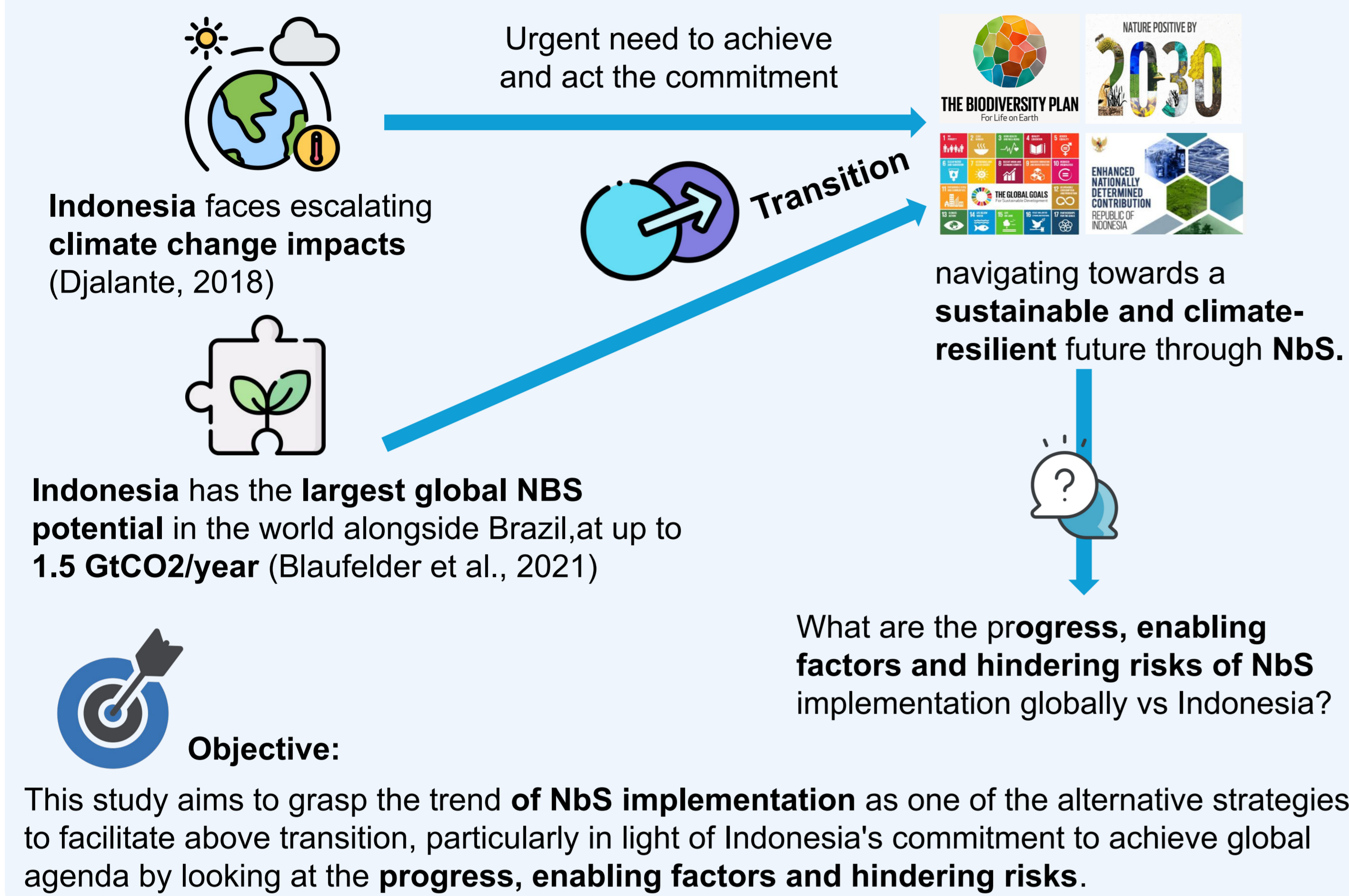


# Navigating Indonesia's Sustainable and Climate-resilient Future through Nature-based Solutions (NbS): A Systematic Literature Review

TRI ATMAJA

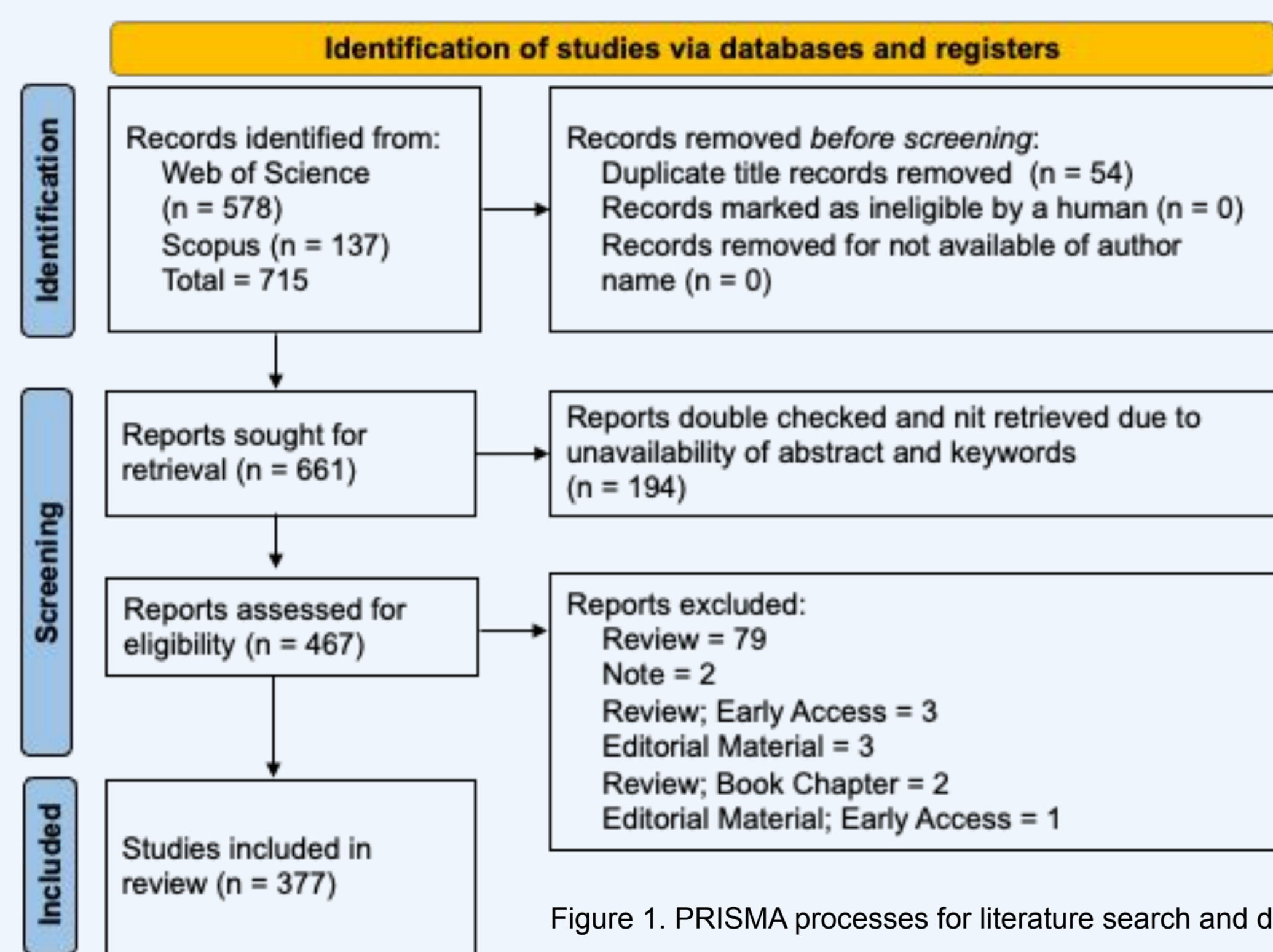
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## Introduction



## Methodology

- Research Focus:** Systematic literature review on NbS implementation in attaining Sustainable and Climate-resilient Future globally and emphasize in Indonesia case.
- Focus:** NbS progress toward global agenda and its enabling factors and hindering risks
- Sampling:** literatures from WoS and Scopus (~ 07-06-2024) with total 715 documents
- Tools:** PRISMA method for systematic review following Page et al., (2021) and Deductive Content Analysis (DCA) following Moldavska & Welo (2017). Figures created by a Python.



Keyword: ("nature-based solution" OR "NBS" OR "NbS" OR "ecosystem-based adaptation" OR "nature-based adaptation" OR "natural climate solutions" OR "nature-based climate adaptation" OR "biodiversity-based solutions" OR "climate-resilient landscapes" OR "community-based adaptation" OR "climate adaptation strategies" OR "ecosystem management" OR "nature-based urban solutions" OR "environmentally sustainable practices" OR "nature-based economic solutions") AND ("NDC" OR "nationally determined contribution" OR "climate targets" OR "Paris Agreement" OR "climate commitments" OR "national action plan" OR "emission reduction target" OR "climate action plans" OR "Sustainable Development Goal" OR "SDG" OR "nature-positive 2030" OR "nature-positive" OR "biodiversity framework" OR "climate-resilient" OR "climate-resilient development") OR ("No Poverty" OR "Zero Hunger" OR "Good Health and Well-being" OR "Quality Education" OR "Gender Equality" OR "Clean Water and Sanitation" OR "Affordable and Clean Energy" OR "Decent Work and Economic Growth" OR "Industry, Innovation and Infrastructure" OR "Reduced Inequality" OR "Sustainable Cities and Communities" OR "Responsible Consumption and Production" OR "Climate Action" OR "Life Below Water" OR "Life on Land" OR "Peace, Justice and Strong Institutions" OR "Partnerships for the Goals") AND ("extreme event" OR "extreme precipitation" OR "extreme temperature" OR "flood" OR "storm surge" OR "cyclone" OR "drought" OR "sea level rise" OR "heat stress" OR "land slide" OR "erosion")

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## Results

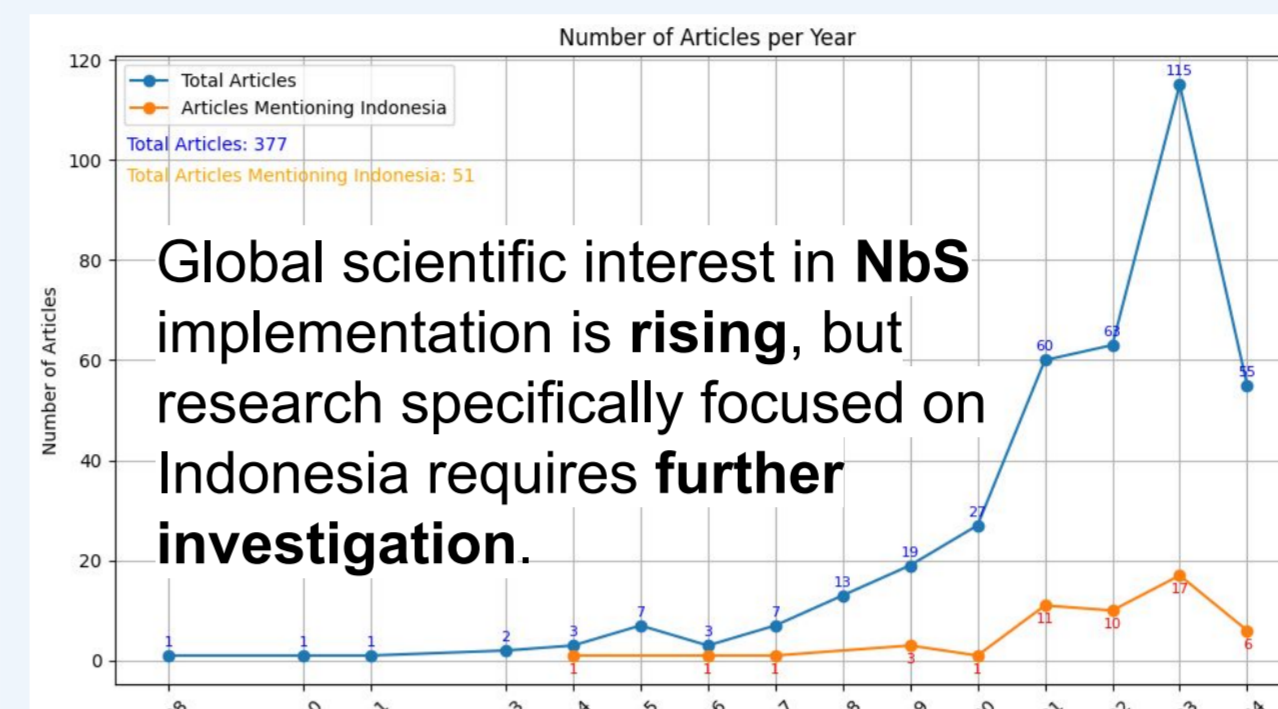


Figure 2. Number of article per year

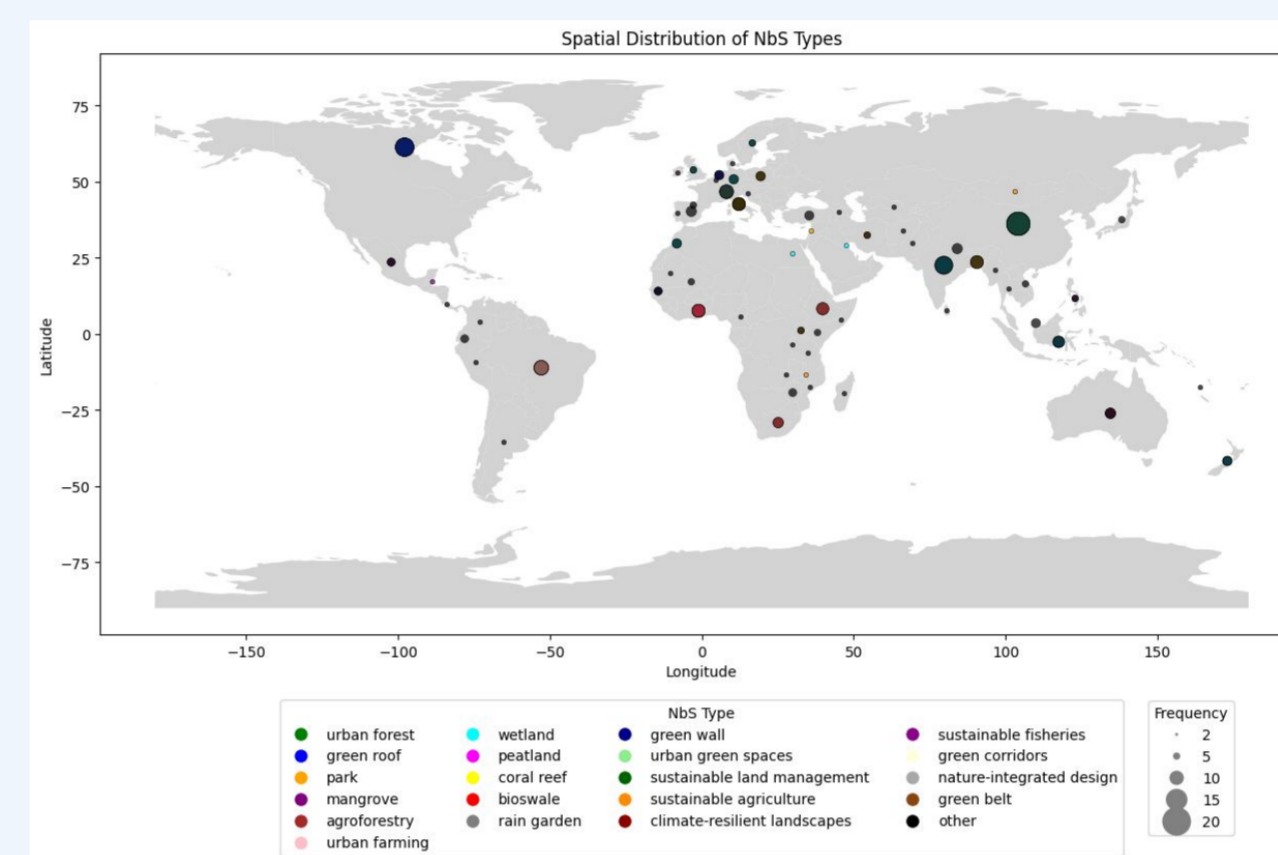


Figure 4. Spatial Distribution of NbS Types

**Based on Figure 5:** NbS can address various climate drivers, especially flood, with five NbS interventions listed to mitigate it. These interventions include mangrove, green roofs, park, and wetland (Chausson et al., 2020). Moreover, wetland is the most NbS type employed in addressing various climate drivers (Seifollahi-Aghmiuni et al., 2019). Agroforestry and sustainable agriculture are highlighted as NbS for drought (Lee & Song, 2024).

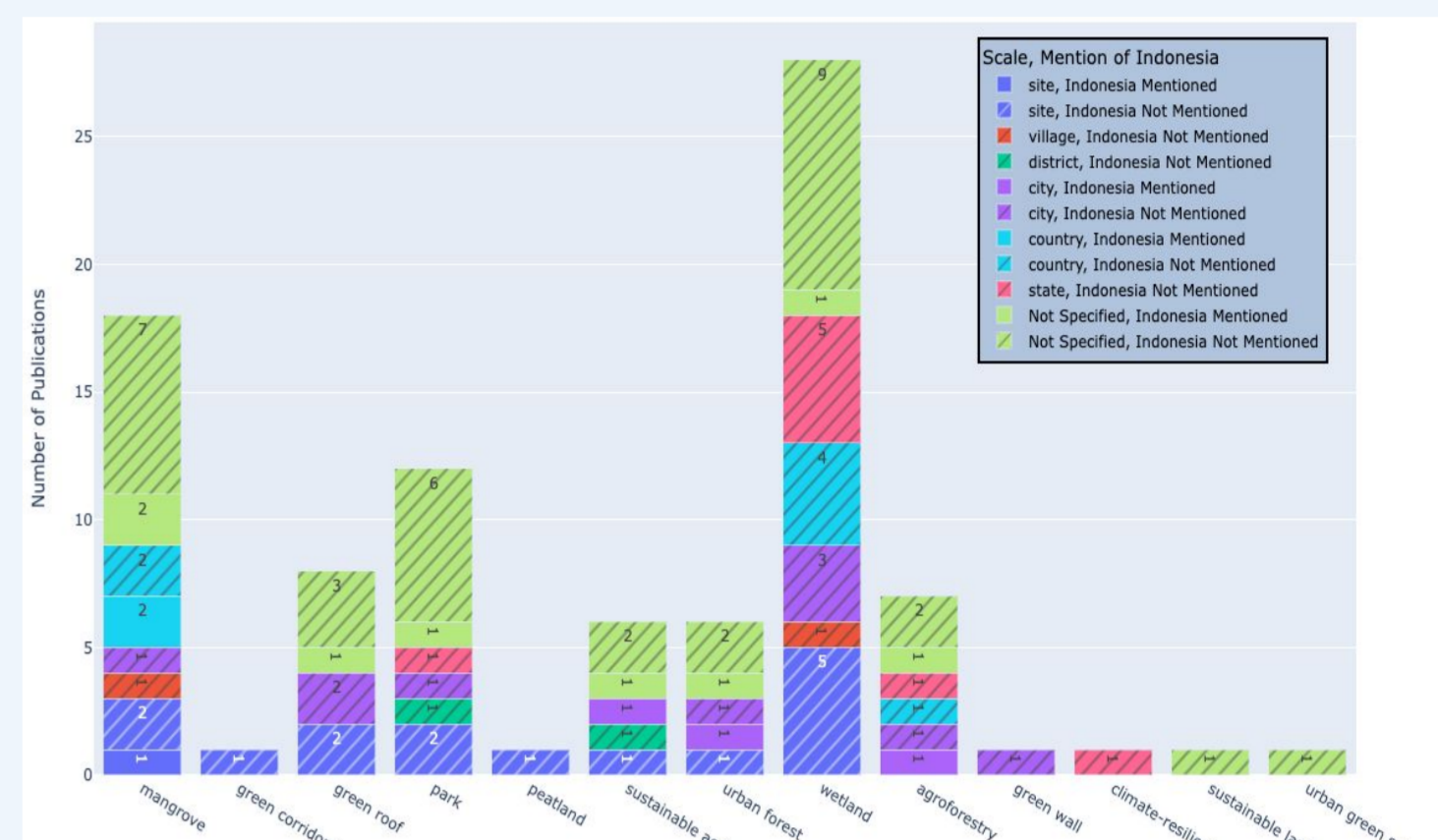


Figure 3. NbS Types and Their Scale Variation

**Based on Figure 3 and 4:**

- Mangrove and wetland:** most discussed NbS type globally and in Indonesia, as the most potential NbS (Arifanti et al., 2022)
- NbS concentrated at the site and city scale.**
- Figure 4 highlights the global spread of various NbS. There are 51 out of 377 cases mentioned Indonesia. Other studies predominantly were conducted in China (26 cases), Canada (11), India (15), US (13), and Brazil (10).

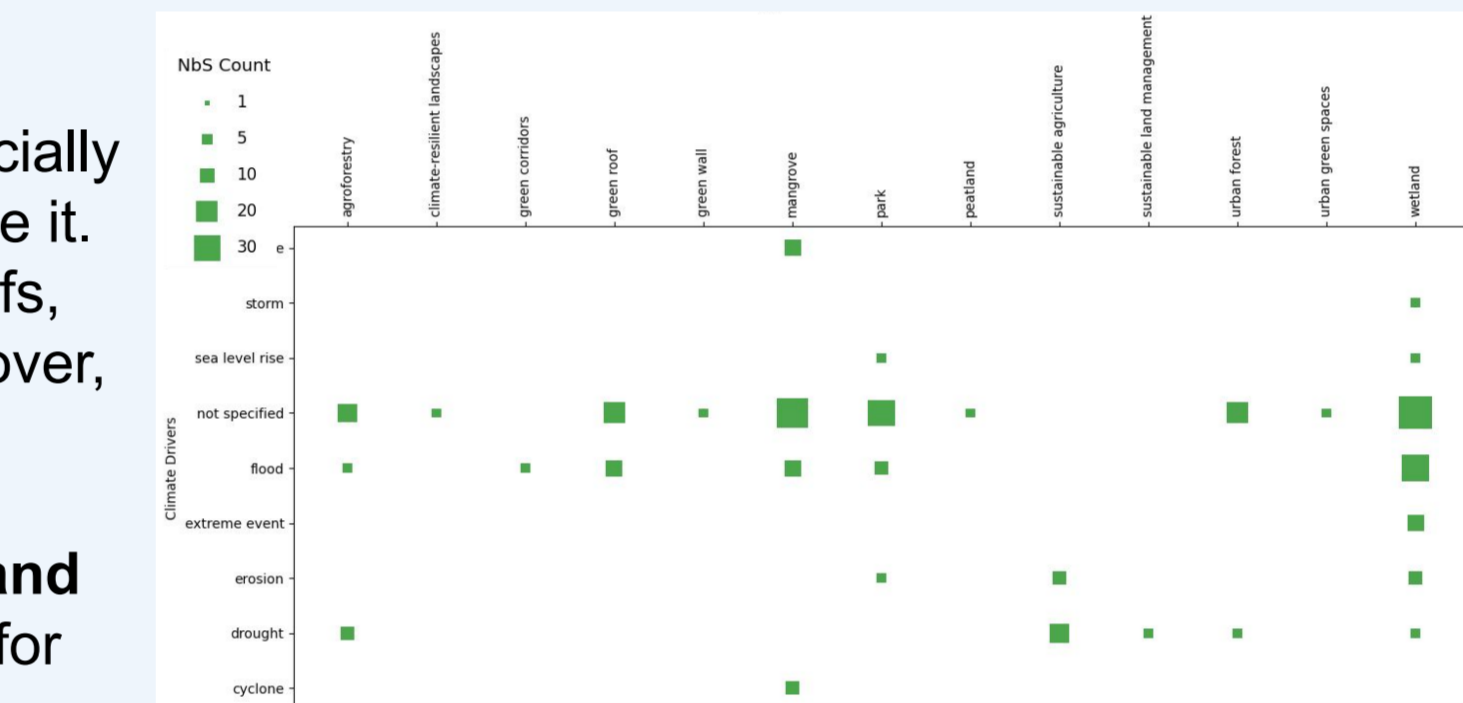


Figure 5. NbS implementation with each scale

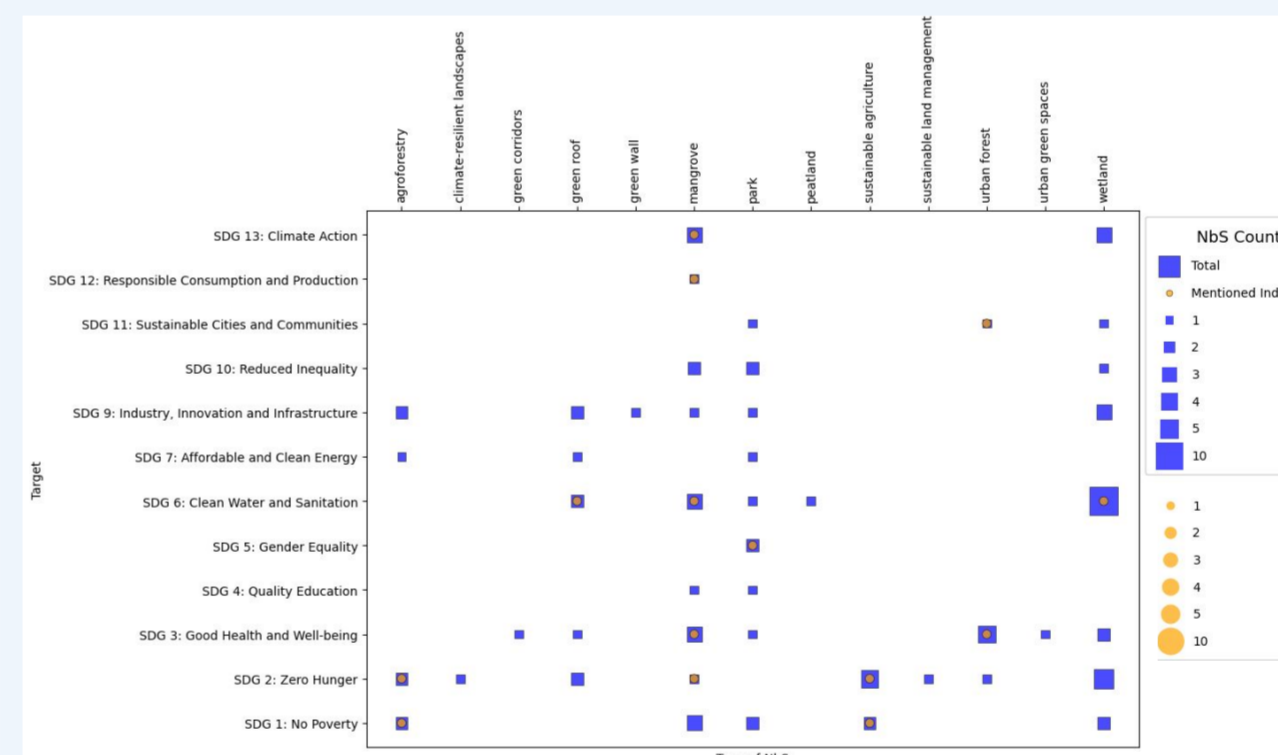


Figure 7. Type of NbS toward SDGs indicator (Total NbS: 91)

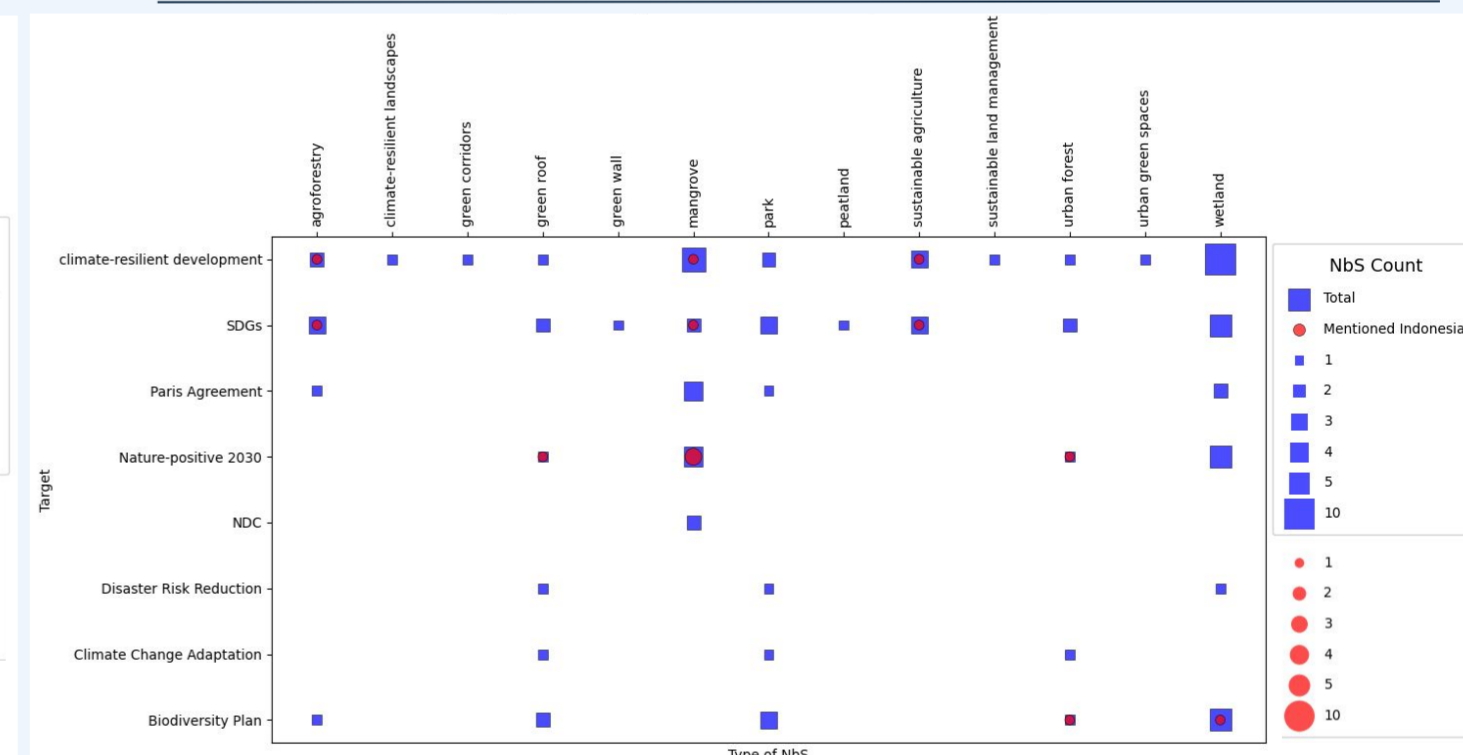


Figure 6. Type of NbS vs Targets (Total NbS counts: 90)

**Based on Figure 6 and 7:**

- NbS are extensively recognized and utilized as one of the alternative strategies for achieving global target including socio-economic and climate challenges (Kabisch et al., 2016).
- Diverse NbS applications across SDGs targets, counted 12 out of 17 goals.
- Significant mention of NbS in Indonesian Context to focus on SDG 2 (Zero hunger), 6 (Good health and well-being), and 6 (Clean water and sanitation). This reflects the relevance and adoption of NbS in Indonesia's national strategies for sustainable development (Hole et al., 2022).

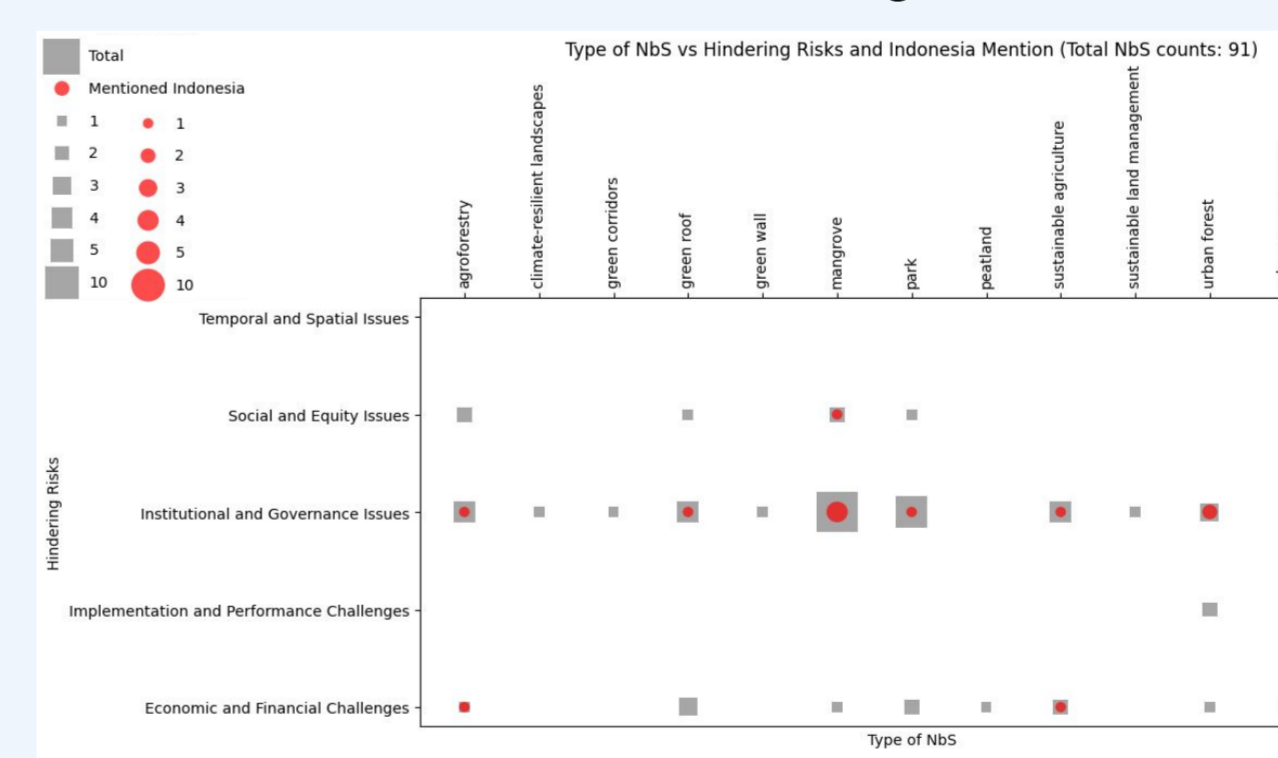


Figure 8. Hindering risk of NbS implementations (n case = 91)

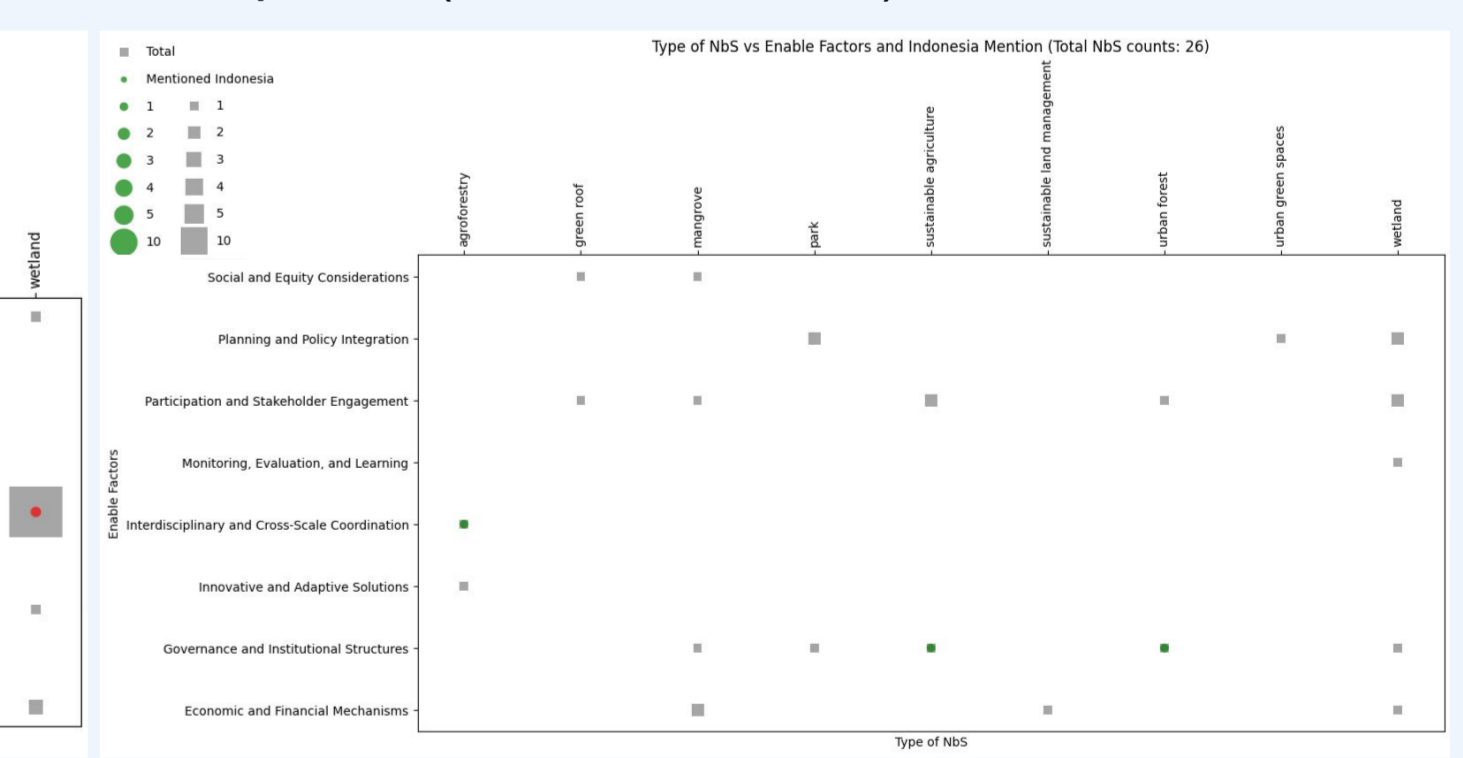


Figure 9. Enable factors of NbS implementations (n case = 26)

**Based on Figure 8 and 9:**

- Effective participation and engagement of stakeholders are essential for enabling NbS like agroforestry (i.e., *Pengelolaan Hutan Bersama Masyarakat*) and urban green spaces (i.e., Urban farming), while still having limited of coordination can hinder these initiatives (Sarabi et al., 2019).
- Robust economic and financial mechanisms support NbS implementation, yet economic challenges often impede the progress of solutions such as mangroves (Favero & Hinkel, 2024).
- Strong planning and policy frameworks facilitate the successful implementation of NbS, whereas inadequate governance structures can significantly obstruct NbS projects (Nesshöver et al., 2017).

## Conclusion

This study highlights the potential of Nature-based Solutions (NbS) for Indonesia's sustainable and climate-resilient future. While global interest in NbS is rising, research specific to Indonesia is limited. Mangrove and wetland ecosystems are key NbS types, addressing climate challenges like flooding and drought. Integrating NbS into national strategies for SDGs is crucial, but challenges like stakeholder engagement and governance exist. By identifying enabling factors and hindering risks, this study provides insights to enhance NbS adoption in Indonesia and globally for sustainable development and climate resilience.

## Acknowledgments

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