Comitê de Bacia Hidrográfica MACAÉ OSTRAS

I Workshop de Gerenciamento Costeiro da RH VIII

Gestão de Recursos Hídricos Integrada à Gestão dos Sistemas Estuarinos e da Zona Costeira

CONSÓRCIO INTERMUNICIPAL LAGOS SÃO JOÃO · FÓRUM FLUMINENSE DE COMITÊS DE BACIAS HIDROGRÁFICAS · FUNDRHI · inea instituto estadual do ambiente · AMBIENTE E SUSTENTABILIDADE · GOV RJ

20, 21 e 22 de Maio - Macaé/RJ

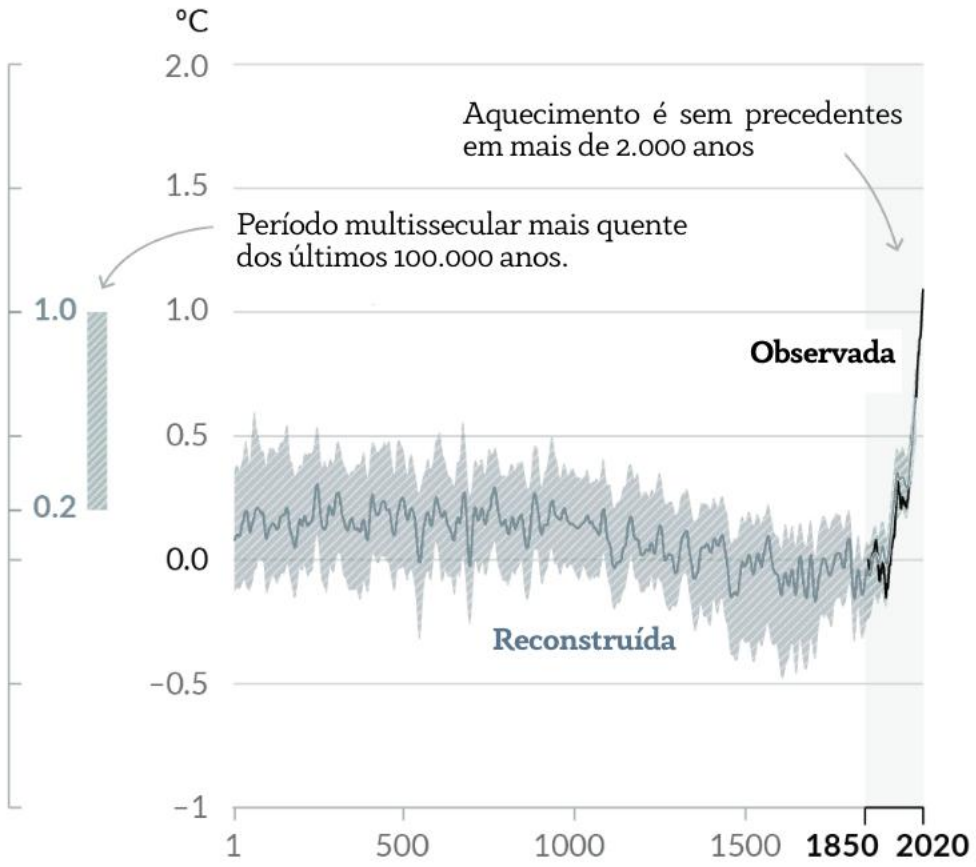
Mudanças Climáticas e Impactos Regionais

I Workshop de Gerenciamento Costeiro da RH VIII

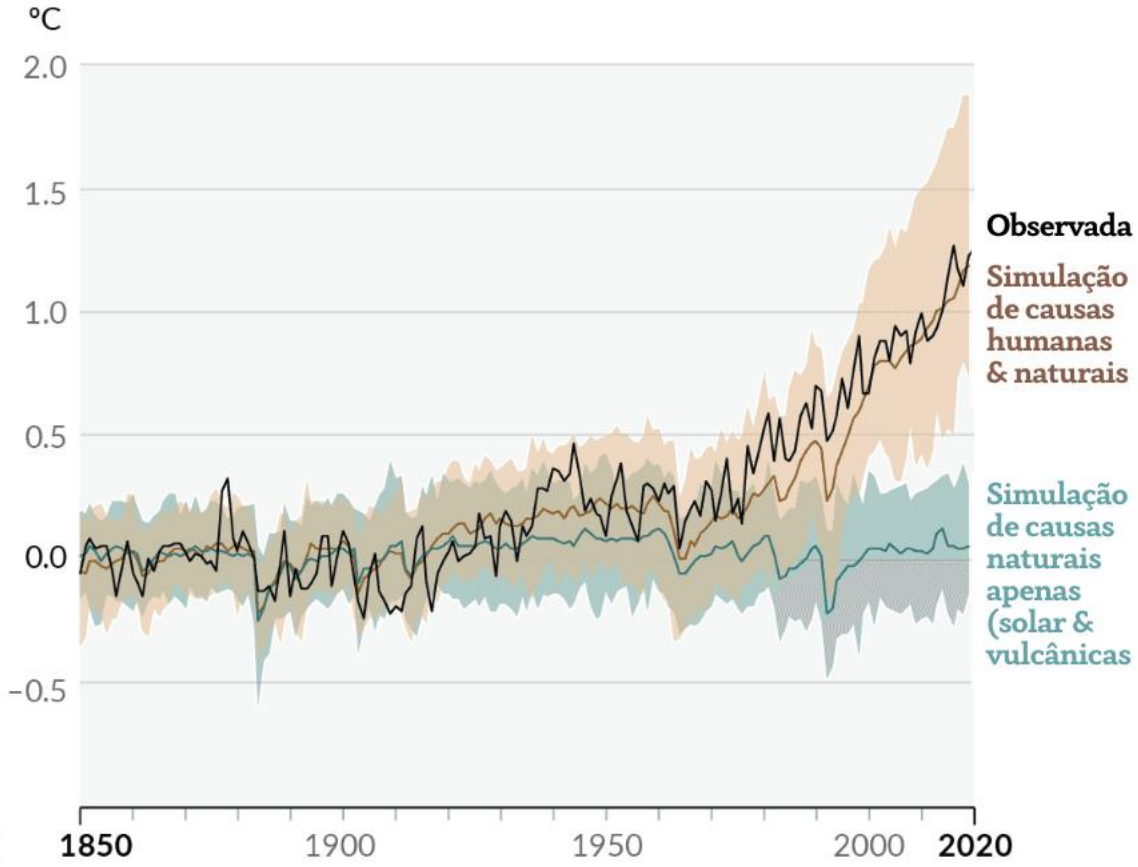
A influência humana aqueceu o clima a um ritmo sem precedentes pelo menos nos últimos 2000 anos

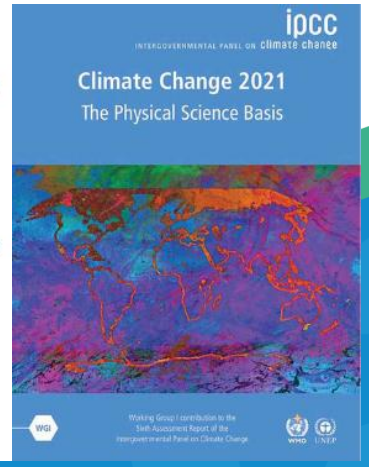
❑ Mudança na temperatura da superfície global em relação a 1850-1900

a) Mudança na temperatura da superfície global (média decenal) as **reconstruída** (1–2000) e **observada** (1850-2020)



(b) Mudança na temperatura da superfície global (média anual) observada e simulada considerando fatores **humanos & naturais** e **fatores naturais** (ambos 1850-2020)

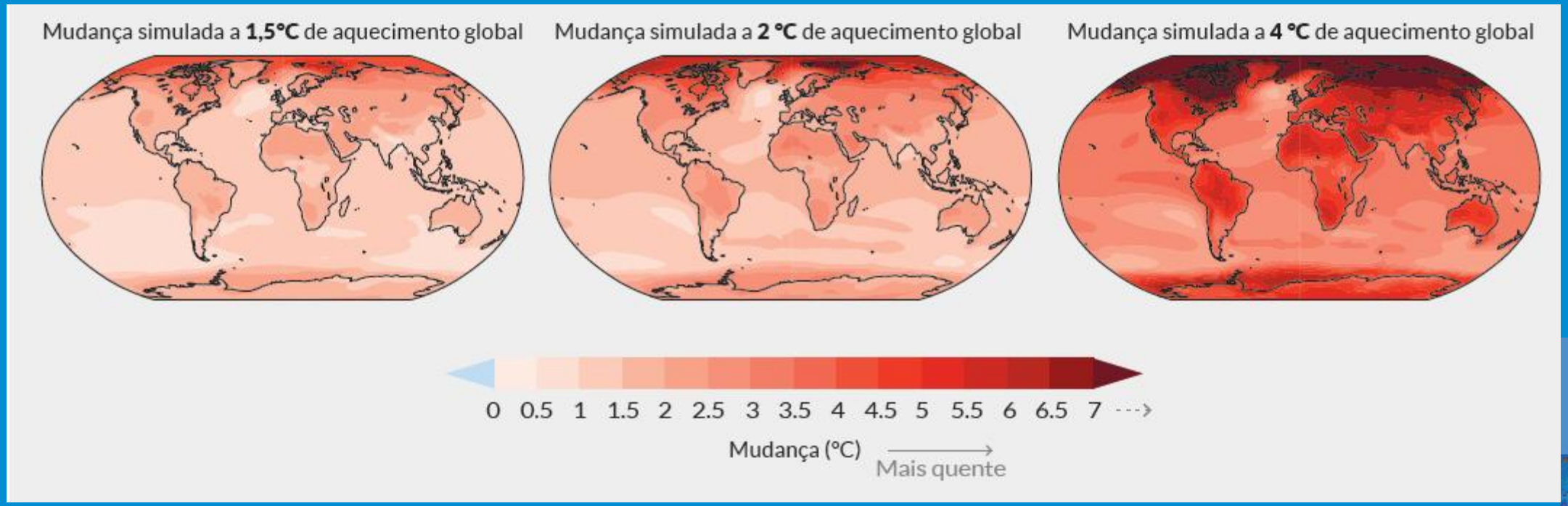




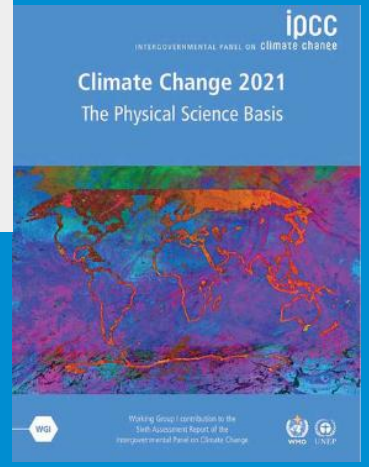
Fonte: Adaptado de IPCC (2021).

A influência humana aqueceu o clima a um ritmo sem precedentes pelo menos nos últimos 2000 anos

❑ **Mudança anual média de temperatura (ºC) em comparação a 1850-1900**

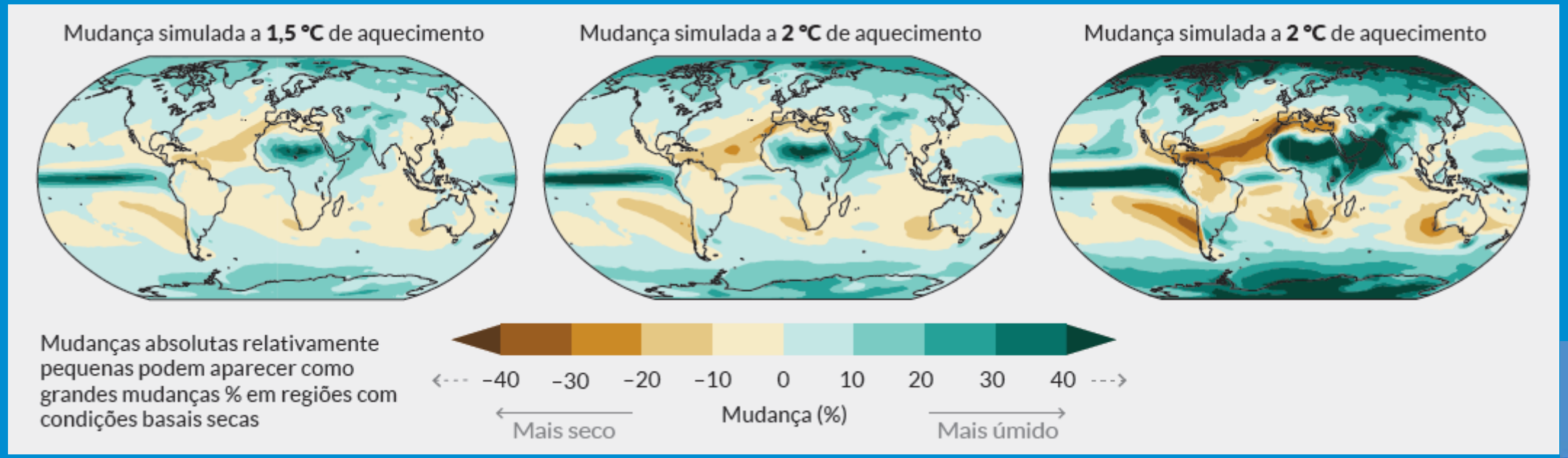


Fonte: Adaptado de IPCC (2021).

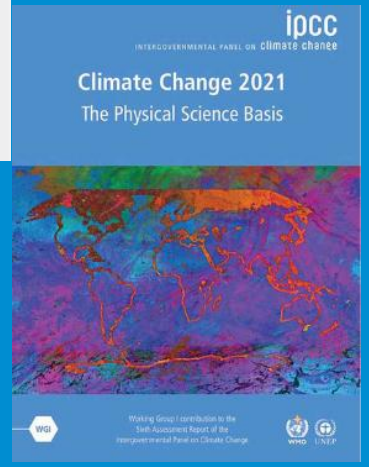


A influência humana aqueceu o clima a um ritmo sem precedentes pelo menos nos últimos 2000 anos

❑ **Mudança anual média na precipitação (%) em comparação a 1850-1900**



Fonte: Adaptado de IPCC (2021).



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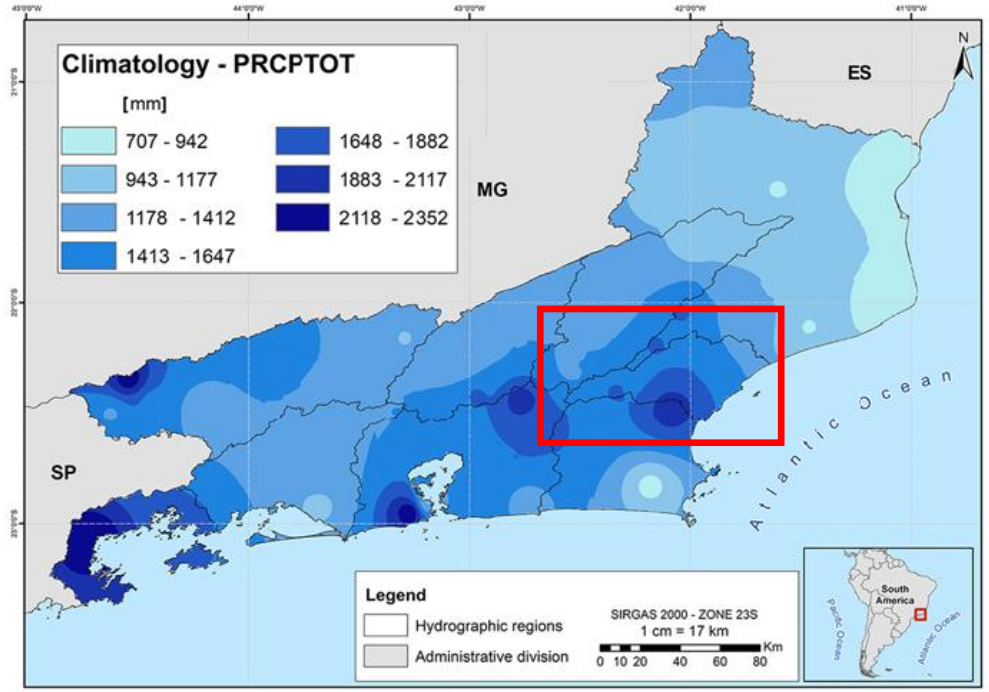
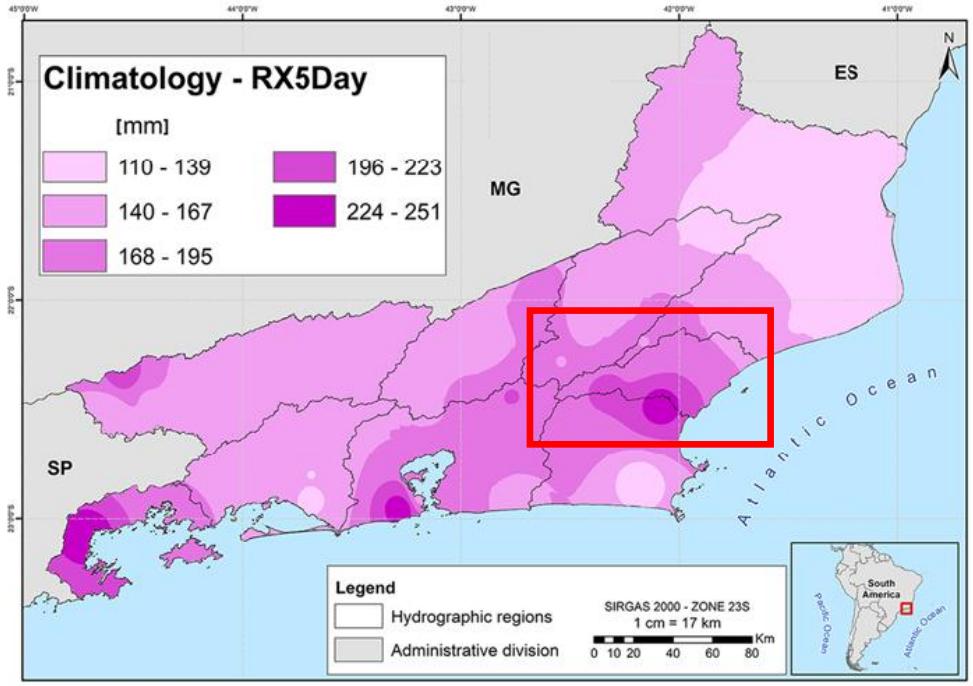
Climatologia de indicadores climáticos extremos associados à precipitação (PRCPTOT e RX5dia) no Estado do Rio de Janeiro

Precipitação Total Acumulada (mm)



Máxima Precipitação Anual em 5 Dias Consecutivos (mm)



Fonte: Adaptado de Luiz-Silva e Oscar-Júnior (2022).

Natural Hazards (2022) 114:713–732
https://doi.org/10.1007/s11069-022-05409-5

ORIGINAL PAPER

Climate extremes related with rainfall in the State of Rio de Janeiro, Brazil: a review of climatological characteristics and recorded trends

Wanderson Luiz-Silva[1,2] · Antonio Carlos Oscar-Júnior[3]

Received: 6 October 2021 / Accepted: 17 May 2022 / Published online: 6 June 2022
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Abstract
This paper presents a synthesis of the main characteristics of precipitation in the State of Rio de Janeiro (Brazil) based on extreme rainfall indicators. Daily precipitation data are derived from 56 rainfall stations during the second half of the twentieth century and the 2000s. Eight indices related to extreme precipitation were analyzed. The Mann–Kendall nonparametric test and the Sen's Curvature were employed to evaluate the significance and magnitude of trends. The primary climatological aspects and identified trends throughout the last decades are discussed, besides the hydrometeorological impacts associated with them. Lower values of annual total precipitation are recorded in northern Rio de Janeiro (around 800 mm) and higher in the southern State (up to 2,200 mm). The Serra do Mar affects the frequency of heavy precipitation, and the areas near the sea and high relief present the highest values of consecutive days with expressive rainfall (more than 150 mm in 5 days). These areas also showed a high concentration of flood and landslides events. Most of Rio de Janeiro exhibits precipitation intensity of about 13 mm/day. The maximum number of consecutive dry days shows a gradient from the coast (about 30 days) to the State's interior (around 50 days). Regarding trends, there is a growth of accumulated extreme precipitation in various stations near the ocean. The extreme rainfall in 24 h displays an increase in most Rio de Janeiro (+1 to +5 mm/decade). The consecutive dry and rainy days present similar signs of decreasing trends, suggesting irregularly distributed precipitation in the State. This study is especially relevant for decision-makers who need detailed information in the short and long term to prevent natural hazards like floods and landslides and the related impacts in the environmental and socioeconomic sectors of the Rio de Janeiro.

Keywords Climate change · Climate extremes · Climatology · Natural hazards · Precipitation · Rio de Janeiro

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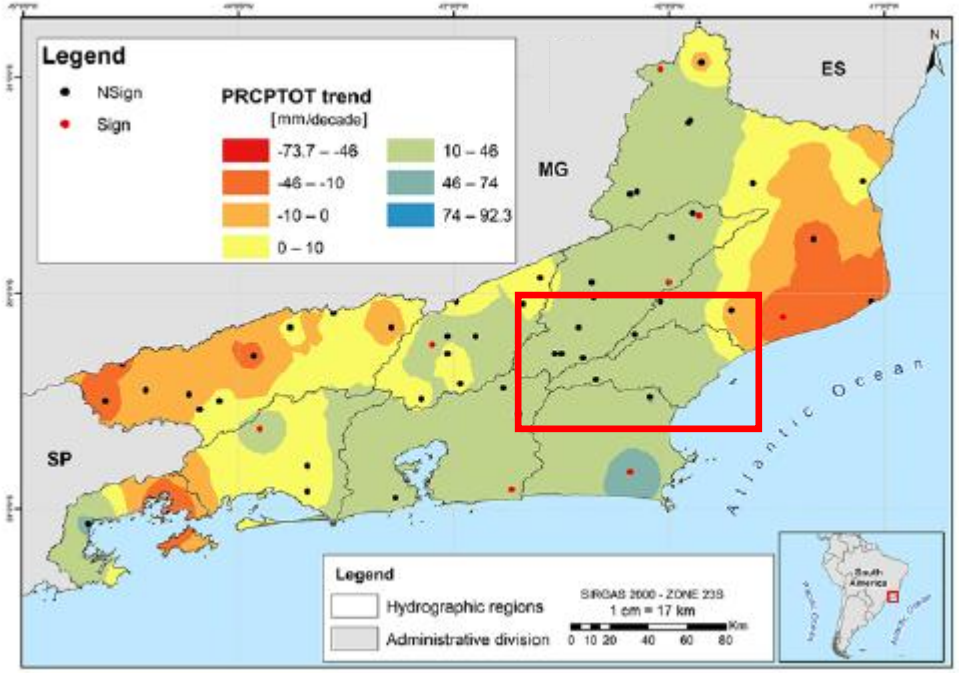
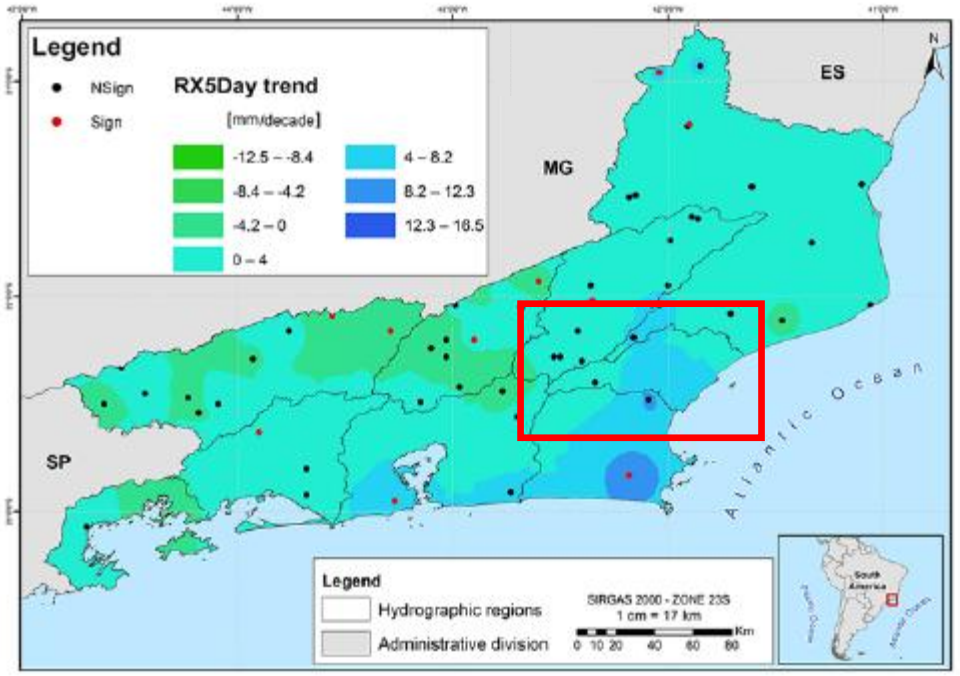
Tendências observadas (por década) dos índices climáticos extremos relacionados à precipitação (PRCPTOT e RX5dia) no Estado do Rio de Janeiro

Precipitação Total Acumulada (mm)



Máxima Precipitação Anual em 5 Dias Consecutivos (mm)



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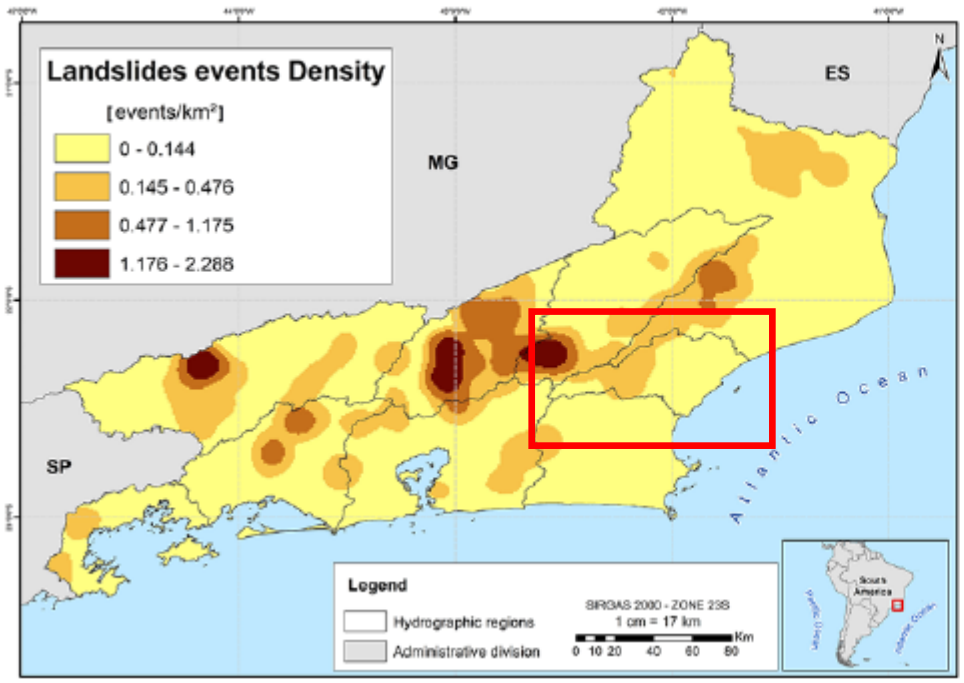
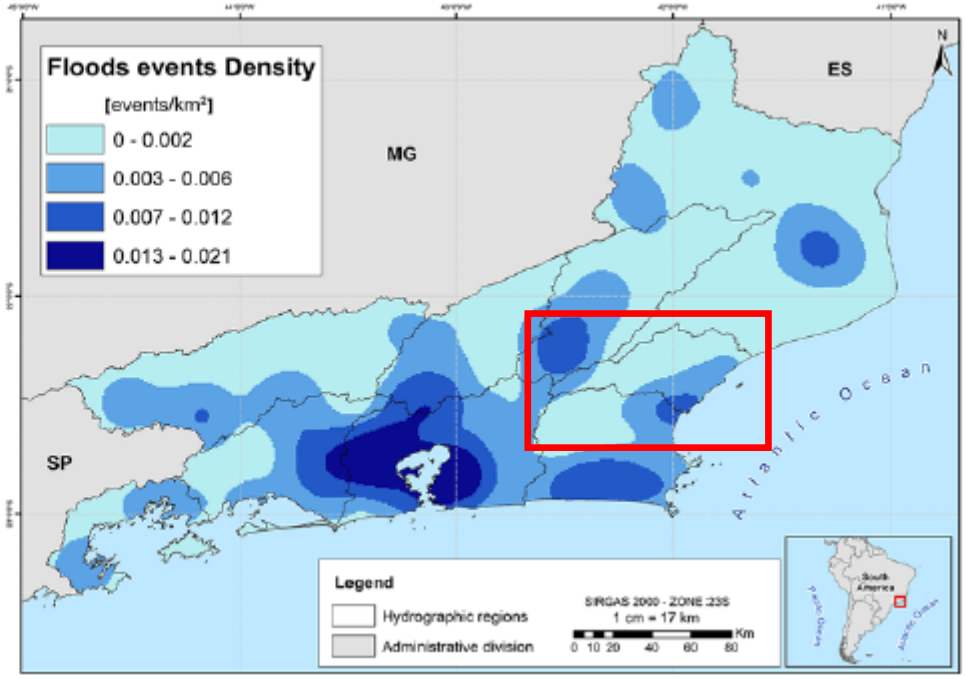
I Workshop de Gerenciamento Costeiro da RH VIII

Densidade espacial (por km²) de episódios de impacto de movimentos de massa e inundações com pelo menos uma morte no Estado do Rio de Janeiro.

Movimentos de Massa



Inundações



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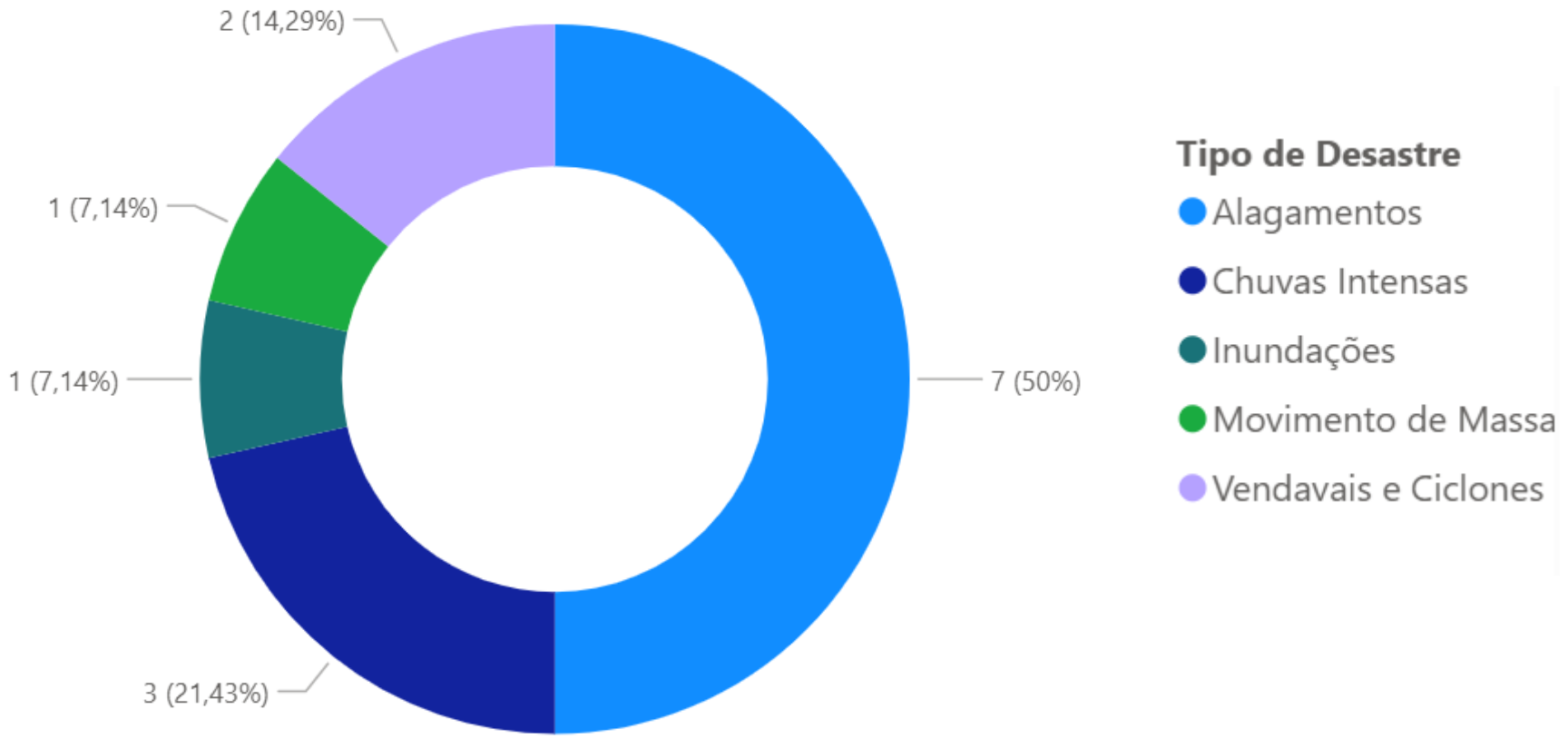
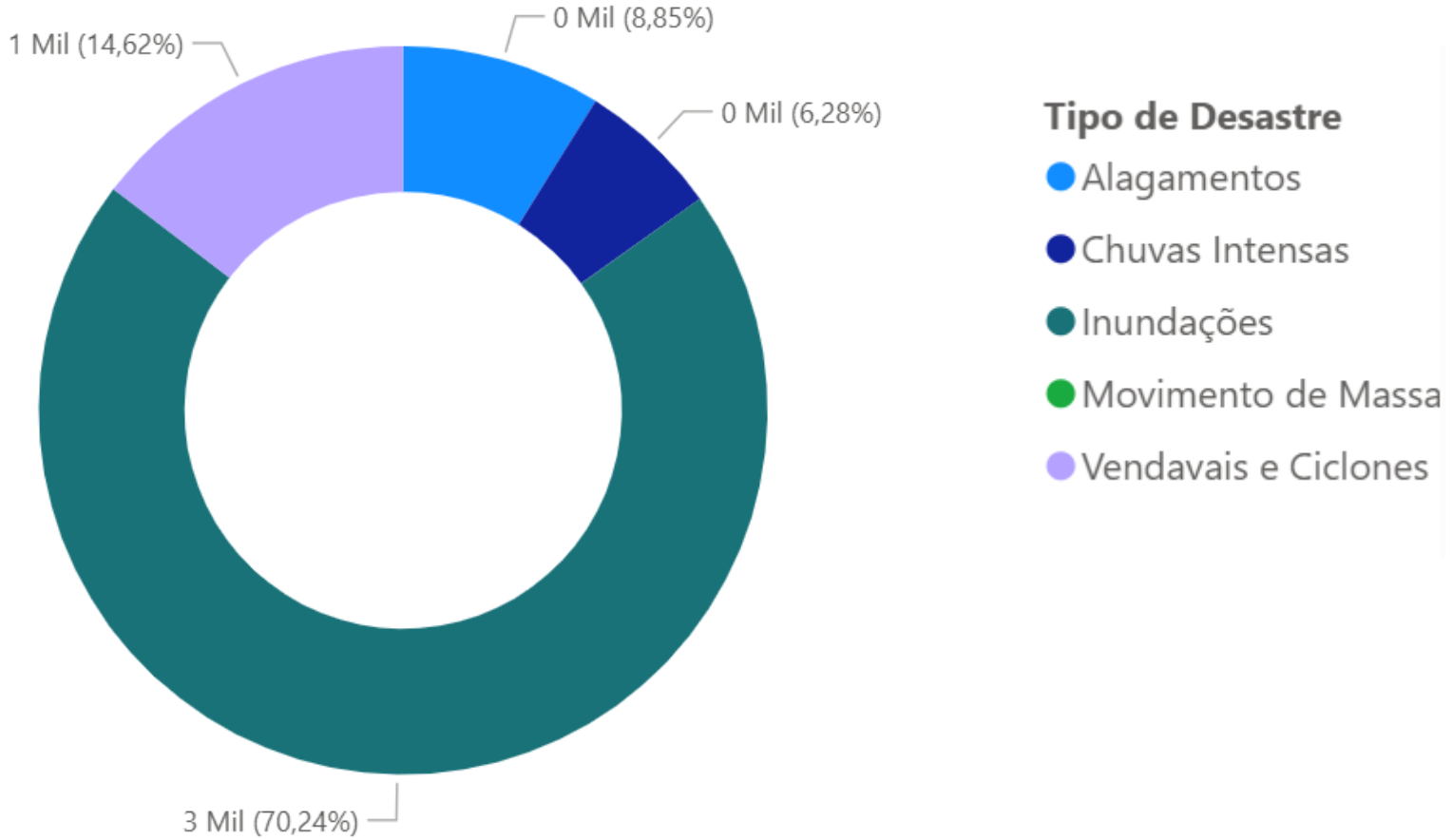
Registro de Desastres em Macaé-RJ: 2004 - 2025



Fonte: Atlas Digital de Desastres no Brasil (https://atlasdigital.mdr.gov.br)

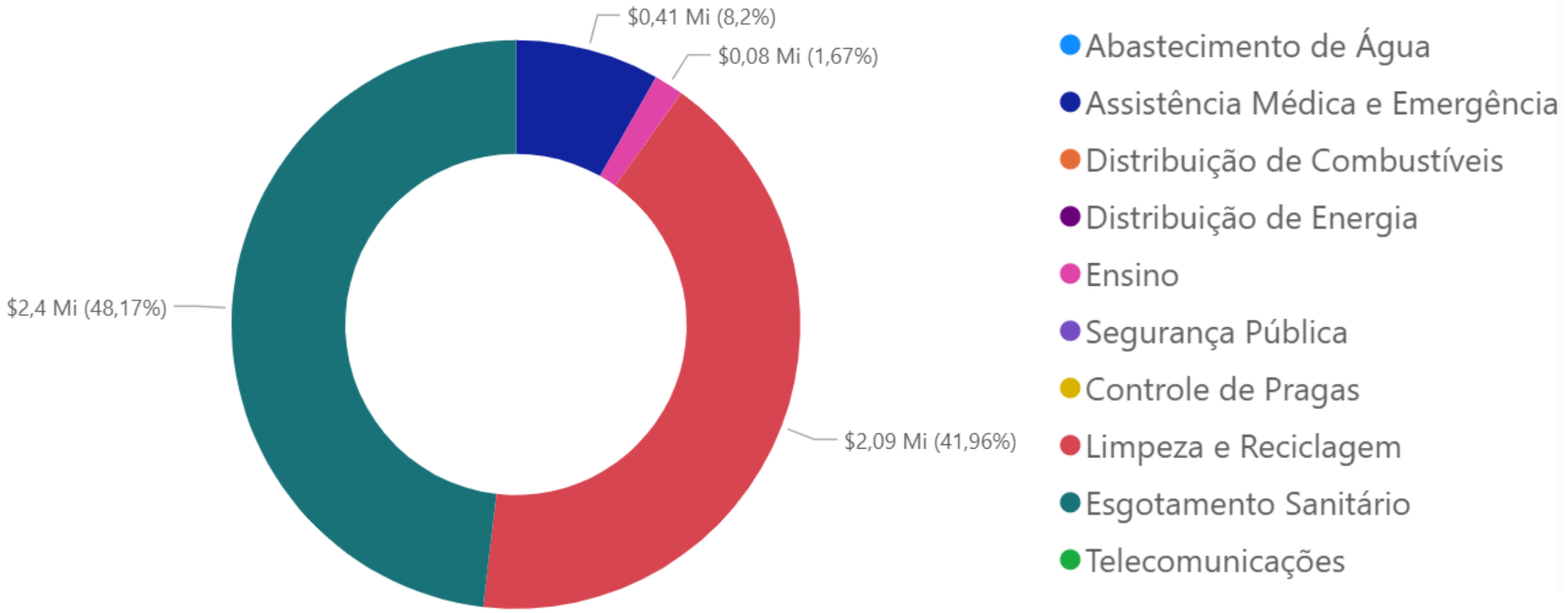
Danos Humanos por Desastres em Macaé-RJ: 2004 - 2025



Fonte: Atlas Digital de Desastres no Brasil (https://atlasdigital.mdr.gov.br)

Prejuízos dos Desastres em Macaé-RJ: 2004 - 2025

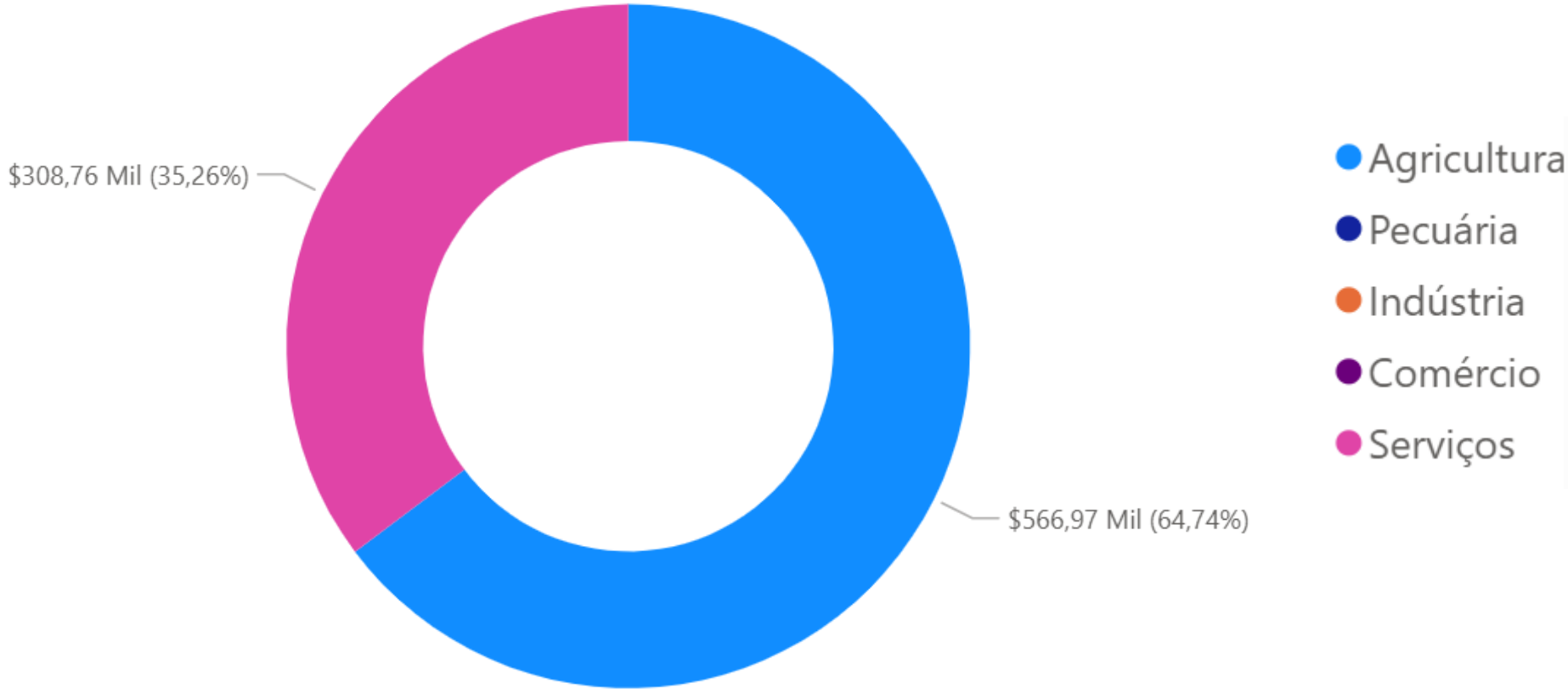
Prejuízo público, por categoria:



Fonte: Atlas Digital de Desastres no Brasil (https://atlasdigital.mdr.gov.br)

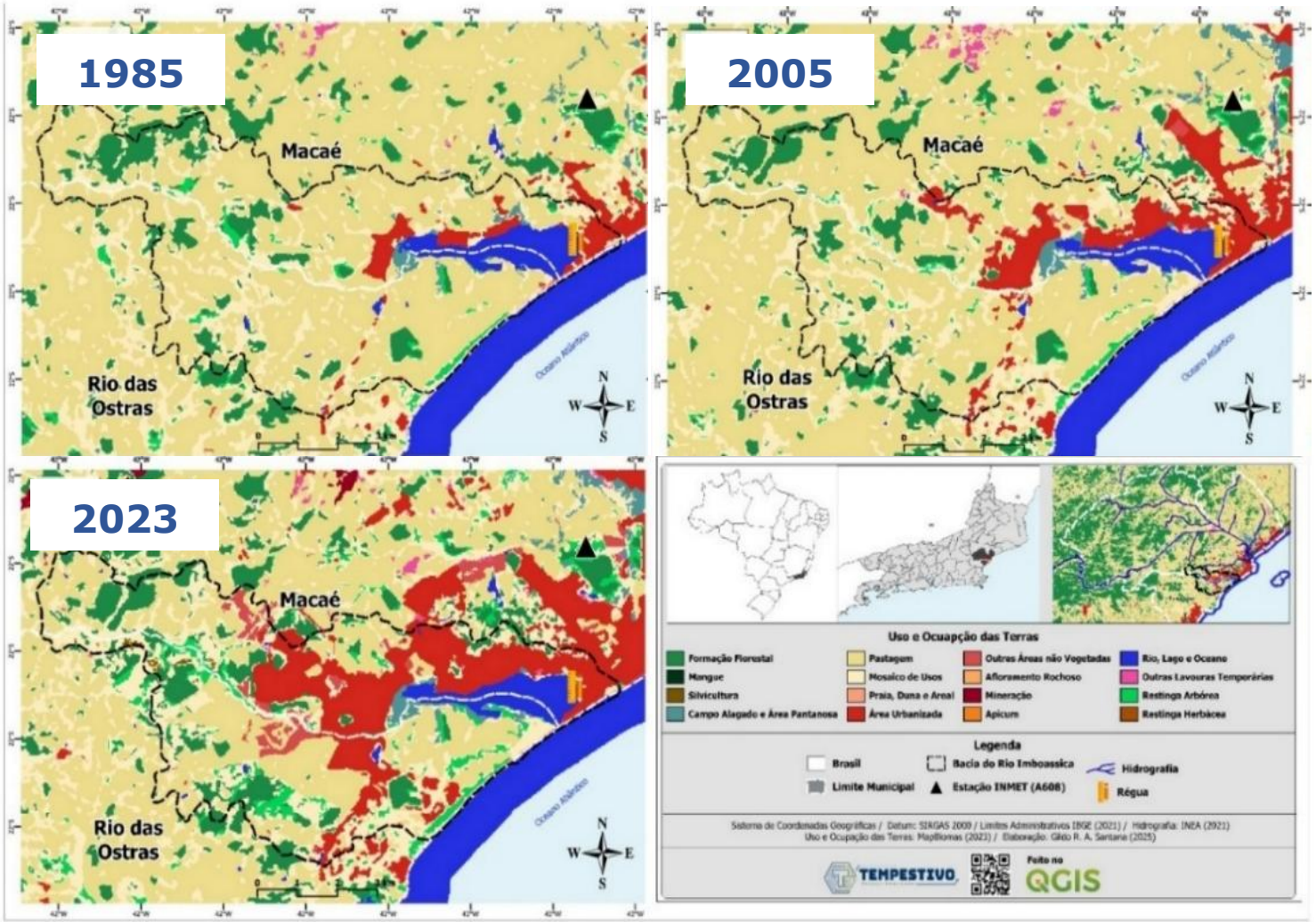
Prejuízos dos Desastres em Macaé-RJ: 2004 - 2025

Prejuízo privado, por categoria:



Fonte: Atlas Digital de Desastres no Brasil (https://atlasdigital.mdr.gov.br)

Bacia Hidrográfica do Rio Imboassica

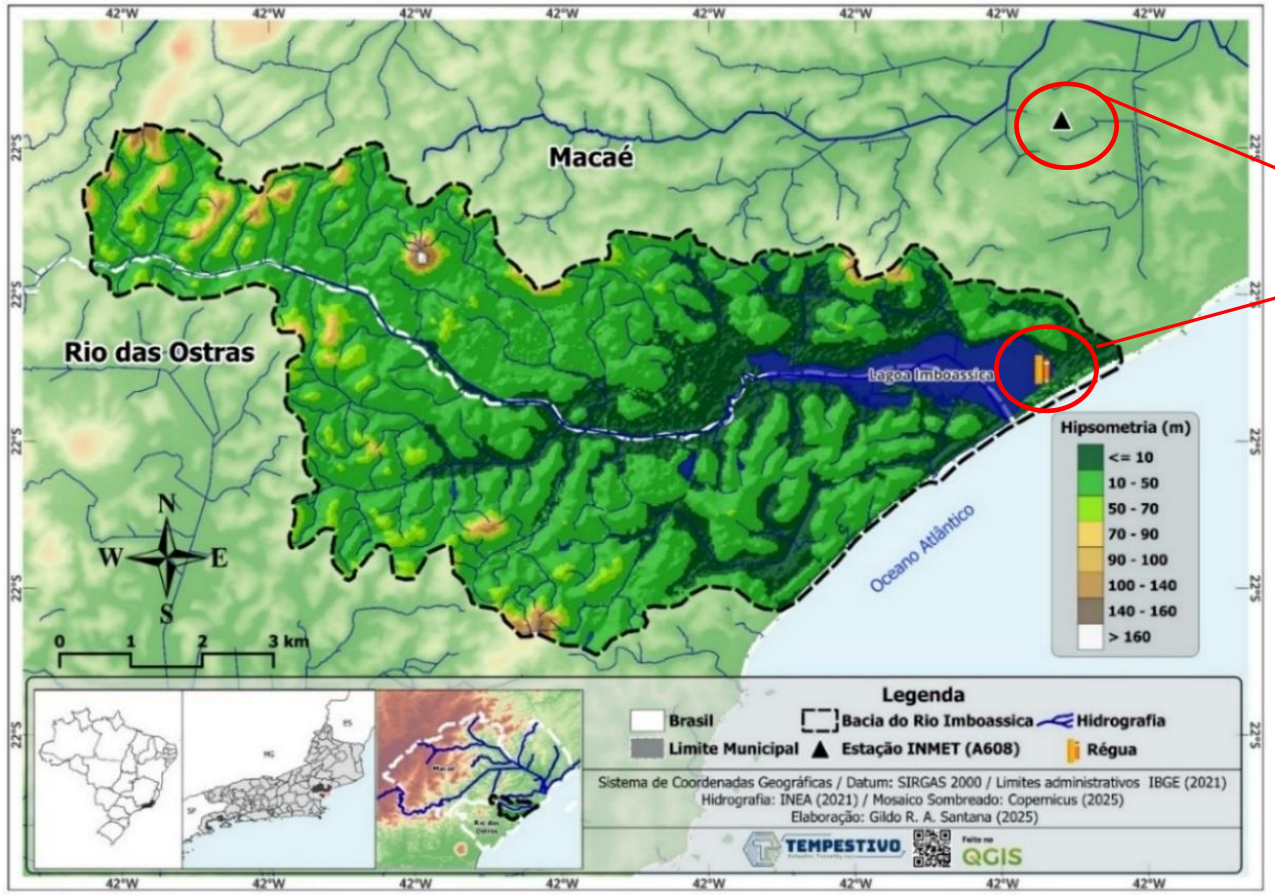


Fonte: Adaptado de Viana, Santana e Santos (2026, artigo submetido).

Uso e ocupação das terras na **Bacia Hidrográfica do Rio Imboassica** nos anos de 1985, 2005 e 2023.

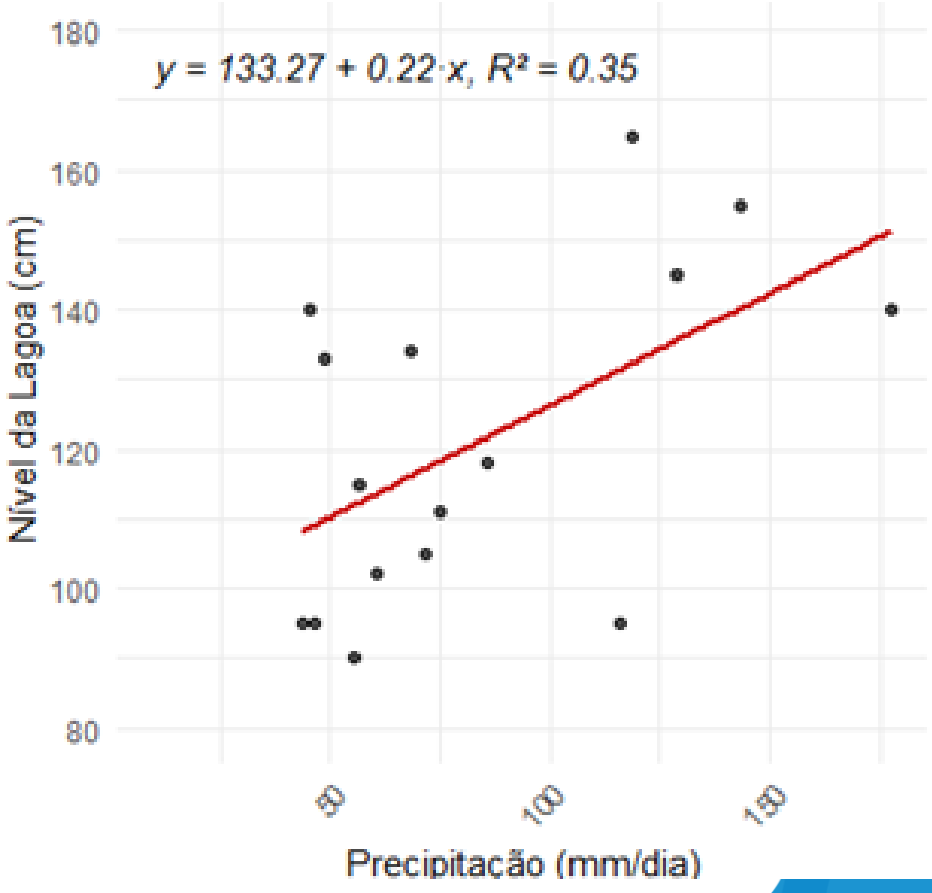
Bacia Hidrográfica do Rio Imboassica

Mapa hipsométrico da Bacia Hidrográfica do Rio Imboassica



Fonte: Adaptado de Viana, Santana e Santos (2026, artigo submetido).

Matriz de correlação entre o nível da lagoa e as duas maiores precipitações diárias anuais.



Considerações Finais

- Mudanças climáticas estão **intensificando os eventos extremos de precipitação**, como chuvas intensas, alagamentos, inundações e movimentos de massa, **aumentando riscos socioambientais** na RH-VIII.

- Os registros de danos humanos e prejuízos econômicos reforça a necessidade de políticas públicas voltadas para prevenção, mitigação e adaptação.

Somente por meio de uma **gestão integrada e participativa**, articulando ciência, gestão pública e sociedade civil, será possível enfrentar os desafios impostos pelas mudanças climáticas.