

Roadmap for bilateral research cooperation



Research cooperation with Brazil

The Research Council has drawn up roadmaps for cooperation with eight priority countries outside of the EU/EEU: Brazil, Canada, China, India, Japan, Russia, South Africa and the US.

The roadmaps contain background information about the research policy and the research and innovation systems in the priority countries, Norway's cooperation with these countries, and an assessment of areas of and opportunities for cooperation. The roadmaps are intended to provide a basis for setting priorities and encourage more targeted cooperation with the selected countries.

The roadmaps are a follow-up of the white paper on research, Meld. St. 18 (2012–2013) *Long-term perspectives – knowledge provides opportunity*, which identifies these eight priority countries.

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1. Key figures and summary of conclusions

KEY FIGURES		
Population in 2012	Inhabitants (mill.)	198.7
Gross Domestic Product (GDP) per capita in 2012	USD (thousands)	11.3
Growth in Gross Domestic Product (GDP) in 2012	Per cent	0.9

R&D EXPENDITURES		
R&D expenditures as a percentage of GDP in 2010	Per cent	1.16
Change in R&D expenditures 2002–2011	Per cent	82.3

INTERNATIONAL COOPERATION		
Joint grant proposals with Norway submitted to FP7	Number	101
Joint projects with Norway awarded funding	Number	26
Success rate of joint grant proposals with Norway in FP7	Per cent	25.7
Grant proposals submitted to FP7, total	Number	1 146
Projects awarded funding, total	Number	175
Success rate for Brazil in FP7	Per cent	15.3

TRADE AND INDUSTRY		
Import of goods and services as a percentage of GDP	Per cent	13
Norwegian goods exports to Brazil in 2012	NOK mill.	5 230
Norwegian goods imports from Brazil in 2012	NOK mill.	8 459
Norwegian direct capital investments in Brazil in 2011	NOK mill.	18 063
Ranking in the Global Innovation Index in 2013		64

Brazil is the fifth largest country and the sixth largest economy in the world (2011). The vast oil discoveries made in Brazil in recent years have attracted many international operators and actors in the supplier industry. The country has seen a strong increase in the number of scientific publications in the past decades.

Norway's expertise in deepwater drilling makes the country a sought-after partner. Participation in research and development activities within this field is also interesting for Norwegian research groups. Brazil is the world's second largest hydropower producer and a world leader in biofuel production, and there is potential for enhanced research cooperation with Norway in these areas. Solar power, wind power, hydropower

and technology for sustainable cities are other relevant areas for closer cooperation.

The Amazon rainforest in Brazil is the world's largest area of rain forest, and in recent years the country has managed to reduce deforestation by over 60 per cent. Norway supports Brazil's efforts with its large contribution to the Amazon Fund, and joint research activities in this area would be beneficial.

The areas of research and innovation with special potential for cooperation between Norway and Brazil are:

- Petroleum
- Renewable energy
- Climate and the environment
- Marine research
- Bioeconomy/food
- Cultural/social issues

2. Brief description of Brazil's research policy and research and innovation system

Research and innovation system

Brazil is the fifth largest country in the world, in terms of both area and population. It is the largest country in Latin America and the only BRICS country (emerging economy) in the region. Brazil was the world's sixth largest economy in 2011. Very few large countries have experienced as high a level of economic growth as Brazil in the past decade. However, growth is slowing down; it was 0.9 per cent in 2012 as opposed to 7.5 per cent in 2010, which was the highest level since 1980. Although there is still a wide income gap, many groups have emerged from poverty and social inequality has been reduced in the past decade.

Brazil is a federal republic, and thus it is necessary to differentiate between institutions and policy at the national (federal) level and the state level. There is also significant variation in the scope and quality of R&D activities among the individual states, despite the Government's stated objective of promoting equal access to education, social inclusion and economic development.

At the *national level*, the *Ministry of Science, Technology and Innovation* ("innovation" was added in 2011) (MCTI) is the most important body for promoting research and technology. It has the primary responsibility for defining and implementing the country's research, technology and innovation policy.

Other ministries, including the *Ministry of Mines and Energy* (MME) and the *Ministry of Fisheries and Aquaculture* (MPA), also take active part in drawing up central plans and the like. The *Ministry of Education* (MEC) plays a key national role via its subsidiary agencies, the Secretariat for Higher Education (*Secretaria de Educação Superior* (SESu)) and the Federal Agency for Support and Evaluation of Graduate Education

(*Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES)*). Among other tasks, CAPES is responsible for approving graduate and post-graduate programmes based on the scientific quality of the research groups.

Each state has a state secretariat for research, technology and innovation. Together, the state secretariats have formed a national council (*Conselho Nacional de Secretários para Assuntos de Ciência, Tecnologia e Inovação (CONSECTI)*) to ensure that local strategies are used as input for a national policy in this area.

Funding sources and bodies

The National Fund for Scientific and Technological Development (*Fundo Nacional de Desenvolvimento Científico e Tecnológico (FNDCT)*) is the most important funding source for research and technology administered by the Ministry of Science, Technology and Innovation (MCTI). FNDCT primarily receives allocations from the sector-oriented funds (see below).

MCTI had a budget of EUR 2 230 billion in 2011. According to the ERAWATCH Country Report of 2011, the ministry’s budget grew by 170 per cent in the 2000–2010 period.

At the national level, MCTI has two important research-funding bodies: the National Council for Scientific and Technological Development (*Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)*), and the Brazilian Innovation Agency (*Financiadora de Estudos e Projectos (FINEP)*, also known as the Studies and Projects Financing Agency).

CNPq – the national research council – was established in 1951, and is Brazil’s oldest research-funding body. The council is charged with promoting and encouraging national scientific and technological development and provides input to national strategies in these fields. The council’s key funding instruments are training grants for master’s and Ph.D. students (both in

Brazil and abroad) and support for implementation and administration of research projects.

FINEP seeks to promote and finance innovation activities and scientific and technological research in public and private companies and institutions. The agency primarily provides support in the form of loans, but also provides a certain amount of grants and fellowships as well.

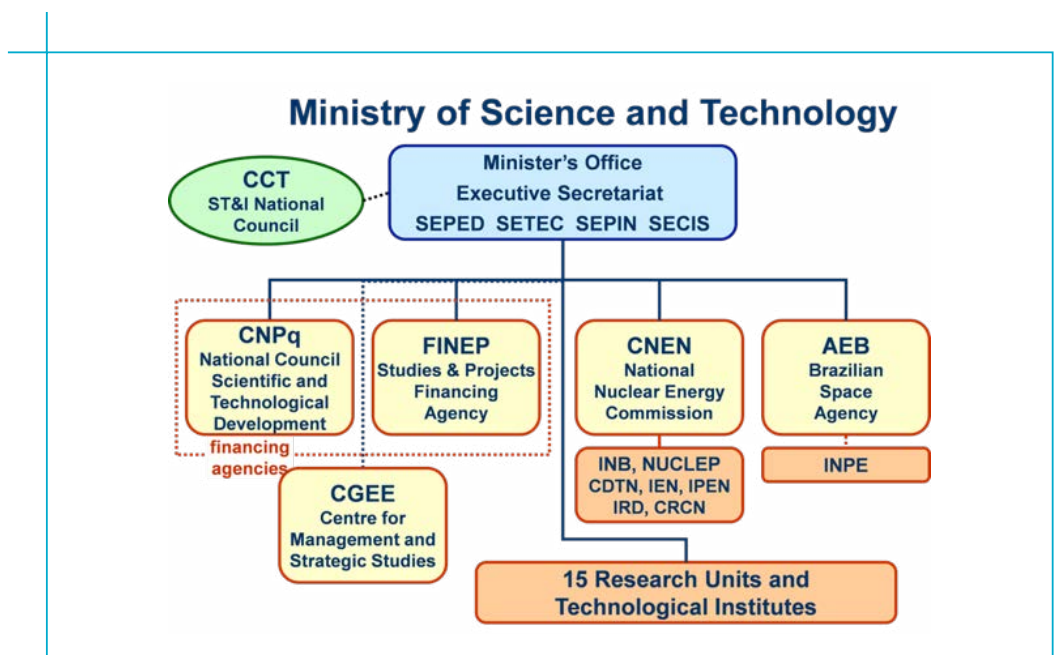
FINEP also serves as the secretariat for the national fund FNDCT, and by extension for the important sector funds, which were established in 1999. There are 16 funds: 14 for specific sectors and two cross-sectoral funds. There are individual sector funds for aeronautics, agriculture, Amazon Basin, biotechnology, energy, space, computer science, minerals, oil, water resources, health, telecommunications, maritime transport, and transport. The Green-Yellow Fund (*Fundo VERDE-AMARELO*) is a cross-sectoral fund for interaction between the universities and industry, and the other cross-sectoral fund is for infrastructure.

CAPES is the most important agency under the Ministry of Education (MEC) for funding of grants for graduate and post-graduate students in Brazil and abroad.

Most states have a regional research foundation (*Fundação de Amparo à Pesquisa (FAP)*), which is funded by one per cent of the state’s tax revenue set aside for this purpose. The São Paulo Research Foundation (FAPESP) is the oldest and largest of these, with a budget of roughly USD 500 million in 2013.

The next-largest regional research foundation is in Rio de Janeiro (FAPERJ). The regional research foundations have established an interest organisation: the National Council of State Research and Innovation Support Foundations (*Conselho Nacional das Fundações Estaduais de Amparo à Pesquisa (CONFAP)*).

AGENCIES GOVERNING RESEARCH ACTIVITIES



In 2010, 52.7 per cent of overall funding for R&D came from public sources: approximately two-thirds from federal sources and one-third from state sources. São Paulo, Rio de Janeiro and Paraná are the states that invest the most in R&D. Although these are some of the wealthiest states, an analysis of figures for São Paulo shows that regional differences are due as much to the states' priorities as to their economic status.

Research-performing institutions

As of 2013, Brazil had more than 2 400 universities and higher education institutions. Depending on their academic organisation, these institutions are categorised as universities (roughly 10 per cent), university centres (roughly 5 per cent), colleges (85 per cent), and a small group of Federal Institutes for Education, Science and Technology (IFET, roughly 2 per cent). The level of research activity varies widely. Some 90 per cent of all higher education institutions are private institutions.

Most of the top institutions are found among the public educational institutions, but some of the private institutions, such as the Pontifical Catholic Universities, have the same high standard. There are a total of 193 *universities*, of which 59 are federal. The ranking of the Brazilian universities differs somewhat depending on which organisation is doing the ranking, but one grouping that tends to stand out, although the positions may vary somewhat, includes the University of São Paulo (USP) and University of Campinas (UNICAMP) (both state universities in São Paulo), the Federal University of Rio de Janeiro (UFRJ) and the Federal University of Minas Gerais (UFMG). Other lists also include São Paulo State University (UNESP) and the Federal University of Rio Grande do Sul (UFRGS) among the top universities. The country's most important research is carried out at the public universities.

The majority of, and the largest, public *research institutes* are found at the national level, and they are often affiliated with a ministry. Thus most ministries participate in the Brazilian research system via one or more institutes. The Ministry of Science, Technology and Innovation (MCTI), for example, governs over 20 research institutes in the highest priority areas via its undersecretariat for the coordination of research units (*Subsecretaria de Coordenação das Unidades de Pesquisa* (SCUP)). Among the largest institutes are the Brazilian Corporation of Agricultural Research (EMBRAPA), which is affiliated with the Ministry of Agriculture, Livestock and Supply (MAPA), and the Oswaldo Cruz Foundation (FIOCRUZ), which is affiliated with the Ministry of Health.

Research and innovation policy

The previous national plan for science, technology and innovation (PACTI, 2007–2010) was succeeded by a new plan in December 2011: the *National Science, Technology and Innovation Strategy 2012–2015 (Estratégia Nacional de Ciência, Tecnologia e Inovação 2012–2015)* (ENCTI)).

The overarching strategic objective is to achieve sustainable development with ST&I as the main driver. The strategy addresses five main challenges:



- To reduce the scientific and technological gap that still separates Brazil from developed nations;
- To expand and consolidate Brazilian leadership in the natural knowledge economy (including green innovation, agribusiness and other natural resource-based activities);
- To promote the development of a low carbon economy;
- To increase the internationalisation of the national research system;
- To reduce social and regional inequalities.

Three main instruments will be employed to achieve these ambitious goals: promotion of innovation, human resources training and capacity-building, and strengthening of S&T research and infrastructure.

The ENCTI strategy sets out specific targets for R&D growth in the public and private sectors, particularly in relation to innovation. Many of the ENCTI priority programmes are in alignment with programmes/thematic areas set out the Greater Brazil Plan (PBM) for industrial policy, also launched in 2011. Common sectors are italicised: *ICT, Pharmaceuticals and the Health Industry Complex, Oil and Gas, Defence Industrial Complex, Aerospace*, Nuclear, Innovation Frontiers (biotechnology and nanotechnology), *Promotion of Green Economy (renewable energy, climate change, biodiversity, and oceans and coastal zones)* and Science, and *Technology and Innovation for Social Development* (ST&I diffusion and improvements in science education, productive inclusion and social technology, and technologies for sustainable cities).

Other important instruments for increasing the level of innovation are the "Innovation Law" (Technological Innovation Act) of 2004 and the "Good Law" (*Lei do Bem*) of 2005. The purpose of the Innovation Law is to make it easier for public research and technology institutions to collaborate with companies on the commercialisation of research results, including questions relating to intellectual property rights (IPR). The Good Law establishes tax breaks for companies for costs relating to innovation projects. Procedures associated with these pieces of legislation have been improved in connection with the new, overarching long-term plans.

In 2011, the Brazilian Government launched an ambitious researcher training and mobility programme entitled Science

without Borders (SwB), whose aim is to send 101 000 students at various levels and researchers to top universities abroad to pursue studies and research in mathematics, natural science and technology. Within the MNT disciplines there are a number of fields in which Brazil will have a great need for qualified personnel in the coming years, including oil and gas, renewable energy, sustainable agriculture, health and ICT. The SwB programme primarily awards one-year scholarships (sandwich scholarships), but candidates may also apply for a fellowship to complete an entire degree abroad. The Government funds 75 000 grants (via CNPq and CAPES), while the private sector funds 26 000.

In March 2013, the Government announced that EUR 12 billion would be earmarked to support innovation activities in companies. Among other things, the funding will be used to establish an institute for research and innovation in industry, EMBRAPIL.

3. Brazil's strengths and weaknesses in research and innovation, and the country's international standing

In 2010, Brazil's gross domestic expenditure on research and development (GERD) was 1.16 per cent. This lies below the OECD average (2.3 per cent), but above the GERD of other major Latin American economies such as Argentina, Chile and Mexico. The target is 2.2 per cent by 2022. (Norway's GERD is 1.65 per cent.)

Other indicators provide insight into Brazil's relative size within R&D. Latin America accounts for only a small share of world distribution of R&D expenditures by continent (approximately three per cent), compared with Asia (35 per cent), North America (32 per cent) and Europe (seven per cent). (Oceania and Africa account for two per cent and one per cent, respectively.) Within Latin America, however, Brazil accounts for the largest share, followed by Mexico, Argentina and Chile, with 1.9 per cent of the world's R&D expenditures – far exceeding Norway's 0.4 per cent.

Brazil's R&D intensity (total R&D expenditures (GERD) as a percentage of GDP) is nevertheless lower than its share of world GDP. This indicator and the one above show that contrary to most Western countries, which are either investing more (e.g. US, 19 per cent) or the same percentage in R&D (e.g. Norway, 0.4 per cent), Brazil is investing relatively less. (Source: *Report on Science & Technology Indicators for Norway, 2013.*)

In the past 10 years Brazil has seen positive development on many S&T indicators. There has been an increase in R&D costs/budgets and in the number of researchers, post-graduate fellowships, publications, and, to a lesser degree, patents.

In a bibliometric analysis conducted by Science-Metrix for the Research Council in 2013, Brazil ranks 14th in terms of the total number of publications (full counting) and 13th measured by the share of internationally co-authored publications

(fractional counting). With growth of more than 50 per cent during the 10-year period from 2003 to 2012, Brazil is now part of the group of countries called the upcoming global leaders in terms of the number of scientific publications.

However, Brazil scores low on many indicators for human resources in science and technology (HRST). In 2006, researcher density (percentage of researchers in the population) was low, with only 1.5 researchers per 1 000 economically active population. (Norway has 7.5 researchers per 1 000 inhabitants. (Source: *Report on Science & Technology Indicators for Norway, 2013.*) The number of degrees in natural science and technology increased to 11 per cent of all new degrees in 2007; however, this is only roughly half of the OECD average. Only 11 per cent of the population aged 25–64 has a tertiary-level education, which is considered relatively low. Nevertheless, the production of new doctoral degrees is rising, and Brazil (like Russia) awards more doctoral degrees per capita than the OECD average.

There is a significant lack of qualified personnel in many companies and sectors, and there is an unmet need for engineers and technical personnel in particular. Companies in the oil and gas and aerospace sectors have the greatest lack. Although the number of engineering graduates has risen in recent years, these cover only half the number needed.

Despite the growth in scientific publication, Brazil has a very modest number of international patents compared with China and India, for example. (China applied for 8 000 patents in 2009, while Brazil applied for 480.) More patent applications are submitted by universities than by companies, but few are approved. This is a reflection of the fact that Brazil does not have an industrial sector that invests in R&D. Brazil ranked 64th on the Global Innovation Index (2013), while China ranked 34th (2012).

Brazil has a strong standing in fields such as agrobiotechnology, biofuel, deepwater oil recovery, aeronautics, health research and ICT. The country is also home to several excellent research-performing universities, but research activity does not carry much of an impact in Brazil's large, complex economy. Many small and medium-sized enterprises (SMEs), in particular, have limited innovation capacity.

In 2010, business expenditure on research and experimental development (BERD) in Brazil was 48 per cent – the highest of the Latin American countries, but much lower than countries such as China (71.7 per cent in 2009) and South Korea (72.9 per cent in 2008). There are also large regional differences within Brazil here: the state of São Paulo accounts for roughly 50 per cent of the country's total R&D expenditures (GERD) and 63 per cent of BERD.

In recent years major national and international companies such as Petrobras (the leading national oil and energy company with its own R&D centre, CENPES) and Vale (a large mining and minerals company) have been intensifying collaboration on innovation with the universities.

4. Existing cooperation with Brazil

Norway and Brazil have been trade partners for more than 170 years. Brazil is Norway's largest export market for services, after the EU and the US. Although trade continues to grow, economic relations between the two countries are now dominated by Norwegian investment and the establishment of Norwegian companies in Brazil. After the EU and the US, Norway makes its largest investment abroad in Brazil, and it was the seventh largest foreign investor in Brazil in 2010. Three sectors account for 96 per cent of the total Norwegian investment: oil and gas (65.3 per cent), industry (26.1 per cent) and renewable energy (4.6 per cent).

Multilateral research cooperation

Bibliometric study 2014

According to the bibliometric study conducted by Science-Metrix for the Research Council, the level of cooperation between Norway and Brazil is relatively low as measured by co-publications (although higher than cooperation between Norway and China, Japan and India). This may be explained by Brazil's low level of co-publication in general, among other things. Although collaboration with Norway has fluctuated during the 10-year period analysed, it has increased overall and is expected to continue to grow.

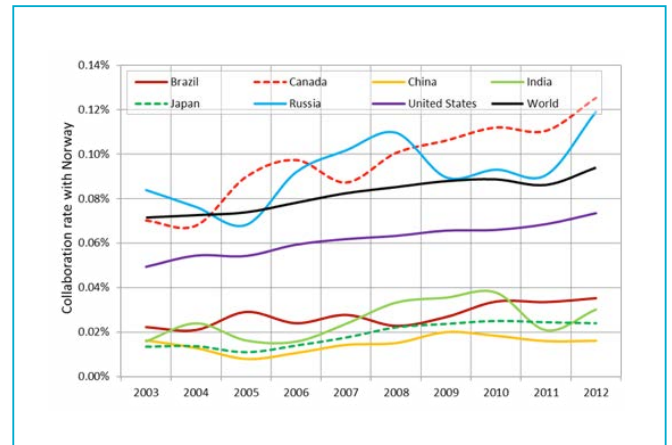
EU cooperation

In 2004, Brazil signed a cooperation agreement with the EU that was operative for the 2007–2012 period and was subsequently renegotiated. According to the agreement, Brazilian research institutions and individual researchers may participate in EU programmes, while only individual European researchers, not research institutions, may participate in/receive support from Brazilian programmes. One of the tasks of the BILAT project B.BICE+ is to disseminate information about EU programmes and activities. (<http://www.b-bice-plus.eu/>)

Among the third countries that participated in the EU Seventh Framework Programme (FP7), Brazil ranked sixth in terms of participation and budget, after Russia, the US, China, India and South Africa, but before Japan. (Source: *Corda Country Profile, March 2012*.) The EU's contribution to Brazil increased substantially from FP6 to FP7 (from EUR 14.4 million to EUR 23.4 million), but under Horizon 2020 it has been decided that as a BRICS country, Brazil must contribute its own funding. This may lead the country to revise its strategy in relation to EU research. Regardless, there will be calls for proposals that include earmarked funding for projects with partners from Brazil (this has already been incorporated into the Horizon 2020 Work Programme for 2014–2015).

Brazil participated in a total of 1 146 grant proposals submitted to FP7, with a success rate of 15.3 per cent. Norway and Brazil were partners in 101 of these proposals, with a success rate of 25.7 per cent. In general, the success rate for joint proposals between Norway and its eight priority countries for cooperation is higher than these countries'

FIGURE 3: COLLABORATION RATE OF SELECTED COUNTRIES WITH NORWAY (2003–2012)



Note: The collaboration rate is based on fractional counting. (South Africa is not included here.) Source: Computed by Science-Metrix using Scopus (Elsevier)

general success rate. Altogether, Brazil collaborates with Norway in 14.7 per cent of the projects in its FP7 portfolio.

The grant proposals featuring Norwegian and Brazilian partners submitted to FP7 extend across a wide range of thematic areas. Most were submitted under the programmes Socio-economic Science and the Humanities (SSH), Environment (including Climate Change) (ENVIRONMENT), Food, Agriculture and Fisheries, and Biotechnology (BIO), and Information and Communication Technologies (ICT). A total of 22 joint projects were registered under the thematic programmes of FP7. Statistics show that the largest number of projects awarded funding and the highest success rate were under the ENVIRONMENT programme.

Together, Norway and Brazil – via their respective national research councils – have participated, and continue to participate, in several EU network projects, including the policy-oriented INCO-NET projects EULARINET (concluded in 2012) and ALCUE NET (launched in 2012) as well as the ERANet-LAC (launched in 2013). Several joint calls for proposals are planned under the latter ERA-NET. Brazil and Norway have also participated in a joint call for proposals on renewable energy under the ERA-NET EULANEST in 2010, under which two joint Brazilian-Norwegian projects were awarded funding.

Bilateral cooperation

There are various schemes to support bilateral cooperation between Norway and Brazil in the form of reciprocal funding schemes or unilateral support.

In autumn 2014, the Research Council of Norway and *CNPq* signed an agreement on research cooperation between the two institutions. An accompanying work plan describes potential forms of cooperation, including joint calls in research areas of common interest.

The Research Council signed an agreement with *FINEP* that same autumn. It will be followed up with an action plan.

Initially, collaboration will target the petroleum sector and may involve both research groups and companies.

In 2012, the *Norwegian Centre for International Cooperation in Education (SIU)* signed an agreement with *CAPES* to develop and strengthen academic cooperation. A joint call for proposals for mobility grants for students and academic staff was issued in 2013, and eight projects were awarded funding. There are currently no other funding announcements planned at this time.

In 2012, Norway signed an agreement to allow Brazilian bachelor's students to study at Norwegian higher education institutions via Brazil's large-scale scholarship programme *Science without Borders*. The programme aims to send 101 000 students in MNT and engineering disciplines to universities abroad. Although its primary focus is on undergraduates, the programme also awards doctoral and post-doctoral fellowships. The first group of 65 bachelor's students came to Norway in autumn 2013. The subsequent call for proposals resulted in a total of 1 800 applications to study in Norway, and there is reason to believe that funding will be awarded to a significantly larger number of students. Doctoral and post-doctoral candidates may now also apply for a stay in Norway. There are also some openings to send Ph.D. students and younger researchers to Brazil. In principle, the programme is fully funded by Brazil.

The Research Council's *Research Programme on Latin America (LATINAMERIKA)* is funded by the Norwegian Ministry of Foreign Affairs for a 10-year period from 2008 to 2017. The primary objective of the programme is to build competence in Norway about Latin America; thus it is not a direct research cooperation programme. The LATINAMERIKA programme encompasses all of the countries in the region, but stresses the need for research on Brazil in particular. The programme has received an increase in allocations earmarked for Brazil in the wake of the Norwegian Government's strategy for cooperation between Brazil and Norway (2011). The bulk of the funding has been awarded to Norwegian researchers, but support has also been granted for cooperation with several Brazilian institutions at the project level. The programme encompasses five broad thematic priority areas.

The new *Large-scale Programme for Petroleum Research (PETROMAKS 2)*, like its predecessor, employs an array of funding instruments for research on and with Brazil within its thematic priority areas. In addition to awarding funding for ordinary research projects, the programme has also awarded support for institutional cooperation.



The *YGGDRASIL mobility programme* has provided grants for research stays of 3–12 months in Norway for Ph.D. students and younger researchers within all disciplines. Brazil is one of the countries from which applications have been accepted. The programme was recently evaluated and will not be continued in its current form.

Brazilian students have received funding to study at Norwegian universities under the *Quota Scheme*. The scheme is currently being evaluated.

Many Norwegian universities and research institutes have signed collaboration agreements on education and research with their Brazilian sister institutions. As a general rule, these agreements do not have designated funding schemes.

5. Grounds for considering cooperation with Brazil

The Research Council of Norway's Strategy for International Cooperation 2010–2020 identifies five main objectives for increasing international cooperation:

- help to address global challenges to society;
- enhance the quality and capacity of Norwegian research;
- secure Norway access to international knowledge production;
- boost the competitiveness of Norwegian trade and industry;
- promote Norway as a leading research and innovation nation in selected research areas.

Cooperation with Brazil is of relevance in relation to several of these objectives.

The world's largest rainforest is located in Brazil's Amazon Basin. Deforestation of this rainforest will critically affect the carbon cycle and thus the impact of global warming and climate change. In recent years Brazil has managed to reduce deforestation by over 60 per cent. Norway makes a large contribution to the Amazon Fund to support these activities, and joint research efforts on deforestation and in other areas will be crucial to *helping to address global challenges to society*.

Norway and Brazil have a long history of trade of two particular items: klippfish and coffee. In recent years, Brazil has become an important, growing market for Norwegian trade and industry in a number of sectors, particularly petroleum, fisheries, aquaculture and forestry. Brazil is now the third most important country in terms of Norway's international investments. More than 150 Norwegian companies have now been established in the Rio de Janeiro area. Continued research activities will be vital to *boosting the competitiveness of Norwegian trade and industry*.

The vast oil discoveries made in Brazil in recent years have attracted many international operators and actors in the supplier industry. Norway's expertise in deepwater drilling makes the country interesting as a partner. Challenges related

to the special discovery conditions in Brazil are particularly interesting, and participation in research and development efforts here may help to *promote Norway as a leading research and innovation nation in this and other selected research areas.*

The primary objective of the LATINAMERIKA programme is to enhance knowledge about Latin America in Norway by supporting high-quality research. Brazil has become an important partner for Norway in many areas, not just in trade and industry, but also in foreign and development policy, tourism, culture and science. A better knowledge base is needed in these and other areas, and efforts here may help to *enhance the quality and capacity of Norwegian research.*

6. Current priorities for Norway's activities vis-à-vis Brazil

The Research Council's activities vis-à-vis Brazil are carried out within a framework of thematic and structural priorities:

- The white paper on research, Meld. St. 18 (2012–2013) *Long-term perspectives – knowledge provides opportunity*, specifies Brazil as one of Norway's priority countries for cooperation.
- The *Norwegian Government's strategy for cooperation between Brazil and Norway* (2011), lists research as a separate "pillar" and as part of and a support for the strategy's four priority areas: private sector cooperation, trade and investment; climate and environmental issues, and sustainable development; global challenges; knowledge exchanges and social development.
- *The Research Council of Norway's Strategy for International Cooperation 2010–2020.*
- Bilateral country-to-country agreements: two Memorandums of Understanding were signed in 2008 and renewed in 2012 between the Norwegian Ministry of Education and Research and the Brazilian Ministry of Science, Technology and Innovation (MCTI) on research and between the Norwegian Ministry of Education and Research and the Brazilian Ministry of Education (MEC) on education. These MoUs are general in nature and do not specify priority focus areas.
- The Research Council of Norway and Brazil's National Council for Scientific and Technological Development (CNPq) signed an agreement on research cooperation in August 2014. An affiliated work plan provides further details on the forms of cooperation.
- The work programme for the geographically oriented LATINAMERIKA programme (2008–2017) names Brazil as a particularly relevant country for research. As of 2012, the programme has received additional earmarked funding for activities related to Brazil. The programme encompasses five broad thematic priority areas.
- The Norwegian Ministry of Petroleum and Energy and the Brazilian Ministry of Science, Technology and Innovation



Photo: Shutterstock

(MCTI) signed the *Brazil-Norway in the 21st Century* (BN21) agreement in November 2013. The agreement encourages cooperation on research, development and demonstration in the oil and gas sector.

- The BN21 agreement is being followed up, among other things, with an agreement signed in November 2014 between the Research Council and the Brazilian Innovation Agency (FINEP). The agreement will initially focus on cooperation in the oil and gas sector, with the possibility of expanding its scope if the parties so choose.
- A 2009 agreement between the Norwegian Ministry of Fisheries and Coastal Affairs (now the Ministry of Trade, Industry and Fisheries) and the Brazilian Ministry of Fisheries and Aquaculture (MPA) opens up opportunities for research cooperation and researcher exchange in areas of common interest.

7. Follow-up and implications

Introduction

The above-mentioned bibliometric study identifies environmental research as a subject area in which Brazil has particular strengths. The country has a relatively high output here, as well as high impact and specialisation scores. The study points out that Brazil has a strong performance in marine and freshwater biology as well. It also shows that although the number of publications in fisheries and aquaculture is low, Brazil has some of its highest specialisation and impact scores in this area.

Relevant areas for research cooperation

Oil and gas

The strategy for cooperation with Brazil identifies oil and gas as the most important sector for private sector cooperation between Norway and Brazil. Large oil and gas discoveries have been made on the Brazilian continental shelf in recent years, making the country an attractive market for oil companies and the petroleum-related supplier industry. Technology and research cooperation is therefore very important. An objective of the 2013 BN21 agreement between the Norwegian Ministry

of Petroleum and Energy and Brazil's MCTI is to develop a specific strategy and work plan for cooperation in the petroleum sector. Topics listed in Oil and Gas in the 21st Century (OG21), Norway's national technology strategy for the petroleum industry, will provide a basis for joint activities and cooperation. The following selected topics from the strategy's four Technology Target Areas (TTA) are of particular relevance:

- Subsea technology
- Drilling and well technology
- Exploration technology and basic research in the geosciences
- Enhanced oil recovery (EOR)
- Environmental monitoring and preparedness

Renewable energy

Brazil is the world's second largest hydropower producer, and roughly 75 per cent of the country's electricity production is based on hydropower. Brazil is also the world's leading producer of biofuel from sugarcane. The strategy for cooperation with Brazil therefore names these as areas of particular interest for closer cooperation. Research cooperation in these areas is limited in the Research Council's project portfolio and consideration should be given to strengthening it. Solar power, wind power, hydropower and technology for sustainable cities are areas with potential for increased cooperation as well.

Energy is also a proposed thematic priority area for cooperation with Brazil under Horizon 2020 and a key focus of the EU-Latin American networks in which Norway is currently participating.

Climate and the environment

Climate change and environmental issues are very high on the political agenda in both Norway and Brazil, and therefore comprise a priority area in the strategy for cooperation with Brazil. Norway's large contribution to the Amazon Fund, which supports forest-related, environmental and development projects, is an example of this. Biodiversity and climate change are one of five thematic priority areas under the ERANet-LAC project and are expected to be included in cooperation targeted towards Brazil under Horizon 2020. Relevant topics in this area include follow-up research on REDD issues (reducing emissions from deforestation and forest degradation in developing countries), the carbon cycle, the climate system, the impacts of and adaptation to climate change, international climate negotiations, and instruments for emissions reduction. Mapping and monitoring of biodiversity are also of relevance here.

Marine research: fisheries and aquaculture

Marine research is named as a relevant thematic priority area for cooperation with Brazil under Horizon 2020. In its allocation letter to the Research Council for 2014, the Norwegian Ministry of Trade, Industry and Fisheries emphasises the importance of giving priority to international research cooperation, and identifies Brazil as one of the countries where special efforts should be made to further develop research cooperation. Fisheries, resource management and aquaculture are other relevant topics for cooperation.

Bioeconomy/food

The bibliometric analysis points to food sciences as one of the areas in which Brazil performs well, both in terms of the number of publications and specialisation. However, there is very little cooperation with Norway in this field, and it is pointed out that Norway could benefit from closer cooperation. The bioeconomy is another thematic priority area under the ERANet-LAC project, and is also one of the topics, together with food safety and sustainable agriculture, recommended for inclusion in cooperation targeted towards Brazil under Horizon 2020.

Social sciences and the humanities

Knowledge about language, culture, philosophy and history is essential, both as a basis for cooperation and as independent research topics. There was limited coverage of these fields in the bibliometric analysis, which primarily looked at co-publication in natural science disciplines. The strategy for cooperation with Brazil, however, points to increased research cooperation on social science and development and foreign policy-related issues as being of interest. The strategy also recommends enhanced cooperation in research and higher education on and for indigenous peoples.

Innovation, industrial development and commercialisation of R&D

Oil and gas

As discussed, oil and gas is the most important sector for private sector cooperation between Norway and Brazil. In addition to the above-mentioned topics, Innovation Norway points to the following topics as being of potentially high relevance to trade and industry:

- Sustainable recovery of shale gas
- LNG as fuel
- Safety

Marine research: fisheries and aquaculture

The strategy for cooperation with Brazil addresses the ongoing cooperation between Norway and Brazil on fisheries and aquaculture management and stresses that this must be knowledge-based. Industry-oriented research cooperation is emerging, and several collaboration agreements have been signed between Norwegian and Brazilian research institutions in this field. Among other things, Brazil would like to cooperate on aquaculture development in the Amazon Basin as an alternative to cattle farming.

Instruments

National research funding

The Research Council's LATINAMERIKA programme will be concluded in 2017. Although all available funding has already been allocated, ongoing projects can be encouraged to expand their collaborative networks with Brazil to encompass activities in other arenas. The programme has helped to increase interest in and support for research targeting Brazil, and continuation of the programme should be discussed.

The Research Council's Department for Petroleum Research will continue to work actively to strengthen ongoing cooperation with Brazil via relevant programmes and initiatives, in keeping with the recommendations in the allocation letter from the Norwegian Ministry of Petroleum and Energy. The allocation letter from the Norwegian Ministry of Trade, Industry and Fisheries, also stipulates that research cooperation with Brazil is to be given priority in programmes receiving funding from that ministry. Cooperation with Brazil may also be of relevance for other thematic programmes at the Research Council and should be considered more closely.

Funding for international partnerships

The new International Partnerships for Excellent Education and Research (INTPART) scheme funds partnerships between Norwegian higher education and research institutions and world-class partners in prioritised countries. Special importance is attached to integrating higher education and research, as well as cooperation with the business and public sectors. The programme is administered jointly by the Research Council and SIU (www.rcn.no/intpart).

Brazil is one of the countries included in this scheme, and although many Norwegian and Brazilian institutions have already signed separate cooperation agreements, the INTPART programme may emerge as an instrument for consolidating existing agreements and generating new ones.

Mobility

Cooperation with Brazil's large-scale *Science without Borders* mobility programme is now opening up opportunities for active use of Brazilian doctoral and post-doctoral candidates at Norwegian institutions, primarily in natural science and technology disciplines. A certain degree of mobility from Norway to Brazil is also possible.

The Research Council and the Norwegian Centre for International Cooperation in Education (SIU) collaborate via the *UTFORSK Partnership Programme* on establishing links between new educational components and existing research cooperation in Brazil, among other countries. A continuation of the programme after the pilot phase will enable these links to be extended.

EU cooperation

Brazil's aspirations for participation in Horizon 2020 and its success rates under FP7, e.g. in cooperation with Norwegian researchers, should be motivation for greater participation in joint proposals with Brazil. The Horizon 2020 Work Programme for 2014–2015 includes many thematic areas in which cooperation with Brazil is encouraged, and more areas are expected to be incorporated in coming years.

Norway and Brazil are participating in the FP7 ERA-NET *ERANet-LAC* (2012–2016) together with other European and Latin American countries. Joint calls for proposals are planned for autumn 2014 and autumn 2015. Funding will be awarded via a virtual common pot in which participating countries

contribute funding for national participants in consortia. The topics for the calls within the thematic priority areas will be finalised after discussion between the parties.

Norway participates in the working group on Brazil under the Strategic Framework for International Cooperation (SFIC), which should be used actively to expand and strengthen cooperation with Brazil within a European framework.

International networks and organisations

The intense focus in both countries on environmental and climate research should result in greater cooperation in the *Belmont Forum*, of which both countries are members, in part through the Future Earth initiative. In addition, both countries are active members of the *International Institute for Applied Systems Analysis* (IIASA), which should open up the opportunity for joint initiatives between the two countries' researchers through this institution. There are also other international networks/organisations that the two countries can utilise to promote increased cooperation, such as the *Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services* (IPBES) and the *Group on Earth Observations* (GEO).

Clusters

Brazil is also investing in cluster development, and has chosen to base its new cluster programme on Norway's Arena Programme and Norwegian Centres of Expertise Programme (NCE). Collaboration agreements between Norwegian and Brazilian clusters are also in place, providing a good point of departure for Norwegian actors in Brazil.

Sources

Regjeringen, 2011, *Regjeringens Brasil-strategi: Nye perspektiver på et tradisjonelt forhold.* (UD 03/2011)

European Commission, 2011, *ERAWATCH Country Reports 2011: Brazil*
http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/br/country

European Commission, European-Latin American Network for Science and Technology, 2008 *EULANEST Country Report: Brazil.*
http://www.access4.eu/_media/Deliverable1.3a_CountryReportBrazil.pdf

European Commission, 2012, *Review of S&T Cooperation Between the European Union and the Federative Republic of Brazil.* Brussels

Senter for Internasjonalisering av Utdanning, 2014, *Brasil: Høyere utdanning og internasjonalt samarbeid*, SIU rapportserie 03/2014

ERAnet-LAC : <http://eranelac.eu/>

Campbell, D. et al., 2014, *Bibliometric Study in Support of Norway's Strategy for International Research Collaboration.* Montréal: Science-Metrix.

Norges Forskningsråd, 2013, *Det norske forsknings- og innovasjonssystemet - statistikk og indikatorer 2013* (Indikatorrapporten)

OECD, 2012, *OECD Science, Technology and Industry Outlook 2012*

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Oslo, October 2014

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