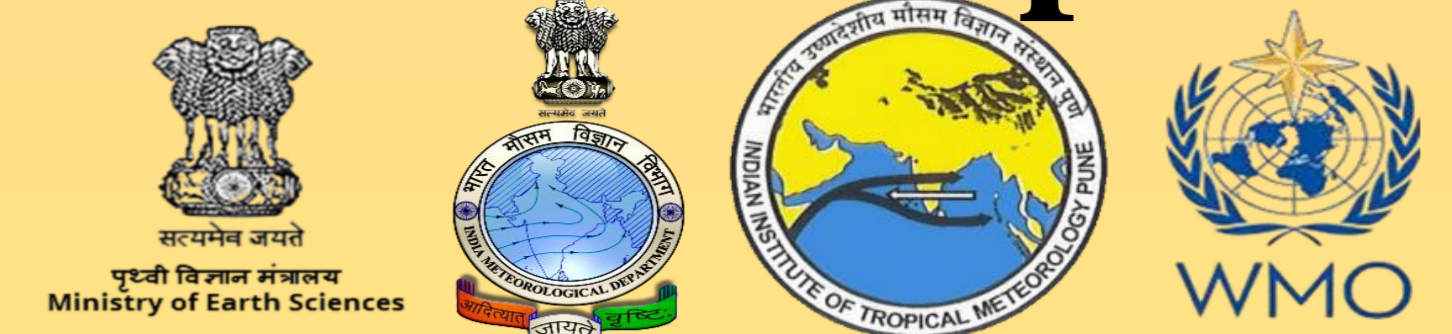


A Research Mapping of CMIP6 and its Socioeconomic Impacts

Dhumal Ankita¹ and Chakraborty Arnab¹

Indian Institute of Tropical Meteorology, Pune, India

Contact: dhumalankita@gmail.com



Abstract

The study on CMIP6 research shows that publications are growing at a rate of 56.4% each year, with 878 papers published since 2016. The main topics include climate change, precipitation, and temperature, with ScenarioMIP driving advancements in climate modeling. There is strong international collaboration, with 40.55% of papers co-authored by multiple researchers, and an average of 6.11 authors per paper. China leads in research output, while India shows potential for growth with 631 citations and 10.5 citations per article. Journals in climatology and sustainability play a key role, and AI and predictive modeling are emerging as future research areas.

Introduction

The Coupled Model Intercomparison Project Phase 6 (CMIP6) is a cutting-edge climate modeling framework that enhances weather forecasting accuracy through improved simulations and datasets. Accurate climate predictions are crucial for agriculture, disaster management, energy, water resources, and public health, helping mitigate risks from floods, droughts, and extreme weather events.

This study maps the role of CMIP6 in forecasting climate patterns and its socioeconomic impact, highlighting its contributions to climate risk assessment, early warning systems, and sustainable development. By improving decision-making, resource allocation, and resilience, CMIP6 benefits policymakers, industries, and communities.

Objectives

- Analyse publication trends on CMIP6-based weather forecasting and socioeconomic impact.
- Map key authors, institutions and collaboration networks in the research field.
- Identify key research themes and emerging topics in the domain.

Research Methodology

This study employs a scientometric analysis using the Web of Science database, retrieving 878 research papers through a keyword-based search on CMIP6 and socioeconomic impact. Articles in English and published between 2016 – 2024 are included in this study. A manual screening process was conducted to ensure relevance. Bibliometric tools like Biblioshiny and Ms-Excel were used to analyse the data.

Overview

The field has experienced rapid growth with a 56.4% annual increase, resulting in 878 publications since 2016. A strong academic influence is evident, with an average of 17.81 citations per document, supported by a well-established knowledge base of 37,277 references. High levels of collaboration characterize the research, with an average of 6.11 co-authors per document and 40.55% international co-authorship. Single-authored studies are rare, with only 11 such documents, highlighting the multidisciplinary nature of this domain.

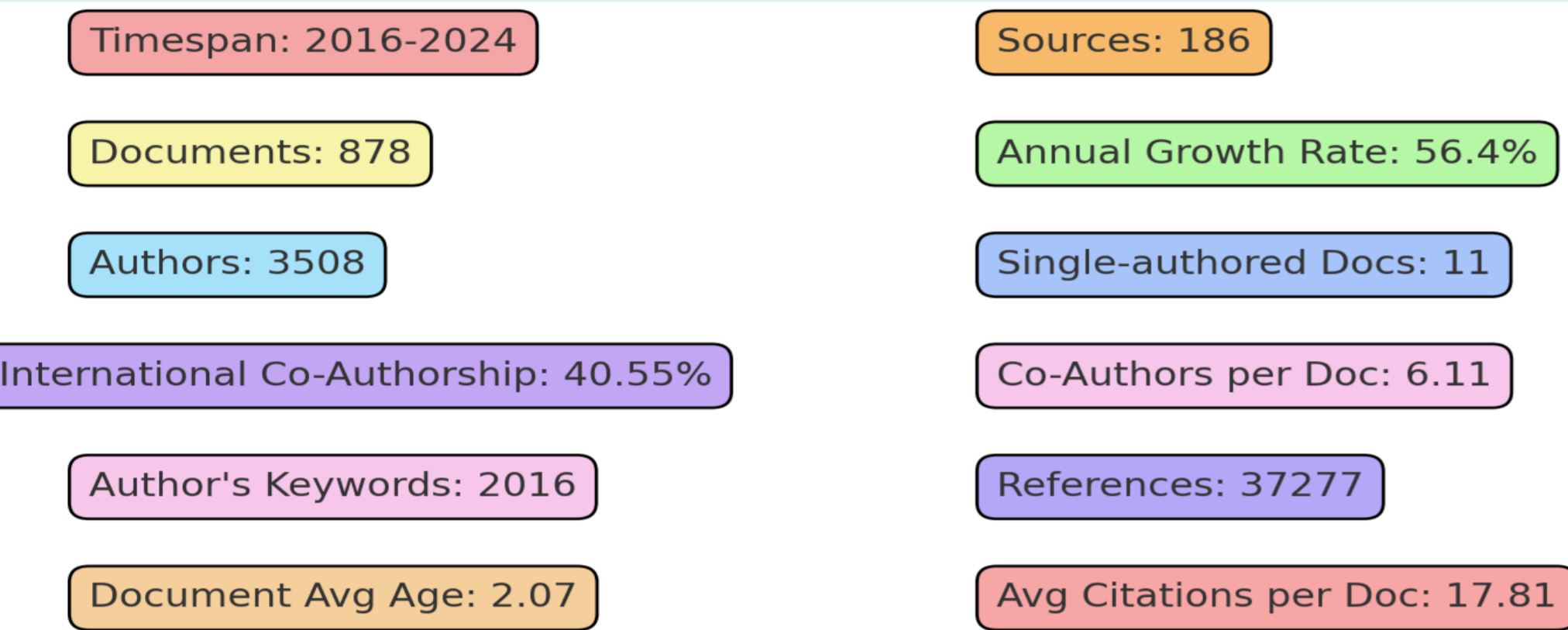


Fig 1: Overview (Web of Science)

Relevant Authors

WANG Y leads the field with 41 publications, followed by SHAHID S with 28, while other notable contributors include WANG G, CHEN X, LI Y, and ZHANG X. The prevalence of Chinese authors suggests a strong influence from Chinese researchers, reflecting global research trends. The field is highly collaborative and interdisciplinary, with shared authorship being a common practice.

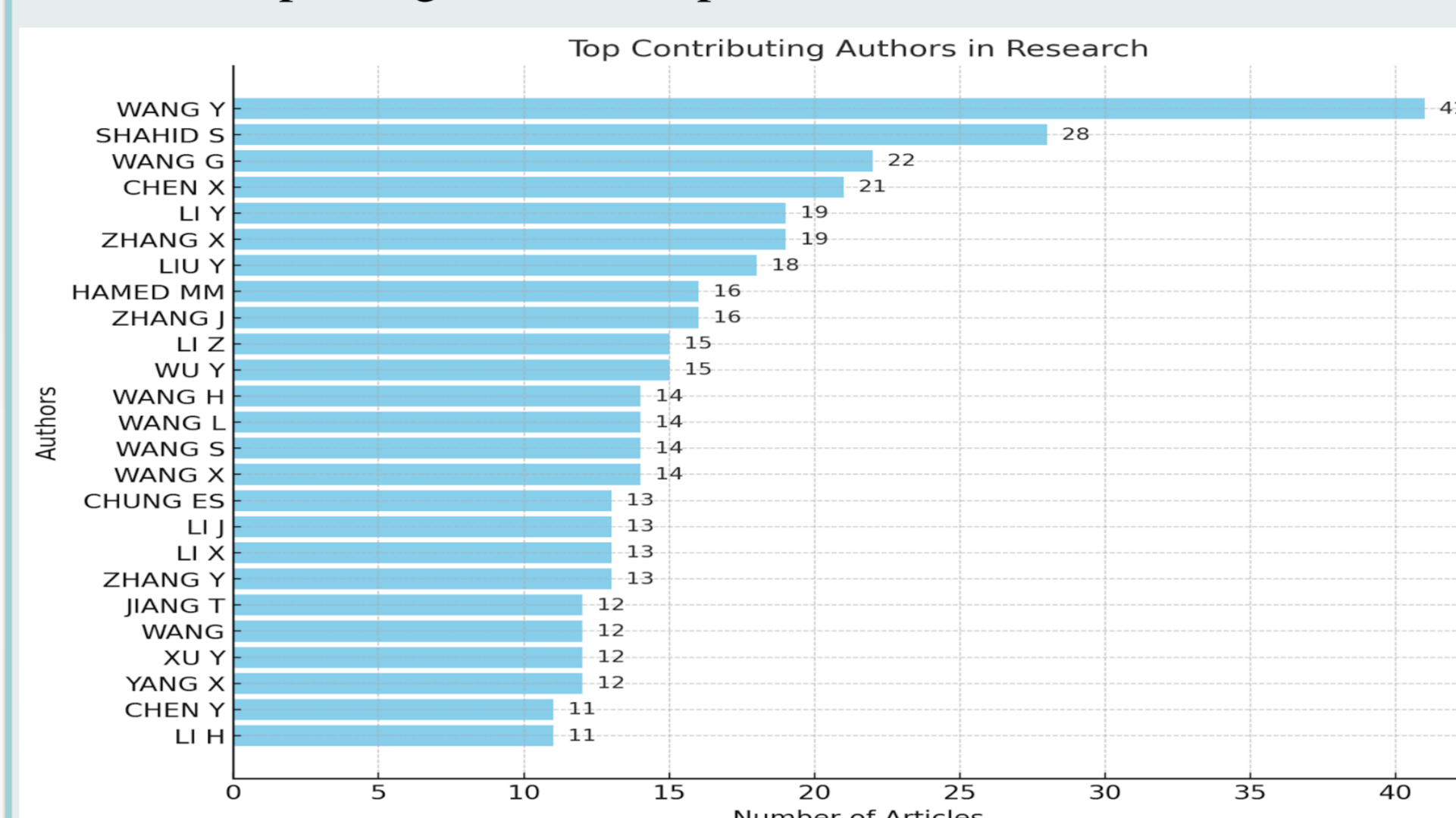


Fig 2: Relevant Authors (Web of Science)

Top Contributing Journals

The International Journal of Climatology leads with 53 publications, reflecting its influence in climate research. Climatology and environmental journals dominate, emphasizing atmospheric science and hydrology. Sustainability and water resource management highlight interdisciplinary research. Open-access sources shows high-impact global collaboration in climate science.

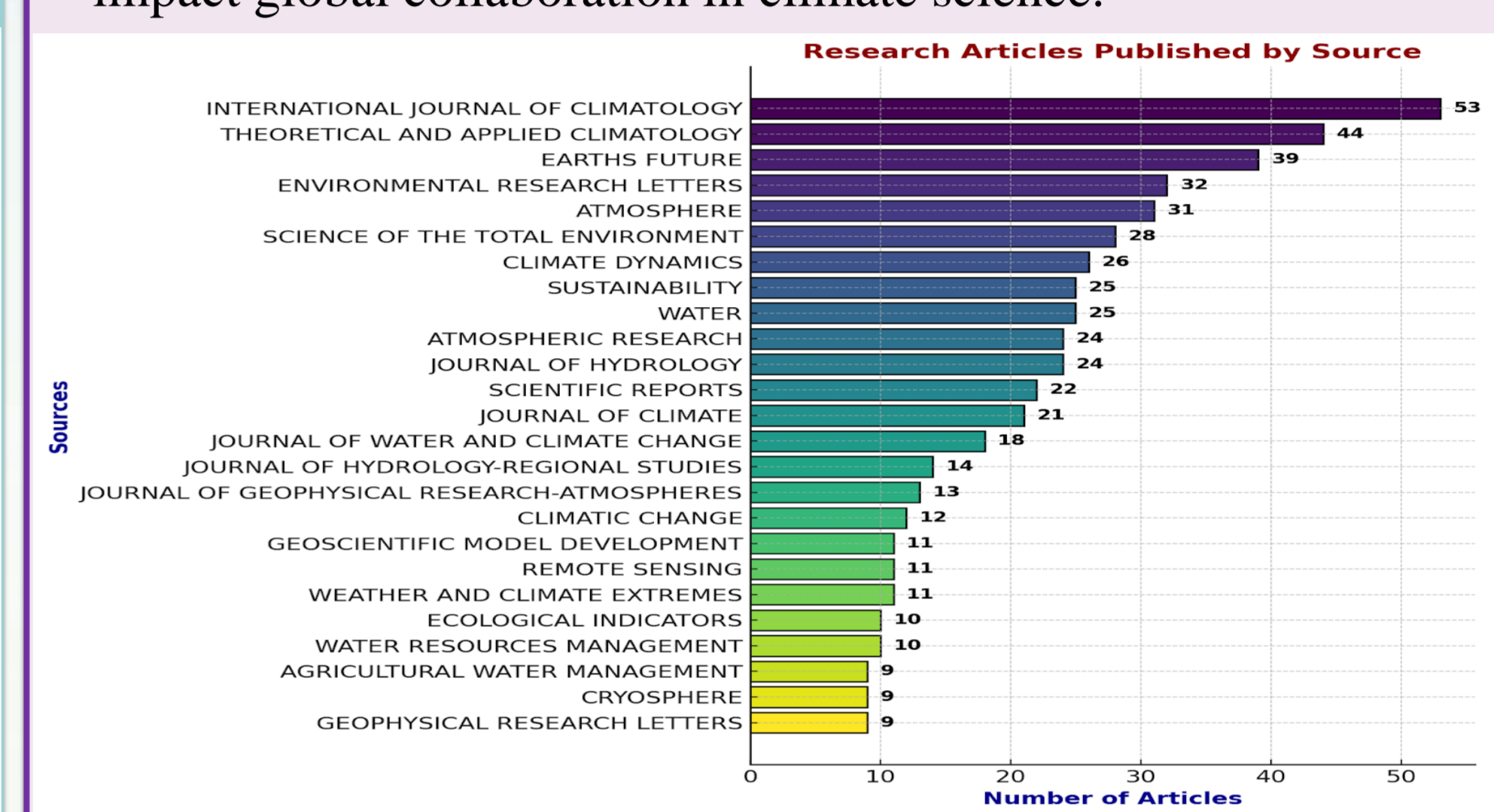


Fig 3: Top Contributing Journals (Web of Science)

Annual growth in the Research Domain

Research activity was slow from 2016 to 2019 but picked up after 2020 due to more recognition and funding. The field has now reached a critical point, with growing knowledge leading to fast advancements. The growth matches trends in areas like AI, renewable energy, and climate studies, where new breakthroughs attract more researchers and boost expansion.

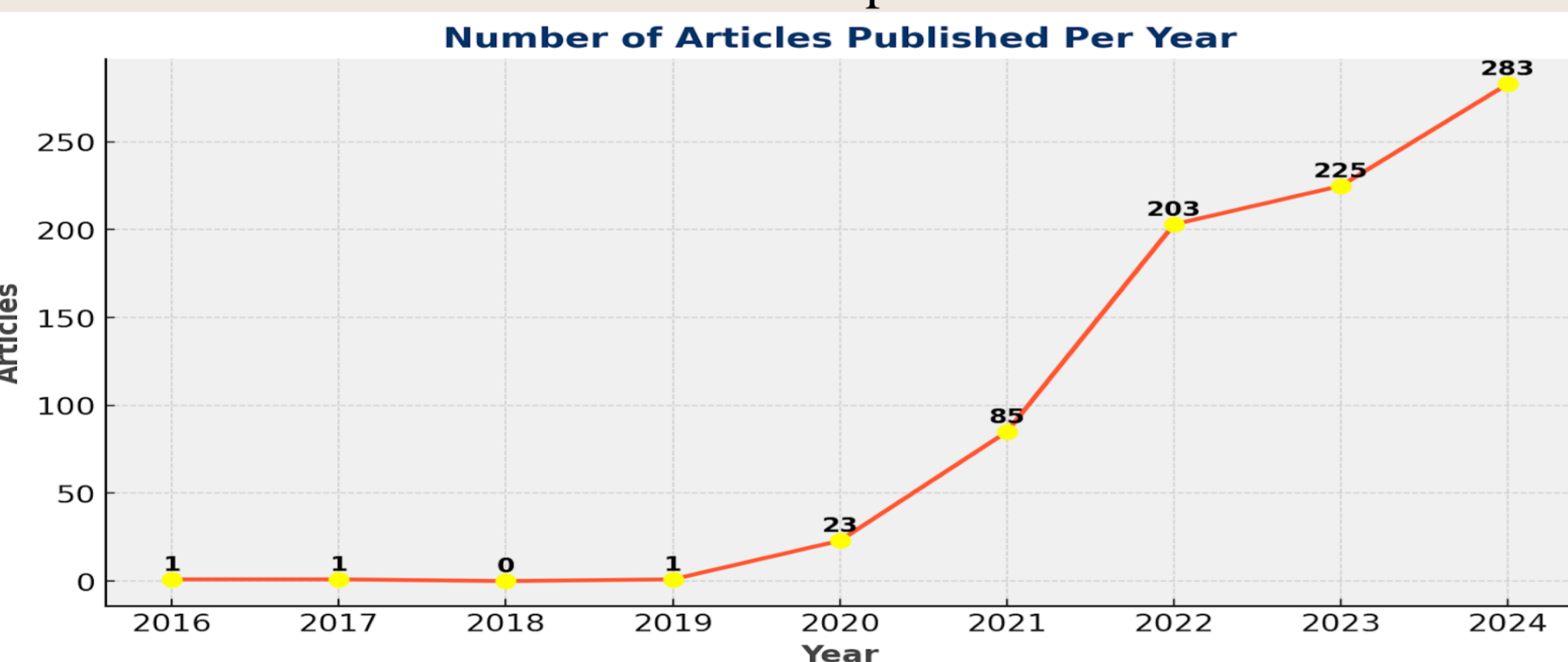


Fig 4: Annual growth in the research domain (Web of Science)

Research Collaboration Network

Researchers played an important role in connecting different research groups and encouraging collaboration across different fields. Their high PageRank values show their influence, while researchers with lower ranks may be newer or less collaborative. The network shows that some researchers specialize, while others act as important links between groups.

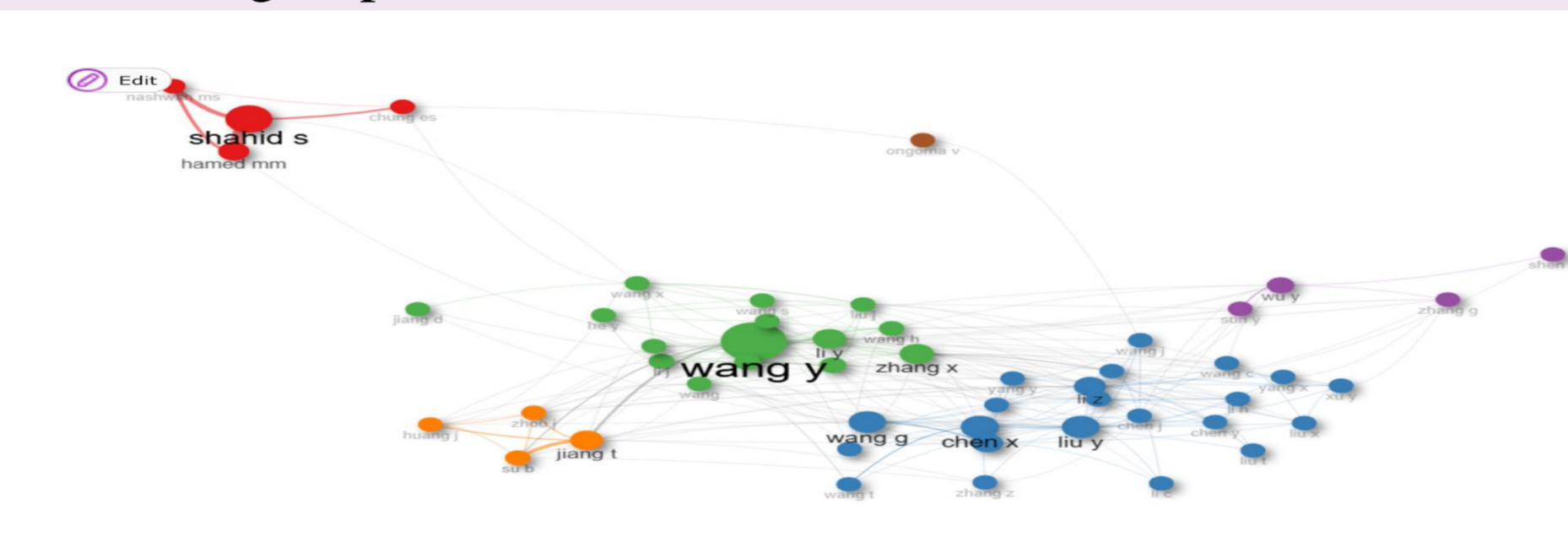


Fig 5: Research Collaboration Network (Web of Science)

Top Affiliations

Nanjing University of Information Science and Technology leads with 197 articles, underscoring China's dominance in climate research. Key contributors include Beijing Normal University, the Institute of Atmospheric Physics, and the Chinese Academy of Sciences. Seoul National University and the University of New South Wales highlight global collaboration. Engineering and hydrology institutes emphasize a multidisciplinary focus on sustainability and technology.

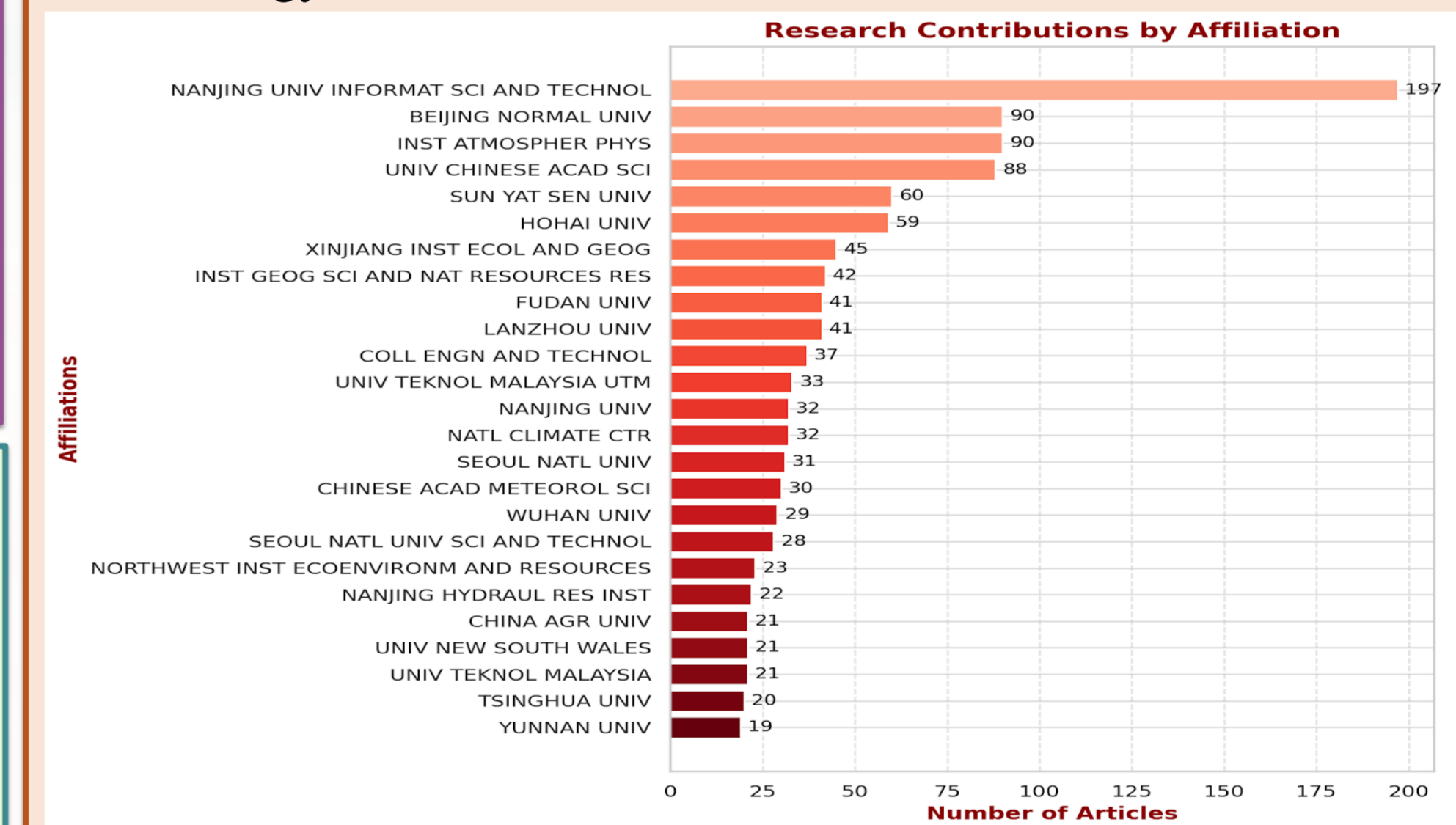


Fig 6: Top Affiliations (Web of Science)

Global Distribution of Research

High single-country publications (SCP) indicate strong domestic research infrastructure, while high multiple-country publications (MCP) signify active international collaboration. The data helps assess research strength, networking capabilities, and global engagement. Understanding collaboration trends enables institutions to enhance partnerships, improve research impact, and drive cross-border innovation.

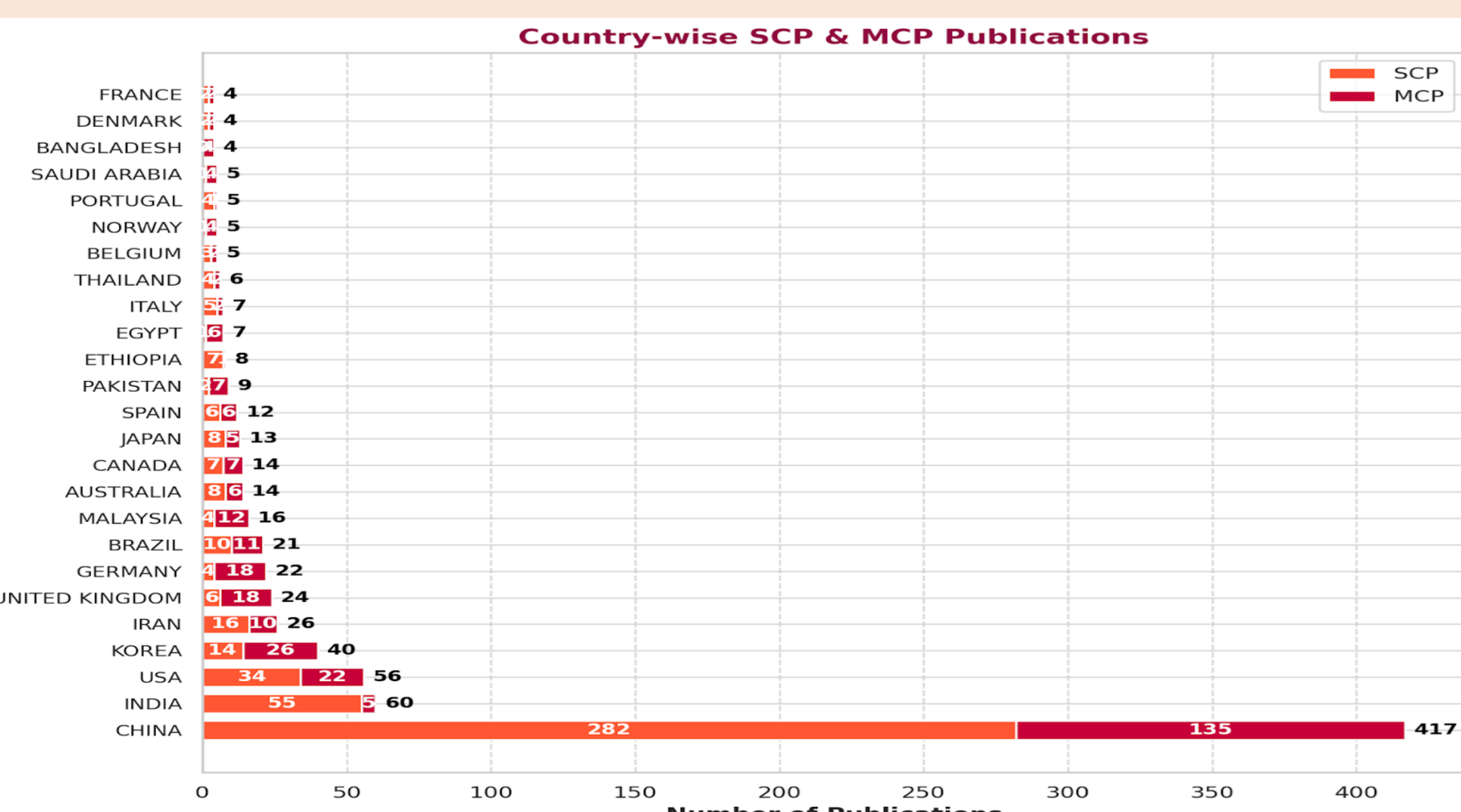


Fig 7: Countries Collaboration (Web of Science)

Trending Topics

Precipitation (221), temperature (191), and climate change (167) dominate climate research. Water-related themes highlight concerns over water availability and extreme weather. Model Intercomparison Projects (MIP) and ScenarioMIP indicate growing reliance on climate models. Aerosols peaked around 2020–2023, while climate change and precipitation remain dominant from 2022–2024. Emerging topics like identification suggest AI integration in future research. Climate and water-related studies will continue evolving with advanced methodologies.

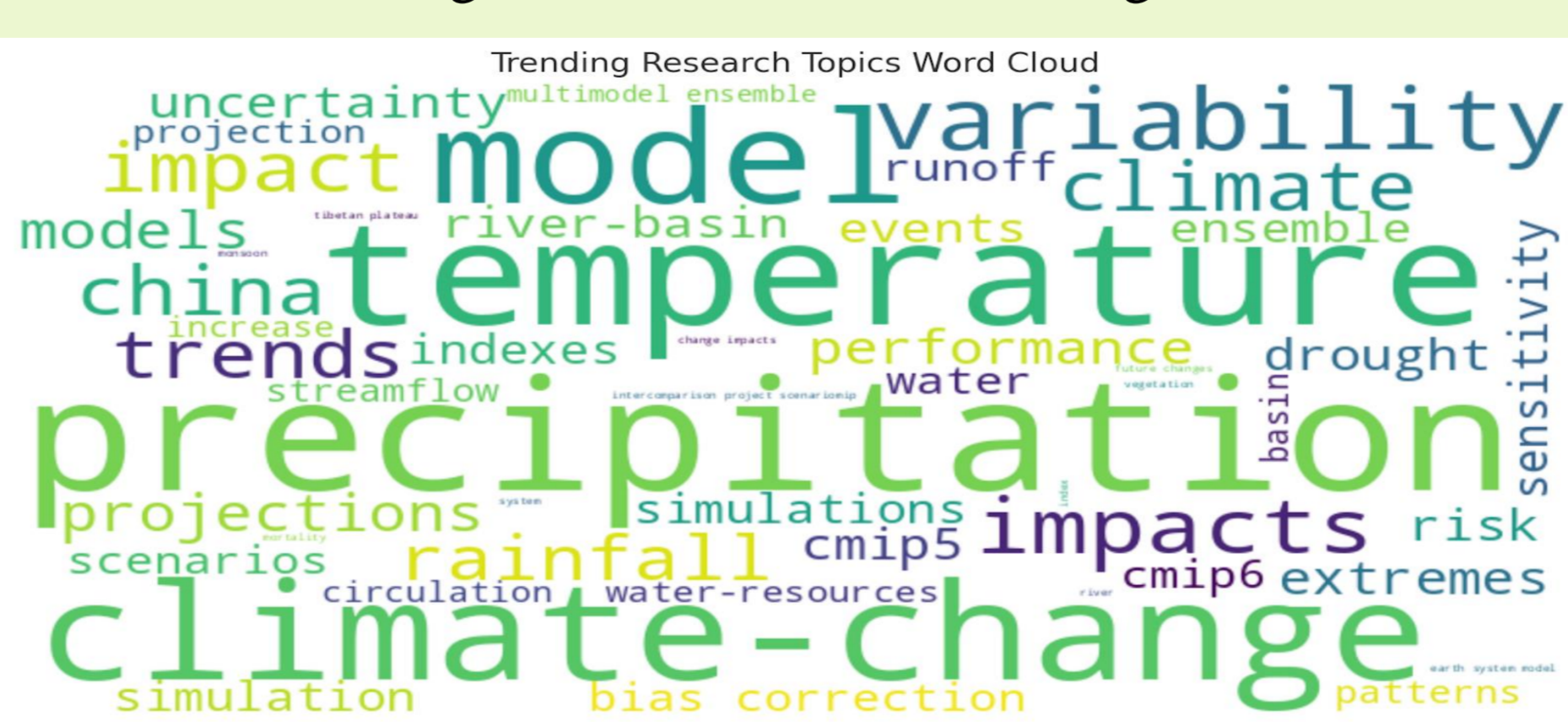


Fig 8: Trending Topics (Web of Science)

Most Cited Countries

Certain countries excel in both research output and impact, while others produce fewer but highly influential studies. India has strong total citations but lags in average citations per article, indicating room for impact improvement. Strengthening global collaborations and focusing on high-impact studies could enhance India's research influence.

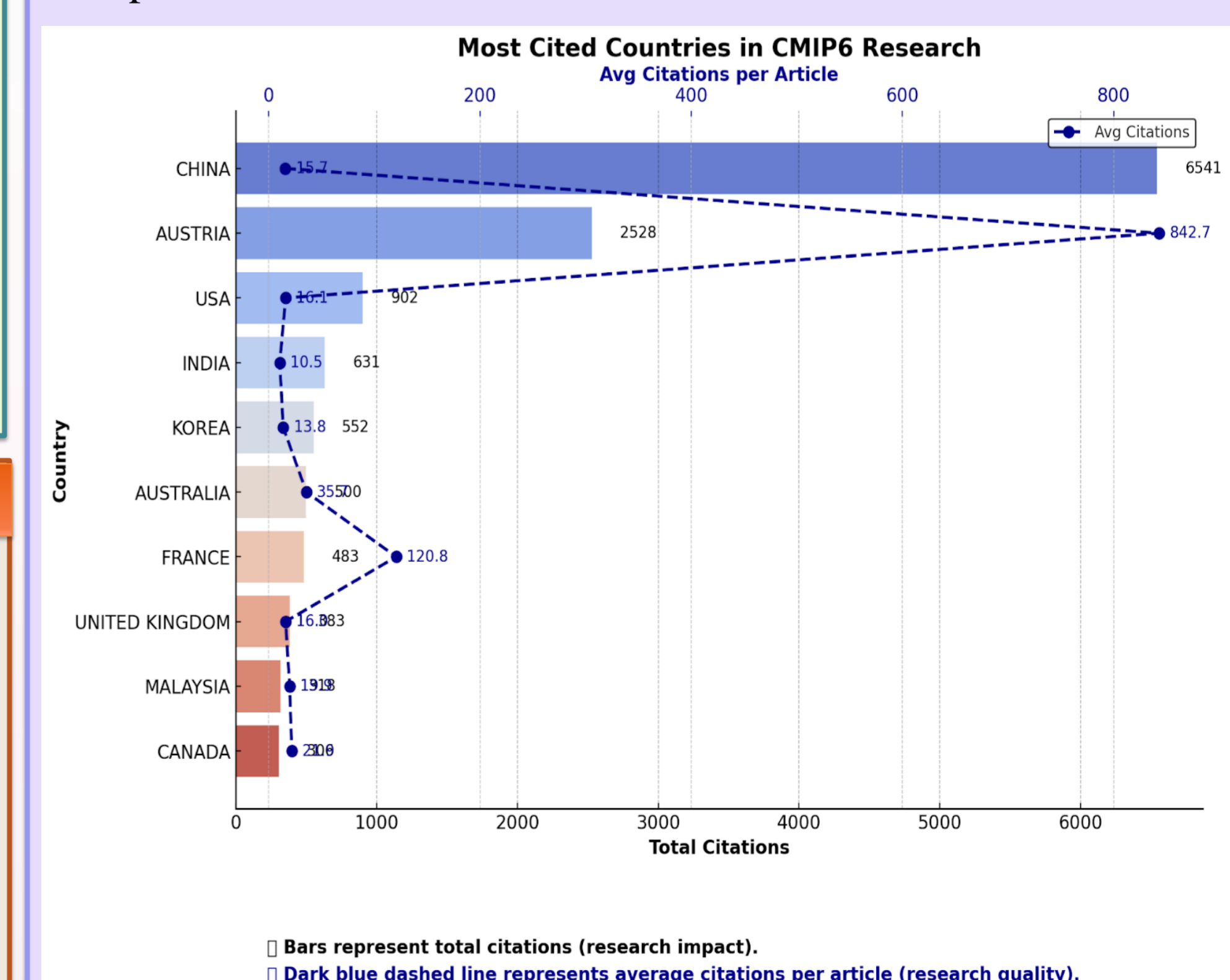


Fig 9: Most Cited Countries (Web of Science)

Conclusion

- Fast-growing field with 56.4% annual growth rate & 878 publications since 2016.
- Strong academic influence with 17.81 average citations per document.
- Key research themes include climate change, precipitation, and temperature.
- Increasing reliance on climate models like ScenarioMIP.
- High global collaboration, with China leading in output.
- India has opportunities to enhance its research impact by focusing on producing more high-quality, high-impact studies.
- Top journals focus on climatology, sustainability, and hydrology.
- Interdisciplinary research integrates hydrology, AI, and engineering.
- Emerging AI applications signal future research directions.

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