



SUMMARY

STRATEGIES FOR NATIONAL ADAPTATION PLANS: a case study from Brazil

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PRESENTATION

In the 21st century, societies on a Global scale face a great challenge, which is to recognize and care for humanity and provide the reduction of greenhouse gas (GHG) emissions, aligned with the elimination of racial, gender, and social inequalities and related oppressions in territories already under impact and effects of climate change.

In this context, **IYALETA - Research, Sciences, and Humanities** brings in this publication a case of strategies for national adaptation plans through the expertise of the research developed under the pilot project **Urban Legal Amazon - Socio-Spatial Analysis of Climate Change (2020-2022)**, contributing to the effectiveness of the Nationally Determined Contribution (NDC's) targets and funding actions for adaptation and loss and damage, in recognition of the dimensions of climate change in the unequal land use in cities of the North and Northeast regions of Brazil.

Attention to the data of social and climatic realities in the country in 2015 and 2021 due to the inefficiency of national, regional, local and sectoral planning for adaptation and advancement of deforestation and fires in the forests of the Amazon, Caatinga, Cerrado, and Pantanal, compromising the NDC's goals for the years 2025 and 2030, which demonstrates **maladaptation** in the view of the risks of adverse results to the climate, with increases and/or reductions in precipitation and superficial warming in urban spaces, resulting in disasters, loss of life and population insecurity.

The analyses in the publication are necessary for the implementation of adaptation and urgent review by the Brazilian State of the National Climate Adaptation Plan (2016), an instrument of the National Policy on Climate Change (PNMC).

Recognizing the reality of the country in interdependence with the Global South in the effectiveness of adaptation, reduction of warming by 1.5°C and elimination of all forms of inequalities, we publish a systematization of studies with the **Summary Strategies for National Adaptation Plans: a case study from Brazil**, a contribution to a decarbonization cycle in the 21st century that does not repeat the inequalities of centuries of carbonization and warming of the planet.

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ACRONYMS AND ABBREVIATIONS

ALU Legal Urban Amazon – Socio-Spatial Analysis of Climate Change

AC Adaptation Committee

CENSUS Brazilian Demographic Census 2010

COP26 United Nations Climate Change Conference, 2021

COVID-19 Coronavirus 2019

DATASUS Department of Informatics of the Unified Health System

GHG Greenhouse gases

IBGE Brazilian Institute of Geography and Statistics

ICS Climate and Society Institute

IPCC Intergovernmental Panel on Climate Change

MUNIC Municipal Basic Information Survey

NDC's Nationally Determined Contributions

NHS National Health Survey

PNA National Adaptation Plan

PNA-BRASIL Federal Government's National Climate Adaptation Plan

PNMC National Climate Change Policy

PPA Permanent Protection Areas

SDGs Sustainable Development Goals

SIDRA IBGE Automatic Recovery System

SIM Mortality Information System

SINAN Notifiable Diseases Information System

SUS Brazilian Unified National Health System

UN United Nation

UNFCCC United Nations Framework Convention on Climate Change



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in the North and Northeast Regions

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Inequalities and Climate Change in the North and Northeast Regions



The great challenge for societies on a global scale in the 21st century is to care for humanity and provide the reduction of greenhouse gas (GHG) emissions, aligned with the elimination of territorial inequalities where the impacts and effects of climate change take place. This scenario has been the caveat to studies in debates in academic spaces, government agendas, and societies because the ambitions of the **Paris Agreement (2015)** need implementation at territorial scales since “there is still a vast set of difficulties, uncertainties, and economic and political conflicts for effective integration of concerns” [1].

Thus, it is for the implementation of the Nationally Determined Contribution - NDC's targets and the effectiveness of adaptation and loss and damage financing in the Brazilian territory that **IYAETA - Research, Sciences, and Humanities develops studies on Climate Change and Inequalities** with the institutional support of the **Climate and Society Institute (iCS)**, having as a pilot project the research **Urban Legal Amazon - Socio-Spatial Analysis of Climate Change - ALU (2020-2022)**¹, with analysis of the dimensions of climate change in the unequal urban planning of the cities of Belém (Pará), Boa Vista (Roraima), Cuiabá (Mato Grosso), Macapá (Amapá), Manaus (Amazonas), Palmas (Tocantins), Porto Velho (Rondônia), São Luís (Maranhão) and Rio Branco (Acre) (**Figure 1**).

In the second half of the 20th century, Brazil advanced by economic growth in the North and Northeast regions, invisibilizing the roughnesses of the social and historical process of the invasion and occupation of the lands of the Original Peoples (Povos



¹ Available at: www.amazonialegalurbana.com.br

Accessed: October 20, 2022

² Carried out by Brazilian Institute of Geography and Statistics (IBGE).

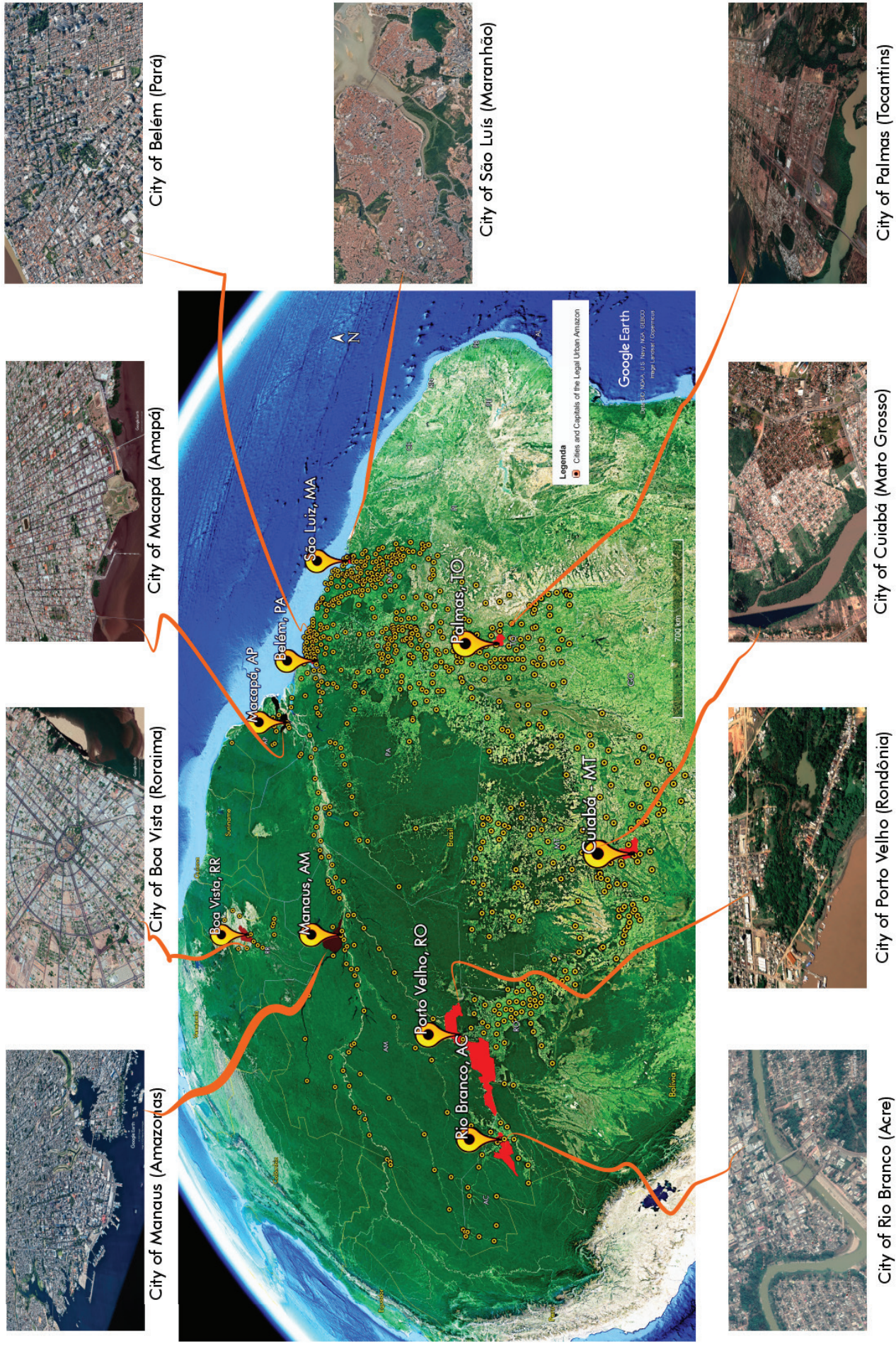
³ SDG 11 - Sustainable Communities and Cities.

Originários), with more concrete or more performant technical objects produced in the set of societies that expressed themselves in and through the spatial realities that were fitted together [2].

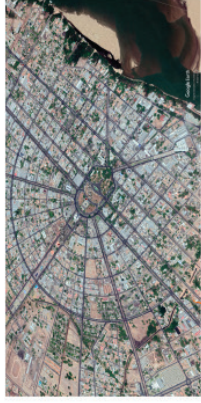
The roughness reveals the climate vulnerabilities in the interdependence between urban inequalities and crimes of deforestation, which impacts 73.53% of the population in the North region and 73.13% in the Northeast region by segregation in access to health, housing conditions, urban and rural mobility, in income and labor distribution, and access to urban land [3].

This is reflected in the monitoring of the indicators of the Sustainable Development Goals (SDGs)², with indicator 11.1.1 (Proportion of urban population living in slums, informal settlements or inadequate housing - 2010)³, on the states of the North and Northeast by the conditions of urban vulnerability twice as high as the national average, which is 41.0%, especially Rondônia in the North and Alagoas in the Northeast region [4] (**Figure 2**).

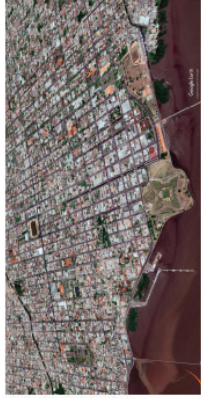
FIGURE 1: Cities and Capitals of the Urban Legal Amazon - Brazil



City of Manaus (Amazonias)



City of Boa Vista (Roraima)



City of Macapá (Amapá)



City of Belém (Pará)



City of São Luiz (Maranhão)



City of Rio Branco (Acre)



City of Porto Velho (Rondônia)

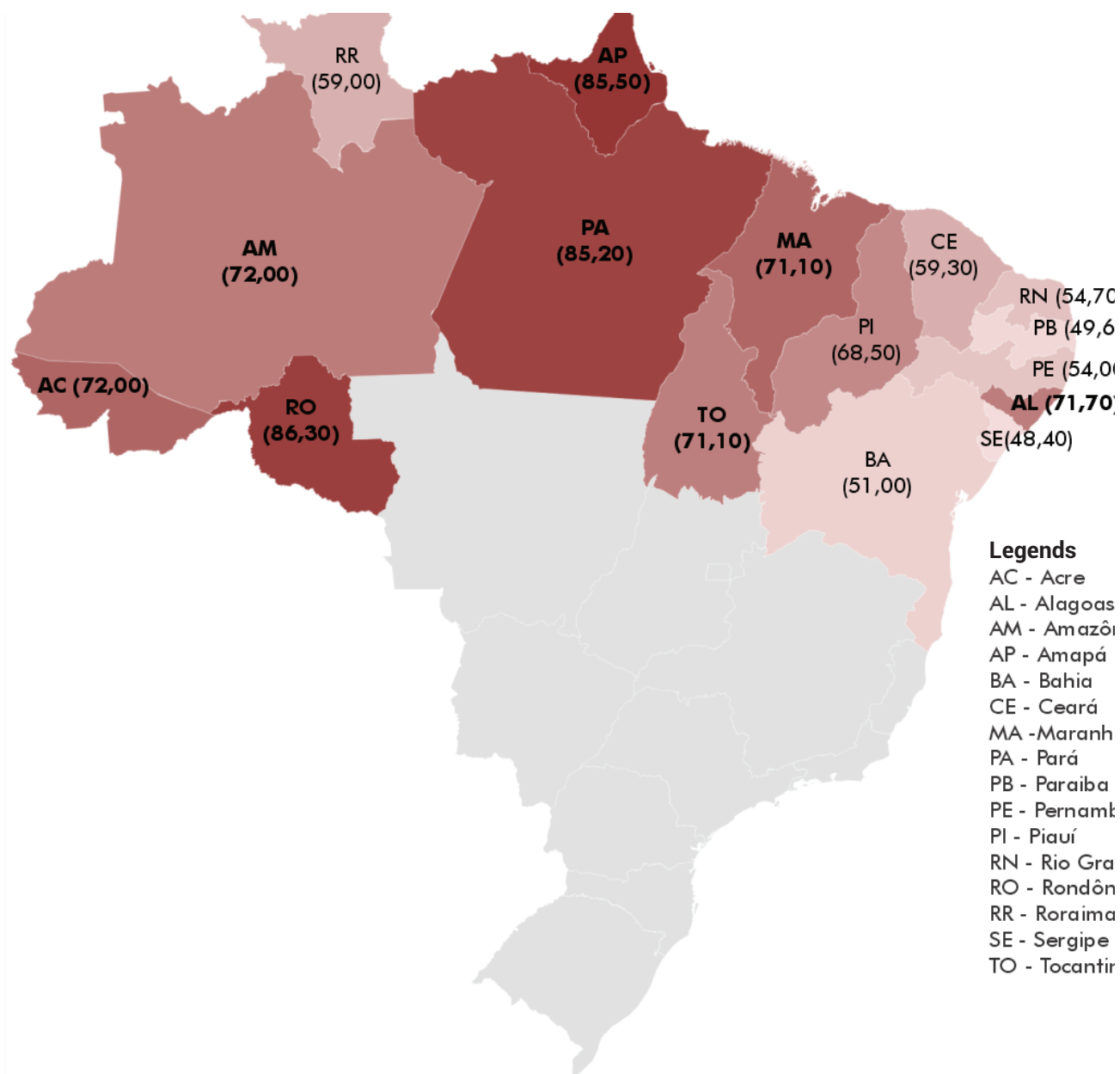


City of Cuiabá (Mato Grosso)



City of Palmas (Tocantins)

FIGURE 2: Proportion of urban population living in slums, informal settlements, or inadequate housing.



Source: Demographic Census 2010

2

Methodology of socio-spatial analysis of inequalities and climate change for adaptation



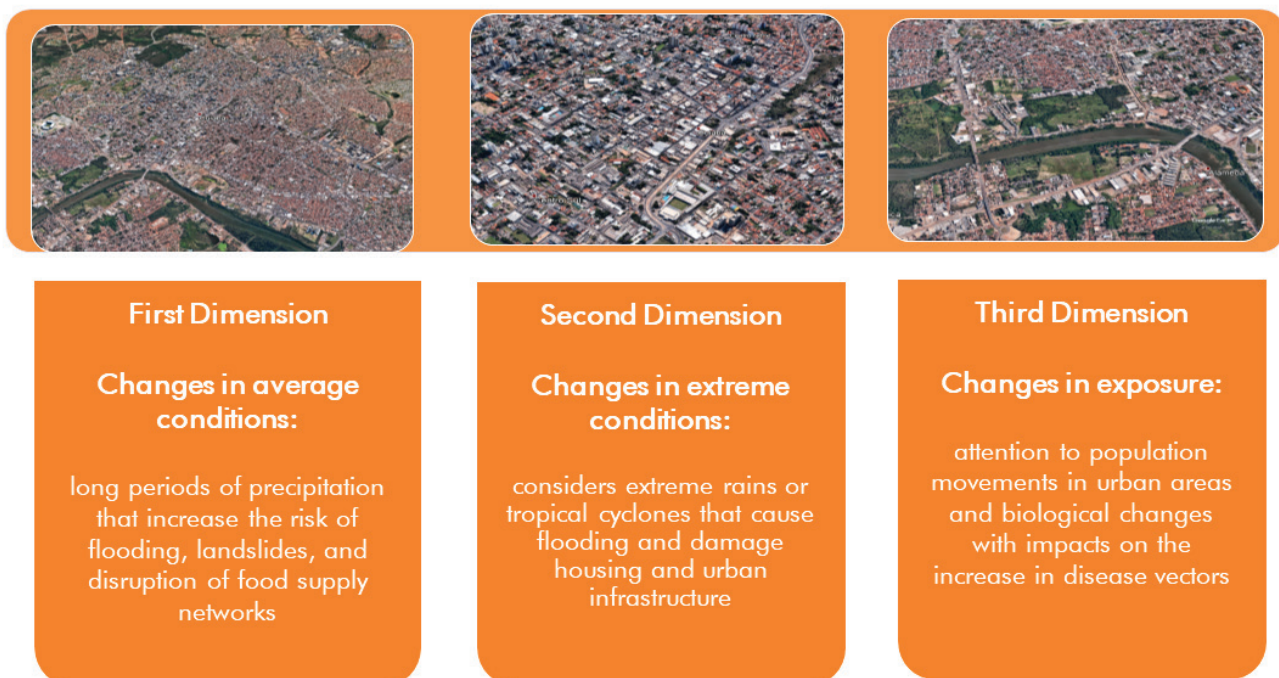
From the dimensions of the effects and impact of climate change, the research delves deeper, anchored in the lens of intersectionality [5], on the scenario of climate change and racial, ethnic, and gender inequalities and their intersections, given social, economic, environmental and health conditions, by territorialization and urbanization in the capital cities of the Legal Amazon, and the North and Northeast regions of Brazil.

To this end, we created a construct based on the markers of race/color⁴ and gender (women: Black, Indigenous, and White; men: Black, Indigenous, and White), considering that both are important structural social determinants [6]. To analyze the effects and impacts of climate change in urban areas, we use the three dimensions of theoretical bases of territorial urban planning **Figure 3**:



⁴ In Brazil, the Demographic Census classifies as Black people the sum of people self-declared as "Black" or "Mixed/Brown" during the application of the questionnaire, according to the technical standards of the Brazilian Institute of Geography and Statistics - IBGE.

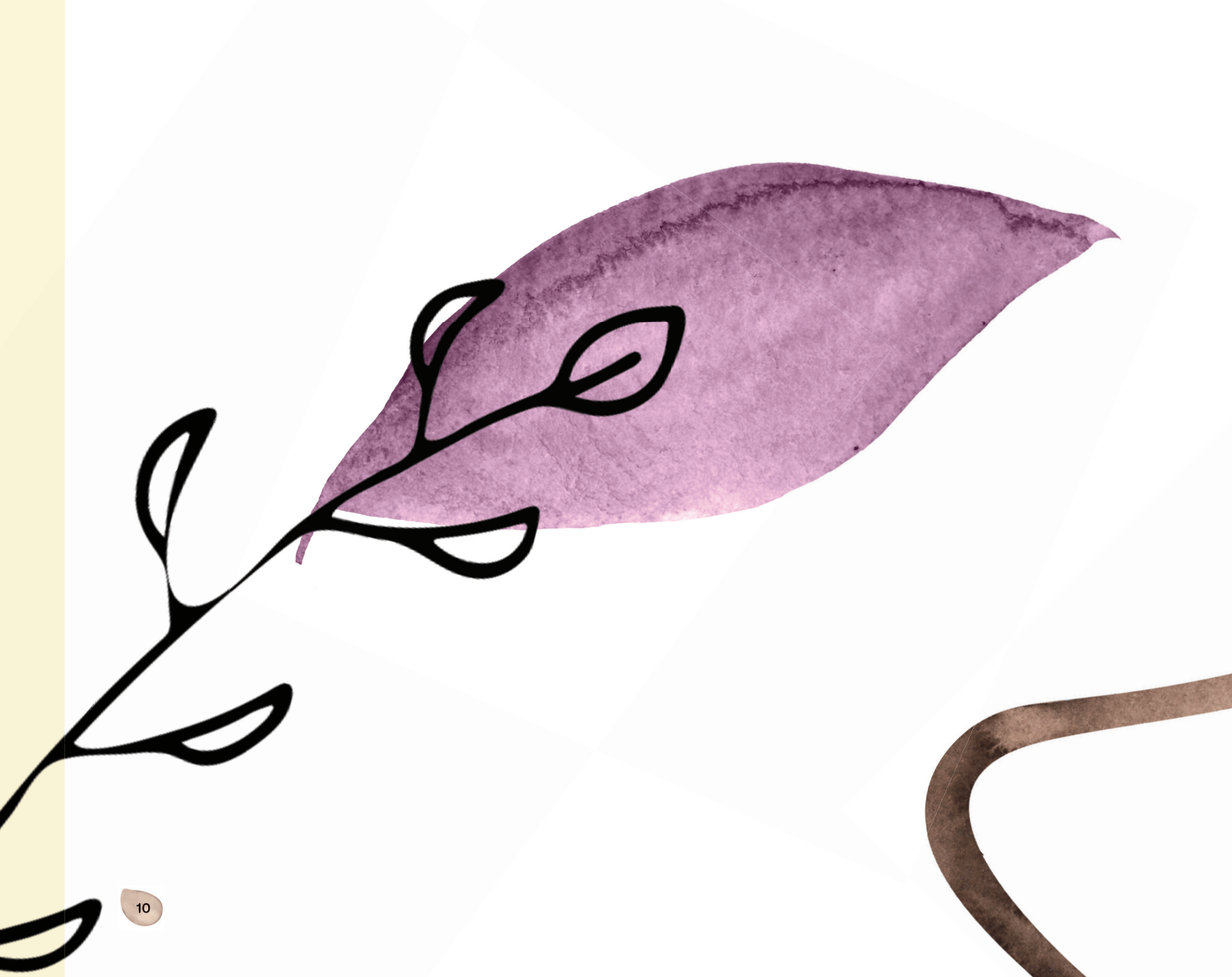
FIGURE 3: Urban Climate Change Dimensions



Health Agents/Family Health Team, all extracted from the latest National Health Survey (2019) [9].

Dengue (2014-2020), Zika (2016-2020), and Chikungunya (2017-2020) notifications for the urban area of the capitals of the North and Northeast regions were extracted from the Information System of Notifiable Diseases (SINAN) of DataSUS/Ministry of Health. Based on this information, we estimated the incidence rates per 100,000 inhabitants, considering the population estimated by the IBGE for each capital. **The three arboviruses chosen are important public health problems in the country and are used as markers of the “Change in exposure” dimension of urban climate change (Figure 3).**

The cartographic data of districts, sub-districts, subnormal agglomerates, faces of intermediate roads and urbanized areas until 2019, distribution of health services, number of deaths, missing persons, and directly affected persons attributed to disasters per 100,000 inhabitants (2015 to 2021), municipal legislations and programs, and sanitation, were extracted from the Territorial Base, Municipal Basic Information Survey (MUNIC), Brazilian Indicators for the SDGs, National Basic Sanitation Survey, Automatic Recovery System (SIDRA) both from IBGE [10]. The cartographic data were analyzed and systematized according to census sectors, districts, neighborhoods, subnormal agglomerates, and urban areas.



3

The Urban Dimensions and the review of the National Adaptation Plan of Brazil

The studies on the dimensions of climate change in the unequal land use planning in the cities of the North and Northeast regions are grounded on the socioeconomic conditions of the populations from the ethnic-racial and gender markers. The analyses refer to the principles and guidelines of the Glasgow Climate Pact - COP26 (2021), considering the ambitions proposed for policies of national plans and adaptation funding in vulnerable territories, with attention to the SDGs, Agenda 2030, and Articles 8 and 7 of Paris Agreement (2015).

At this point, the studies of the **IYALETA Research Association**⁵ on urban master plans and the impacts of climate change in the cities of Legal Amazon are the basis for the revision of the **National Plan of Adaptation to Climate Change - 2016** [11], that without effectiveness, impacts the **direct commitments with the SDGs**: 1

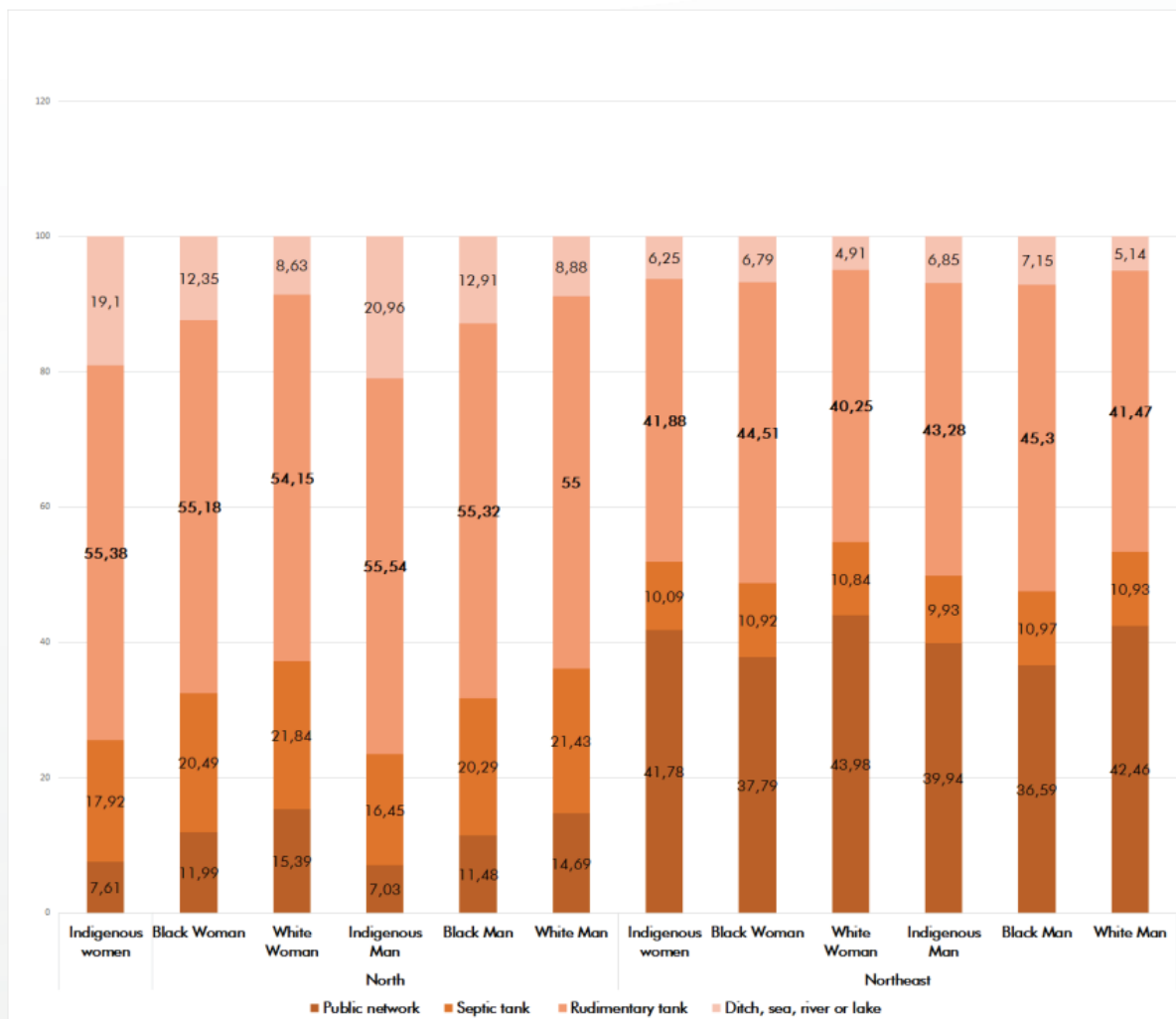
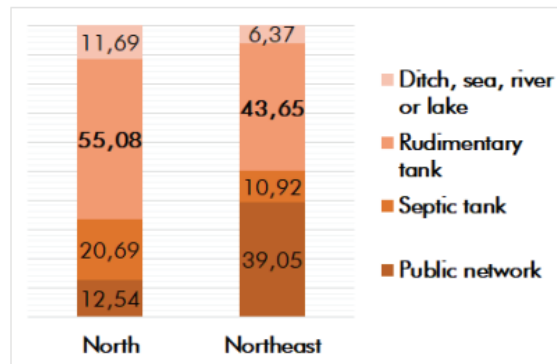


⁵ Available at: <https://www.iyaleta.org/plataformas/pesquisa/>
Accessed: October 20, 2022

- Eradicate poverty in all forms and places; 5 - Achieve gender equality and empower all women and girls; 6 - Ensure availability and sustainable management of safe drinking water and sanitation for all; 10 - Reduce inequalities within and between countries; 11 - Make cities and communities more inclusive, safe, resilient and sustainable; and 13 - Take urgent action to combat climate change and its impacts, according to data on household characteristics of residents in urban areas by race and gender, North and Northeast regions (**Table 1**).

Moreover, we highlight SDG 5, considering that the imposition of unequal gender urbanization in the capitals of the Legal Amazon directs to Black and Indigenous women [12,13] the responsibility of family and community welfare. This phenomenon worsens structural and pre-existing inequalities, such as gender, race, and territory, as shown in the data on access to basic sanitation services in the North and Northeast regions (**Graph 1**).

GRAPH 1: Proportion of access to basic sanitation services by race and gender in the North and Northeast regions. Demographic Census, 2010.



Source: Demographic Census (2010) - Brazilian Institute of Geography and Statistic (IBGE)

Table 01 Household characteristics of residents in urban areas by race and gender, North and Northeast regions, Brazil, 2010

Household Characteristics	Woman (N/%)				Man (N/%)			
	Total (N/%)	Indigenous	Black	White	Indigenous	Black	White	
	3.510/0,31	424.452/37,17	146.797/12,85	3.440/0,30	426.494/37,35	137.339/12,03		
North Region (N/%)								
Waste collection								
Public collection system	79,32	63,24	78,79	82,71	60,8	78,11	81,96	
Collected in bucket	11,95	16,23	12,16	11,03	16,71	12,21	11,23	
Burning on the property	7,01	16,14	7,28	5	18,14	7,79	5,41	
Buried on property or other destination*	1,72	4,39	1,76	1,25	4,35	1,88	1,4	
Water supply								
Public network with plumbing	59,96	53,65	60	61,31	51,44	59,46	60,37	
Public network without plumbing	7,41	14,53	7,82	5,57	14,83	25,33	28,33	
Well or spring with plumbing	17,24	7,12	16,33	20,56	6,69	16,07	20,66	
Well or spring without plumbing	8,67	8,73	8,92	7,23	8,84	9,26	7,66	
Other sources	6,71	15,97	6,93	5,33	18,2	7,19	5,49	
Northeast Region (N/%)								
Waste collection								
Public collection system	75,96	80,42	74,89	79,88	78,3	73,96	79	
Collected in bucket	15,24	10,43	15,61	14,2	10,88	15,72	14,42	
Burning on the property	5,36	5,55	5,88	3,46	6,67	6,33	3,85	
Buried on property or other destination*	3,44	3,6	3,62	2,47	4,15	3,99	2,73	
Water supply								
Public network with plumbing	83,93	83,98	83,44	86,73	81,93	82,38	85,79	
Public network without plumbing	5,19	6,11	5,64	3,66	6,15	5,96	3,9	
Well or spring with plumbing	2,69	2,23	2,44	3,19	2,46	2,49	3,26	
Well or spring without plumbing	1,88	1,6	1,99	1,33	2,08	2,19	1,48	
Other sources	6,32	6,08	6,5	5,1	7,37	7	5,58	

*Included played in wasteland, street, river, lake or sea or other unspecified destinations

Source: Demographic Census (2010) - Brazilian Institute of Geography and Statistics (IBGE)

4

Planned Adaptation: a challenge to the subhuman ordering context

Inequalities are determinants and are reflected in the impacts and effects of climate change in urban spaces in North and Northeast cities because the conditions of access to public policies for housing, water supply, sanitation, and access to health services have a direct impact on the lives of populations in unequal urban territories. This was observed in the socio-spatial

analyses in the ALU⁶ research regarding the population composition in the cities, recognizing that the territorial configuration is structuring and has a direct relationship with impacts and effects of processes of inequality in the cities and the advance of deforestation and fires in Amazonian municipalities [12].

Analyzing the databases is important – this is what presents the synthesis of the technical evaluation


component of the first global stocktaking of the Adaptation Committee (AC) of the United Nations Framework Convention on Climate Change (UNFCCC) [14] regarding efforts to manage, to overcome uncertainties from persistent gaps in climate and socioeconomic data analysis and interpretation difficulties because good “data coverage takes time and financial, technological, and capacity resources, and therefore uncertainties are a natural part of adaptation planning. Improving the delivery of climate services is one way to manage such uncertainties.” [14].



⁶ For more information about the research, you can access the website <https://amazonialegalurbana.com.br/> and download the Iyaleta papers and reports with the research results of the 09 capitals of the Urban Legal Amazon, conducted by the Iyaleta Research Association.

⁷ UNFCCC, 2022, p. 15

“When applying projections for climate impact studies and adaptation planning, it is good practice to integrate top-down and bottom-up approaches. The top-down approach primarily uses downscaled model and scenario data to assess how their findings may affect the system of interest. The bottom-up approach starts with the local vulnerability and decision-making context and then assesses how climate change might affect it, primarily based on the experience of local decision-makers.”⁷




According to the Adaptation Committee (2022), the provision of climate services is an excellent way to organize regional and national dialogues, facilitate exchanges between the institutions that produce data and the people who will access these data for climate and socioeconomic policy purposes, with reasonable interpretation for the consideration of different values and perspectives.

In this field, the systematization of data on racial and territorial inequalities is fundamental in the interpretation of climate data in cities and capitals of the North and Northeast regions of Brazil, given **the correlated oppressions that intersect**, reduce “the alternatives for social ascension and [contribute] to the great spatial mobility of its population, which is one of the main factors to explain the speed and extent of changes in land cover and use” [15].

In this way, when intersecting the data on population, subnormal agglomerates, natural disasters, and population directly affected by the impacts and effects of climate change, according to the data made available by SIDRA-IBGE, one digs into the urban territorial dimensions in the capitals of North and Northeast regions in interdependence, evidencing the human conditions of urban populations living in **Subnormal Agglomerations**⁸.



⁸ The Manual for Delimitation of Sectors of the 2010 Census classifies as a subnormal agglomeration each group consisting of at least 51 housing units, most of which lack with of essential public services, occupying or having occupied, until a recent period, land owned by others (public or private) and generally arranged in a disorderly and dense manner).

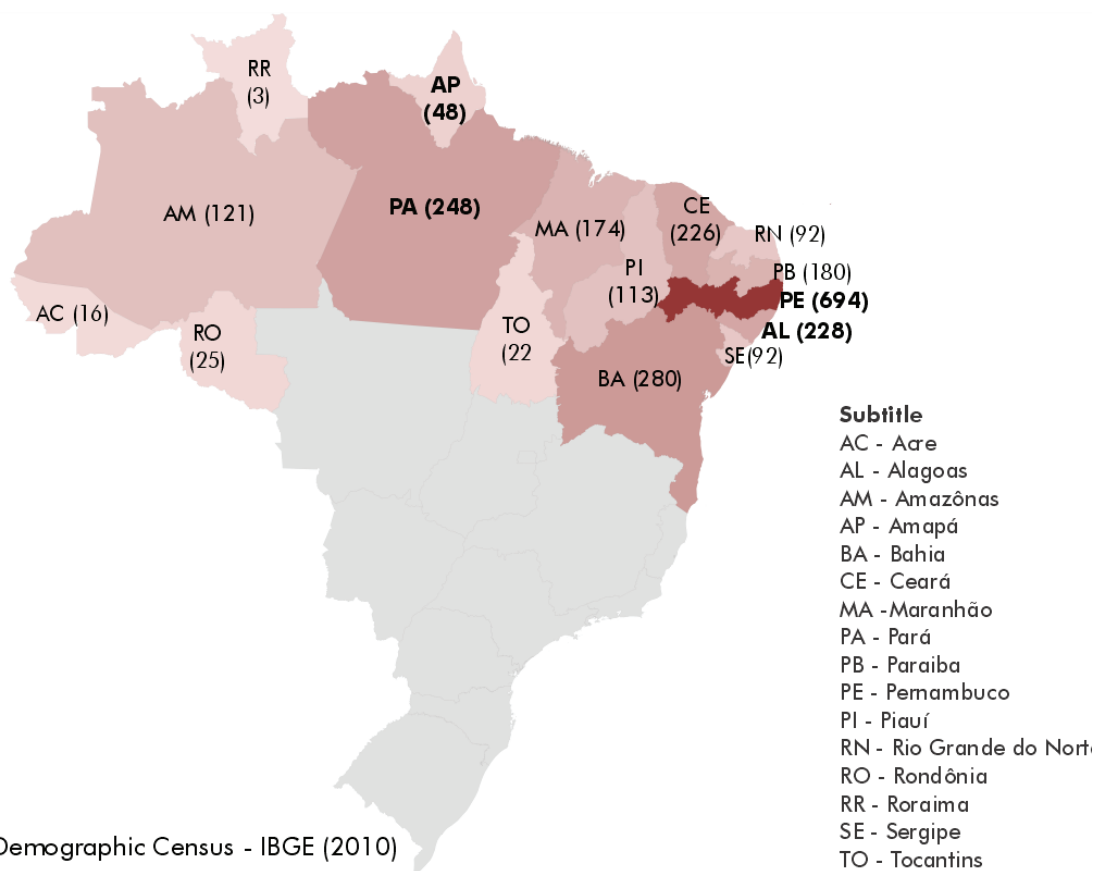


In the North and Northeast regions, people living in urban households accounted for 36.14% of the country, while in the North, the total population of urban households was 73.53%, and in the Northeast, 73.13%. Similarly, the number of areas classified as subnormal agglomerations in the Northeast was 2,079, while in the North, 483, representing, respectively, 32.85% and 7.63% of the areas in Brazil [8] (Figure 4).

Analyzing the urban population residing in the six capitals of the Northern region (Belém, Boa Vista, Manaus, Macapá, Rio Branco, and Porto Velho), these added up to **256 urban areas classified as subnormal agglomerations, representing 53.00% of the areas in the six Northern states**, apart from the city of Palmas in Tocantins. In the six capitals, urban residents were **4,626,976.00 inhabitants (71.88%), and 66.39% were self-declared Black**. 1,200,770 people lived in subnormal agglomerations, representing **36.10% of the urban population** accounting **36,10% da população urbana**. More data systematization of race/color and gender is presented in **Table 2**.

In the nine capital cities of the Northeast region (Aracaju, Salvador, Fortaleza, João Pessoa, Maceió, Natal, São Luís, Recife, and Teresina), **919 urban areas were classified as subnormal agglomerations, which represented 44.20% of the total areas in the nine states of the region**. In the Northeast, **11,495,691.00 inhabitants lived in capital cities, of which 95.02% lived in urban areas, and 65.81% declared themselves Black**. Near 2,341,488 people lived in subnormal agglomerations, representing **17.63% of the urban population**. The deepening of the conditions of inequality between Black and White populations by race/color and gender are systematized in **Table 3**.

FIGURE 4: Number of areas of Subnormal Agglomerations in the states of the North and Northeast regions of Brazil. Demographic Census 2010.



Source: Demographic Census - IBGE (2010)

Table 2. The urban resident population in municipalities with subnormal agglomerates, according to race/colour, in six capital cities of the North region

Capital cities	Household situation	Race/Colour		
		Indigenous (N/%)	Black(N/%)	White (N/%)
Porto Velho (Rondônia)	Total	21.105 / 0,34	4.133.690 / 66,80	1.7217,06 / 27,82
	Subnormal agglomerates	0,33	68,48	29,39
	Urban area	0,23	76,51	21,84
Rio Branco (Acre)	Total	0,19	66,99	30,89
	Subnormal agglomerates	0,21	71,48	26,17
	Urban area	0,31	73,88	22,82
Manaus (Amazonas)	Total	0,21	70,23	27,46
	Subnormal agglomerates	0,22	72,03	26,60
	Urban area	0,33	78,34	20,37
Boa Vista (Roraima)	Total	0,19	70,71	27,91
	Subnormal agglomerates	3,02	71,12	24,82
	Urban area	7,35	77,87	13,40
Belém (Pará)	Total	2,17	71,62	25,17
	Subnormal agglomerates	0,16	71,76	27,26
	Urban area	0,16	76,64	22,48
Macapá (Amapá)	Total	0,16	65,56	33,34
	Subnormal agglomerates	0,18	72,32	26,41
	Urban area	0,10	75,73	23,09
		0,21	70,97	27,69

Source: Demographic Census (2010) - Brazilian Institute of Geography and Statistics (IBGE).

Table 3. Urban resident population in municipalities with subnormal agglomerations, according to race/color, in nine capitals in the Northeast region

Capital cities	Household situation	Race/Colour		
		Indigenous (N/%)	Black(N/%)	White (N/%)
		24,774 / 0,22	7.565,299 / 65,81	3.752,855 / 32,65
São Luís (Maranhã)	Total	0,18	69,62	29,11
	Subnormal Agglomerates	0,15	77,15	21,66
	Urban area	0,19	66,43	32,25
Teresina (Piauí)	Total	0,16	71,01	26,27
	Subnormal Agglomerates	0,23	78,46	18,38
	Urban area	0,16	68,74	28,67
Fortaleza (Ceará)	Total	0,13	61,74	36,78
	Subnormal Agglomerates	0,12	70,36	28,12
	Urban area	0,13	60,07	38,45
Natal (Rio Grande do Norte)	Total	0,11	53,95	44,96
	Subnormal Agglomerates	0,19	65,68	33,12
	Urban area	0,10	52,63	46,29
João Pessoa (Paraíba)	Total	0,27	53,77	44,40
	Subnormal Agglomerates	0,28	66,80	31,24
	Urban area	0,27	51,79	46,39
Recife (Pernambuco)	Total	0,24	57,33	41,47
	Subnormal Agglomerates	0,19	70,04	28,96
	Urban area	0,25	53,57	45,18
Maceió (Alagoas)	Total	0,26	61,80	36,77
	Subnormal Agglomerates	0,29	70,98	27,57
	Urban area	0,26	60,50	38,07
Aracaju (Sergipe)	Total	0,38	66,31	32,00
	Subnormal Agglomerates	0,24	75,10	23,35
	Urban area	0,40	65,24	33,05
Salvador (Bahia)	Total	0,28	79,48	18,89
	Subnormal Agglomerates	0,26	87,42	10,95
	Urban area	0,30	75,55	22,81

Sources: Demographic Census (2010) - Brazilian Institute of Geography and Statistics (IBGE)

4.1

Adaptation as climate public policy

Recognizing and understanding racial and territorial urban inequalities in the context of the North and Northeast regions is fundamental to formulating and structuring policies to combat, reduce, and/or limit the impacts of climate change. For the UNFCCC Adaptation Committee, these are **adaptation needs**, in which circumstances require actions to ensure the safety of populations and assets in response to climate impacts [16].

Hence the importance of the Federal Government's National Plan for Climate Adaptation - PNA (2016)⁹, an instrument of the National Policy on Climate Change (PNMC)¹⁰ of the Brazilian State, a tool to combat the impacts and effects of climate change by managing and reducing long-term climate risk, and in implementing Article 7 of Paris Agreement (2015).

However, data from 2015 and 2021 show that this instrument of national, regional, local, and sectoral planning has not been implemented but has advanced with deforestation and fires in the forests of the Amazon, *Caatinga*, *Cerrado*, and *Pantanal*, and has not adapted to reduce GHG emissions in cities, which already compromises the country's NDC's for the years 2025 and 2030. What is observed is a **maladaptation to** the risks of adverse results to climate, with increases and/or decreases in precipitation and surface warming in urban spaces and the effects of disasters, loss of lives, territories, and population insecurity [16].

Between the signing of the Paris Agreement and the 26th Conference of the Parties (COP26) in Glasgow (2021), Brazil did not follow the **path**¹¹, that is, the "temporal evolution of natural or human systems towards a future state" [16]. It moved by the maladaptation, without paths, and without transparency, given the **risks** pointed out by the data on "early warning system of disasters," "plan for implementation of works and services for the reduction of disaster risks and the number of deaths" and "persons missing, dead and directly affected by disasters," as can be observed in the states of the North and Northeast regions, for the year 2020 (**Graphic 2 and Panel 1**).

In the absence of effectiveness and the need to face the risks of disasters and deaths of the population due to extreme events of climate change, the states of the Northeast and North regions show an exponential increase in the number of people affected and killed, especially

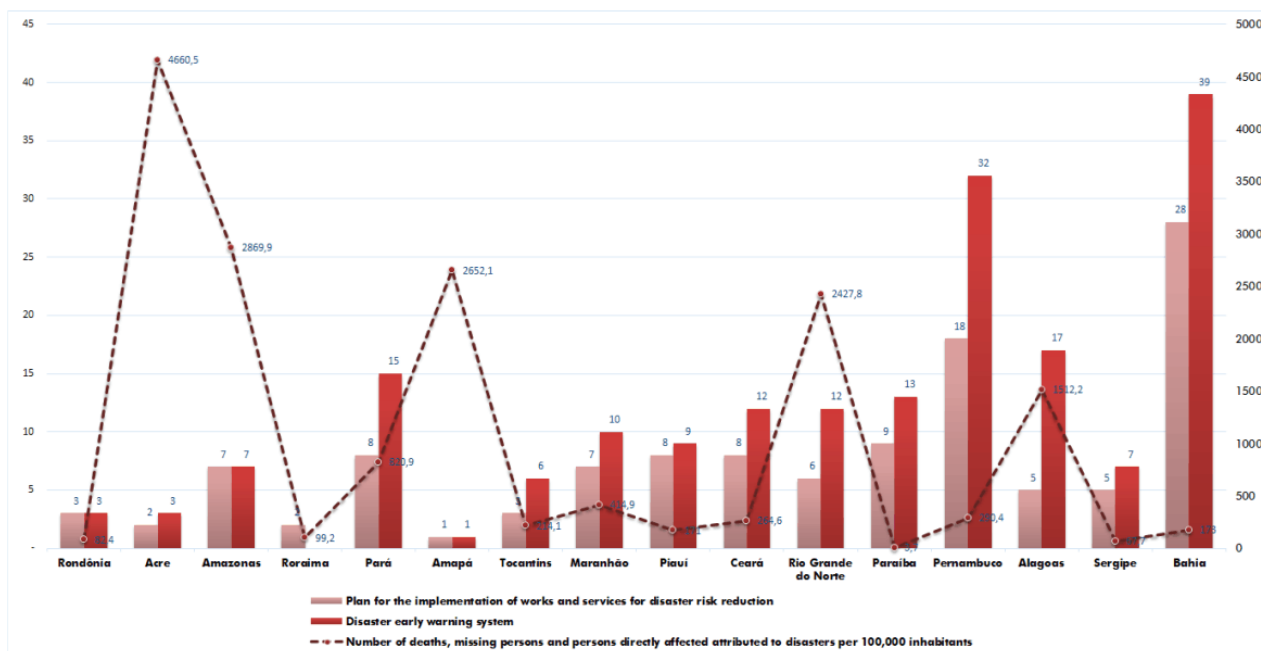


⁹Published in Ministerial Ordinance No. 150 of May 10, 2016, published in the Official Gazette of the Union of May 11, 2016.

¹⁰The National Policy on Climate Change - PNMC (Law no. 12.187, of December 29, 2009), regulates the preparation of the National Plan of Adaptation to Climate Change (PNA).

¹¹Pathway concepts range from quantitative and qualitative scenario sets or narratives of potential futures to solution-oriented decision-making processes for achieving desirable societal goals. Pathway approaches typically focus on biophysical, techno-economic, or socio-behavioral trajectories and involve various dynamics, objectives, and actors at different scales (IPCC, 2022a). (UNFCCC, 2022, p.08)

GRAPHIC 2: Disaster early warning system, the implementation plan of works and services for disaster risk reductions, and the number of deaths, missing persons, and directly affected persons attributed to disasters per 100,000 inhabitants in North and Northeast Brazilian states. 2020.



Source: Ministry of National Integration - MI, National Secretariat for Civil Defense and Protection - SEDEC; Integrated Disaster Information System - S2ID. IBGE/ Estimates of the resident population in Brazil and Federation Units, with reference date on July 1st. Basic Municipal Information Survey (Munic)-2020

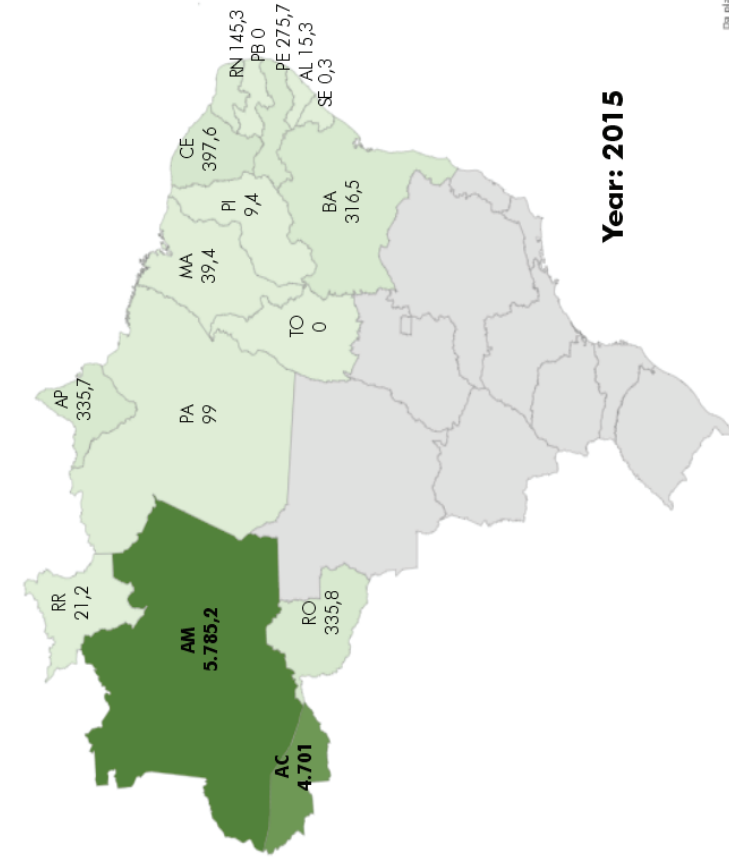
in the capital cities of the states in both regions, spaces of greater population density and urban territory.

Notably, we understand that the data of Panel 1, in the states of Acre and Amazonas (Northern region), in 2015, need attention, given their maintenance and evolution. However, data for 2021, for the states of Amapá, in the North, and Rio Grande do Norte, in the Northeast, are worrisome and define what the Adaptation Committee defines as Trade-off¹².



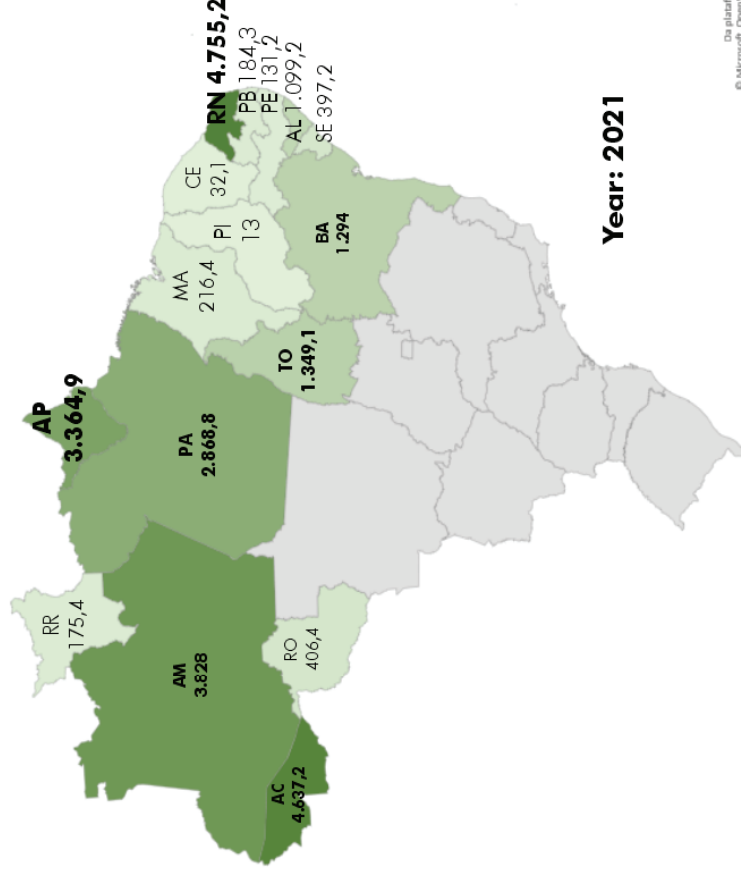
¹² A circumstance that arises when a policy or measure aimed at one objective reduces the outcomes of one or more other objectives due to adverse side effects, potentially reducing the net benefit to society or the environment (IPCC, 2022a). (UNFCCC, 2022, p.08)





Year: 2015

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Year: 2021

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- Subtitle
- AC - Acre
 - AL - Alagoas
 - AM - Amazonas
 - AP - Amapá
 - BA - Bahia
 - CE - Ceará
 - MA - Maranhão
 - PA - Pará
 - PB - Paraíba
 - PE - Pernambuco
 - PI - Piau
 - RN - Rio Grande do Norte
 - RO - Rondônia
 - RR - Roraima
 - SE - Sergipe
 - TO - Tocantins

Panel 01 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000, inhabitants in North and Northeast Brazilian states, 2015 and 2021.

Source: Ministry of National Integration - MI, National Secretariat for Civil Defense and Protection - SEDEC Integrated Disaster Information System - S2ID/IBGE (2021)

4.2

Adaptation: sanitation and health conditions

Ethnic-racial and gender inequalities are identified in housing and sanitation conditions, with the concentration of the Black and Indigenous population in the indicators of greater vulnerability in cities of the North and Northeast regions of the country (Table 1). These findings are closely related to the incidence of arboviruses such as Zika, Dengue, and Chikungunya, as evidenced in previous studies in the Urban Legal Amazon [12,13,15].

Access to health services is essential for social groups living in unequal spaces because it is necessary to effectively control arboviruses (Dengue, Zika, and Chikungunya) through health promotion, disease prevention, and sanitary and epidemiological surveillance in the notification of cases. However, what is observed in the cities of the North and Northeast regions is that in many of them, there is a high percentage of households that have never received visits from an endemic disease agent, especially in Porto Velho (69.95%), Manaus (49.63%), and Macapá (41.84%), respectively (Table 4).

Table 4 Incidence rate (po 100.000 inhabitants) of arboviruses (dengue, zika virus and chikungunya) in the capitals of the North and Northeast of Brazil, 2020

Capital cities of the North and Northeast region	Dengue	Zika Virus	Chikungunya
North	129,89	10,13	21,83
Porto Velho	56,36	19,28	25,59
Rio Branco	320,02	33,62	34,83
Manaus	42,98	5,27	3,51
Boa Vista	86,74	3,34	18,11
Belém	15,74	2,47	21,21
Macapá	7,02	4,29	4,09
Palmas	168,14	36,57	41,46
Northeast	263,1	19,5	131,79
São Luís	66,37	5,77	4,42
Teresina	122,57	2,76	18,89
Fortaleza	367,49	6,81	31,94
Natal	115,67	11,79	63,45
João Pessoa	331,49	15,05	106,54
Recife	100,4	15,12	172,37
Maceió	88,07	4,68	8,87
Aracaju	137,31	20,91	357,49
Salvador	386,01	23,35	446,08

Source: Disease Notification Information System/DataSUS; IBGE

Table 5 Frequency of visits by agents of endemic diseases to residences in the urban space of the capitals of the North and Northeast of Brazil, 2019

Capital cities of the North and Northeast region	Frequency of visit by an endemic disease agent (%)							Ignored
	Monthly	Every 2 months	From 2 to 4 times	One time	Never received			
North	10,51	7,6	17,88	18,47	40,31	5,24		
Porto Velho (Rondônia)	5,02	2,81	10,45	21,88	54,8	5,04		
Rio Branco (Acre)	17,45	15,16	37,34	10,85	13,77	5,43		
Manaus (Amazonas)	6,81	4,99	9,61	35,79	39,35	3,45		
Boa Vista (Roraima)	11,56	12,5	30,03	17	23,25	5,66		
Belém (Pará)	12,84	12,08	33,33	17,52	16,73	7,5		
Macapá (Amapá)	5,21	4,14	17,63	25,57	43,43	4,02		
Palmas (Tocantins)	28,31	16,29	19,03	10,19	18,87	7,31		
Northeast	18,3	11,05	21,36	15,92	28,77	4,6		
São Luis (Maranhão)	27,4	13,61	20,81	14,68	19,99	3,52		
Teresina (Piauí)	11,53	15,47	30,74	22,34	16,13	3,79		
Fortaleza (Ceará)	19,7	13,93	29,14	15,31	13,07	8,85		
Natal (Rio Grande do Norte)	22,5	11,09	22,55	16,36	21,83	5,67		
João Pessoa (Paraíba)	21,45	9,02	14,04	14,35	35,78	5,36		
Recife (Pernambuco)	25,07	15,87	22,47	10,21	22,69	3,7		
Maceió (Alagoas)	23,05	13,29	26,46	15,86	15,59	5,75		
Aracaju (Sergipe)	20,76	12,31	26,44	13,38	22,39	4,73		
Salvador (Bahia)	14,83	12,02	28,97	18,81	19,91	5,47		

Source: National Health Survey, PNS/IBGE

Cases of arboviruses are presented in **Table 4** and show that the North region presents lower rates of Dengue, Zika virus, and Chikungunya compared to the Northeast region. According to the Ministry of Health, there were fewer cases recorded in 2020 compared to the previous year, 2019, and this occurred because of the pandemic that directly influenced the fight against arboviruses through the transfer of human and material resources to combat COVID-19, impacting the reduction of services, with possible underreporting of cases of arboviruses.

Another critical factor that may be associated with the context of the pandemic is the population's fear of seeking care in a health facility [17]. Furthermore, the pandemic led many municipalities to discontinue the home visits of endemic agents and reduce vector control activities in the home environment. However, this reality existed previously, according to the analysis from the National Health Survey conducted in 2019 (**Table 5**) [9]. Regarding incidence rates of arboviruses in capital cities, Rio Branco and Palmas stand out as the three arboviruses in the North. At the same time, Salvador presents the highest rates in the Northeast, followed by Fortaleza for Dengue and Aracaju for Zika virus and Chikungunya (**Table 4**).

Despite the underreporting, recent studies pointed out the elevation of Dengue incidence during the pandemic, characterizing what epidemiologists have described as the Syndemia between COVID-19 and Dengue. The syndemic effect between these two conditions has been reported in some Brazilian territories and several countries of the American continent, particularly in Dengue endemic regions. As an aggravating factor, this syndemic scenario occurs in a national context of dismantling social protection systems right after the Zika epidemic in 2016, the introduction of Chikungunya, and an outbreak of Yellow Fever in 2018 [12].

It's important to highlight that women are the primary victims of arboviruses and their consequences, and the Zika Virus cases presented a particularity of being an arbovirus that can also be transmitted during pregnancy and through sexual intercourse. This peculiar situation impacted the reproductive health of women [12]. Furthermore, in front of the unequal impacts of climate change, these effects have been worsened among vulnerabilized social segments, such as women and Black and Indigenous populations.

Thus, the **path of adaptation** to climate change, involving urban master plans and sectoral plans, needs to be considered so that the communities are reached by the densities and territories, considering the context of ethnic-racial and gender inequalities and their intersections in the delineation of urban spaces in urban realities such as the North and Northeast of Brazil.

5

Zero Inequalities: the adaptation of the Global South

The realities of the Global South need to have data and transparency as the basis for **adaptation pathways**, as highlighted by the IPCC's Sixth Assessment Report (2022), that the reduction of vulnerabilities in places with poverty is the major challenge of climate governance in achieving the goal of reducing global warming by 1.5°C until 2030. This requires addressing limited access to basic public services, increased occurrences of conflict, and the high levels of climate-sensitive livelihoods experienced by family farmers, traditional communities, and urban populations [18].

Therefore, by the recognition of science, we present 08 (eight) considerations to the Brazilian reality in interdependence with the Global South, for the effectiveness of adaptation policies and funding based on the reduction of GHG emissions and the elimination of inequalities, according to Article 7 of the Paris Agreement:

- 1 Transparency for the approval and recognition of National Adaptation Plans with the realization of informed and constitutional consultations with the population to define public and private projects.
- 2 Foster regional, national, and territorial networks of researchers, associations, and research institutes for capacity building, knowledge transfer for climate governance, and developing and implementing local and sectoral plans for adaptation to climate change.
- 3 Promote the territorialization of funding from the Adaptation and Climate Funds with financing lines for local and sectoral public and private plans.
- 4 Promotion of Prior and Informed Consultation for revising National Adaptation Plans in indigenous peoples' communities and traditional communities and territories in the urban and rural areas.

5 The municipalities may present, by 2025, master plans elaborated in a participatory way and with scientific, environmental, hydrographic, climatic, social, and cultural data based on the urban dimensions of climate change.

6 Raise public actions for the elaboration of climate change plans aimed at zero deforestation of the urban Permanent Protection Areas (APP), with projects for the environmental regeneration of lakes, streams, and forests, taking into account the long periods of drought and concentrated rains that impact the lives of the population.

7 Develop local and sectoral adaptation plans that more acutely guarantee human rights for Black and Indigenous women based on gender and race/color inequalities with goals to eliminate urban vulnerabilities.

8 Prioritize the elimination of 100% of the incidence rates of arboviruses (Zika, Dengue, and Chikungunya), with attention to the ethnic-racial, gender, and generational profile, is an ambition for the revision of the PNA - Brazil (2016), and this involves urban master plans and local and sectoral adaptation plans that have the resilience to extreme climate change.

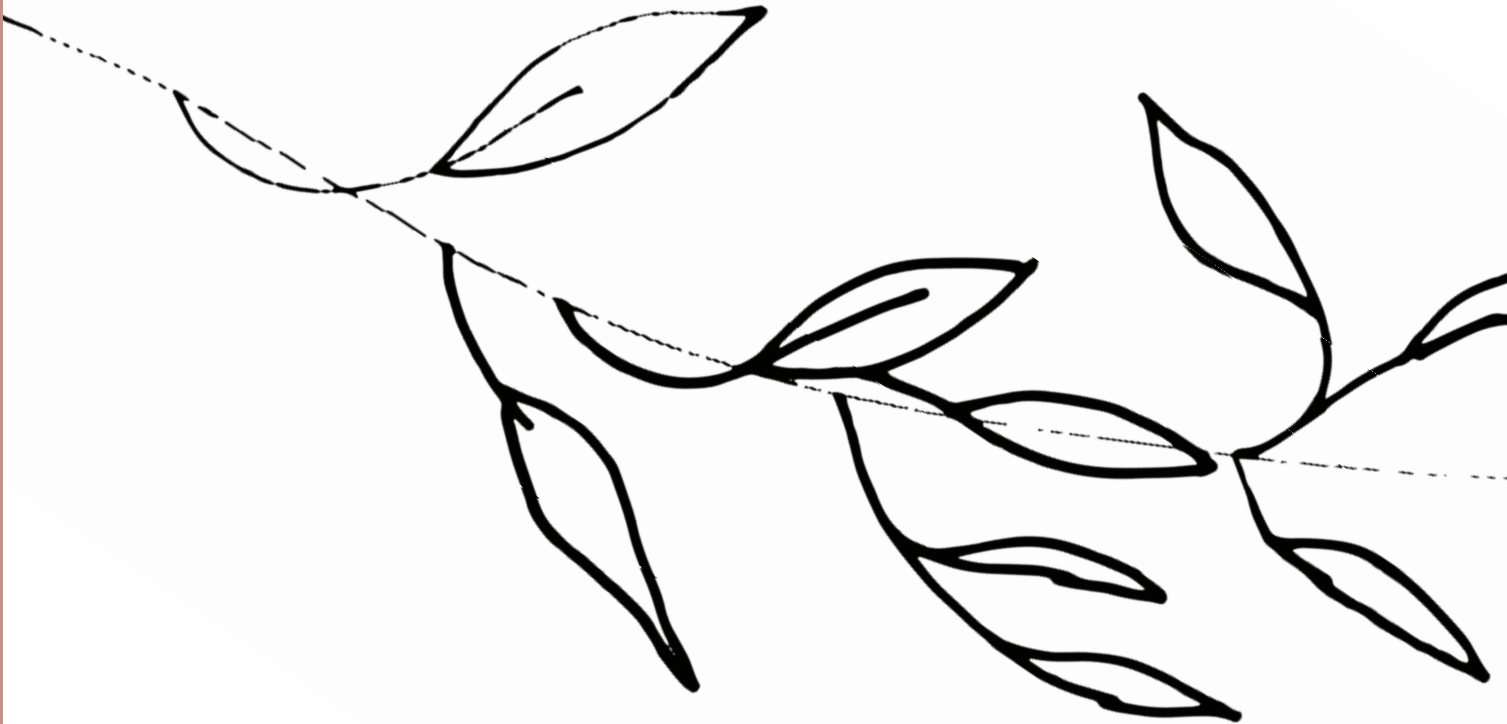


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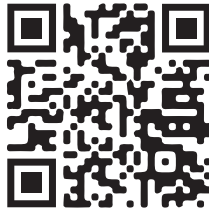
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"1.5°C and Zer0 Inequalities" is a call to action from **Iyaleta - Research, Sciences, and Humanities** to Parties and national and subnational governments responsible for the effectiveness of the Adaptation Fund, the National Adaptation Plans and the approval of Loss and Damage regulatory mechanisms, and to those who have signed the Paris Agreement - United Nations Framework Convention on Climate Change (UNFCCC). In an intersectional way, we seek that the Nationally Determined Contributions - NDC's (2025 and 2030), besides reducing GHG emissions, eliminate racial, ethnic, gender, generational, and social inequalities in territories and cities of the Global South, humanitarian care for Planet 2050.





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