of Anglo-Saxon background. Therefore, they are based on sociocultural processes that are different from those of Brazil. Even so, the research findings lead to relevant final reflections.

V. Conclusion

The study found that property crime rates remained high despite favorable morphological conditions for natural surveillance and visual permeability in the city center. In conclusion, these findings suggest that natural surveillance alone does not account for the elevated incidence of street thefts and robberies, highlighting the need for a holistic framework considering socioeconomic, cultural, and spatial factors. When dealing with CPTED and defensible space, previously mentioned elements (*e.g.,* territoriality, access control, image and maintenance, activity support, target hardening, geographical juxtaposition), future research should consider a comprehensive evaluation aligned with the theory's postulates when defining a conceptual framework.

This research generated an evaluation methodology based on urban landscape morphology and crime prevention theories, stressing natural surveillance through visual aspects. It is noteworthy that even with the application of specific weightings to the criteria analyzed, defined by consulting specialists in the fields of urban studies and public safety, no significant relationship was found between lower-rated levels of landscape morphology conditions and areas with higher incidences of crime.

This result was not expected, because, according to environmental criminology theories, the possibility for more natural surveillance is indicative of, potentially, fewer offenses. Previous research did not account for visual aspects solely analyzed, although it emphasizes that crime prevention elements should be verified together. These results could be interpreted in two diverse ways, or as a statement that CPTED measures should be verified together, or that the findings imply that natural surveillance potential has a minor role in preventing crime.

Urban and security policymakers need to recognize the importance of a holistic approach to crime, integrating socioeconomic alternatives with urban landscape spatial projects to enhance the overall quality of life. Nevertheless, it was possible to evaluate morphological aspects of the urban landscape related to crime incidence, specifically theft, and robbery, supported by a case study applied to the central neighborhood of the municipality of São José dos Pinhais. The achievement of this goal was made feasible by the definition of the conceptual framework and the determination of the methodological procedures in the format of an essayistic investigation.

The interpretation of the analytical results reveals that it is impossible to diagnose clear associative parameters of visual permeability and

natural surveillance of the studied places. Even so, the lack of relationships between violence indices and morphological patterns also cannot necessarily be confirmed, because the established criteria and adopted approaches may have restricted the findings regarding the safety potential associated with morphology.

The investigated areas are rated medium-high and high quality for security capacity, which does not conform to their crime rates, considering the principles of defensible spaces and CPTED. These precepts are more consistent with the contexts of countries of Anglo-Saxon origin. Then, a comparison with other landscape-morphology references for investigations in the Brazilian and Global South context is recommended. Such adaptations should consider the history of the area's urban development, natural, and topographical conformation, the cultural setting in terms of living behavior and criminal dynamics, and an understanding of local economics future.

Regarding the criminal incidence in urban spaces, the research question produces broad and generic answers. In this context, possible directions for future studies include the investigation of morphology in terms of other criminal typologies. It is also suggested to use broader and more multidisciplinary methodological techniques related to landscape form, which may or may not be performed remotely from aerial and oblique images. Likewise, it is an exploratory attempt to select and measure the importance of different morphological criteria in crime occurrence. Upcoming research could benefit from comparison case studies between known and unknown circumstances.

Other methods could be implied, or quantitative, such as the use of GIS, remote sensing, and AI analysis for large sets of data for expanding alternatives of obtaining relations and correlations, and qualitative, such as the use of surveys of ethnographical research to understand individuals' nuance and perceiving space. An alternative investigation would involve associating different regions of a city, or other urban areas, with urban morphology and criminal incidence. This would aim to expand theory and practice as support for the design, planning, and management of safe landscapes in cities.

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Memberships

Fellows/Associates of Social Science Research Council

FSSRC/ASSRC Memberships

Introduction

FSSRC/ASSRC is the most prestigious membership of Global Journals accredited by Open Association of Research Society, U.S.A (OARS). The credentials of Fellow and Associate designations signify that the researcher has gained the knowledge of the fundamental and high-level concepts, and is a subject matter expert, proficient in an expertise course covering the professional code of conduct, and follows recognized standards of practice. The credentials are designated only to the researchers, scientists, and professionals that have been selected by a rigorous process by our Editorial Board and Management Board.

Associates of FSSRC/ASSRC are scientists and researchers from around the world are working on projects/researches that have huge potentials. Members support Global Journals' mission to advance technology for humanity and the profession.

FSSRC

Fellow of Social Science Research Council

FELLOW OF SOCIAL SCIENCE RESEARCH COUNCIL is the most prestigious membership of Global Journals. It is an award and membership granted to individuals that the Open Association of Research Society judges to have made a 'substantial contribution to the improvement of computer science, technology, and electronics engineering.

The primary objective is to recognize the leaders in research and scientific fields of the current era with a global perspective and to create a channel between them and other researchers for better exposure and knowledge sharing. Members are most eminent scientists, engineers, and technologists from all across the world. Fellows are elected for life through a peer review process on the basis of excellence in the respective domain. There is no limit on the number of new nominations made in any year. Each year, the Open Association of Research Society elect up to 12 new Fellow Members.

Benefits

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Get access to a closed network

A FSSRC member gets access to a closed network of Tier 1 researchers and scientists with direct communication channel through our website. Fellows can reach out to other members or researchers directly. They should also be open to reaching out by other.

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Certificate, LoR and Momento **2** discounted publishing/year **Gradation** of Research **10** research contacts/day **1 GB** Cloud Storage **GJ** Community Access	**Certificate,** LoR and Momento **Unlimited** discounted publishing/year **Gradation** of Research **Unlimited** research contacts/day **5 GB** Cloud Storage **Online Presense** Assistance **GJ** Community Access	**Certificates,** LoRs and Momentos **Unlimited** free publishing/year **Gradation** of Research **Unlimited** research contacts/day **Unlimited** Cloud Storage **Online Presense** Assistance **GJ** Community Access	**GJ** Community Access

Preferred Author Guidelines

We accept the manuscript submissions in any standard (generic) format.

We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

Alternatively, you can download our basic template from https://globaljournals.org/Template.zip

Authors should submit their complete paper/article, including text illustrations, graphics, conclusions, artwork, and tables. Authors who are not able to submit manuscript using the form above can email the manuscript department at submit@globaljournals.org or get in touch with chiefeditor@globaljournals.org if they wish to send the abstract before submission.

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Authors must ensure the information provided during the submission of a paper is authentic. Please go through the following checklist before submitting:

1. Authors must go through the complete author guideline and understand and *agree to Global Journals' ethics and code of conduct,* along with author responsibilities.
2. Authors must accept the privacy policy, terms, and conditions of Global Journals.
3. Ensure corresponding author's email address and postal address are accurate and reachable.
4. Manuscript to be submitted must include keywords, an abstract, a paper title, co-author(s') names and details (email address, name, phone number, and institution), figures and illustrations in vector format including appropriate captions, tables, including titles and footnotes, a conclusion, results, acknowledgments and references.
5. Authors should submit paper in a ZIP archive if any supplementary files are required along with the paper.
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7. Manuscript submitted *must not have been submitted or published elsewhere* and all authors must be aware of the submission.

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It is required for authors to declare all financial, institutional, and personal relationships with other individuals and organizations that could influence (bias) their research.

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Plagiarism is not acceptable in Global Journals submissions at all.

Plagiarized content will not be considered for publication. We reserve the right to inform authors' institutions about plagiarism detected either before or after publication. If plagiarism is identified, we will follow COPE guidelines:

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- Findings
- Writings
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- Graphs
- Illustrations
- Lectures

- Printed material
- Graphic representations
- Computer programs
- Electronic material
- Any other original work

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1. Substantial contributions to the conception and acquisition of data, analysis, and interpretation of findings.
2. Drafting the paper and revising it critically regarding important academic content.
3. Final approval of the version of the paper to be published.

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The corresponding author should mention the name and complete details of all co-authors during submission and in manuscript. We support addition, rearrangement, manipulation, and deletions in authors list till the early view publication of the journal. We expect that corresponding author will notify all co-authors of submission. We follow COPE guidelines for changes in authorship.

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Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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Global Journals is in partnership with various universities, laboratories, and other institutions worldwide in the research domain. Authors are requested to disclose their source of funding during every stage of their research, such as making analysis, performing laboratory operations, computing data, and using institutional resources, from writing an article to its submission. This will also help authors to get reimbursements by requesting an open access publication letter from Global Journals and submitting to the respective funding source.

Preparing your Manuscript

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

Format Structure

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for writing a good quality Social Science Research Paper

Techniques for writing a good quality homan social science research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of homan social science then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

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12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.
Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

19. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

20. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

21. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

22. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

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Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

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Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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