

Biodiversity Research in 2024

A global perspective with a
focus on Latin America





Preface

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The publication of this global report on biodiversity research, with a focus on Latin America, comes at a very timely moment. Not only we are approaching the discussions at the Biodiversity COP in Cali, Colombia, but we are also experiencing the effects of multiple environmental crises—particularly the climate, food, and water crises—that intersect with biodiversity loss and degradation. At this critical time for decision-making on investments in biodiversity conservation, having this state-of-the-art assessment is crucial.

The importance of biodiversity is increasingly evident. Beyond its intrinsic value and the significance of understanding the world we inhabit, biodiversity plays a crucial role in controlling zoonotic events, regulating the climate, ensuring food security, and promoting our well-being and health. In short, our survival depends on biodiversity. Awareness of this dependency likely explains one of the key findings of this survey: biodiversity research articles are 20% more frequently cited (or have greater impact) than those from other research areas.

As in other fields, scientific production in biodiversity is clearly linked to research infrastructure and investment, with more structured countries (particularly the United States, China, and European nations) having higher output, and in many cases, producing articles with greater impact and quality. However, it is important to highlight that research activity and growth in biodiversity are occurring more intensively in countries with high biodiversity. This is especially true in Latin America, which accounts for around 14% of global scientific output, with a particularly significant contribution from Brazil and Mexico (together responsible for 58% of Latin American production). This research is essential for expanding knowledge in regions of high biodiversity, such as the Amazon and Congo basins, as well as addressing areas at high risk of species extinction, like Brazil's Atlantic Forest or Southeast Asian forests.



58%

The share of Latin America's biodiversity research produced by Brazil and Mexico.

3x

Biodiversity articles are cited in policy documents three times more frequently than those in other fields.

This faster growth in knowledge within megadiverse countries is certainly due to national policies supporting research funding. In this context, Brazil stands out, with two of its national funding agencies ranked among the four most cited in biodiversity research (CNPq and CAPES), as well as a state agency (FAPESP, from São Paulo) ranked among the world's top 15. The existence of biodiversity research programs with consistent and substantial financial support over time, such as the Biota-FAPESP Program, is essential for establishing a local community capable of understanding its biodiversity. Only through such efforts we can promote participatory and inclusive conservation and restoration practices, as well as ensure the fair and equitable distribution of biodiversity benefits for human well-being.

As this report highlights, biodiversity research is inherently global and collaborative. However, it is crucial that biodiverse countries, especially those in the Global South, do not merely take a secondary role. They must take on (co-)leadership roles in these collaborations, bringing forward their own questions, needs, and societal challenges. A decolonial or anticolonial perspective must guide these international partnerships.

In this regard, it is also encouraging to see that biodiversity research is closely connected to public policy documents—10% of biodiversity articles are cited in policy documents, which is three times more frequent than in other fields. This relationship would likely be even stronger if we could more comprehensively map documents in different languages, considering policy documents at all scales (global, national, regional, and local).

The data from this report collectively indicate that biodiversity is a rich and fertile field for research and international collaboration, with significant potential to drive meaningful societal change. This knowledge must be fully considered to help us progress toward the targets set by the Global Biodiversity Framework.

Executive summary

This report reveals the current state of biodiversity research worldwide with an emphasis on Latin America. The analysis covers the impact of biodiversity research globally on science and policy.

Biodiversity research globally is characterized by above average scientific impact, with a Field-Weighted Citation Impact (FWCI) of 1.20.

Biodiversity research is characterized by a high degree of international collaboration, with 36% of global publications involving authors from more than one country. This trend is even more pronounced in regions such as Africa, Australasia, and the Middle East, where 64–68% of biodiversity research papers reflect cross-border partnerships. These high levels of collaboration highlight the global nature of biodiversity challenges and the shared efforts of scientists to address them through collective research initiatives.

Europe leads global biodiversity research, accounting for 32% of all publications in the field—nearly double that of the next highest region, the US & Canada, which contribute 17%. East Asia, including China, follows closely with 16%, while Latin America accounts for 11% of global output. Individually, the United States and China are the top contributors, with 27,000 and 25,000 published papers, respectively, followed by UK (12,000), Germany (11,000) and Brazil (10,000).

In recent years, Europe's lead has widened. Also output from East Asia has increased more rapidly compared to all other regions. While countries like US and China or regions like Europe lead in terms of output, it is the Global South that show a stronger focus on biodiversity: they contribute more to biodiversity research relative to their overall output across all disciplines—the so-called Relative Activity Index or RAI. Latin America has a RAI of three times the world average while Africa and Australasia have a RAI of two times the world average. In contrast the Middle East and East Asia have the lowest RAI (half the world average).

Biodiversity research demonstrates a significant impact on society, with 10% of publications being cited in policy documents—three times higher than the average citation rate across all disciplines. This highlights the importance of biodiversity research in informing and shaping public policy. Australasia and the US & Canada are particularly notable, with 20% and 15% of biodiversity research, respectively, being referenced in policy documents.



Latin America is a critical region for global biodiversity. Brazil and Mexico account for 58% of the region's research output, with a Field-Weighted Citation Impact (FWCI) close to the global average of 1.2. Although other Latin American countries contribute less in terms of volume, their FWCI is notably higher, ranging from 1.5 in Argentina to 3.2 in Bolivia.

In Latin America, 51% of biodiversity research publications involve authors from multiple countries, surpassing the global average of 36% for the field. The United States, United Kingdom, and Spain are the leading collaborators by volume. International collaborations from the region demonstrate strong impact, with Field-Weighted Citation Impact (FWCI) values ranging from 2 to 5. In terms of citation impact, China, South Africa, and Switzerland stand out as top partners.

Latin America contributes significantly to biodiversity research, publishing over three times the global average relative to its overall research output, with Panama and Bolivia leading the region. This research has a notable impact on global policy, with 8.5% of Latin American biodiversity studies cited in policy documents, approaching the global average of 10%. This is also considerably higher than the 3.7% of all Latin American research referenced in policy documents.

32%

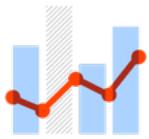
of global biodiversity research publications come from Europe.

11%

come from Latin America.

Key findings

Global biodiversity research is characterized by:



Above average scientific impact

The FWCI for global research in biodiversity is 1.20, 20% above the overall average for research across all disciplines.



High level of international collaboration

Of all biodiversity research publications, 36% include authors from more than one country. This proportion is substantially higher than for research publications across all disciplines globally (21%). Biodiversity research publications from Africa, Australasia and the Middle East are highly international, with 64–68% including authors from more than one country.



Strong contribution from Europe

As a region, Europe contributes 32% of all biodiversity research publications, ahead of the US & Canada (17%) and East Asia (which includes China; 16%), with strong contributions from Latin America (11%) and Africa (6%). Among the top 20 most prolific countries, Switzerland, the Netherlands and Sweden lead in (field-weighted) citation impact.



High relative activity in key Global South regions

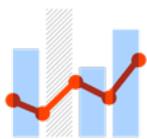
Latin America and Africa publish substantially more on biodiversity research than their overall contribution to global research, while East Asia and the Middle East publish relatively less.



Significant Impact on Policy

Of recent biodiversity research 10% is cited in policy documents, which is three times higher than for research across all disciplines. Australasia and the US & Canada stand out have remarkable high policy impact at 20%, respectively 15%.

Biodiversity research in Latin America demonstrates:



High scientific impact globally

In Latin America, Brazil and Mexico contribute 58% of all biodiversity research with a FWCI around the world average of 1.2. The other Latin American countries, while contributing less in numbers, have typically significantly higher FWCI, ranging from 1.5 for Argentina to 3.2 for Bolivia.



Strong international collaboration

Of all biodiversity research publications produced by Latin America, 51% include authors from more than one country. This is higher than the biodiversity research field worldwide (36%). The US, UK and Spain are the leading collaborating countries in numbers. The FWCI of the international collaborations is high across the board with FWCI values between 2 and 5. China, South Africa and Switzerland are on top as citation impact is concerned.



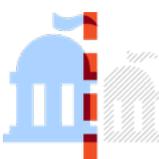
High relative activity across Latin America

Latin America publishes substantially more about biodiversity research than their overall contribution to global research, more than three times the world average.



Impact on biodiversity policies worldwide

Of all the research out of Latin America 8.5% is cited in policy documents, which is close to the global average of 10% for biodiversity research and substantially higher than 3.7% of all research out of Latin America cited in policy documents.



Significant contribution from universities in Brazil

In the top 30 of most prolific Latin American universities in biodiversity research, 20 are from Brazil, three from Mexico, and two from Chile. University of São Paulo (USP), National Autonomous University of Mexico (UNAM), São Paulo State University (UNESP), Federal University of Rio de Janeiro (UFRJ), and State University of Campinas (Unicamp) make up the top 5. The Chilean Universidad de Concepcion ranks highest on citation impact: the only institute in the top 30 with a FWCI above 2.



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Introduction

The term ‘biodiversity’ encompasses the variety of living beings on Earth, including microorganisms, plants, animals, and ecosystems such as coral reefs, forests, and deserts.

It is explored at three levels: genetic diversity, species diversity, and ecosystem diversity, including diversity in abundance, distribution, and behavior. Biodiversity is a key concept in the biological sciences, used to describe biological variation and quantify differences in terms of the phylogenetic structure of lineages, also known as the ‘tree of life’. Biodiversity has both instrumental value for humans and intrinsic value in its own right, providing good reasons for conserving particular species or regions.

This report is part of a series of reports that Elsevier has released over the years, including the international reports such as:

- The Power of Data to Advance the SDGs. (2020) www.elsevier.com/connect/sdg-report
- Pathways to Net Zero: The Impact of Clean Energy Research. (2022). www.elsevier.com/connect/net-zero-report
- Elsevier’s reports on gender in research: www.elsevier.com/connect/gender-report
- Clinician of the Future: a 2022 report. (2022). www.elsevier.com/connect/clinician-of-the-future
- Elsevier Corporate Responsibility: www.elsevier.com/about/corporate-responsibility/climate-action
- Climate Advisory Board: www.elsevier.com/about/corporate-responsibility/climate-action/climate-advisory-board

In 2023 Elsevier published its first report on Biodiversity Research, covering global science and a deep dive on the Netherlands. This report showed the sharp contrast for the Netherlands on biodiversity: the state of biodiversity itself is dismal while the biodiversity research out of the Netherlands belongs to the absolute world top. Leading up to the 16th meeting of the **Conference of the Parties on Biological Diversity (COP16)**, scheduled for October 21–November 1, 2024, in Cali, Colombia, we are now presenting a new biodiversity report, with an updated global outlook and a special emphasis on Latin America.

Methodology

To investigate Biodiversity Research we identified research by looking at Scholarly Output indexed in Scopus returning on the following search string:

(TITLE-ABS-KEY("biodiversity" OR "species richness" OR "species diversity" OR "ecosystem diversity" OR "phylogenetic diversity" OR "functional diversity" OR "conservation biology" OR "ecological diversity"))

We conducted several tests before settling on the above string. The search string is on the conservative side, meaning it is tailored more on precision than re-call, as we aimed to avoid the inclusion of non-relevant papers. Tests on smaller vs. larger datasets confirmed that the main patterns that emerged were at core the same so this smaller and more precise dataset provides us with a good degree of confidence on the key insights it reveals.

Globally we identified approximately 137,000 publications between 2019 and 2023.



Content of biodiversity research

This section covers the themes and subject areas prominent in biodiversity research.

Global and regional trends

This section addresses the most active countries and regions in biodiversity research and also explores its growth over time.

Research trends

At a glance the global distribution of Scholarly Output in the field of biodiversity reflects the overall spread we see for the complete corpus of published research, with US and China as individual countries publishing the largest number of papers. Europe as a block is highly influential on biodiversity research. However, a closer look reveals some interesting differences.

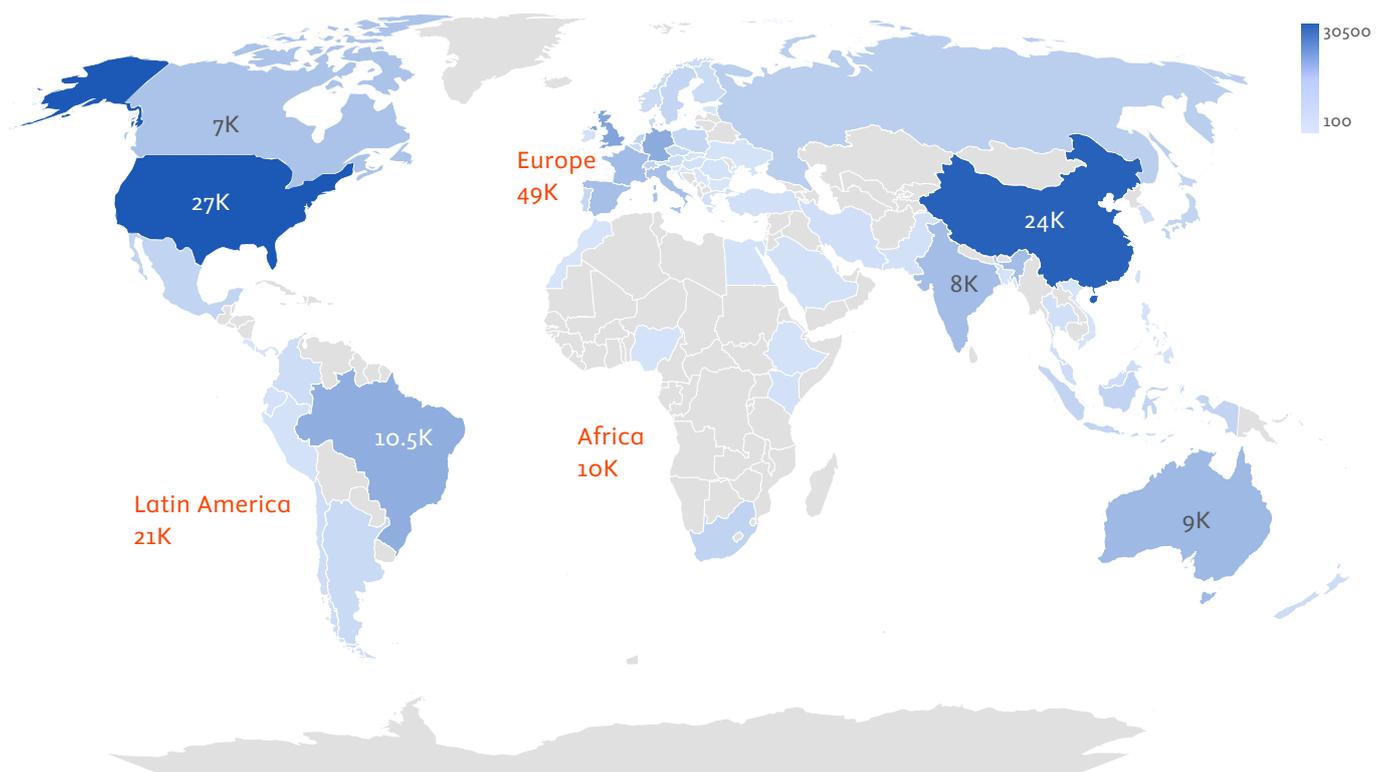


Figure 4: Global view of Scholarly Output in Biodiversity. The numbers denote the publications from these regions and countries.

While North America and Europe have a long history of biodiversity research and conservation, with well-established institutions and funding mechanisms, rapid economic development and urbanization in many Asian countries have led to increasing concerns about biodiversity loss. Meanwhile Africa is home to a vast array of biodiversity, but research and conservation efforts are often hampered by limited resources and infrastructure. However, there are growing initiatives to address biodiversity loss in this region. And Latin America is renowned for its biodiversity, including the Amazon rainforest and the Andes mountains. There is a strong focus on biodiversity conservation in many Latin American countries which is reflected in the volume of published research involving authors from this region, but challenges such as deforestation and illegal wildlife trade persist. See also the separate section by Prof. Hughes on the threats to biodiversity.

6%

The average annual growth rate for biodiversity research in the last 5 years, significantly above the 4% across all disciplines.

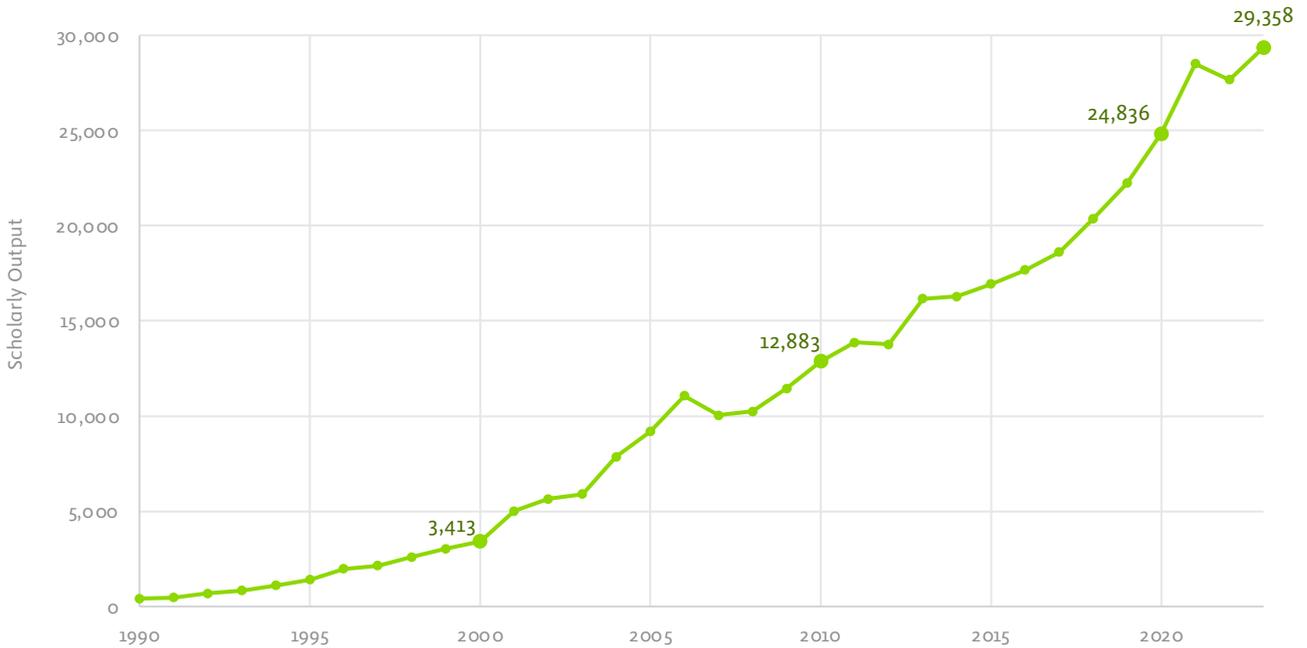


Figure 5: Global trend of Biodiversity Research: showing how increase has intensified since 1990.

Global trend of Biodiversity Research

We saw rapid growth in biodiversity research since 1990 and in the last five years the average annual growth rate is 6% for biodiversity research and 4% for research across all disciplines.

What are the main threats to global biodiversity?

Dr. Alice Hughes,

University of Hong Kong,

Editor-in-Chief of *Climate Change Ecology*

The main threats to global biodiversity include different forms of over-exploitation of resources (from wildlife trade, to overfishing and overhunting, mining, and timber extraction), the degradation of habitats (either by unsustainable use, or through various forms of pollution or the impact of invasive species, but also habitat loss and wildfires), and other threats such as disease; which can be exacerbated by changing climates (including changing mean climate and increased extremes), as well as other forms of threat. In sum these factors either directly reduce populations directly, reduce the quality and quantity of available habitat, or increase rates of mortality through exposure to pathogens, pollutants, high temperatures, extreme climate events, or reduced food resources.

Species survival is dependent on access to sufficient suitable habitat to reproduce and survive through the full annual cycle. The loss and destruction of habitats, as well as habitat fragmentation pose major risk to species survival. For species with wide-ranges or those that need to migrate, the loss of habitat may be a particular threat, and consequently various migratory birds have shown major declines since the 1970s as they have lost range used for parts of their migratory cycle. Deforestation, mining, and even damming all drive a loss of habitat, and habitat quality. Other forms of unsustainable use include over-grazing, and even the unsustainable collection of wildlife (which may also cause trophic cascades). Chemical pollution, in addition to light, and even sound pollution may render certain habitats unsuitable for species dependent upon them. Degraded systems are also more vulnerable to invasion, and with invasive species comes an increased risk of pests and pathogens.

All risks are also exacerbated by a changing climate, as well as making people especially vulnerable to pathogens by posing increased eco-physiological stress. Extreme events will also increase in frequency with a changing mean climate. In marine environments acidification and bleaching also present major threats to marine ecosystems.

Most of these threats are due to human unsustainable use and management, and thus relate to the existence and implementation of policy. Others such as changing climate are secondary impacts from other unsustainable activities but are harder to directly regulate (as are diseases or invasive species once present).

Regional outlook

The Relative Activity Index looks at the proportion of research in this area compared with the total research published by each region (Figure 6). The factor that stands out immediately is that when we look at normalized data (Relative Activity Index) Latin America is by far the most prolific region in biodiversity research. The picture in absolute numbers (pie chart in Figure 7) shows that Europe is the most influential.

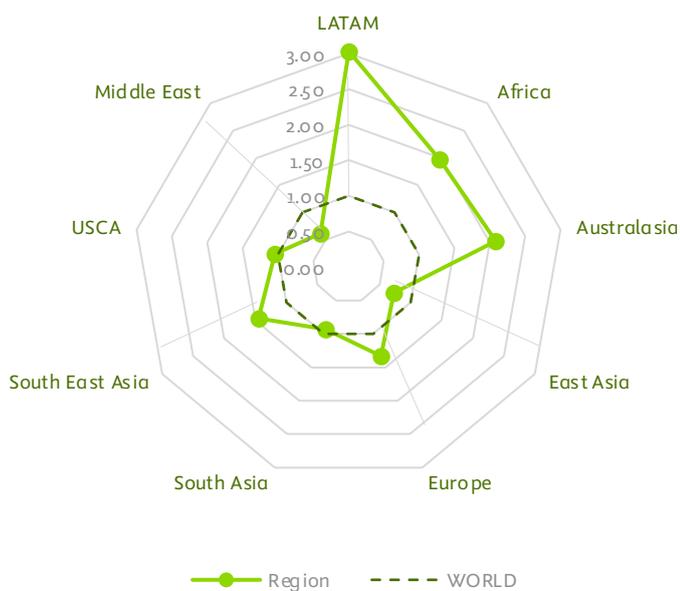


Figure 6: Biodiversity research across different regions, measured in relative term, reveals the focus of each region on this topic.

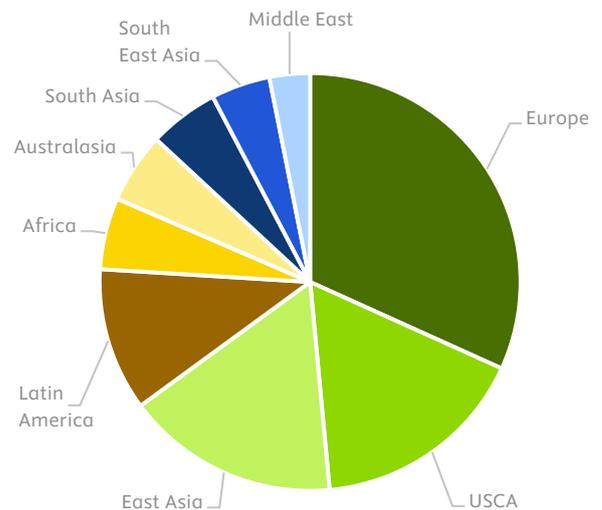


Figure 7: The contribution to biodiversity research by region indicate the actual contribution to the corpus of literature, with Europe leading the way.

Regional trends over the years

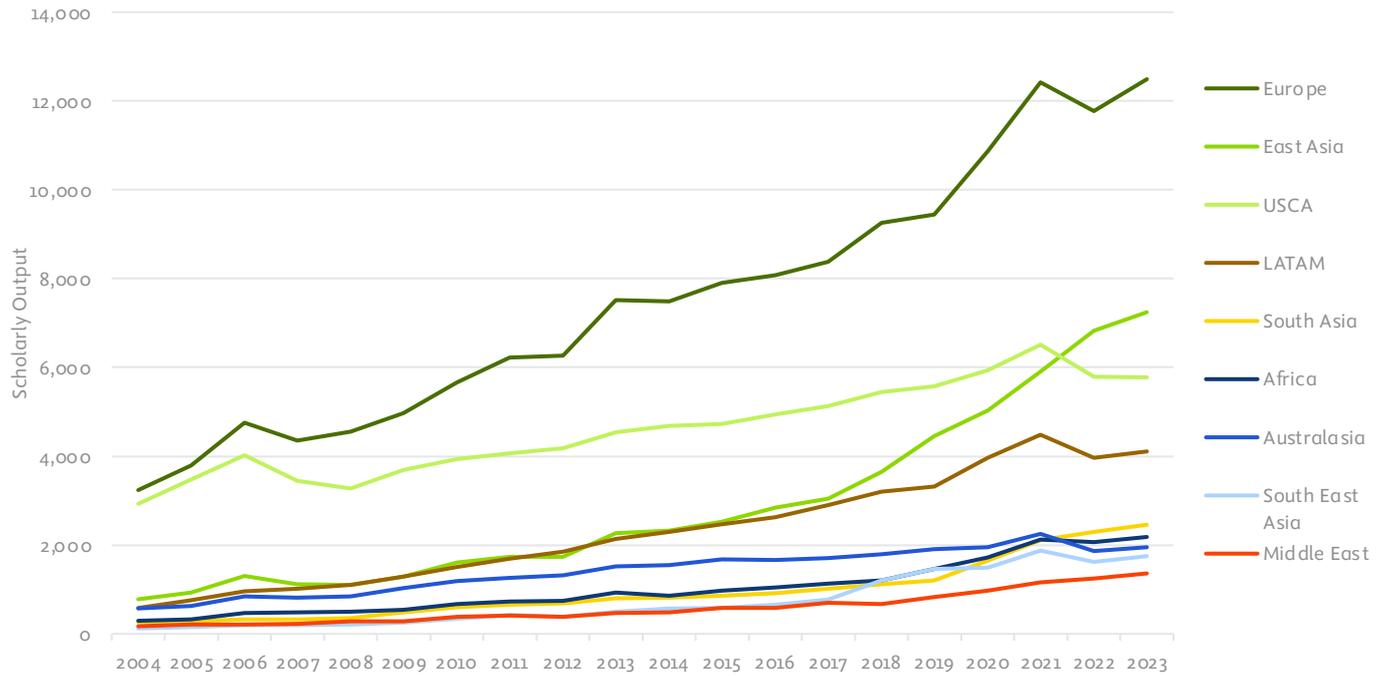


Figure 8a: Europe started out in the lead and the gap with the other regions only widened. USCA had a modest growth rate and was overtaken by East Asia.

Contribution to biodiversity research by different regions has seen a shift over the years. Figure 8a shows that publications with authors in Europe grew steadily and strongly since 2004, reaching more than 12,000 publications in 2023. The United States & Canada saw a slower growth, and have been overtaken by East Asia since 2021, the latter owing much of its growth to the performance of China. The publications with authors in Latin America have been growing at a rate above that of the US & Canada, closing partially the gap with the latter region.

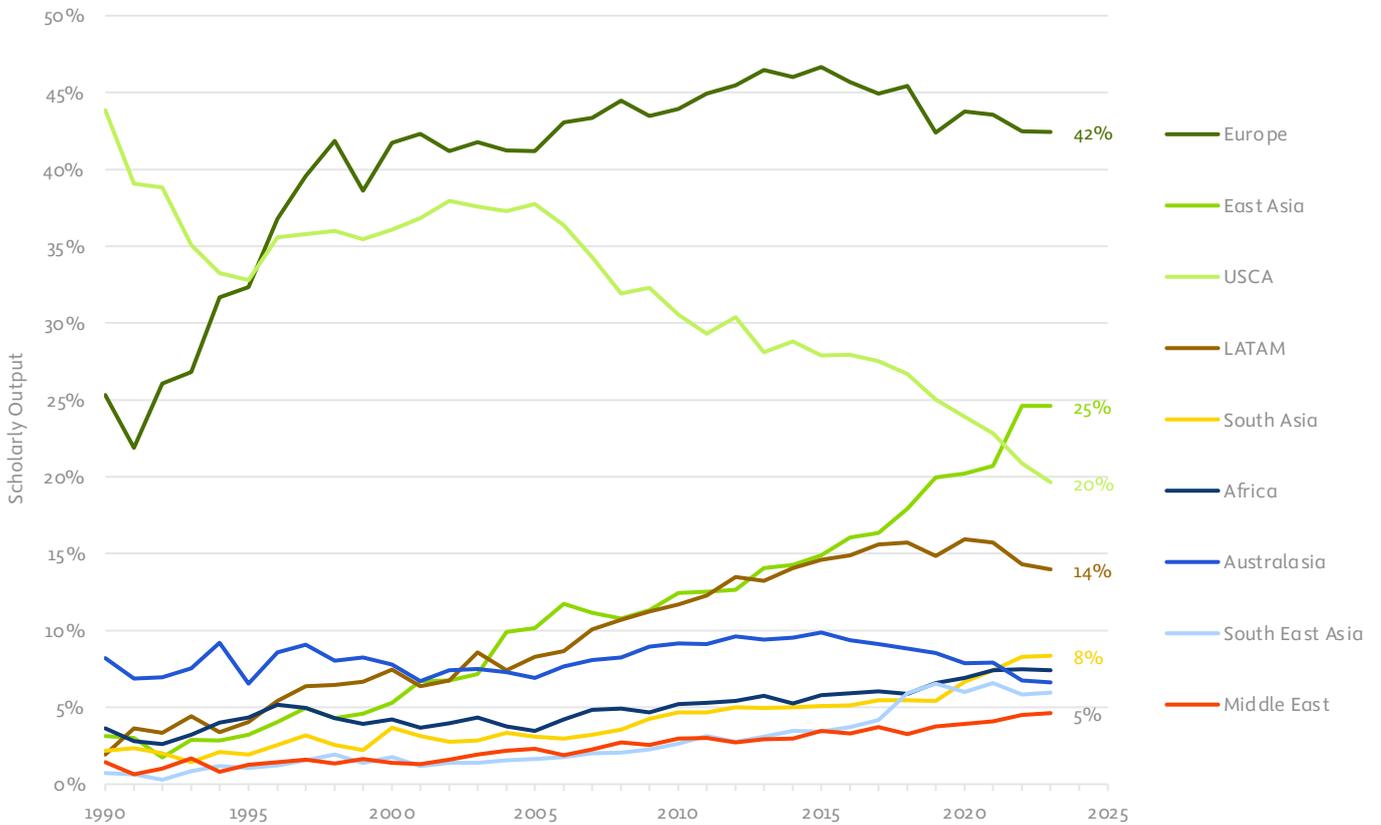


Figure 8b: Europe is leading. Gap between Europe and US widening. East Asia (which include China) is fast growing. Some research is from more than one region and therefore the percentages of all regions added will exceed 100%.

Authors in Europe appear in 42% of the publications (Figure 8b). Authors in East Asia (mostly in China) appeared, in 2023, in 25% of the publications, with a strong growth after 2017. The number of articles with authors in the United States & Canada grew steadily, but at a slower pace than other regions, so that these two countries lost share, falling from 35% in 2004 to 20% in 2023. Publications with authors in Latin America grew steadily, and represented, in 2023, 14% of the World total.

14%

The share of global biodiversity publications attributed to authors in Latin America in 2023.

Citations levels by regions

The Field-weighted citation impact (FWCI) is an indicator of mean citation impact and compares the actual number of citations received by a paper with the expected number of citations for papers of the same document type (article, review, or conference proceeding), publication year, and subject area. When the paper is classified in two or more subject areas, the harmonic mean of the actual and expected citation rates is used. The indicator is therefore always defined with reference to a global baseline of 1.0 for all research combined. We see that globally for Biodiversity the FWCI is 1.20, meaning that on average globally biodiversity research is cited 20% more time than average.

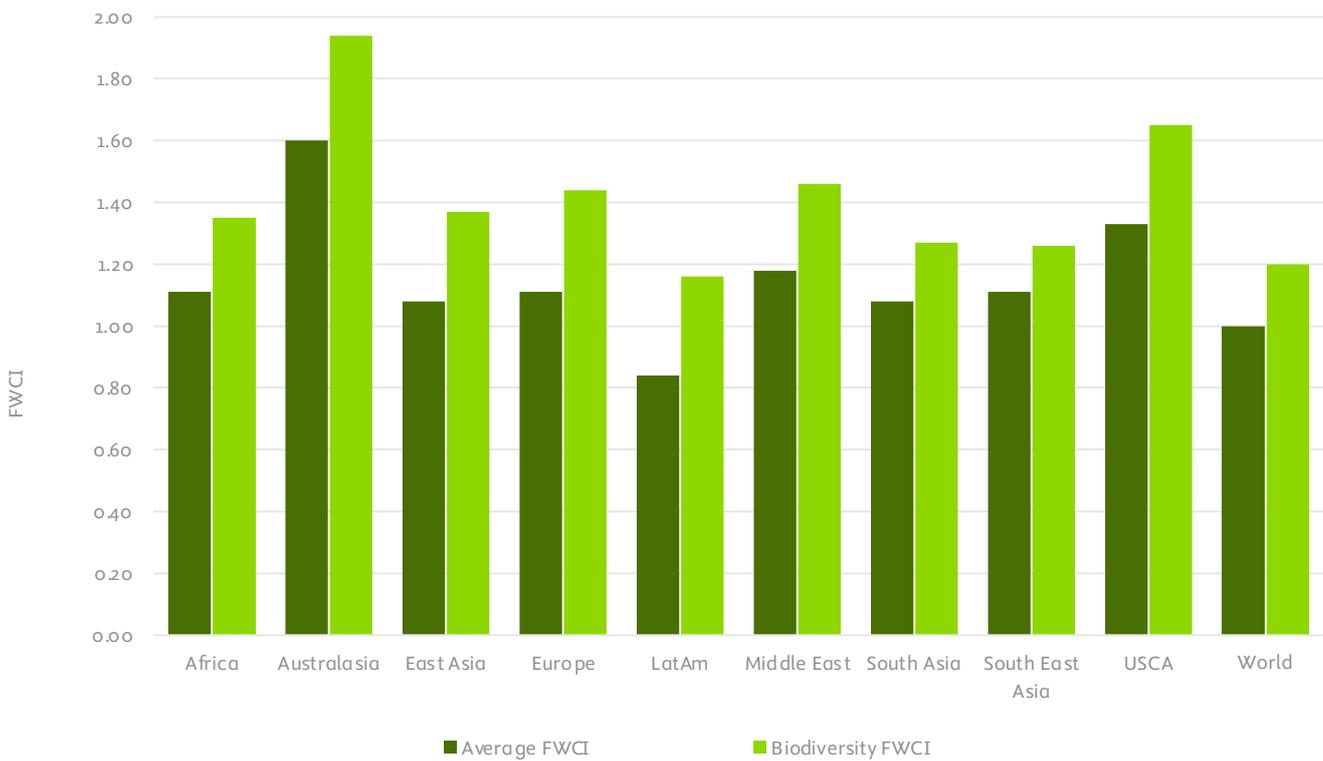


Figure 9: Here the FWCI of biodiversity research is depicted for the various regions and compared to the world average of biodiversity research of 1.2.

As shown in Figure 9 the field-weighted citation impact (FWCI) for biodiversity research per region is higher than average research for all regions. The Australasia region leads the way as far as citation impact goes but US & Canada are not far behind.

Most prolific countries globally

The scholarly output per country (Figure 10) shows the usual science powerhouses in the lead: US and China. The top 20 countries in the area of biodiversity research show a mix of Global North and Global South countries. Brazil makes it into the top 5 of most productive countries. If we look at the field-weighted citation impact (FWCI) then a completely different picture emerges: Switzerland, the Netherlands and Sweden in the lead, and only Russia below the world's average. South Africa scores high among the Global South countries— at the same level as Italy and Spain in citation impact. In Appendix B there is more information on biodiversity research per country.

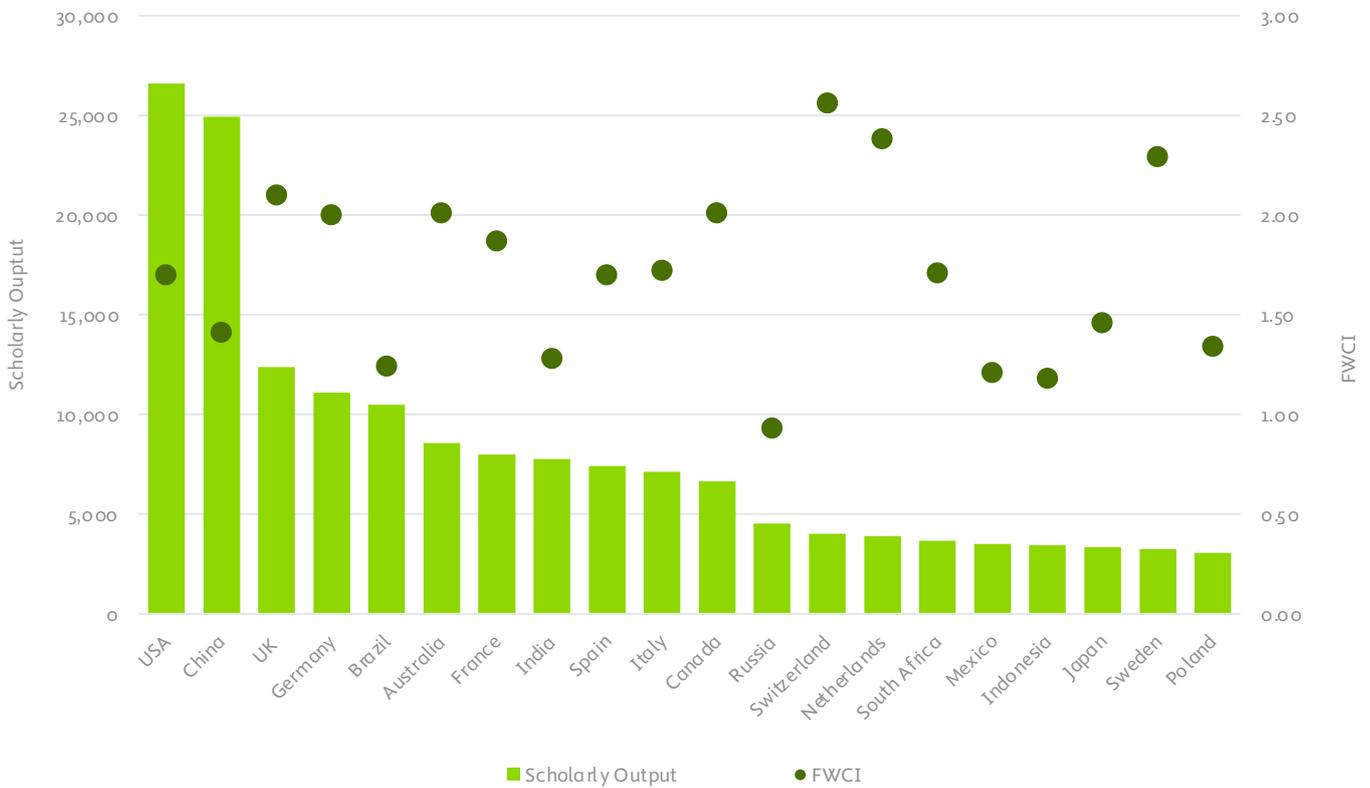


Figure 10: The 20 most prolific countries (publications 2019–2023): volume of research (light green bars) and citation levels as FWCI (dark green dots).

Most frequently mentioned funders in biodiversity research

Approximately 52% of Biodiversity Scholarly Output identified in Scopus mention at least one funder¹. Those that were acknowledged in more than 1,000 publications of the type “article” in the period 2019-2023 are shown in Figure 11.

Among these, there are 5 funders in China, 3 from Brazil, 4 from the European Commission, 3 from the United States, and one each from Australia, Canada, Germany, Japan, Mexico, Portugal, and the UK.

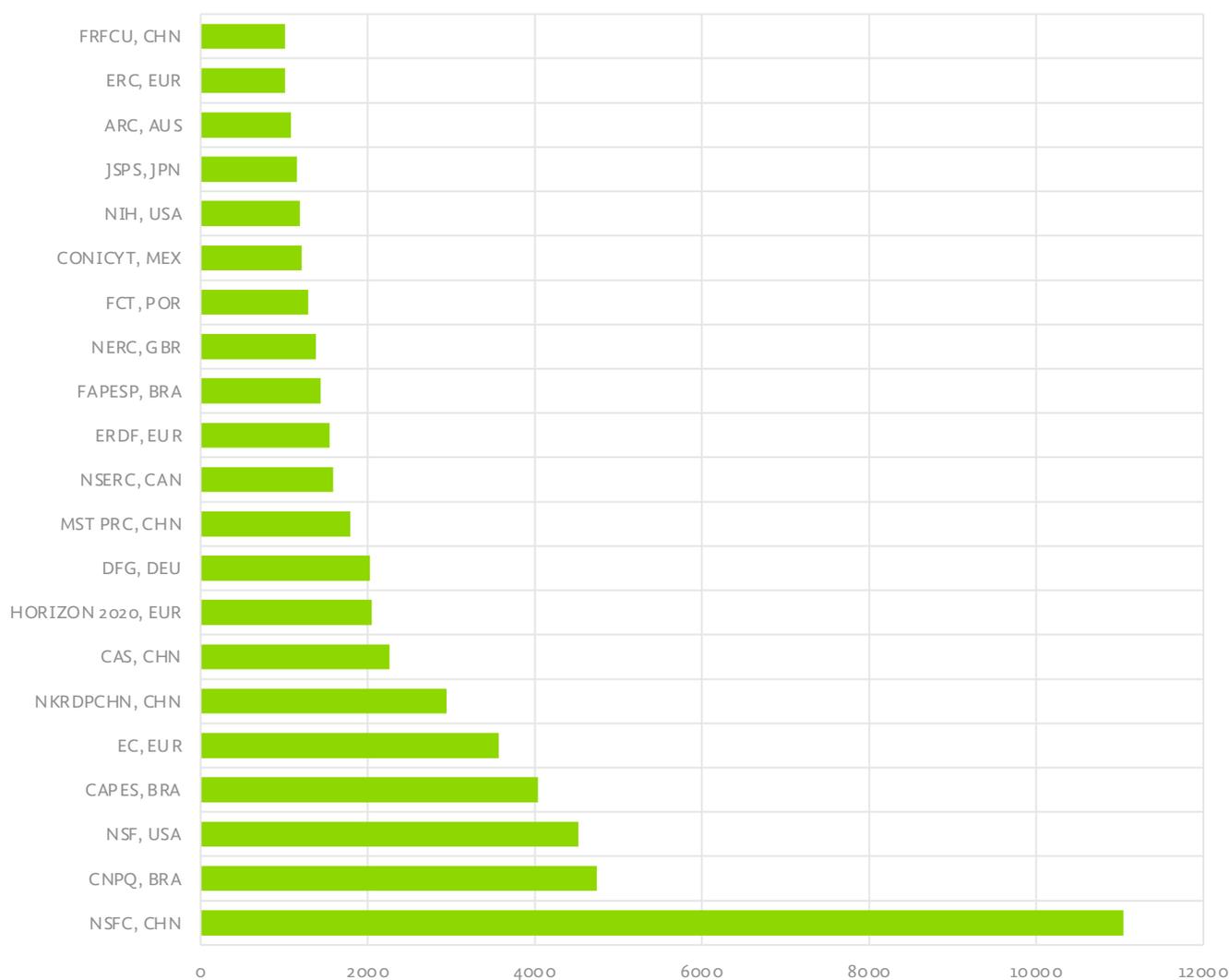


Figure 11: Most frequently mentioned funders in biodiversity research.

¹ The identification of funders is made using the 'Acknowledgements' section of the articles.

Editorial Comment

Dr. Lewis Collins,

Editor-in-Chief of One Earth

Nature's rich tapestry of life provides essential services that sustain our health, food security, and economic stability. These natural contributions include the provision of clean water, fertile soil, and a diverse food supply, as well as cultural benefits that enrich our communities. Among these invaluable services, climate regulation stands out as a critical function of biodiversity, playing a vital role in mitigating the impacts of climate change and fostering resilience in the face of environmental challenges. But nature's biological diversity—and the critical services it provides—is rapidly declining, primarily through human's modification of nature and appropriation of land and resources, with just five percent of the world's land mass left untouched human activity. To strengthen the mitigation of and resilience to climate change, it is thus vital that conservation strategies consider the restoration and protection of nature within human-modified landscapes.

Article highlight:

In a research article published in *One Earth* this year, the Earth Commission, Awaz Mohamed and colleagues assessed the minimum level of (semi-)natural habitat in agricultural and urban areas required to sustain nature's contribution to people. They find that at least 20–25% of habitat per square-kilometer is required and that only one third of global human-modified lands currently meet this threshold. The study's findings provide broad targets for conservation efforts.

Article information:

[Securing Nature's Contributions to People requires at least 20%–25% \(semi-\)natural habitat in human-modified landscapes](#)

Awaz Mohamed, Fabrice DeClerck, Peter H. Verburg, David Obura, Jesse F. Abrams, Noelia Zafra-Calvo, Juan Rocha, Natalia Estrada-Carmona, Alexander Fremier, Sarah K. Jones, Ina C. Meier and Ben Stewart-Koster

About One Earth:

[One Earth](#) is Cell Press' flagship sustainability journal. The journal provides a home for high-quality research and perspectives that significantly advance our ability to better understand and address today's sustainability challenges. Through publishing monthly thematic issues the journal seeks to break down barriers between the natural, social and applied sciences and the humanities, stimulate the cross-pollination of ideas, and encourage transformative research.

International collaboration

This section explores the importance of international partnerships in advancing biodiversity research.

Biodiversity health is a local as well as a global issue. The interconnectivity of life on Earth means that working in international collaboration is important. Biodiversity research is highly international with 36% of papers including authors from more than one country, compared to only 21% for research globally. Also comparing with other notable subjects such as Climate Action, Life Below Water, Earth and Planetary Sciences and Environmental Sciences, Biodiversity shows higher shares of international collaboration in research.

The highest rate of international collaboration is seen in publication output from Africa, Australasia and Middle East, all with rates higher than 60%. On the opposite side of the spectrum, South Asia and East Asia, both close to the world average with 37% and 36% respectively.

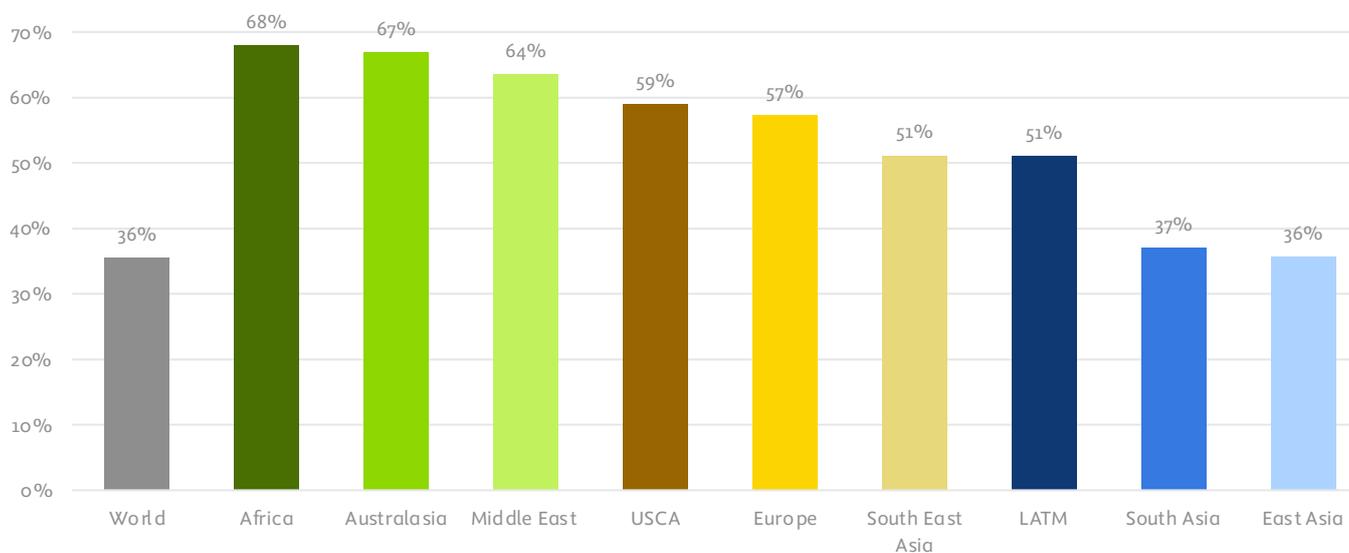


Figure 12: Percentage of biodiversity research papers by authors from more than one country, across different regions, in the years 2019–2023. This chart shows the level of international collaboration in biodiversity research, with the world average in gray (first column on the left), and the regions in color.



“The Global South’s significant publishing activity underscores the vital role of a diverse and engaged scientific community leading the way in conservation and biodiversity research, emphasizing its critical impact on shaping effective environmental policy.”

Dr. Mauro Galetti

Center for Research on Biodiversity
and Climate Change, São Paulo
State University (UNESP), Brazil

Impact on Policy

What is the impact of biodiversity research on policies globally?

Globally we find that approximately 10% of recent publications in biodiversity research have been cited by policy documents. This is much higher than the average for all global publications for the same period which stand as 3.5%. We find the same trend in all regions: biodiversity research is more cited in policy documents than overall research.

Diving deeper to look at where the policy citations are coming from, we found that more than half the policy documents citing biodiversity research are various governments from more than 90 countries.

The European Union and the US in particular are responsible for the largest part of these documents. To name a few of intergovernmental organizations citing this research: United Nation, WHO, UNESCO, World Bank, IMF and UNICEF.

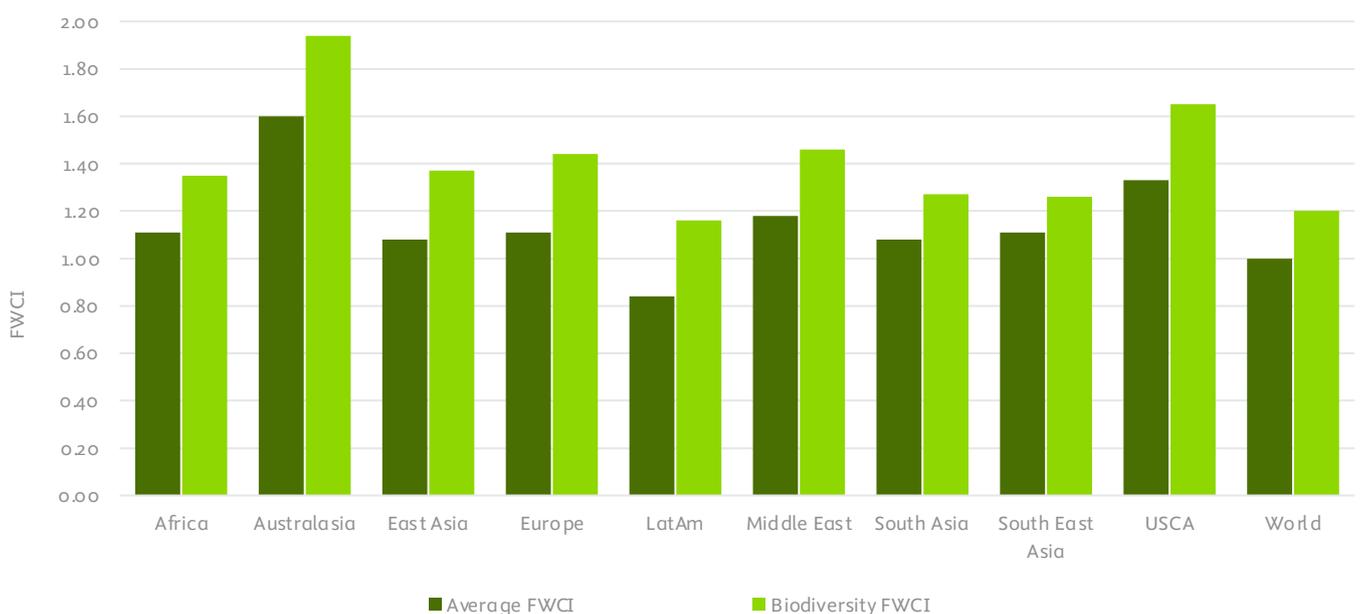


Figure 13: Scholarly Output (2019–2023) cited in Policy Documents. For each region we compare the levels for all research vs the levels for Biodiversity research alone.

Change of biodiversity topics in recent years

Has biodiversity research changed in Latin America in time? The analysis of topic clusters is one way to examine if there has been a change and in which topic. Figure 15 shows that the two main Topic Clusters remained the same from the period 2014–2016 to the period 2021–2023. The third most important Topic Cluster in 2014–2016, Microsatellite DNA, Genetics, RNA, lost importance and fell to the 6th position in 2021–2023. Similar trend occurred for the Clusters Anura, Endangered Species, Ultraviolet Radiation and Deep Sea, Climate Change, Environmental Monitoring.

On the other hand, the Cluster on Protected Area, deforestation, Natural Resource rose from the tenth position in 2014–2016 to the third most relevant position in 2021–2023. 'Biometrics, Siluriformes, Robot' and 'Climate Change, Environmental Niche Modelling, Protected Area' experienced similar rises in relevance.

While Climate Change and Endangered Species remain the two most relevant topic clusters, the changes show a tendency towards an advance in the interest by researchers to add to the knowledge about forest protection, deforestation, and protected areas. This is coherent with the increased relevance of the topic for the region and for the World, especially considering the region includes the Amazon rainforest. Additionally, the increased interest reflects the growth in the research community in Latin American countries, allowing for a broader reach in terms of research themes to be tackled.

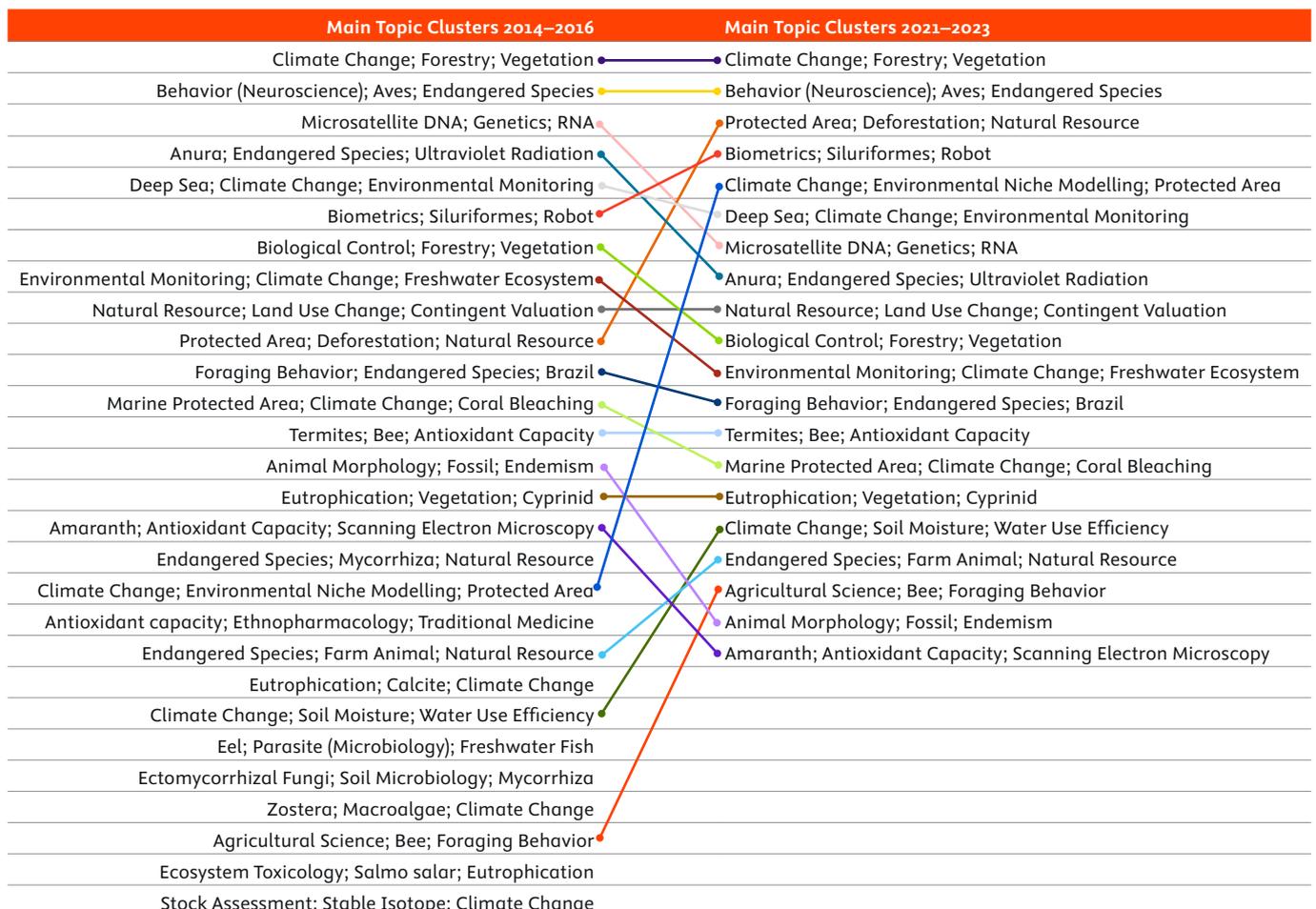


Figure 15: Clusters of topics in biodiversity research in the three-year period 2014–2016 vs 2021–2023. Colored lines connect the same topic in the two periods.

Latin America’s most prolific international partners

As we see in Figure 16, about 42% of Latin America international collaboration in biodiversity research is with the US (21% of all Latin America biodiversity research). The UK is the second most prolific partner with 20%, while China, a powerhouse in research, comes in with a modest 6%. In the area of Global South–South collaboration only South Africa makes the top 15.

The weighted citation impact (FWCI) shows that incredibly high impact of collaboration: far above the global average of 1.2 for biodiversity research, all above 2 and in some cases close to 5. China and South Africa lead the way on citation impact with 4.81 and 4.73 while the US scores the lowest here.

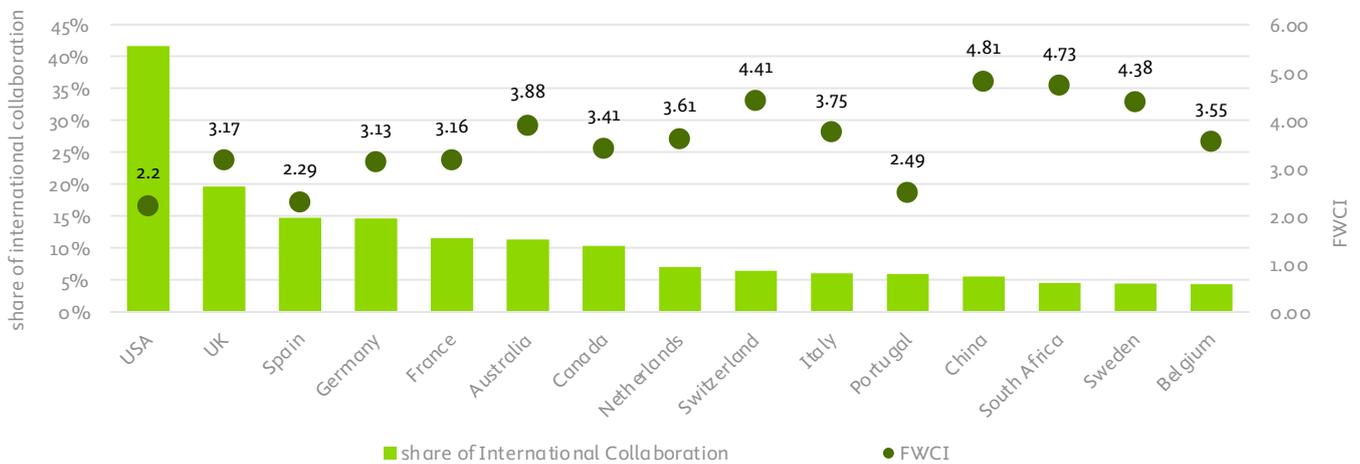


Figure 16: Most prolific Latin America countries in biodiversity research. World average FWCI 1.19. Average for Latin America FWCI 1.15.

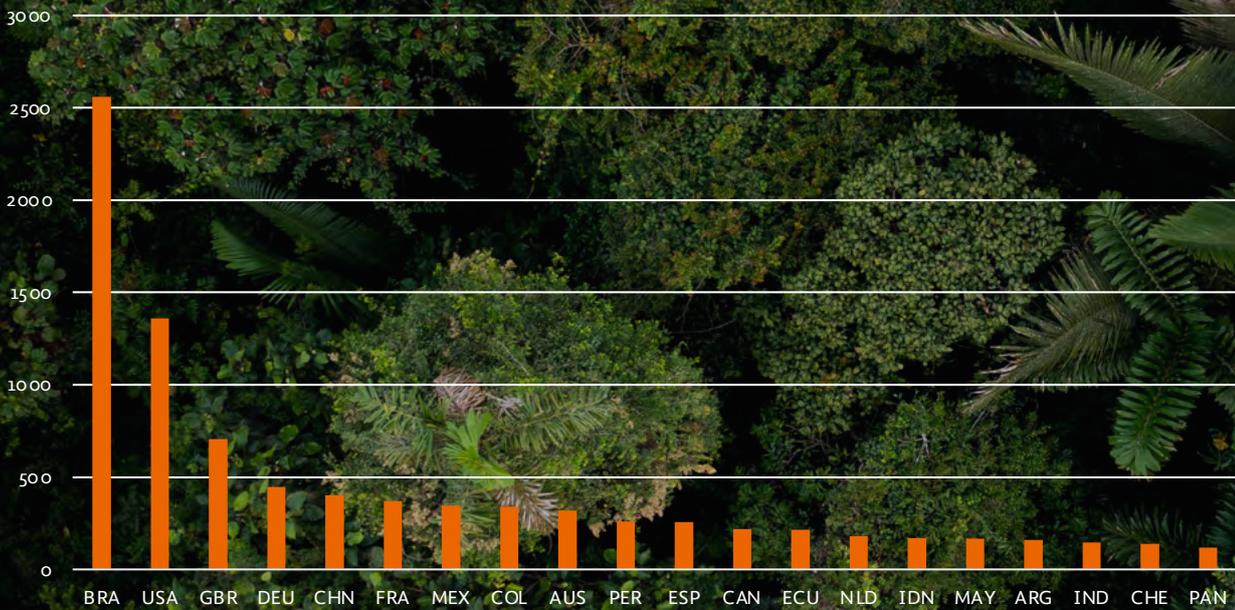
Institution	Country	Scholarly Output	FWCI
Smithsonian Institution	USA	647	2.53
Université de Montpellier	France	386	3.18
University of Florida	USA	318	3.07
Université PSL	France	295	3.49
University of Oxford	UK	272	4.73
Friedrich Schiller University Jena	Germany	226	4.91
Martin Luther University Halle-Wittenberg	Germany	211	5.04
Sorbonne Université	France	203	3.19
Leipzig University	Germany	202	5.24
University of Queensland	Australia	198	4.51
University of British Columbia	Canada	198	4.95
Cornell University	USA	190	3.81
University of Copenhagen	Denmark	186	4.35
École pratique des hautes études	France	177	3.76
University of Lisbon	Portugal	175	2.77
University of Helsinki	Finland	172	4.02
University of Cambridge	UK	172	5.22
Czech Academy of Sciences	Czech Republic	171	4.73
L’Institut Agro Montpellier	France	166	3.69
University of East Anglia	UK	165	3.75

Figure 17: Most prolific universities outside Latin America collaborating with Latin America.

If we look a bit deeper and explore the institutes that collaborate with Latin America (Figure 17) we see a mixed image with the US, France and UK in the top 5. The Smithsonian Institute from the US leads the way with the highest number of publications. Germany jumps out for its high FWCI (above 5) only matched by the University of Cambridge in the UK.

Focus on Biodiversity and the Amazon region

Countries in Latin America have stepped up their research engagement with the Amazon during the last 20 years. The largest share of publication on this theme has authors in Brazil, showing the commitment of the Brazilian research community. Mexico, Colombia, Peru, Ecuador, Argentina and Panama also stepped up their participation



The Amazon covers about 40% of South America, touching eight countries (Brazil, Bolivia, Peru, Ecuador, Colombia, Venezuela, Guyana, and Suriname), plus French Guyana. The Amazon River is the world's largest river by volume, carrying more than five times the volume of the Congo or twelve times that of the Mississippi. It drains an area nearly the size of the forty-eight contiguous United States and has over 1,100 tributaries, 17 of which are longer than 1500km. The 'Scientific Panel for the Amazon' describes biodiversity in the region as "...the greatest concentration of biodiversity on Earth, with >10% of the world's described species compressed into only about 0.5% the Earth's total surface area".

40%

The portion of South America covered by the Amazon, which spans eight countries.

Biodiversity research in Latin American Countries

When we look at Biodiversity research coming out of Latin America, we find that Brazil is responsible for 43.5% of all Latin America biodiversity research. Second is Mexico with 14.5%. Argentina 9.8%. Colombia 7.7%. In Latin America the overall FWCI of biodiversity research is 1.15, just below global average. However, the most prolific countries in Latin America have much higher levels of citations as illustrated by the chart below (Figure 18).

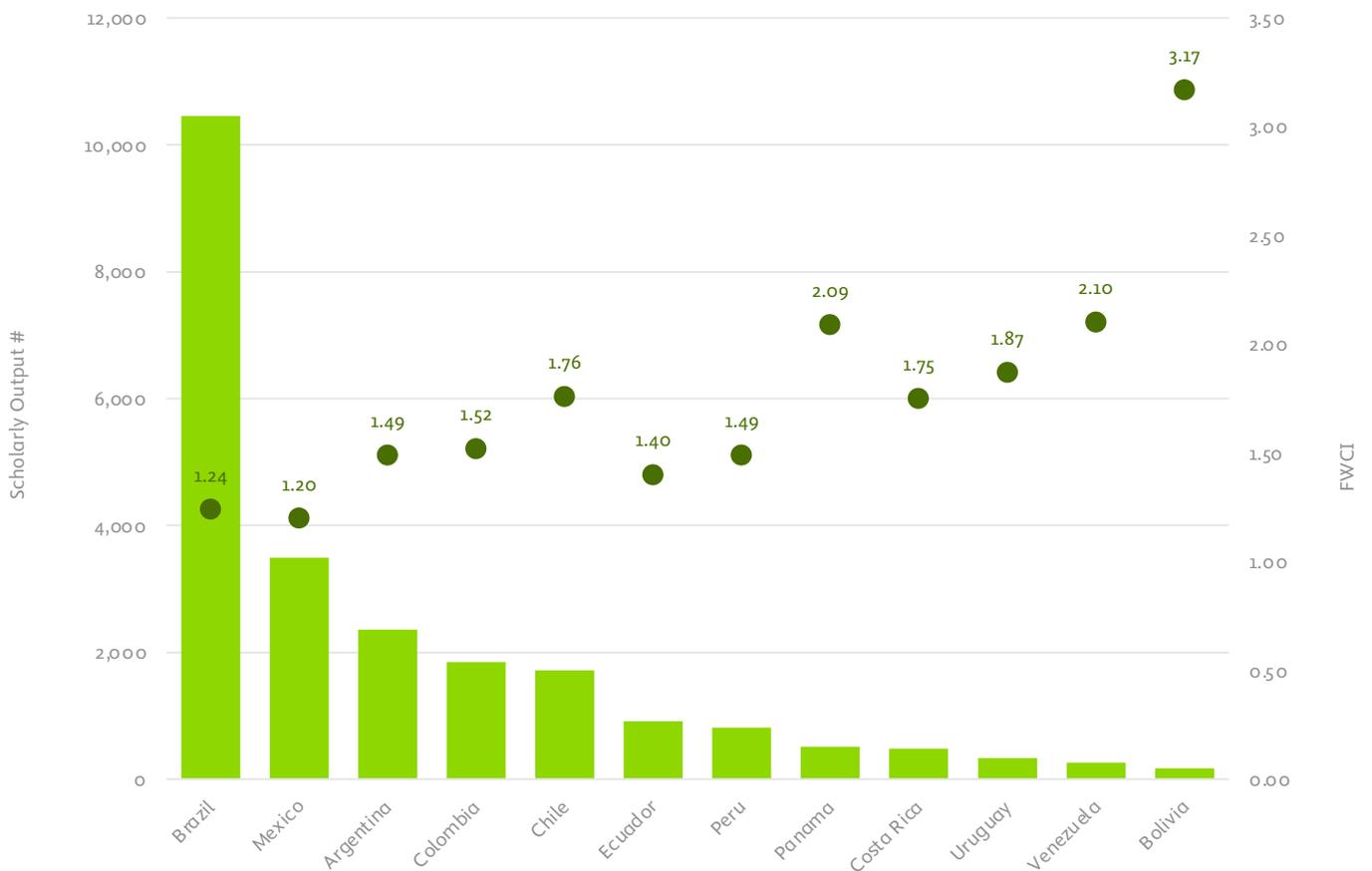


Figure 18: Most prolific Latin America countries in biodiversity research. World average FWCI 1.19. Average for Latin America FWCI 1.15.

Intensity of research activity in Latin America countries

An interesting way of looking at how strong a country is focused in a particular research area is to look at the level of publications in such area relative to the overall size of Scholarly Output for the country. This method allows us to compare countries of different size, by normalizing the data. The chart below (Figure 19) shows that Panama and Bolivia have the largest shares of their research dedicated to topics related to Biodiversity. It should be noted that countries with relatively low number of papers might have a remarkably high RAI which might be the case with Panama and Bolivia.

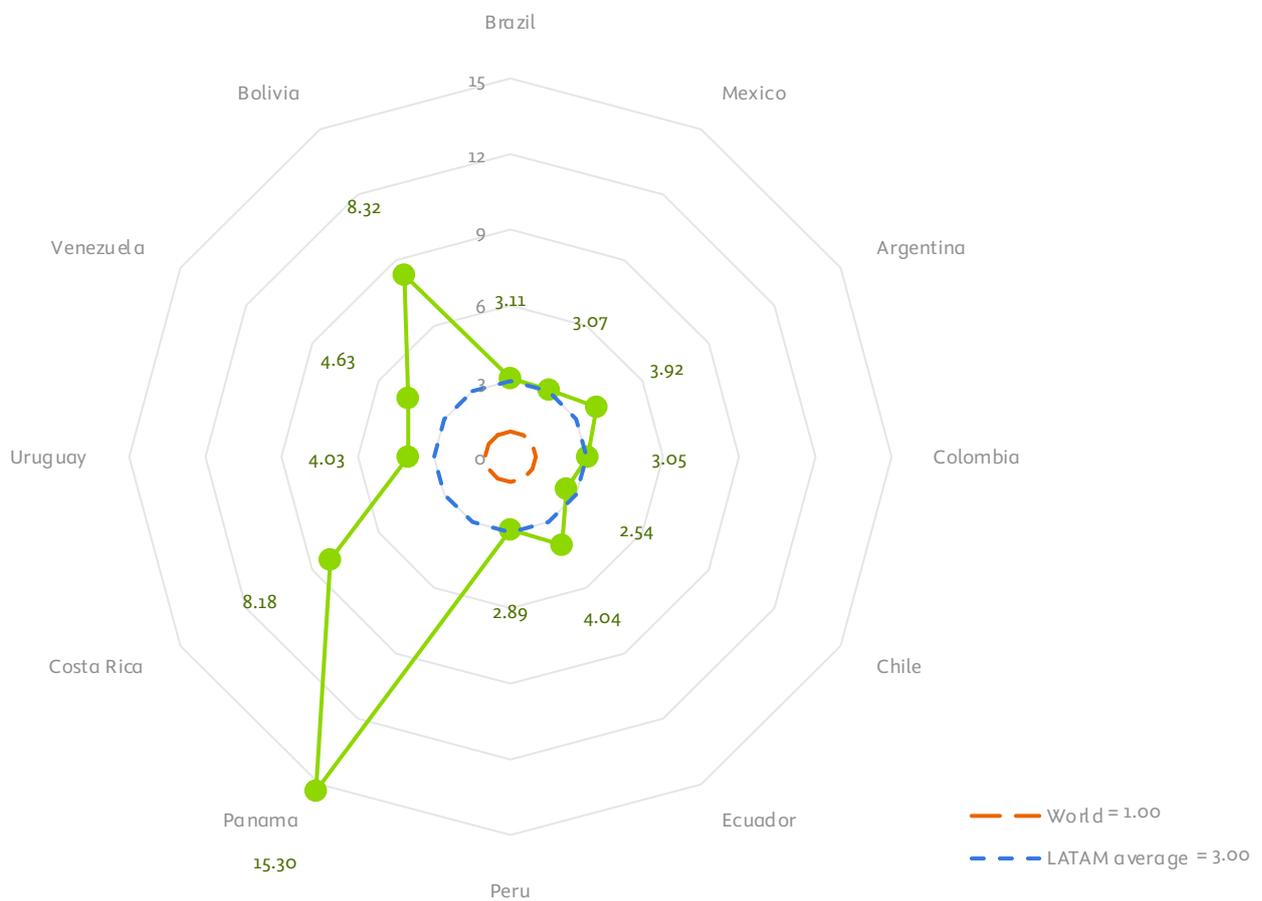


Figure 19: The level of activity on biodiversity compared to the overall activity across all disciplines, the so-called Relative Activity Index (RAI) for key Latin America countries. The Latin America average is 3 times the world average. The solid green line denotes the RAI per country, the orange dashed line the World's average and the blue dashed line the average for Latin America.

Which universities in Latin America contribute the most to biodiversity research?

Which institutions across Latin America contribute most to biodiversity research? As we see in Figure 20 the University of Sao Paulo in Brazil and the Universidad Nacional Autonoma de Mexico lead in productivity. Brazil dominates the top 30 with more than 20 institutes, Mexico and Chile are represented by two, respectively three institutes. The Chilean institutions do well on citation impact, with the Universidad de Concepcion the only institute with a FWCI of more than 2.

Institution	Country	Scholarly Output	FWCI
Universidade de São Paulo	Brazil	1691	1.70
Universidad Nacional Autónoma de México	Mexico	1419	1.34
Universidade Estadual Paulista Júlio de Mesquita Filho	Brazil	854	1.39
Universidade Federal do Rio de Janeiro	Brazil	772	1.46
Universidade Estadual de Campinas	Brazil	643	1.79
Universidade Federal de Minas Gerais	Brazil	617	1.63
Universidade Federal do Paraná	Brazil	587	1.31
Universidade de Brasília	Brazil	520	1.55
Universidade Federal do Pará	Brazil	520	1.39
Universidade Federal do Rio Grande do Sul	Brazil	518	1.84
Universidade Federal de Goiás	Brazil	499	1.61
Universidade Federal de Pernambuco	Brazil	480	1.49
Universidade Federal de Viçosa	Brazil	384	1.24
Universidade Federal de Lavras	Brazil	370	1.69
Universidade Federal de São Carlos	Brazil	356	1.40
Universidade Federal de Mato Grosso	Brazil	354	1.55
Universidad de Buenos Aires	Argentina	352	1.44
Universidad Nacional de Colombia	Colombia	350	1.68
Instituto Politécnico Nacional	Mexico	337	0.94
Universidade Federal da Paraíba	Brazil	335	1.40
Universidad de Concepción	Chile	332	2.09
Universidade Federal do Rio Grande do Norte	Brazil	331	1.61
Universidade Federal de Santa Catarina	Brazil	322	1.73
Universidad de Chile	Chile	313	1.73
Pontificia Universidad Católica de Chile	Chile	303	1.72
Universidade Federal de Mato Grosso do Sul	Brazil	301	1.57
Fundação Oswaldo Cruz	Brazil	286	1.1
Universidade Estadual de Maringá	Brazil	272	1.26
Universidade Federal da Bahia	Brazil	271	1.43

Figure 20: Most prolific Latin America countries in biodiversity research. World average FWCI 1.19. Average for Latin America FWCI 1.

Conclusions

Both globally and in Latin America, biodiversity research is a story of high quality and impact, partnership and collaboration.

+20%

The citation impact of research from Brazil and Mexico, indicating their contributions are 20% above the world average.

Global biodiversity research is of high quality and growing fast. The European contribution is leading the rest of the world and has grown in strength over time compared with the US, China, Latin America, and Africa. Considering the relative contribution of nations to biodiversity research, the Global South is clearly outperforming the Global North: regions like Latin America and Africa contribute two to three times the number of publications in biodiversity (normalized for their overall scholarly contribution), while East Asia (including China) and the Middle East underperform.

Based on the key findings in this report, it is evident that biodiversity research from Latin America is highly regarded by the international scientific community. Brazil and Mexico contribute more than half of all research in Latin America and have a citation impact 20% above the world average. Other Latin American countries, while contributing less in numbers, have significantly higher impact, e.g. Argentina with a FWCI of 1.5 and Bolivia with a FWCI of 3.2. The report also highlights the impact biodiversity research from Latin America has on policy: biodiversity science is cited more than twice as much in policy documents than all research out of Latin America.

Biodiversity research is clearly part of a global scientific ecosystem. This is certainly the case for Latin America where about half of the research is performed with institutions outside the region. Key collaborating countries are the US and in Europe. The citation impact of this international research is ranging from high to very high: the FWCI is between 2 and 5. China, South Africa and Switzerland lead the way on most impactful international collaborations with Latin America.



“Securing more local and international funding for biodiversity research in Latin America can empower researchers addressing critical issues like climate change and biodiversity loss. With the highest biological diversity on the planet, Latin American researchers are essential for developing new policies that effectively protect this invaluable biodiversity. Their insights and expertise are crucial for fostering sustainable practices and ensuring the conservation of unique ecosystems.

Dr. Mauro Galetti

Center for Research on Biodiversity and Climate Change, São Paulo State University (UNESP), Brazil

The top 30 of most prolific South American institutes in biodiversity research has a strong representation by Brazil with University of São Paulo leading the pack. Of the 30 institutes, 20 are from Brazil, three from Mexico and two from Chile.

In addition to biodiversity research, Latin America is home to an outstanding contribution to biodiversity as such. For instance, the Amazon region alone has the greatest concentration of biodiversity on Earth with more than 10% of the world's species compressed into a surface area of only 0.5% of the Earth's surface. Biodiversity is also high on the political agenda in Latin America as host of the 2024 United Nations Biodiversity Conference of the Parties to the Convention on Biological Diversity (COP 16). This report shows unequivocally the strength of Latin America in biodiversity research, its impact on the global scientific community, its significant international partnership and especially the exceptionally high relative contribution to biodiversity research. It is fair to say that Latin America is a trailblazer on biodiversity and biodiversity research.

51%

The share of Latin American Latin American biodiversity research that involves global partners.



Supporting information

Definitions

This report is based on Scopus data. Scopus is a large citation database launched in 2004 by Elsevier. It is one of the most prominent tools for researchers to find relevant academic publications, track citations, and analyze research trends. It covers 36,377 titles from 11,678 publishers. For more information see scopus.com.

Scholarly Output

Scholarly Output describes the products of scholarly activity, such as journal articles, books, book chapters, conference papers, and other forms of research dissemination.

Citation

A citation is a formal reference to earlier work made in a paper or patent, frequently to other papers. A citation is used to credit the originator of an idea or finding and is typically used to indicate that the earlier work supports the claims of the work citing it. The number of citations received by a paper from subsequently published papers can be used as a proxy of the quality or importance of the reported research.

FWCI (Field-weighted citation impact)

Field-weighted citation impact (FWCI) is an indicator of mean citation impact and compares the actual number of citations received by a paper with the expected number of citations for papers of the same document type (article, review, or conference proceeding), publication year, and subject area. When the paper is classified in two or more subject areas, the harmonic mean of the actual and expected citation rates is used. The indicator is therefore always defined with reference to a global baseline of 1.0 and intrinsically accounts for differences in citation accrual over time, differences in citation rates for different document types (e.g., reviews typically attract more citations than research articles), as well as subject specific differences in citation frequencies overall and over time and document types. It is one of the most sophisticated indicators in the modern bibliometric toolkit.

International collaboration

International collaboration in this report is indicated by papers with at least two different countries listed in the authorship byline.

Subject Area classification

The subject area classification used in this report is mapped to the Journal Classification (ASJC) used in the Scopus database. Scopus uses a hierarchical structure with 27 main subject areas. Each publication can be linked to multiple ASJCs. This means that when you look at the breakdown by subject area a publication will be counted twice if it appears in a Scopus Source mapped to two categories, as SciVal doesn't use fractionalization. Therefore, for most entities in SciVal, if you add up the percentage values in the pie or donut charts, they will equal more than 100%. The percentages represent the relative publication share per subject area.

RAI (Relative Activity Index)

Relative Activity Index is defined as the share of an entity's publications in a subject relative to the global share of publications in the same subject. A value of 1.0 indicates that an entity's research activity in a field corresponds exactly with the global activity in that field; higher than 1.0 implies a greater emphasis while lower than 1.0 suggests a lesser focus.

Topics and Topic Clusters:

A Topic is a collection of documents with a common focused intellectual interest and can be large or small, new or old, growing or declining. As with the nature of today's research landscape many Topics are multidisciplinary, and old Topics may be dormant, but they still exist. Topic Clusters are formed by aggregating Topics with similar research interest together to form a broader, higher-level area of research. These Topic Clusters can be used to get a broader understanding of the research being done. A publication can only belong to one Topic and one Topic Cluster.

Glossary of terms

Academic-corporate collaboration:

In Scopus, institutions are classified into one of four main sectors (Corporate, Academic, Government, and medical sectors). In this report, academic–corporate collaboration is analyzed via the proxy of papers whose authors’ affiliations belong to both the academic and corporate sectors.

Citation:

A citation is a formal reference to earlier work made in a paper or patent, frequently to other papers. A citation is used to credit the originator of an idea or finding and is typically used to indicate that the earlier work supports the claims of the work citing it. The number of citations received by a paper from subsequently published papers can be used as a proxy of the quality or importance of the reported research.

International collaboration:

International collaboration in this report is indicated by papers with at least two different countries listed in the authorship byline.

Appendix A

Global regions

For the purpose of this report, when we referred to large global regions, we used SciVal classifications to agglomerate most countries. Although this is an arbitrary allocation in some cases, this exercise provides a useful global overview of some trends.

Latin America: Brazil, Mexico, Chile, Colombia, Argentina, Peru, Ecuador, Cuba, Uruguay, Costa Rica, Venezuela, Puerto Rico, Panama, Bolivia, Paraguay, Guatemala, Honduras, Dominican Republic, El Salvador, Nicaragua, Haiti, French Guiana, Guadeloupe, Martinique

Europe: United Kingdom, Germany, Italy, France, Russian Federation, Spain, Netherlands, Poland, Switzerland, Sweden, Belgium, Portugal, Denmark, Austria, Norway, Czech Republic, Greece, Finland, Ukraine, Ireland, Romania, Hungary, Serbia, Slovakia, Croatia, Slovenia, Bulgaria, Lithuania, Cyprus, Estonia, Latvia, Luxembourg, Belarus, Iceland, Bosnia and Herzegovina, Malta, North Macedonia, Albania, Moldova, Montenegro, Monaco, Liechtenstein, Greenland, Faroe Islands, San Marino, Gibraltar, Andorra, Vatican City State, Svalbard and Jan Mayen, Jersey.

USCA: United States and Canada.

East Asia: China, Japan, South Korea, Taiwan, Hong Kong, Macao, Mongolia, North Korea.

Middle East: Iran, Turkey, Saudi Arabia, Israel, Iraq, United Arab Emirates, Jordan, Qatar, Lebanon, Oman, Kuwait, Georgia, Palestine, Bahrain, Armenia, Yemen, Syrian Arab Republic.

Africa: all countries within the African continent.

South Asia: India, Pakistan, Bangladesh, Sri Lanka, Nepal, Bhutan, Maldives.

South-East Asia: Indonesia, Malaysia, Singapore, Thailand, Vietnam, Philippines, Brunei Darussalam, Myanmar, Cambodia, Laos, Timor-Leste.

Australasia: Australia, New Zealand, New Caledonia, French Polynesia, Papua New Guinea, Solomon Island, Samoa, Tonga.

Appendix B

Most prolific countries in biodiversity research and their key metrics

Countries/regions	Relative Activity Index (RAI)	Scholarly Output	Field-Weighted Citation Impact	International Collaboration (%)
United States	1.02	26,590	1.69	59.9
China	0.79	24,876	1.41	32.3
United Kingdom	1.46	12,357	2.10	79.0
Germany	1.55	11,091	1.99	74.7
Brazil	3.11	10,463	1.25	46.8
Australia	2.01	8,564	2.01	68.0
France	1.77	7,993	1.87	73.3
India	0.87	7,738	1.27	28.6
Spain	1.76	7,414	1.70	70.9
Italy	1.34	7,137	1.71	57.5
Canada	1.47	6,642	2.01	69.6
Russian Federation	1.03	4,530	0.93	33.9
Switzerland	2.02	4,013	2.55	84.2
Netherlands	1.54	3,894	2.38	83.5
South Africa	3.12	3,659	1.72	67.5

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