AtlantECO

Atlantic ECOsystems assessment, forecasting & sustainability

Policy Brief

Advancing equitable research cooperation in Ocean sciences across the Atlantic Ocean

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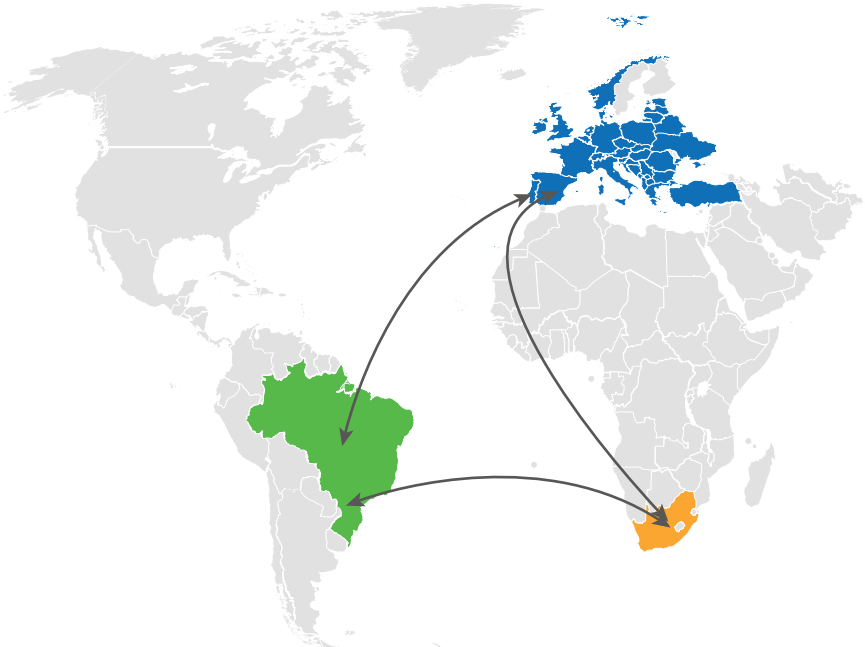
Summary

This policy brief explores the challenges and opportunities for fostering equitable, long-term international scientific cooperation in ocean sciences across the Atlantic. Developed through collaboration between European, Brazilian, and South African partners working in the EU-funded AtlantECO project, this policy brief highlights the need for fair, ethical, and inclusive research practices that respect different cultures and local realities.

Despite various international agreements, significant barriers remain, including disparities in research capacity, funding, and technology access. Bureaucratic hurdles and the prevalence of “parachute science” further limit meaningful collaboration. Strengthening infrastructure, streamlining administrative processes, promoting research mobility, expanding open-access research, and fostering co-funding mechanisms are essential steps toward a more balanced research landscape. This brief advocates for a more inclusive and effective approach to Ocean science by addressing these challenges, ensuring equitable participation in marine research and supporting sustainable ocean management.



Background & Context

Through its unique ecosystems and physicochemical processes, the ocean regulates climate, cycles nutrients, produces half of Earth's oxygen, and supports global food security. Managing the ocean sustainably is crucial to safeguarding the well-being of both human societies and the broader natural world. Advancing our scientific understanding of oceanic processes is essential for strengthening sustainable ocean governance through the development of science-based policy tools, making support for ocean research a crucial priority. Ocean sciences encompass various research fields, from biological, chemical, geological, and physical research, to social science research studying socioecosystems.

Recent advancements in research tools and methods have opened up new frontiers in Ocean sciences. The significant rise in ocean data acquisition and observation — spanning environmental data, imaging data, and various -omics fields such as metagenomics, transcriptomics, and metabolomics — has opened new opportunities to enhance our understanding of ocean systems and predict their future changes. Over the past decade, new tools and methods in Ocean sciences have:

- Deepened our understanding of the community structures and functions of the Ocean microbiomes.
- Improved Ocean circulation models.

To fully and equitably harness these emerging research opportunities, research collaborations in Ocean sciences must be strengthened to collectively advance our global knowledge of the ocean.

Introduction

The AtlantECO project, funded by the European Union's Horizon 2020 programme, is a research and innovation project aimed at advancing the understanding of the Atlantic Ocean to improve its management and improving predictions of future changes. Its research agenda was divided into three main scientific pillars:

- The Ocean microbiomes
- Plastics and the plastisphere
- Seascape and connectivity

AtlantECO was the first research project to be fully co-developed by the EU, Brazil and South Africa, providing equal opportunities and funding to all three partners. This project gathered 36 research partners from 13 countries, along with many collaborators across the Atlantic basin.

By equitably involving researchers from both the Northern and Southern Hemispheres, the AtlantECO project creates favourable conditions to overcome "parachute science", a practice whereby researchers from higher-income countries collect field data in other countries without collaborating with local researchers (4-6).

These research practices driven by external expertise and priorities have been a growing concern across many scientific fields (4), including Ocean sciences (6, 7). Given its high costs and limited accessibility compared to other scientific fields, Ocean sciences strongly highlight research disparities and parachute science practices. Despite the Southern Hemisphere covering more of the Earth's ocean surface, Ocean Science is predominantly led by countries in the Northern Hemisphere. A UNESCO report (8) revealed that Northern countries – including the United States, Canada, and several European countries – lead global Ocean sciences in both academic publications and citations (Figure 1). Conversely, researchers from some Southern countries remain significantly underrepresented in research agendas, international conferences, and publications (6).

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By creating conditions for equitable research cooperation, the AtlantECO project could be perceived as a successful example of "Science Diplomacy". This fluid concept, used to describe the interplay between science and international relations, can be divided into three categories – "Science for Diplomacy", "Science in Diplomacy", and "Diplomacy for Science" (9, 10). As the AtlantECO project was initiated under the All-Atlantic Ocean Research and Innovation Alliance (AAORIA) signed by several countries in the Northern and Southern Hemispheres, it particularly exemplifies "Diplomacy for Science" by showcasing how diplomatic efforts can facilitate and strengthen international scientific collaboration.

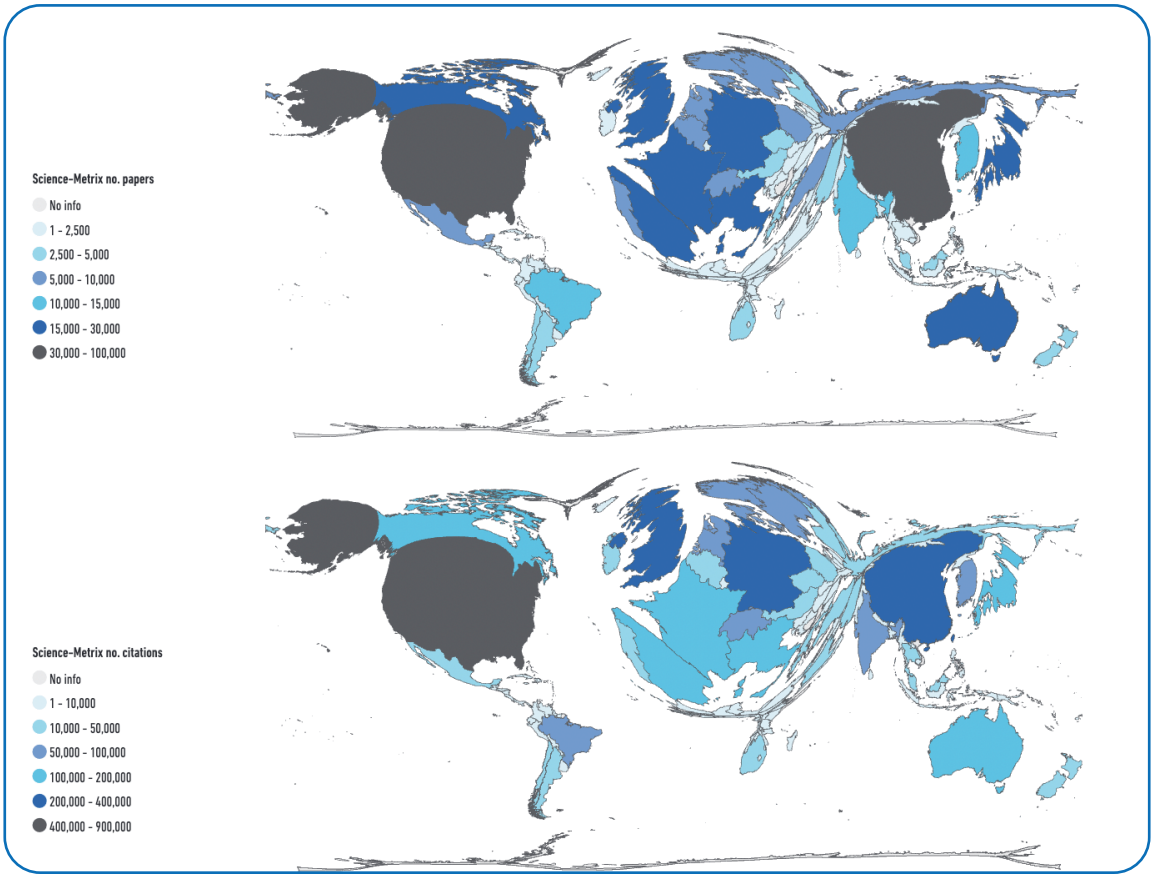

Figure 1. The current research gap in Ocean science publications and citations, reproduced from UNESCO (2017)

Current international frameworks supporting cooperation in Ocean sciences

International legally binding frameworks fostering collaborative and equitable research practices

The United Nations Convention on the Law of the Sea and the BBNJ treaty

The United Nations Convention on the Law of the Sea (UNCLOS) indicates, in its 242nd article, that States and competent international organisations shall promote international cooperation in marine scientific research (11). In addition, UNCLOS provides a framework encouraging equitable access to marine research data – it promotes, in its 244th article, the flow of scientific data and information transfer from marine research, especially towards developing States, and indicates, in its 249th article, that organisations undertaking research in exclusive economic zones shall "provide access for the coastal State, at its request, to all data and samples derived from the marine scientific research project" and "provide assistance in their assessment or interpretation" (idem).

The new **United Nations Agreement on Biodiversity Beyond National Jurisdiction (BBNJ) treaty**, designed to regulate and protect biodiversity beyond national jurisdictions, was adopted in September 2024 as the third implementing agreement to the United Nations Convention on the Law of the Sea. Confirming the status of the High Seas as international waters with a common responsibility, the BBNJ treaty forces states to think beyond borders, and can be a major step towards an internationally designed framework for Ocean sciences cooperation. The BBNJ's 14TH article indicates that non-monetary benefits arising from activities concerning marine genetic resources in areas beyond national jurisdiction should be shared through access to samples and sample collections, to digital sequence information, to open scientific data, as well as encouraging research capacity-building, increased technical and scientific cooperation, and transfer of marine technology (12). The BBNJ's fifth part provides guidelines to develop Parties' marine research capacities, in particular developing States, including through technology transfers *(idem)*.

The Convention on Biological Diversity and the Nagoya Protocol

The **Convention on Biological Diversity** (CBD) encourages scientific cooperation in environmental and biological sciences. For instance, its 18th article states that "contracting Parties shall promote international technical and scientific cooperation in the field of conservation and sustainable use of biological diversity", with a special focus on building national capacities (13).

Additionally, the Nagoya Protocol, which implements the CBD, establishes a benefit-sharing mechanism between countries providing genetic resources along their coastlines, often countries in the Southern Hemisphere, and the users of these resources, including researchers. It additionally promotes research cooperation and equitable practices in marine genomics. Its 23rd article requires all Parties to "collaborate and cooperate in technical and scientific research and development programmes", as well as to "promote and encourage access to technology by, and transfer of technology to, developing country Parties", and that "where possible and appropriate such collaborative activities shall take place in and with a Party or the Parties providing genetic resources" (14). Its 22nd article also promotes the strengthening of countries' "endogenous research capabilities" to add value to their genetic resources.

Other international and European frameworks supporting Ocean science cooperation

Atlantic frameworks

Some existing North-North, South-South, and North-South agreements – aimed at strengthening and developing transatlantic marine research collaborations – led to the All-Atlantic call for projects, from which stemmed the AtlantECO project. Building upon EU-US and EU-Canada Science & Technology agreements (15), the Galway Statement was signed by Europe, Canada, and the United States in 2013 to promote research collaborations in Ocean sciences to improve our understanding of the Atlantic Ocean. The Atlantic Ocean Research Alliance (AORA), was later established in 2015 to implement the Galway Statement, with cooperation areas including aquaculture, Ocean health and stressors, as well as seabed mapping (16).

In 2017, building on the establishment of the South–South Framework for Scientific and Technical Cooperation in oceanic research between South Africa and Brazil (15), the All-Atlantic Belém Statement was signed by the European Union, Brazil, and South Africa to deepen scientific cooperation by promoting joint research projects, capacity building, and data sharing (17).

Finally, in 2022, the All-Atlantic Ocean Research & Innovation Alliance (AAORIA) (18) declaration was signed in Washington. The signatories included the EU, Argentina, Brazil, Canada, Cabo Verde, Morocco, South Africa, and the US. This declaration builds on and reinforces the implementation of previous agreements, including the Galway and Belém statements. It also strengthens existing cooperation frameworks, such as the 2020 Administrative Arrangement on Marine Research & Innovation Cooperation between the European Commission and Morocco. Additionally, it builds on the Mindelo Arrangement between the European Commission and Cabo Verde and the EU-Argentina Administrative Arrangement, both signed in 2018 (19).

European frameworks

At the European level, two key frameworks promote research collaboration in Ocean sciences: the EU Mission "**Restore our Ocean and Waters**" and the **EU Ocean Pact**. The **EU Mission**, which supports the EU's Biodiversity Strategy for 2030, aims to protect Ocean health. It fosters research innovation projects and cooperation among member states across major sea basins, including the Atlantic-Arctic, the Mediterranean, the Baltic-North Sea, and the Danube-Black Sea. (20). Additionally, the **EU Ocean Pact** aims to establish sustainable Ocean governance through a holistic approach encompassing a wide range of policies, from conservation and economic policies to marine research and innovation policies. As the Ocean Pact has recently been established, its potential contributions to Ocean science cooperation have yet to be assessed.

International frameworks

Finally, at the international level, the **United Nations Decade of Ocean Science for Sustainable Development 2021-2030** (Ocean Decade), aims to strengthen Ocean sciences and support knowledge generation to protect the Ocean and support sustainable development. To implement the Ocean Decade, UNESCO's Intergovernmental Oceanographic Commission (IOC) was mandated to coordinate Ocean sciences, develop capacities, and promote collaborative international research projects. The IOC has been supporting capacity building and networks of scientists since the early 2000s (21). Having coordinated Ocean sciences for several decades, the IOC must now adapt to the growing diversity and complexity of Oceanic research.

Challenges

An effective South-North cooperation: main challenges identified

1. Uneven research capacities: networks, equipment, funding, and access to publishing

Due to the limited number of agreements supporting South-South research collaborations and the lack of funding for Southern-led initiatives, Ocean research networks in many Southern Hemisphere countries remain scarce.

Important steps in building research partnerships, such as hosting international workshops and transferring funds across borders, are less accessible in Southern countries. As explained by Asase et al. (2022) (22), biodiversity researchers from these countries often lack the funds to visit other laboratories and attend conferences to strengthen their research networks. Consequently, the lack of research networks in Southern Hemisphere countries greatly hinders regional research capacities and advancements. For instance, due to the lack of Southern research networks, the few existing research vessels remain inefficiently used.

2. Lack of co-funding

Moreover, **many countries in the Southern Hemisphere lack research infrastructure and equipment**, hindering their capacity to both **collect samples** and conduct **data analysis**. Additionally, these countries may lack the necessary equipment to meet the state-of-the-art research standards in sampling practices.

Upon data sampling and analysis, publishing in high-impact indexed journals can be very costly for researchers from Southern Hemisphere countries (23). Although publishing in some regional journals can be financially accessible, as they may require lower publishing charges, highly-cited international journals' publishing costs remain high and can be equal to Southern researchers' monthly salary (idem). Open Access publishing, which aims to ensure equitable access to research articles, requires researchers to pay for Article Processing Charges (APCs), thereby shifting publication costs from institutions to individual researchers (24). High-impact publications' APCs can range from 2,000 US$ to 12,000 US$ (idem).

Finally, **collaborative research projects remain rarely co-funded** by countries in the Southern Hemisphere, limiting the development of cooperative cross-border research projects driven by joint investments and perpetuating the dependency on Northern funding mechanisms and research agendas. The AltantECO project was, for instance, solely funded by the European Union through the Horizon Europe 2020 programme. Efforts to secure co-funding from Southern funding agencies were often hindered by a lack of understanding of the co-funding principle among decision-making boards.

Overall, these remaining gaps in research funding, networks, and equipment can lead to a brain drain from some Southern countries towards Northern countries. For example, during the AtlantECO project, after the Tara Oceans project (2009-2013), among the six South American postdocs who received funding to conduct research in European labs to explore the vast Tara Oceans dataset, most of them never returned to their home country.

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3. Bureaucratic hurdles

Obtaining permits to collect samples in countries' exclusive economic zones (EEZ) has been, at times, very complex during the AtlantECO project. These processes were frequently marked by extensive bureaucracy, requiring the implementation of the Nagoya Protocol and involving the navy in multiple countries. Moreover, coordinating the imports of equipment and the exports of samples was challenging. We acknowledge that these legal needs and permit and compliance processes are mandatory in the frame of the Convention on Biological Diversity, but governments could be more involved in the legal process to facilitate the work of researchers, thereby minimising time loss and promoting efficiency. For future regional or international calls for projects, the European Union could work on a more structured science-to-policy interface, which is not the same thing as a CSA (Coordination and Supporting Action) project.

Recomendations

Key opportunities to improve Ocean science collaboration across the Atlantic

1. Improving research capacities in both directions

AtlantECO acknowledges the need to strengthen research capacities at all stages of the scientific process, from sampling to data analysis, in both Northern and Southern Hemispheres, to achieve successful North-South and South-South research cooperation. Technology transfers and increased research funding opportunities should strengthen countries' capacities to collect samples. It is equally important to continue increasing Southern countries' data processing and analysis capacities to guarantee equitable opportunities for data analysis. Additionally, sampling, processing, and data analysis procedures should be designed to align with locally available equipment and technologies, helping to bridge research gaps between Northern and Southern countries. In AtlantECO, researchers sometimes adapted processing standards to accommodate equipment available in certain Southern countries. This ensured that DNA processing could be carried out in lower-resourced regions without relying solely on expensive facilities. Some protocol steps were modified to match locally available resources, and sequencing platforms accessible in Southern countries were used, even if they were not the latest models.

Additionally, enhancing regional research networks would strengthen Southern countries' capacities in both sampling and data analysis. Finally, simplifying the sampling permit process and reducing administrative barriers would facilitate cross-border research efforts.

After data sampling and analysis, research findings should be shared in open databases, ensuring equitable access to both data and publishing opportunities. Open-access databases are key to fostering research cooperation, as they guarantee equal access to current research advancements and provide equal opportunities for data analysis. Several open databases facilitate data sharing, such as the European Nucleotide de Archive (ENA) and the International Nucleotide Sequence Database Collaboration (INSDC) for genetic data, Data Publisher for Earth & Environmental Science (PANGAEA) for environmental data, and EuroBio imaging and Bio studies for imaging data. Since different types of data are currently stored in separate databases, efforts should focus on creating holistic databases that integrate diverse marine data, including genetic, imaging, and environmental information. Moreover, annotated open data platforms, which integrate modelling and visualisation interfaces, should be prioritized and further developed to simplify and catalyse data mining and analysis. To facilitate researchers' use of these databases, training programs should be provided and scientific information should be available in multiple languages.

Northern and Southern researchers should be given equal opportunities to publish in academic journals. To achieve this objective, a portion of the collaborative research projects' funding should cover publication costs. High-impact journals, such as Nature or Science, should also consider providing a waiver of publication fees or Article Processing Charges (APCs), to account for the disparities in researchers' incomes across Northern and Southern Hemisphere countries. As long as researchers do not have equal access to publish in high-impact journals, the number of publications in these journals should not be the sole measure of a researcher's success (23).

Finally, it is important to strengthen researchers' skills and knowledge across borders. To encourage knowledge exchange and training, "brain circulation" should be encouraged, instead of "brain drain", by providing opportunities for short stays abroad (25). Additionally, young researchers across countries should be given opportunities to strengthen their research experience. The AltantECO project illustrates how a collaborative research project can successfully involve Early-Stage Researchers (ESRs). Finally, to foster meaningful future research collaborations and knowledge exchange, scientists from the Northern Hemisphere should be encouraged to follow short training programs emphasising the importance and benefits of partnering with local researchers. These researchers shall understand that, as explained by De Vos & Schwartz (2022), capacity development occurs in both directions as local researchers' expertise can largely enrich research agendas.

2. Fostering meaningful collaborative research programs

To establish successful and long-lasting collaborative research programs, it is crucial to increase funding and institutional support. This will help strengthen **regional research networks, both between the Global North and South (North-South) and among countries in the Global South (South-South).**

Additionally, co-funding mechanisms between the Northern Hemisphere and Southern Hemisphere should be encouraged, to reduce the dependency on Northern funds as a unique source of funding. In addition to government funding sources, collaborative research projects across the Atlantic could be funded by multilateral funds. Some international environmental funds, such as the Global Environment Facility (GEF), have been criticized for power imbalances between donors and recipients, leading to distrust among some Southern Hemisphere countries (26).

It is essential to ensure that multilateral funding mechanisms for Ocean science research are fairly negotiated and governed. This would guarantee equal decision-making power and opportunities for countries across both the Southern and Northern Hemispheres.

To ensure meaningful collaborations, **local researchers should be included at all stages of the research project, including in the research design**. Involving local scientific expertise from the very beginning of a research project ensures that local needs are properly addressed and that the benefits of the research are equitably shared.

Furthermore, this reduces the dependency on external expertise and may guarantee the research project's alignment with local capacities. A notable example is the Tara Schooner Mission Microbiomes, conducted within the scope of AtlantECO, where local researchers were successfully integrated into the research agendas.

Before the Tara research schooner arrived in various regions, local and foreign researchers worked together to synthesize existing knowledge, identify research gaps, and define key research questions. During the schooner's research cruise in Brazil and South Africa, local researchers played an active role in developing regional research projects and designing sampling strategies. After data collection during the AtlantECO Mission Microbiomes, researchers continued collaborating with local partners to align research efforts with local priorities.

Recognizing and strengthening cross-cultural and cross-institutional collaboration is essential for the success of research programs. Considering cultural differences and country-specific contexts at every stage helps create an inclusive and effective research environment. Successfully navigating this cross-cultural landscape also requires valuing and integrating local knowledge, including traditional and practice-based knowledge.

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Additionally, research programs should account for local institutional requirements, governance structures, and power dynamics. To support this, local collaborators can play a key role in interpreting and navigating their country's institutional context, from project design to publication of results.

Conclusion

To prevent parachute science and ensure equitable access to new research opportunities in Ocean Sciences ultimately achieving the science we need for the Ocean we want—stronger collaboration between the Northern and Southern Hemispheres is essential. The AtlantECO project, which fosters research cooperation between scientists from both Hemispheres, highlights both the challenges and opportunities for building fair and sustainable partnerships in Ocean sciences. Although legal frameworks support South-South and North-South collaboration in Ocean science, significant challenges remain. These include difficulties in obtaining sampling permits and disparities in research capacity between the Southern and Northern Hemispheres—particularly in infrastructure, equipment, research networks, funding, and access to publishing. To bridge these gaps, efforts to strengthen research capacities must continue.

Technology transfers and increased funding would enhance sampling and data analysis capacities, while streamlining sampling permits would facilitate research efforts. Additionally, research data should be shared through comprehensive, well-annotated open databases, and all researchers should have fair access to publishing.

Building research skills and fostering collaboration across borders is also essential. This can be achieved by offering short-term research stays, involving young researchers in projects, and training Northern researchers on the value of partnering with local experts.

Beyond capacity-building, establishing long-term, meaningful collaboration requires strengthening North-South and South-South research networks, co-funding research initiatives, reinforcing cross-cultural and cross-institutional cooperation, and ensuring local researchers are involved at every stage of a project. This approach ensures alignment with local capacities and priorities.

Finally, since advancements in Ocean science contribute to sustainable ocean governance, it is crucial to provide researchers from both Hemispheres with equal opportunities to engage in governance processes and share their expertise with policymakers.

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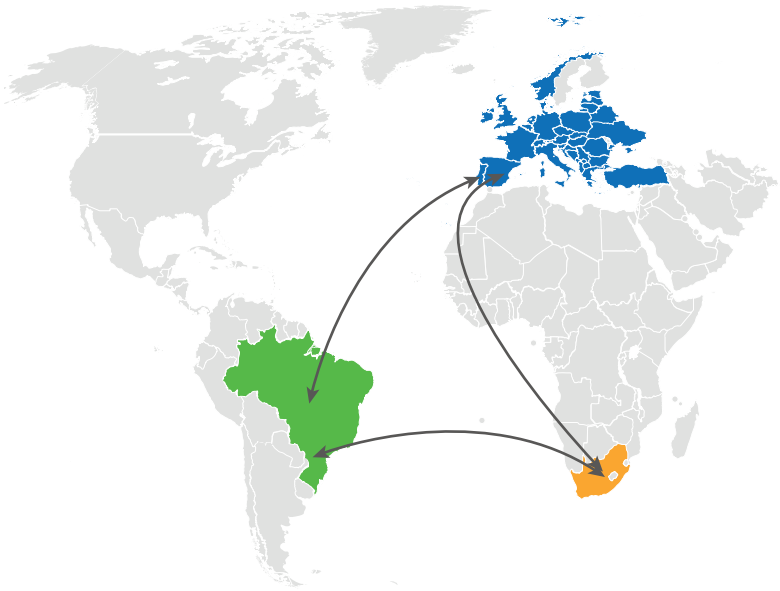

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