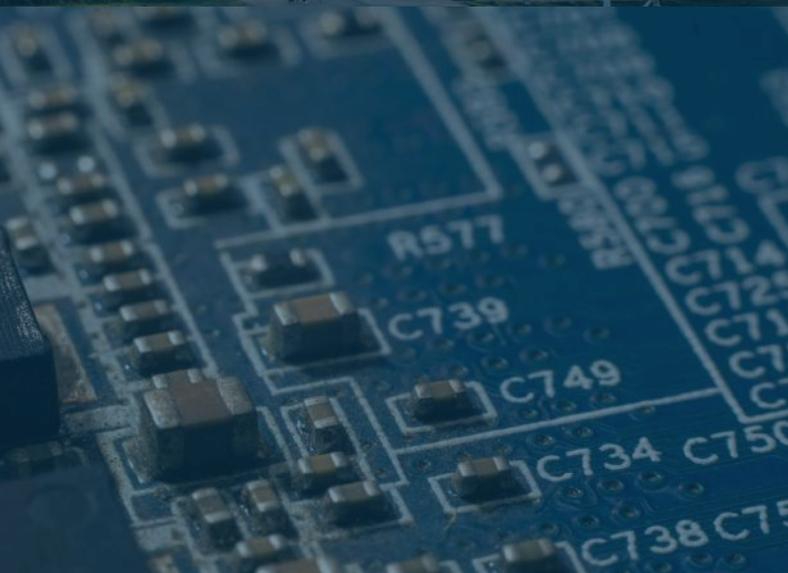


CEBRI



**ROYAL DANISH
EMBASSY**
Brasília

Energy Transition Program



Policy Note Series

CEBRI–Danish Embassy in Brazil Partnership

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CEBRI



**ROYAL DANISH
EMBASSY**
Brasília

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About the project

This document is the result of a strategic partnership between the Brazilian Center for International Relations (CEBRI) and the Embassy of Denmark in Brazil, established with the objective of fostering structured dialogue, knowledge exchange, and capacity building on key issues related to sustainable development and societal transitions. Grounded in the shared understanding that complex global challenges require cooperative, evidence-based, and inclusive approaches, the initiative sought to create a dedicated platform for engagement between Brazilian and Danish stakeholders from government, academia, the private sector, and civil society.

The project was designed to promote the exchange of best practices and policy experiences between Brazil and Denmark — two countries with distinct institutional trajectories but complementary strengths in areas such as digital transformation, climate action, sustainable agriculture, energy transition, and public governance. By leveraging Denmark's internationally recognized expertise in sustainability-driven policymaking and Brazil's scale, diversity, and innovation capacity, the partnership aimed to contribute to more informed and resilient policy debates within the Brazilian context, while also generating mutual learning opportunities.

Throughout 2024, the initiative was implemented through a series of high-level seminars and dialogues, primarily hosted at the Danish Residence in Brasília, with selected activities integrated into CEBRI's engagement under the T20 framework during Brazil's G20 presidency. These meetings convened policymakers, public officials, researchers, and practitioners to discuss concrete challenges, emerging opportunities, and pathways for cooperation across thematic areas central to the sustainable transition agenda. The discussions emphasized practical solutions, institutional capacity building, and the translation of international experiences into policies adapted to national and subnational realities.

The policy notes presented in this publication are one of the key outputs of this project. They synthesize insights, debates, and contributions arising from the seminars, with the aim of informing decision-makers, supporting evidence-based policymaking, and strengthening Brazil–Denmark cooperation over the medium and long term. More broadly, the initiative underscores the value of sustained international partnerships as instruments for advancing sustainable development, enhancing policy coherence, and fostering trust-based dialogue in an increasingly complex global environment.

Policy note 1

The Role of Artificial Intelligence and Data in the Health Sector

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* This policy note reflects the personal research, analysis, and views of the authors and does not represent the position of the institution, its affiliates, or partners.

Objectives

On August 15th, 2024, Cebri and the Denmark Embassy in Brazil held the seminar on "the Role of Artificial Intelligence and Data in the Health Sector".

The in-person seminar gathered experts and Government authorities from both countries, including representatives of the Brazilian Ministry of Health (MoH), the Danish Health Data Agency, the Danish MedCom, the Oswaldo Cruz Foundation (Fiocruz), and from academia and civil society (the full list of panelists and participants is attached). The seminar was also opened to a larger online audience through YouTube¹.

The seminar aimed to identify opportunities for matchmaking and deepening the collaboration between academia, public and private sector from both countries. Aligned with the ongoing debates promoted by the *Global Digital Health Initiative* (GIDH) and with the best practices of Danish experience, the seminar focused on some of the challenges on safe and reliable secondary use of health data, as well as on the development and impact of AI on healthcare.

The main topics discussed were data governance and regulation, public-private partnerships for building health architecture and equitable access to digital health. After a keynote speech from Prof. Søren Brunak² followed by a presentation from the representative of Brazilian MoH, panelists had the opportunity to highlight their views on the challenges related to the equity in AI-driven healthcare solutions, the integration of healthcare data workflows, and policies and procedures for responsible use of sensitive health data.

The Policy Note draws on the insights of the Seminar in order to inspire future developments of Brazilian-Danish cooperation regarding the use of technology and innovation in the health sector. This document presents an overview of the Brazilian-Danish partnership in the field of health, the challenges faced by each country and the opportunities for strengthening future collaboration. The ideas and proposals are based on the contributions of the following experts to whom we are extremely grateful: Laura Boeira, Flavio Vidal, Fabro Steibel, Tiago Bahia, Lars Hulbaek, Vibeke van der Sprong, Victória Paulo Menin, Félix Rígoli and Søren Brunak.

¹ Click here to access and see the recording of the event:
<https://www.youtube.com/watch?v=ojKU8ntWxt0>

² Click here to access and see about the Professor:
<https://research.ku.dk/search/result/profile/?id=9398f2a1-bef5-4491-9b57-083e6758eac2>

Overview

Denmark is a world leader in Digital Health and has strong ties of cooperation with Brazil on supporting efficient health care management in the country.

One of the main achievements of this partnership has been the definition of goals and indicators for the *Digital Health Strategy for Brazil 2020-2028* (ESD28).³ The DHS establishes seven priorities for the digitization of health in Brazil: **i)** to ensure the leadership of the MoH; **ii)** to accelerate the adoption of electronic medical records at the three levels; **iii)** to support best clinical practices, through services such as telehealth and apps developed by the MoH; **iv)** to engage patients and citizens, to promote the adoption of healthy habits and the management of their health; **v)** to train health professionals in Health Informatics; **vi)** to create an environment of interconnectivity; **vii)** to stimulate open innovation in health.

Both countries understand that artificial intelligence and secondary use of health data represent a pivotal cutting-edge technology supposed to improve healthcare delivery, create more effective workflows and systems as well as contributing to the learning healthcare system model.

Both countries have faced digital transformation in healthcare at an **unprecedented speed**, especially after Covid-19. In Brazil, the pandemic has accelerated the adoption of telemedicine (expanding access to medical consultations, especially in remote areas), electronic health records (accelerated the adoption across public and private healthcare facilities, as example *SUSConnect* app), artificial intelligence and data analytics (AI-driven tools was utilized to analyze medical images⁴), and healthtech startups (investment growth with venture capital in startups developing solutions for telemedicine, digital therapeutics, remote monitoring, and patient engagement)

The SUS Digital Program⁵, that drives the digital transformation in more than 4,200 Brazilian municipalities is considered the main access door to the services of the *Unified Health System* (SUS), the **largest public health service in the world**, allowing patients of different localities to receive healthcare from specialists from any region of the country, and at the same time accessing, in the palm of their hands, their clinical history and digital solutions. The digitalization of medical records has streamlined the organization of and access to patient information, improving efficiency and continuity of care.

³ Click here to access and see more about the ESD28:
<https://datasus.saude.gov.br/26o-boletim-conectesus-trata-sobre-a-visita-da-delegacao-dinamarca-sa-de-saude-ao-brasil/>

⁴ Click here to access and see more about an example of AI-driven diagnostic:
<https://g1.globo.com/df/distrito-federal/noticia/2020/04/13/pesquisadores-da-unb-criam-sistema-que-auxilia-no-diagnostico-mais-rapido-da-covid-19.ghtml>

⁵ Click here to access and see more about SUS Digital program website:
<https://www.gov.br/saude/pt-br/composicao/seidigi/meususdigital>

Brazil respects a tradition of producing knowledge in a shared way. The Brazilian health ecosystem is composed of world-leading institutions, such as Fiocruz, scientific communities and technical committees from the MoH that collaborate to create a culture of data collection, organization, analysis and interpretation, through high-level indicators that are used to monitor and evaluate health policies. For example, the *DataSUS* platform, managed by the Brazilian MoH, is integral to the functioning of Brazil's public health system, providing the data needed for effective healthcare management, policy development, and research. It supports a wide range of applications, from monitoring disease outbreaks to managing hospital resources and evaluating public health interventions such as epidemiological surveillance, health indicators and statistics, vaccine coverage, primary care information, and pharmaceutical assistance.

Denmark's approach to digital healthcare has become a model due to its comprehensive integration of healthcare sectors and data of widely different modalities. Denmark is a pioneer in implementing a digital national electronic health platform (Sundhed.dk⁶), which consolidates patient information from different healthcare providers. This model is facilitated by the national personal identification number that was implemented in 1968. The major advantage of the Danish system is the use of a common infrastructure, allowing for data sharing and communication. This emphasis on interoperability has helped put Denmark in pole position and create a patient-centric health sector, meaning that health data can be used for various research purposes, clinical decision support systems (CDSS) and AI applications. Most recently, researchers are using machine learning to predict survival in intensive-care units (Nielsen, A. B. *et al.*, 2019), identify patients with unplanned transfer to intensive care (Placido, D. *et al.*, 2023) and estimate temporal disease progression (Siggard, T. *et al.*, 2020) using longitudinal data from Danish population.

Through AI, Denmark is already achieving positive results in the treatment of cancer. Denmark has a predictive model, using data from more than 70,000 patients with more than 15 data points for each patient. In the case of cancer surgery, this model identifies the mortality risk for each individual patient who enters the unit with the same diagnosis. And after identifying mortality, the next step is to categorize each patient into risk groups ranging from low risk to medium risk, high risk and very high risk. Based on these four categories, doctors decide on the best treatment before surgery and also after surgery. This methodology has resulted in the significant decrease of the numbers of medical complications after surgery

Another impressive opportunity brought by AI is the use of Gen AI data to estimate comorbidity. Danish researchers have studied the co-occurrence of

⁶ Click here to access and see more about the Sundhed.dk: <https://www.sundhed.dk/>

diseases and the effects of external exposures, such as diet, lifestyle and patient care, linking network dynamics to real-life (Hu, Thomas and Brunak, 2016⁷).

Challenges

Both countries face the challenge of data security and privacy. Balancing the need for data sharing with the protection of patients' personal information remains a challenge for health authorities. This includes the ability to ensure that data is protected from cyberattacks and also that patients' personal information is handled with responsibility. Many technical solutions could be applied, all of them focused on encryption, access controls, data anonymization and de-identification, data minimization, regular security audits and risk assessments, compliance with data protection regulations, employee training and awareness, logging, advanced threat detection and response, data sharing agreements, and incident response plans.

Denmark's main challenge includes the use of health data to treat individual patients. While Denmark's digital healthcare system is highly advanced, it also faces challenges regarding the use of data for patient care. It is estimated that the population over 75 will double in Denmark in the next 30 years (Denmark's Statistics⁸), which puts pressure on the healthcare system due to growing demand. In order to alleviate this situation, digitalization is being incorporated into treatments to make care more individualized and coherent. However, some aspects challenge the full implementation of new technologies, such as the difficulty of technically integrating the new system at national and sub-national level and implementing a new working model, coupled with a shortage of professionals. Besides the siloed culture of different regions/hospitals remains a challenge for a shared experience of digital health data use.

Denmark has excelled the use of AI to advance pre-treatment and diagnosis, in cases this is possible and useful. AI has multiple potential uses in health systems, such as helping citizens to navigate the health system, sharing information on health promotion and speeding diagnostics, when feasible. It can help health professionals to spend less time on administrative processes. The main challenge here is to facilitate access to and interpretation of health data so that health professionals have more time to devote to patient care than to reading and interpreting reports. AI can also be a powerful tool to identify outliers in patient treatment, and use this to give feedback to health staff to double check patient status and adherence to treatment protocols.

⁷ Click here to access and see more about the study "Network biology concepts in complex disease comorbidities": <https://pubmed.ncbi.nlm.nih.gov/27498692/>

⁸ Click here to access and see more about Denmark's statistics: <https://statistikbanken.dk/statbank5a/default.asp?w=820>

Brazil's main challenges include the integration of datasets, data regulation and the asymmetric regional digital infrastructure that inhibits the equal development of digital health throughout the territory. As a country of continental dimensions, Brazil faces very particular geographical challenges. Associated with the intense social inequality that marks the country, delivering a quality public health service becomes a complex mission that needs to take into account all the multiple realities of the population. In this sense, it is necessary to think about structures that guarantee access to digitalization for all regions equally, in order to generate opportunities to get closer to patients across the country, and not exacerbate inequalities. It is also key to invest in digital health literacy so that citizens can fully benefit from technology.

Integrating the database is an essential objective to facilitate the provision of services. Brazil has opted for having hundreds of databases under the supervision of the MoH instead of a central dataset. This choice makes interoperability a central condition of the system. There is no single model for interoperability, but efforts are needed to engage stakeholders, align the use of systems with standard terminologies, promote regionalization and tackle data fragmentation. MoH works with the premise that the technical-scientific community that uses health data is jointly responsible for the production of knowledge. This means that the technology needs to be user-driven and user-friendly and that people who experience the day-to-day running and management of the public health systems are just as important as the technologies developed.⁹

Another challenge is the responsibility for the data collected. It is necessary to ensure, through a regularization structure, that this information will be used responsibly, guaranteeing its privacy and confidentiality, and not for commercial purposes. To prevent hackers and guarantee user trust, a regulatory model based both on the health specificities and the *Brazilian General Law on Data Privacy* (LGPD) is necessary. From this perspective, another key issue is the definition of degrees of responsibility for health data management and how it should be shared, given that this data circulates freely within the system.

There is also a risk of widespread user distrust of the system. User participation in defining the digital health strategy is still very small, especially when compared to the participation of managers, academics and researchers. Building the basis of digital health without the collaboration of the target public could weaken the structuring of this system. In this sense, the lack of familiarity of the user with these technologies can cause distrust and discourage popular participation, making it susceptible to fake news and misinformation. It is important to make digital transformation accessible and intelligible for all.

The last topic addressed in the Seminar was the role of the private sector in

⁹ Click here to access and see more about digital health advancements and challenges in Brazil: <https://ieps.org.br/panorama-ieps-04/>

health digitalization. In Denmark, the private sector has a stronger presence than in Brazil, where the private sector is perceived as highly self-centered. As digitalization grows faster in the private sector, the public health system faces the risk of being left behind.

Recommendations based on Best Practices

Capacity building and strengthening. Adequate capacity building is very important for achieving the objectives of the ESD28. Although official documents recognise the need for training for health professionals and health management, there are no specifics on how it should be carried out. Initiatives such as short-term courses for professional qualification in digital health and telehealth practices need to be expanded, as do the topics they cover, for both health and tech professionals. One possible solution is to include telemedicine and other digital tools in the academic training of health professionals. In this regard, technical partnerships with Danish universities and health institutions to build and strengthen capacities among Brazilian professionals could be beneficial. It is also necessary to identify key-competences and develop them among a larger audience of those who are part of the system, such as caregivers for the elderly, workers in mental health and occupational medicine institutions, midwives, pharmacists and public health specialists.

Digital health literacy. Digital health literacy is defined by the World Health Organization¹⁰ as the ability to search for, find, understand and evaluate health information from electronic sources and to apply the knowledge acquired to address or solve a health problem. High levels of digital health literacy are related to greater knowledge of one's own health conditions and greater effectiveness in managing chronic health conditions independently. An index that monitors the level of digital literacy of the general population and of health professionals could be an important source of data to tackle the main challenges to overcome. In addition, some strategies can facilitate the understanding and use of technologies: to write content based on practical actions and explicit instructions, to adopt plain language, to organize the display of content and simplify navigation, to test platforms with individuals with a low level of digital literacy and to engage users in the process of co-development of new digital tools through methodologies such as Design Thinking. Digital health literacy may in the future increasingly require some familiarity with the principles of AI tools and methods.

¹⁰ Click here to access and see more about digital health literacy:
https://cdn.who.int/media/docs/librariesprovider2/data-and-evidence/english-ddh-260823_7amcet.pdf?sfvrsn=4c674522_2&dow%20nload=true

Overcoming the public-private divide. While Denmark has a very small private health sector, private providers are willing to cooperate with data provision because they also benefit from the knowledge generated by the system. Brazil could create a combination of both incentives and stricter regulation to enable data sharing from the private sector. On the incentives side, data availability could produce a win-win situation, considering that public health benefits cover both private and public users, for example, in terms of surveillance, medication, food, etc. On the regulatory side, guaranteeing anonymization of datasets can be a good strategy.

Standardization. While Denmark is making great strides in the use of AI for clinical treatment at a large scale, Brazil is still struggling with the first steps of making data communicate with each other. Denmark has experience in standardizing patient records and questionnaires across all sectors of the health system. Brazil could benefit from this expertise to advance a new paradigm for data integration and availability to facilitate AI application. Importantly, standardization of more global nature is likewise important, for example when AI methods should be benchmarked in other populations and geographies.

Data Security. Denmark is a world model in developing a specific and standardized IT “architecture” that ensures that not only technological systems can communicate effectively but also can follow high security requirements. MedCom¹¹ is a non-profit organization that develops, tests, certifies and helps to implement the digital standards that enable the healthcare system to share relevant data securely. The organization can support *DataSUS* in implementing security standards and also a regulatory agency/sub-agency that could oversee the digitization of the SUS and the treatment of data.

¹¹ Click here to access and see more about MedCom: <https://medcom.dk/medcom-in-english/>

Policy note 2

Advancing Digital Government at the Subnational Level: Pathways for Cooperation between Brazil and Denmark

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* This policy note reflects the personal research, analysis, and views of the authors and does not represent the position of the institution, its affiliates, or partners.

Objectives

On September 11, 2024, CEBRI and the Danish Embassy in Brazil held the seminar "Advancing Digital Government at the Subnational Level: Pathways for Cooperation between Brazil and Denmark". The in-person seminar brought together experts and government officials from both countries, including the Minister of Digital Affairs of Denmark, the Executive Secretary representing the Minister of Management and Innovation in Public Services of Brazil (MGI), and the president of the National School of Public Administration of Brazil (ENAP). Panelists Kátia Argolo, Strategic Solutions Manager at the Data Processing Company of the State of Bahia, Joana Portela, Secretary of Economic Development of the City of Recife, Lisiane Lemos, Secretary of Digital Inclusion and Support for Equity Policies of the State of Rio Grande do Sul, and Loyane Tavares, Director of Diffusion of Digital Transformation at the Secretariat of Digital Government of the MGI, were moderated by Fernando Filgueiras, Director of Strategic Information and Innovation at the Ministry of Education, as they presented their experiences with digital strategies at their levels of government. The seminar was also open to a larger online audience through YouTube.

The seminar aimed to identify partnership opportunities and deepen collaboration between the two countries. Denmark and Brazil have been cooperating bilaterally in the areas of public service innovation and digital government since 2015.¹² This strong partnership consists of the exchange of strategies, approaches and institutional experiences of implementing and expanding digital government to improve the delivery of public services in the country.

The main topics discussed were digital inclusion, capacity development and cooperation between different levels of Government. After the presentation by the Minister and the Executive Secretary, panelists from the three levels of the Brazilian government had the opportunity to present their perspectives on the challenges and opportunities related to the interaction between the federal level and subnational levels of government in digital transformation.

The panelists also highlighted the relevance of gender equality for digital transformation. They recognized the need to overcome gender bias in both managing digital transformation and accessing digital public services. Age and socioeconomic gaps are notorious barriers to social inclusion that can be aggravated by gender bias: in Brazil, a closer look at meaningful connectivity reveals that 28% of men have meaningful connectivity compared to only 17% of women. Given the complexity of federative arrangements, thinking about digital

¹² Click here to access and see about the bilateral cooperation:
<https://www.gov.br/governodigital/pt-br/noticias/brasil-assina-novo-acordo-com-a-dinamarca-para-promover-governo-digital-e-inovacao-na-administracao-publica>

government without considering the intersectional nature of gender issues may be a way of neglecting the challenges still present in Brazil at all levels of government.

This document presents an overview of the Brazilian-Danish partnership in the field of digital government, the challenges faced by each country and the opportunities to strengthen future collaborations. The ideas and proposals were inspired by the contributions of the following government representatives to whom we are extremely grateful: Cristina Kiomi Mori, Caroline Stage Olsen, Betânia Lemos, Fernando Filgueiras, Katia Argolo, Lisiane Lemos, Joana Portela Florêncio and Loyane Tavares.

Overview

Denmark is a world leader in Digital Government and has strong cooperative ties with Brazil in supporting digital transformation at both national and subnational levels. One of the achievements of this partnership is the launch of the National Digital Government Strategy 2024-2027 (ENDG)¹³, which seeks to articulate digital transformation initiatives across the various federative spheres, through common objectives and recommendations. Platforms such as gov.br and Fala.br led Brazil to second place in the World Bank's most recent digital government maturity index (2022), ahead of countries such as Germany and the United States (Leaf, 2024).¹⁴ More than 160 million people have a GOV.BR account, which is used to access more than 4,000 digital public services. However, digital advancement faces inequalities and connectivity gaps in several parts of the country, which requires the continuity of analog services and, in the long term, may affect the progress of digitalization. The provision of online services by states and municipalities is, on average, far behind that of the Federal Government. While 76% of federal agencies offer public services entirely online, this number drops to 45% in state agencies and 32% in municipalities (TIC GOV, 2021).

Both countries understand that progress in digitalization is crucial to making public services more inclusive and efficient. Digital inclusion is an important way to strengthen democracy and institutions, making public services more transparent and reducing costs so that resources can be reallocated to other areas of interest. Furthermore, it is important to highlight the importance given by both countries to digital advancement in accordance with sustainable development, within the scope of the so-called “*twin transitions*”, that is, digital

¹³ Click here to access and see about the ENDG:

<https://www.gov.br/governodigital/pt-br/estrategias-e-governanca-digital/estrategianacional>

¹⁴ Click here to access and see about this statistic:

<https://www1.folha.uol.com.br/mercado/2024/05/governo-digital-federal-chega-a-156-milhoes-mas-municipios-ainda-patinam-e-convivem-ate-com-internet-discada.shtml>

and green transformation. Finally, it is worth noting that the guiding principles of the digitalization process in both countries are quite similar, in order to value responsibility towards citizens and the appropriate and ethical treatment of the use of their data.

The Brazilian Government is guided by the search for a State that is more inclusive, effective, intelligent, transparent, participatory and sustainable.

Using Denmark as inspiration, Brazil is committed to advancing the integration of municipal, state, and federal services, but at the same time, it needs to deal with structural challenges. In total, Brazil has 5,565 municipalities, according to the Brazilian Institute of Geography and Statistics (IBGE). Of these, 73% have between 10,000 and 20,000 inhabitants. Digitizing government services faces challenges due to logistical and operational issues, especially in coordinating state and municipal governments and ensuring consistent service coverage. While progress has been made, interoperability issues still hinder the digitization of 14% of services. Currently, 62% of the most in-demand federal services and 39% of state-level services are fully online. (TIC GOV/CETIC, 2023)

An important initiative in this regard is the National Digital Government Network (Rede GOV.BR), a collaborative forum for exchanging solutions and experiences in digital government.

The *GOV.BR* Network is composed of 27 federative units and more than 1,400 Brazilian municipalities - corresponding to 116.7 million inhabitants -, including all capitals, which can use free of charge *GOV.BR* tools, such as single login, electronic signature and digital proof of life. Also through the *GOV.BR* Network, a pilot use of the *Conecta GOV.BR* platform is underway, an important initiative to promote the interoperability of public policy and personal data, to provide greater intelligence and effectiveness for public services and policies. Another relevant initiative to approach subnational entities is the federative caravan, an effort by the Federal Government to reach out to these agents on various issues. Finally, Brazil has made progress with its new *National Identity Card* (CIN), with 15 million documents issued. *GOV.BR*, whose access credentials are improved with each *CIN* issued, already has more than 4,000 digital services on the platform.

Denmark, for its part, has already achieved the necessary preconditions for digital transformation.

In total, 97% of the population, in a country of 5.4 million inhabitants, and 100% of companies have access to the Internet, and these high levels make access to digital public services even easier. Denmark's digitalization process began in 1995 with the first national digital strategy, and since then, this agenda has been structured to ensure the participation of the population. In this regard, the central government strives to transform the public sector through integrated initiatives between subnational entities to facilitate access to services, seeking to ensure a good experience for citizens. At the same time, the country relies on the Digital Government to deal with social challenges, such as the lack of professionals and the climate issue.

The lack of professionals is a serious problem for both the private and public sectors in Denmark. The government's perspective is that it is necessary to rethink the entire workflow to find new ways to deliver the necessary services more efficiently and with the capacity to implement new technologies quickly, in order to create value for society and support workers in carrying out their tasks. The idea is that processes that are more efficient can help professionals serve more people in the best possible way. A great example is the use of telemedicine to support citizens, especially the growing group of people with chronic diseases, enhancing the availability of the health system to treat cases that require immediate and more serious care.

In the context of the climate crisis, Denmark understands that digitalization is crucial for the green transition to be successful. The war in Ukraine has made it clear that climate policy is also a security policy, which requires comprehensive measures to minimize greenhouse gas emissions, reduce waste, make materials more efficient and protect drinking water. New technologies and digital solutions offer new opportunities to make the green transition more efficient and less costly for citizens, supporting conscious behavior and sustainable consumption.

Another achievement of the Danish Government is the trust of its citizens in the digital service. The Danish population benefits from a welfare state model that places the state at the center of most events in the lives of its citizens. As a result, the country has high levels of trust in the state, enabling popular engagement in government initiatives. The government uses digital identity as a key to access the citizen portal, which offers more than 2,000 services on a single platform. For 10 years, Denmark has instituted a law¹⁵ that enables Danish public authorities, such as the central government, regions and municipalities, to communicate with residents and businesses digitally, establishing that communications sent via this postal solution have the same legal effect as documents sent via traditional letters.

Denmark promotes literacy and digital inclusion actions. In recent decades, the Government has invested heavily in digital literacy campaigns and outreach programs, focused primarily on groups with likely difficulty using technology, such as the elderly, disabled and refugees, in addition to offering a new subject called "understanding technology" to elementary school students in order to help with digital inclusion. This initiative is in line with one of the priorities of *National Digitalization Strategy*¹⁶, which is based on 9 visions that define the direction in which digital solutions should be implemented to solve concrete social problems and create value for citizens and companies.

¹⁵ Click here to access and see about the danish legislation:
<https://en.digst.dk/systems/digital-post/current-legislation-about-digital-post/>

¹⁶ Click here to access and see about the National Strategy for Digitalization:
<https://en.digst.dk/strategy/the-national-strategy-for-digitalisation/>

Challenges

One of the main challenges for Digital Government in Brazil is user interaction. Although Brazilian society is already feeling the impacts of digital transformation and has a population that is largely part of this context, with over 180 million people connected to the internet, there is a large portion of the population that, even with the internet, still faces difficulties in obtaining significant connectivity, limiting their access to online platforms and services. In this context, governments at all levels are developing strategies to reach citizens who do not consume online services, seeking other media, such as radio and television, to encourage and educate them about the use of digital tools. There are also important initiatives to offer services through the most commonly used applications and networks.

Low digital literacy can make it difficult to adopt digital services, as well as facilitate the spread of misinformation. Low digital fluency is a trend among some demographic groups, such as the elderly, but it is also a problem for those who do not have daily contact with technology. Many areas of the country are not covered by significant connectivity, which even limits tacit knowledge, and learning through these tools. In this regard, *Balcão Gov.Br*¹⁷, with in-person service units, is being tested to bring digital services closer to citizens and assist those who have greater difficulty using technology. In addition, the partnership between levels of government has advanced to enhance existing in-person service spaces, so that federal services can be accessed and are closer to the population.

The biggest challenge is to qualify these people for the future, empower them where they are, taking advantage of every window of opportunity to train a qualified, digitally literate, and prepared to avoid and prevent scams workforce that can benefit from digital public services.

Gender bias remains an additional challenge. Advancing digital government must necessarily take into account that women and men have different life experiences and challenges, and that this diversity enriches policymaking, resulting in more inclusive and effective digital services for the entire population. In addition, we must actively work to eliminate the digital divide for women, who often face regional, socioeconomic and cultural barriers to accessing digital technologies and services. Policies and services must be designed not only to avoid discrimination but also to actively promote equality.

Therefore, it is necessary to be aware of the type of information and public service sought by men and women, since gender bias also interferes with the demands of these groups. Women's access to public services is strongly linked

¹⁷ Click here to access and see about Balcão Gov.Br: <https://balcao.acesso.gov.br/>

to care services, such as scheduling appointments and school enrollment, while the services most consumed by men are related to workers' rights, social security and taxes, sectors with greater digital maturity. Another aspect is the nature of the work performed by men and women in relation to internet access. According to studies by the Regional Center for Studies on the Development of the Information Society (Cetic, 2023), 54% of men can access the internet at their workplace, compared to only 36% of women.

Another concern of the Brazilian Government is promoting user confidence.

Based on the experience gained through cooperation with Denmark, the government understands the importance of this value, which is so dear to Danish society, for the population's engagement with digital services. The digitalization of Danish public services is largely based on citizens' trust in the State. It is through this bond of trust that the Danish population is willing to share their data and use digital solutions, which, for Brazil, is still a challenge. Despite this, digitalization, if implemented efficiently and to the user's satisfaction, can increase citizens' trust in the Brazilian State. Thus, promoting quality public service builds people's trust in the government, since the perception that their needs have been adequately met is a fundamental point in promoting trust and presents itself as an opportunity for the country's development.

The user experience is fragmented across the three levels of government.

While the Federal Government is working to standardize structures and language to enhance the user experience, many users still encounter multiple, disjointed processes and scattered solutions. Navigating different platforms can be discouraging, particularly for those with limited access to digital technologies. It is crucial to emphasize that the goal is not just to deliver digital services, but to provide simple, effective, and inclusive services for all citizens. The unification of access points and design standards significantly improves the user experience, making digital platforms easier to navigate. However, the absence of a shared digital infrastructure or common standards between governments hinders interaction, leading to communication gaps and challenges in delivering quality public services. In this context, it is essential to distinguish between merely completing tasks (task fulfillment) and ensuring that the service is well-suited to the user's needs (user experience).

For example, the National Identity Card (CIN) is not yet a unified document. Although all states already offer the new digital card, there is still no standardization of the names of the applications, highlighting the lack of communication and integration between the states. Thus, one of the main projects of the MGI (mentioned in the Digital Strategy) is the consolidation of the implementation of the National Identity Card as a single document with biometrics, as was done with the CNH and the work card, in a single application. Although 15 million identity cards have already been issued based on this new model, there is still a long way to go before this document becomes an efficient

digital public service and part of citizens' daily lives.

A challenge for national standardization is the diversity of digital maturity levels between states, municipalities and even between Federal Government agencies. The different levels of digital maturity are intrinsically linked to other difficulties related to logistical diversity, the country's territorial extension, geographic obstacles to the physical infrastructure for internet access, different population sizes and budgets, among other factors. This combination means that each sphere of power starts from a different place on the journey to achieve digital maturity, which imposes unique challenges on the Brazilian digitalization process. At the same time, cooperation between levels of government is essential so that, despite the asymmetries, the entire country can advance together on this agenda. Cases of integration of municipal and state services, based on state or regional platforms, are shown to be important strategies for accelerating the maturity of the entities involved and, consequently, delivering intelligent and intuitive journeys to citizens swiftly, as is the case in Bahia through the *ba.gov.br* Platform and the SEI system.

Integration requires a robust data infrastructure and a strategic approach to data sharing. Building on the groundwork laid during India's G20 presidency, Brazil recognizes the need to better structure its data, not only to prevent losses and inefficiencies but also to support progress in other areas, such as standardization, user journey unification, and enhancing citizen trust. The government's goal is to develop a national data infrastructure that seamlessly integrates the various databases across all levels of government, thereby creating a digital public framework that facilitates efficient data sharing. To achieve this, cooperation with subnational governments must be expanded, alongside encouraging broader participation in the Gov BR Network, which currently includes all 27 federative units and over 1,400 municipalities. Additionally, the expansion of single sign-on services and the *Conecta GOV.BR* initiative—capable of sharing various databases and fostering a more interconnected ecosystem—is critical. Implementing a comprehensive data governance and management model is essential, not only to ensure the efficient organization of the data network but also to promote the reuse of standardized and reliable data sources. This approach will enable the sharing of consistent information, enhance confidence in decision-making, and improve the analytical capabilities of public managers.

Concerning the governance of the digitalization process, it is essential to take advantage of the experiences of states and municipalities to enhance and disseminate them throughout the country. The federal government already understands that its role is not to produce solutions, but rather to be a partner capable of disseminating positive experiences and listening to demands, to create interactions that promote joint development. From this perspective, the improvement of governance mechanisms encourages the advancement of

partnerships with states and municipalities and enables the organization of the country's public data. In addition, governance plays an important role in advancing digital maturity, since this common orientation can reach even the smallest municipalities and make governments move in the same direction, so that everyone is focused on the needs of citizens and the provision of quality public services.

Finally, public-private segmentation, especially in areas such as healthcare, makes system integration difficult. Public administrators do not have access to digital records from the private sector. Engaging the private sector with the public sector is a huge challenge, which makes it difficult to provide digital services to everyone, since the data is not made available to public administrators. Therefore, it is essential to consider federative collaboration in the public-private sphere as well, with the aim of including the entire population in the digital solutions offered by the State.

Recommendations based on good practices

To achieve an integrated standard, it is necessary to advance cooperation between levels of government. From this perspective, some initiatives are very important and facilitate federative collaboration. The development of a local digital government strategy, following the recommendations of the ENGD, is essential for entities to work together in a coordinated and efficient manner. Furthermore, the organization of digital solutions in packages facilitates the provision of services to municipalities and their adherence to digital services, since the search for a specific service is frequent. Therefore, the subsequent work of the MGI should be to negotiate a broader scope of municipal participation in the *GOV.BR* Network and the integration of its services into the *gov.br* platform. Finally, the federative cooperation unit created by the MGI facilitates cooperation between government entities and enables greater harmonization of digital services.

Combating gender bias. As demonstrated during the event by the experiences of the panelists, affirmative actions are crucial to realizing women's potential in the job market as a whole, but especially in the areas of technology and digital government. Opening exclusive courses for women on a wide range of technology topics, such as cloud computing and programming, has the potential to boost their careers and reinsert them into the job market, and has been very successful in the experiences presented, with high participation and waiting lists. In addition to exclusive training classes, another positive experience is the provision of exclusive service channels for women, such as *SAC Mulher*, implemented by the Government of Bahia on the *ba.gov.br* Platform. Through this channel, women have access to various services, from job vacancy inquiries

and training courses to assistance and support related to the protection of women's rights and public defense.

Transparency and Management of Citizen Data. In providing digital services, it is important to ensure that citizens have access to transactions made using their CPF and the ability to monitor the progress of their requests. This makes it possible, for example, to generate documents showing the status of ongoing processes and access information regarding their use of services, as seen in the State of Bahia through the *ba.gov.br* platform. This approach helps build trust between citizens and the government, creating opportunities for greater data sharing and provision, ultimately enhancing the user experience. This model naturally evolves into digital wallets that can be used across public and private services, based on the citizen's consent.

Digital Service Cycle Management. The digital transformation process requires a dynamic management of service behavior so that it is possible to evolve, adjust and even eliminate services based on changes in the needs of the target audience in a proactive and data-based manner, considering the “FIGITAL” concept of relationship with the citizen (physical, digital and social). Thus, there is no static vision of service delivery, but rather of continuously evolving designs, based on the greatest reach and satisfaction of the citizen. In Bahia, the *ba.gov.br* platform makes available to digital service managers, who are part of the service ecosystem, indicator panels to monitor the behavior of services and their target audience, highlighting points for improvement and general performance levels. Also in this line, work should be done on expanding the *Balcão GOV.BR*, which is currently in pilot operation in the states of Piauí and Minas Gerais, in addition to the cities of Lages (SC) and Niterói (RJ).

Digital literacy initiatives. Although simplifying solutions is an important step towards digital inclusion, it is also necessary to think about preparing the population to use digital tools, since this literacy is important not only for adhering to services but also for preventing scams and the spread of fake news. In this regard, the use of physical services is a pilot that has proven to be positive in helping citizens. *Balcão GOV.BR*, *Conecta Recife* and the *BA.GOV.BR* Platform are capable of bringing the population closer to the digital government and facilitating its understanding and learning. The *BA.GOV.BR* Platform provides videos (*Facilita program*) that help citizens use the Platform's features and digital services, which prioritize difficulties or suggestions indicated by citizens in back-office support or opinion polls.

Innovation and the Change Process. Digital training needs to reach public servants and managers at all levels, together with the development of a culture open to innovation and its consequences for business, work processes and management of agencies at different levels of government. The change in mentality brought about by training processes for Digital Government brings the

challenge of building a positive environment that is predisposed to the transformation taking place, preventing herculean efforts to train people from being frustrated by the rigidity of outdated and hermetic structures and regulations.

Ethical use of Generative Artificial Intelligence. The arrival of Generative Artificial Intelligence (GAI) brings exponential possibilities for the transformation and legitimization of an inclusive, proactive, fast, innovative and prosperous State. However, we face the challenge of using GAI systems in a responsible, fair and transparent manner, respecting differences, rights and people's privacy, creating new opportunities for education, entrepreneurship and growth.

Overcoming the public-private divide. Partnerships with the private sector are crucial for achieving universal access to the digital solutions outlined in the Strategy. In this regard, the positive experiences of Recife and the State of Bahia with Meta and Amazon provide valuable models that can be expanded nationwide. WhatsApp, one of Meta's most popular platforms in Brazil, is used in Recife via *Conecta Zap* to simplify access to digital services and on the *BA.GOV.BR* platform in Bahia. This partnership has the potential to enhance communication between citizens and the state, enabling public services to be automatically offered without the need for users to actively seek them out. Additionally, it promotes greater inclusion through audio features that allow citizens to describe what they need and be redirected, without having to know the exact service name. Amazon, in partnership with SENAI, offers cloud computing courses for women, addressing gender bias, digital literacy, and fostering closer collaboration with the private sector. These experiences are not only replicable in other regions but also provide a model for other sectors, such as healthcare, that could benefit from public-private partnerships. A robust digital infrastructure, supported by the expertise of major tech companies, can inspire other private institutions to collaborate with the government in implementing solutions that benefit the entire population.

Policy note 3

Decarbonizing Agriculture: Ideas for Transformation and Cooperation in Brazil and Denmark



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* This policy note reflects the personal research, analysis, and views of the authors and does not represent the position of the institution, its affiliates, or partners.

Objectives

On November 28, 2024, the Brazilian Center for International Relations and the Embassy of Denmark to Brazil hosted the seminar titled “Decarbonizing Agriculture: Ideas for Transformation and International Cooperation”. The hybrid seminar brought together experts and government authorities from both countries, including the Danish Ambassador to Brazil, Eva Bisgaard Pedersen, Senior Fellow at CEBRI and *Vallya Participações*, Larissa Wachholz, Senior Researcher from the Aarhus University’s Department of Agroecology, Niels Halberg, Special Advisor to the Brazilian Ministry of Agriculture and Livestock, Pedro Augusto Machado, UnB assistant professor of international relations, Niels Soendergaard, Regional Marketing Manager of Novonosis for Latin America, Fernando Tupich, and Head of Office of International Relations of Embrapa, Marcelo Morandi. The speakers have been moderated by Rafaela Guedes, Senior Fellow at CEBRI and content curator for this project. The seminar was broadcast on YouTube through CEBRI’s channel.

Considering that the decarbonization of the agricultural sector is a key priority for both Denmark and Brazil, and a necessary step towards the achievement of the goals set forward in the Paris Agreement and the 2030 Agenda, the primary goal of the event was to foster meaningful discussions and collaboration around innovative approaches to decarbonize agriculture. This included sharing experiences from both countries, with the understanding that innovative approaches always need to be adapted to each country’s specific context and needs.

The event also had the purpose to promote multi-sectoral dialogue and international cooperation to address challenges related to agricultural sustainability, the recovery of degraded areas, and the decarbonization of agriculture, focusing on opportunities for innovation and climate financing. Through in-depth discussions among representatives from the public and private sectors, academia, and civil society, the aim was to strengthen strategic partnerships, identify synergies, and build concrete solutions capable of reconciling agricultural production, environmental preservation, and economic development.

The invited experts emphasized the importance of viewing agricultural production not only as a source of challenges, but also as an ally and a driver of solutions to global issues such as the transition to sustainable land use and food systems and linked to the energy transition. Thus, the necessity of dialogue and cooperation among the agricultural, energy, and industrial sectors was also underscored.

Overview

With its vast territorial expanse and agroecological diversity, **Brazil is one of the world's leading agricultural countries and an important stakeholder when it comes to advancing sustainable practices in agriculture.** The recovery of degraded areas, the promotion of integrated systems, and the encouragement of technological innovation are at the core of solutions capable of aligning productivity, food security, and climate change mitigation.

Of the 160 million hectares of pastureland in Brazil, approximately 100 million are considered to have some degree of degradation. Of these 100 million degraded hectares, about 40 million are deemed economically viable for recovery through conversion to agricultural activities. These areas are the target of the *National Program for the Conversion of Degraded Pastures (PNCPPD)*¹⁸, coordinated by Brazil's Ministry of Agriculture and Livestock, with support from other ministries and institutions such as BNDES and Embrapa. Through financing, the program promotes the recovery of pastures, agricultural conversions, planted forests, native forest restoration, and crop-livestock-forestry integration (CLFI).

The transition to sustainable agriculture and land use involves not only innovative practices but also robust public policies and effective international partnerships. Data presented at the event indicate that crop-livestock-forestry integration (CLFI) and biological soil management techniques can not only increase productivity but also position Brazil as a global leader in efficient and responsible land use.

Denmark's Green Tripartite Agreement, established in 2024, is a pioneering policy choice designed to decarbonize agriculture through a multi-pronged approach. The agreement establishes a CO₂e tax on agricultural emissions, including livestock, peatland, and fertilizer use, while simultaneously offering subsidies for emissions reduction and biochar storage. This comprehensive strategy seeks to balance emissions reduction with the maintenance of a competitive agricultural sector, demonstrating a commitment to a just transition for farmers while addressing climate change and biodiversity goals.

¹⁸ For more information about the *National Program for the Conversion of Degraded Pastures (PNCPPD)*, see the official program legislation at

<https://www.fao.org/faolex/results/details/en/c/LEX-FAOC222677/>

Or consult details about its presentation to investors and international forums at

<https://www.gov.br/agricultura/en/news/ministry-of-agriculture-presents-pasture-conversion-program-to-investors-in-the-united-states-of-america> and

<https://www.gov.br/agricultura/en/news/brazil2019s-ministry-of-agriculture-and-livestock-presents-degraded-pasture-conversion-program-to-brics>

1.1 Sustainable Agriculture and the Role of Soil

Soil health is a central element in promoting resilient agriculture. Brazil is advancing with innovative technologies, such as biological soil markers, which enable the diagnosis of agricultural ecosystem health and the planning of effective recovery strategies. Initiatives like the national soil health database, created by Embrapa, highlight the country's potential to lead the development of science-based practices.¹⁹

Denmark contributes to the *European Mission Soil Health*, which aims at establishing 100 Living labs for co-creation of sustainable soil management practices involving land users, scientists and other stakeholders. Aarhus University is leading several trans-European soil projects, *AI4SoilHealth*, *Prepsoil*²⁰ and is a key partner in the *EJP Soil* co-founded R&I partnership, where Embrapa has participated as co-founder of research. Thus, there is a basis for continued collaboration between Brazil, Denmark and EU initiatives in the area of soil management for sustainable land use and food systems.

By recovering degraded soils and promoting biomass increase, carbon emissions may be reduced while sequestration capacity is expanded. This virtuous cycle, mentioned by specialists during the debate, reinforces the importance of research and innovation with land managers through co-creation and efficient processes where science-based knowledge may inform policies that encourage conservation practices, such as no-till farming, the use of beneficial bacteria, and integrated management. Improved international collaboration in science-policy interfaces, which may leverage knowledge gained in reducing agriculture's climate impact through technologies and management, has a potential for supporting transition to sustainable land use in a value chain and food system perspective.

1.2 Challenges and Opportunities in Climate Financing

One of the greatest challenges faced by Brazilian producers, especially small and medium-sized ones, is access to adequate financing. Although the PNCPD has received significant initial funding, the costs associated with credit — such as high-interest rates (15% per year) and exchange rate risk — make investments unfeasible for many farmers.

Discussions during the event highlighted the need for hybrid financial solutions, with the participation of international partners, to reduce the cost of credit.

¹⁹ Embrapa's BioAS initiative, featuring the largest soil enzyme activity database globally with over 30,000 samples from across Brazil, reflects the nation's leadership in agricultural innovation. More information can be found at:

<https://www.embrapa.br/busca-de-noticias/-/noticia/86932290/bioas-rede-de-laboratorios-e-ampliada>

²⁰

Click here to know more about the initiative: <https://prepsoil.eu/>

Proposed solutions include:

- I. Raising international funds in strong currencies with subsidized exchange rate hedging.
- II. Public-private partnerships aligned with international demand for biofuels and carbon credits.
- III. Flexibility in programs, allowing donor countries to link resources to specific objectives such as food security or emissions neutrality.

1.3 International Cooperation and Technological Innovation

Brazil has the opportunity to leverage its diplomatic capacity and experience in tropical agriculture to lead multilateral forums, promoting solutions adapted to the climatic and socioeconomic realities of the Global South. The country's success in the G20, which advanced topics like bioeconomy and food security, demonstrates that it is possible to build consensus in a challenging international landscape.

Cooperation with countries like Denmark, both public and private sector, is relevant to share cutting-edge technologies and fostering the bioeconomy. Biotechnology and bioinput-based solutions provide sustainable solutions for agricultural production, replacing synthetic fertilizers and pesticides with sustainable alternatives. Innovative technologies for reducing GHG emissions from livestock production and land use developed by the Danish policy driven science programs may inspire implementation as well as be inspired by the Brazilian PNCPD initiative.

1.4 Opportunities in Biofuels and Circular Economy

The global energy transition represents a window of opportunity for the Brazilian agricultural sector. Data indicates that Brazil could double its biofuel production using just 5% of degraded pastureland, without compromising food security²¹. Technological routes, such as the production of biodiesel, ethanol, and biogas, integrated with systems like CLFi, optimize land use and diversify producers' income streams.

²¹ Studies suggest that converting 5% of degraded pastureland into biofuel crop production could significantly increase Brazil's output while maintaining food security, highlighting the country's potential to lead in sustainable energy solutions through innovative land-use strategies. For more details, see Agência FAPESP, *Conversion of 5% of pasturelands to croplands could double biofuel production, study shows*, available at: <https://agencia.fapesp.br/https://agencia.fapesp.br/conversion-of-5-of-pastureland-to-cropland-could-double-biofuel-production-study-shows/41622>

Additionally, the circular economy offers additional gains. Agricultural residues, such as DDG (a by-product of ethanol) and bovine tallow, are already used in biofuel production, closing cycles and reducing emissions. The same concept applies to agribusiness, with the potential to transform waste into raw materials for other production chains, such as animal feed, cosmetics, and pharmaceuticals.

Summary: This context section highlights the urgency and opportunities of decarbonizing Brazilian agriculture, emphasizing soil health, climate financing, and technological innovation as fundamental pillars. COP30 emerges as a decisive event to consolidate Brazil as a global leader in sustainable solutions, promoting international cooperation and attracting strategic investments.

Recommendations Based on Best Practices

Based on the discussions and experiences shared during the event, CEBRI identified strategic recommendations, grounded in national and international best practices that can be replicated and expanded to strengthen agricultural sustainability, the recovery of degraded areas, and the decarbonization of the economy. These recommendations aim to provide concrete guidelines for decision-makers, the private sector, academia, and civil society organizations.

1. Strengthening Technical Assistance and Capacity Building

Implementation of Digital Capacity-Building Programs: Inspired by India's successful experience with rural connectivity, it is recommended to expand digital infrastructure in Brazil to enable access to remote technical assistance. Tools like the use of artificial intelligence (AI) — exemplified by *Raimundo* a virtual assistant — should be employed to train small producers in an accessible and personalized way. *Raimundo* provides farmers with access to the world's largest database on tropical agriculture, enabling producers of all sizes to receive immediate answers based on robust scientific data. The assistant not only provides real-time guidance on best farming practices, pest control, and soil management but also helps farmers adapt to climate change by offering predictive insights based on weather patterns and crop cycles. Available via WhatsApp, a widely used platform in Brazil, it empowers producers with knowledge that was previously limited to experts, bridging the digital divide in rural areas by ensuring that even those in remote regions can enhance their yields, reduce losses, and increase profitability.

Local Knowledge Transfer: Programs like *Integra Zebu*, which disseminate conservationist practices through demonstration pilots, should be expanded. Developed by the Brazilian Association of Zebu Breeders (ABCZ) in partnership with public and private entities, this initiative promotes sustainable livestock

farming by integrating cattle production with crops and forestry. Its core objective is to recover degraded pastures and improve land use efficiency through Integrated Crop-Livestock (ICL) and Integrated Crop-Livestock-Forestry (ICLF) systems. The program relies on model farms that serve as living laboratories, where producers witness firsthand the benefits of sustainable techniques. The strategy of “learning by envy,” where neighbors observe results and replicate good practices, is an effective approach to engaging local producers.

Public-Private Partnerships: Strengthen partnerships between research institutions, such as Embrapa, and the private sector to accelerate the transfer of innovative technologies, such as bio-inputs, soil monitoring tools, and integrated production systems.

2. Promoting Conservation Agriculture and Soil Recovery

Promotion of Crop-Livestock-Forestry Integration (CLFI): Recognized as a system that mimics nature, CLFI should be encouraged as a practice that sequesters carbon, improves soil health, and increases productivity. Specific financing policies can support the adoption of this model, particularly on small and medium-sized farms.

Soil Health as a Strategic Indicator: Expand soil health monitoring programs, such as those led by Embrapa, using biological, physical, and chemical indicators. Mapping tools, like the national soil health database, should be widely available to guide public policies and private investments. Collaboration with like-minded programs and policies in Denmark and EU is an option to leverage the efforts and capacities across the continents.

Encouraging the Use of Bio-Inputs: Expand the use of bacteria and other bio-inputs in agriculture to reduce dependency on chemical fertilizers and pesticides, promoting more sustainable and climate-resilient production.

3. Innovative and Accessible Financial Solutions

Reducing Interest Rates and Creating Specific Credit Lines: Establish credit lines with subsidized interest rates and longer grace periods to encourage small producers to adopt sustainable and technological practices. Credit access should be simplified and tailored to local realities.

Securing External Resources with Flexible Use: Explore international partnerships to enable innovative financing lines that address bilateral interests, such as food security contracts, carbon credit generation, and biofuel production.

Climate Transition Financing Focused on Bioeconomy: Develop specific financial instruments to support bioeconomy projects, such as the recovery of degraded pasturelands and the use of agricultural and forestry residues in biofuel

production and other circular economy products.

4. Monitoring and Measuring Impacts

Implementation of Digital Monitoring Tools: Adopt technologies such as drones, sensors, artificial intelligence, and satellite systems to measure the impact of sustainable agricultural practices in real-time. Monitoring tools are essential to ensure the integrity and additionality of carbon credits.

Creation of Standardized Indicators: Establish national and regional indicators to measure soil health, greenhouse gas emission reductions, and the economic and social benefits resulting from conservationist practices.

Involving Local Stakeholders in Technology Validation: Engage producers, researchers, and NGOs in processes to evaluate and validate sustainable practices and technologies, ensuring that results are applicable in different contexts.

5. Bioeconomy and Valuing Natural Resources

Sustainable Use of Residues: Encourage the use of agricultural and industrial residues for the production of biofuels, agricultural inputs, and high-value-added products, such as pharmaceuticals and cosmetics, promoting the circular economy. Examples include using bovine tallow and açai residues.

Policies to Incentivize Planted Forests: Develop technologies and solutions for specific challenges, such as the removal of eucalyptus stumps in planted forest areas, facilitating the conversion of these areas into croplands or new plantations.

6. Engagement and Strategic Communication

Environmental Education and Communication with Producers: Conduct educational campaigns focusing on the economic and environmental benefits of sustainable practices, demystifying regulatory requirements and demonstrating concrete results in productivity and financial returns.

Showcases and Demonstration of Results: Use events like COP 30 to showcase successful projects, positioning Brazil as a global leader in sustainable agriculture, bioeconomy, and degraded area recovery.

Fostering Multi-sectoral Dialogue: Continue promoting events that bring together representatives from government, the private sector, academia, and civil society to discuss joint solutions and integrate efforts for sustainability.

Policy note 4

Winds of Change: Opportunities to Unlock Brazil's Offshore Wind Potential and Experiences from Denmark

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* This policy note reflects the personal research, analysis, and views of the authors and does not represent the position of the institution, its affiliates, or partners.

Objectives

On November 29, 2024, the Brazilian Center for International Relations (CEBRI) and the Embassy of Denmark to Brazil hosted the event “Winds of Change: Opportunities for Unlocking Brazil’s Offshore Wind Potential and Experiences from Denmark.” The event brought together renowned experts and government authorities from Brazil and Denmark, including Alessandra Lehmen, Environmental and Climate Lawyer at Juchem Advocacia; Bernardo Busel Niedmann, Chief Advisor of the Danish Energy Agency; Birgitte Egelund Olsen, Professor of Law at Aarhus University; Juliano Martins, Senior Market Intelligence Analyst at ABEEólica; and Karina Araujo Sousa, Director of the Energy Transition Department at the Brazilian Ministry of Mines and Energy (MME). The seminar was opened and moderated by Rafaela Guedes, Senior Fellow at CEBRI, Independent Consultant, and International Advisor at APCO, with remarks by Eva Bisgaard Pedersen, Ambassador of Denmark to Brazil. The hybrid event, which explored opportunities for advancing Brazil’s offshore wind sector through international cooperation and shared expertise, was broadcast live on CEBRI’s YouTube channel.

The event has focused on analyzing and identifying opportunities, challenges to drive the development of the offshore wind energy sector in Brazil, drawing inspiration from Danish and international best practices. Denmark, globally recognized as a pioneer in offshore wind energy development, offers a consolidated reference model in planning, regulation, and project implementation. The objective is to present and discuss lessons learned, including best practices and challenges overcome in managing licensing processes, mitigating environmental impacts, and fostering community engagement so that Brazil can adapt these insights to its own reality.

Additionally, the event addressed the consent process, one of the most complex and challenging stages in offshore project development. This term encompasses a set of legal, regulatory, and technical requirements that ensure the project meets environmental, safety, navigation, and grid integration standards. In this context, the discussion explored how Denmark’s “one-stop shop” model and other international systems can contribute to simplifying and streamlining this process in Brazil, reducing regulatory fragmentation and minimizing risks of delays.

Brazil boasts one of the world’s best offshore wind resources, with an estimated potential of over 1,200 GW, according to data from the World Bank.²² However, the country’s historical dependence on hydropower, combined with the impacts of

²² For more details, see:

<https://www.worldbank.org/pt/news/opinion/2024/08/15/eolicas-offshore-vem-do-mar-o-vento-que-sopra-novas-opportunidades-para-o-brasil#:~:text=agosto%20de%202024>

climate change on water resources, demands the diversification of its energy matrix. One of the key discussions taking place amidst Brazil-Denmark cooperation is, therefore, the strategic role that can be played by offshore wind energy in Brazil as a driver of energy security, economic decarbonization, and green industrialization. In addition to contributing to clean electricity generation, offshore wind energy also offers opportunities for green hydrogen production, a key component for decarbonizing hard-to-abate industrial sectors such as steelmaking, fertilizers, and maritime transport. The event explored how offshore wind can integrate with other emerging technologies, such as Power-to-X, energy storage, and water desalination, amplifying both economic and sustainable benefits.

The event has been efficient in its purpose to contribute with experiences on how the development of offshore projects in Brazil balances economic gains with the protection of marine biodiversity and the mitigation of socio-environmental impacts. In this regard, the event proposed discussions on robust practices in marine spatial planning, environmental monitoring, coastal community engagement, and the implementation of compensation programs and social benefits, aiming to ensure fair, participatory, and sustainable development. At the same time, it has recognized the importance of creating an investment-friendly environment, promoting regulatory predictability, legal security, and economic feasibility to attract investors. Recommendations for establishing a clear and streamlined regulatory framework aligned with international best practices, as well as financial incentive mechanisms like Contracts for Difference (CfD), will be explored in a whitepaper being produced under a partnership between CEBRI and Danish Energy Agency to boost the offshore wind market in Brazil.

The event also sought to identify infrastructure and institutional capacity gaps that require improvement. This includes modernizing strategic ports, expanding transmission networks, and strengthening regulatory agencies and environmental bodies to handle the complexity of offshore wind projects. Finally, the event underscored the importance of international cooperation in accelerating the energy transition. Knowledge exchange and experience-sharing with countries like Denmark, which has a well-established trajectory in implementing offshore wind farms, are essential for technology transfer, regulatory best practices, and innovative solutions applicable to the Brazilian context.

Overview

Brazil presents a unique and significant potential for offshore wind energy development, thanks to the combination of a vast coastline and steady, high-quality winds that place the country among the most promising in the world for this type of energy generation. In addition, Brazil has been identified by the International Energy Agency (IEA) as the second largest hydropower producer in the world as well as the second biofuels producer in the world, being considered as a very well-positioned country to conduct an energy transition at low cost.²³ On the international stage, Denmark has played a leadership role in the development of offshore wind energy, pioneering the implementation of offshore wind farms since the 1990s. The Danish experience includes the application of a centralized environmental licensing and regulatory model, known as the "one-stop shop," which organizes and simplifies the necessary steps for project approval. In simple terms, the "one-stop shop" process means that the Danish Energy Agency (DEA) serves as both the "pediatrician" and the "geriatrician" of projects, managing them from start to finish and acting as a central point of contact between various decision-making agencies. In addition to streamlining licensing processes, the one-stop shop model also helps concentrate knowledge about the projects and the sector under the stewardship of a single institution.

Denmark is also a reference in mitigating environmental and social impacts, integrating green hydrogen solutions, and developing port infrastructure adapted to the logistical needs of this industry. Despite having a mature offshore wind market, Denmark also faces dilemmas such as the "green versus green dilemma," which recognizes the paradox that producing clean energy often requires building infrastructure that can threaten local biodiversity. On the other hand, failing to combat climate change will lead to irreversible biodiversity loss. Similarly, the "global versus local dilemma" acknowledges the global need to combat climate change while balancing the acceptance of local communities affected by clean energy projects. Opposition from local communities not only delays the construction of such infrastructure but can even lead to the cancellation of projects. In this context, experts agree that it is essential to structure offshore wind energy projects around three key legal pillars: **i)** community acceptance; **ii)** nature and biodiversity protection; and **iii)** the establishment of efficient dispute resolution mechanisms.

The event, therefore, occurred at a strategic moment for Brazil as the country seeks to align its energy and climate policies with the goals of the Paris Agreement and its NDCs (Nationally Determined Contributions), particularly in light of the call to triple renewable power by 2030 agreed upon by UNFCCC Parties at COP28. Brazil's commitment to achieving carbon neutrality by 2050 and the recent updates to its climate targets demonstrate the country's ambition to

²³ Click here to see Brazil's profile at the IEA website: <https://www.iea.org/reports/brazil-energy-profile>

advance clean and sustainable energy sources, especially given the challenges posed by climate change, such as recurring water crises affecting hydropower generation. As presented by a specialist from Brazil's Ministry of Mines and Energy, the country aims to develop an offshore wind market not only as a source of clean energy but also as a generator of industrial development, structural capacities, and new jobs.

The development of offshore wind energy in Brazil presents opportunities alongside structural, regulatory, and socio-environmental considerations that need to be addressed. Key aspects include environmental licensing, institutional coordination, transmission infrastructure, and community engagement. Unlike Denmark, Brazil is still in the process of establishing a comprehensive marine spatial planning framework to guide offshore project implementation. Such a framework would help identify suitable areas with minimal environmental and social impact while also enhancing predictability and legal clarity for investors.

Another central aspect of the Brazilian context is the socio-economic relevance of the energy sector. Offshore wind energy can not only help diversify the energy matrix but could also play a crucial role in the country's green reindustrialization. The development of offshore wind farms creates opportunities for job generation, strengthening local value chains, and technological capacity-building, with a focus on green hydrogen production — an essential solution for decarbonizing hard-to-abate industries such as steelmaking, fertilizers, and maritime transport.

Additionally, Brazil has a history of offshore exploration in sectors such as oil and natural gas, providing a technical and operational foundation for the implementation of offshore wind farms. However, it is necessary to promote a just transition by involving local and traditional communities, such as fishers and riverside dwellers, ensuring the mitigation of socio-economic impacts and promoting shared benefits. Denmark's experience with financial compensation and community engagement was highlighted as an important reference for Brazil.

Finally, the event is part of a global context where international cooperation is essential to address the challenges of the energy transition. The partnership between Brazil and Denmark, through technical cooperation, exemplifies how the exchange of experiences can contribute to the development of more efficient, innovative, and contextually adapted public policies. Discussions on incentive mechanisms such as Contracts for Difference (CfD) and the need to ensure transparency, predictability, and regulatory stability to attract investors were central to the debate.

In summary, the event provided a valuable platform for dialogue to analyze international best practices, identify the specific challenges, and build a structured and sustainable pathway for offshore wind energy development in

Brazil. The combination of international experience — especially from Denmark — and adaptation to the specificities of the Brazilian context will be fundamental to unlocking the potential of this energy source and consolidating Brazil as a global player in the energy transition.

Recommendations Based on Best Practices

Based on the analysis of the presented context and the experiences shared during the event, CEBRI summarized some guiding principles to promote offshore wind energy development in Brazil. These principles aim to address regulatory, socio-environmental, and infrastructural challenges while fostering a model of sustainable, equitable, and competitive growth.

1. Strategic Planning and Regulation

Implementation of Marine Spatial Planning (MSP): Priority should be given to defining appropriate areas for offshore wind energy development, avoiding zones of high environmental sensitivity, critical biodiversity, and areas with intense economic activity, such as artisanal and commercial fishing. Spatial planning should integrate socio-economic, environmental, and infrastructural data, ensuring transparency and participation from all stakeholders.

Simplification and Centralization of the Licensing Process: Inspired by Denmark's "one-stop shop" model, Brazil could advance the creation of a centralized authority to coordinate the licensing process. This approach will provide greater efficiency, clarity, and predictability for investors and public agencies. Licensing should be conducted in an integrated and digitized manner, using open-access platforms to promote transparency.

Regulatory Harmonization and Institutional Capacity Building: It is necessary to strengthen inter-ministerial and inter-institutional governance, ensuring coordinated action among agencies such as IBAMA, the Navy, the Ministry of Mines and Energy, and the Ministry of Ports and Airports. Technical capacity-building for institutions responsible for handling the complexity of offshore projects is also recommended.

Development of a Clear Regulatory Framework: Establishing a robust regulatory framework is essential to eliminate legal uncertainty. This framework should address aspects of the business model, such as licensing, concessions, environmental requirements, social compensation, and incentive mechanisms.

2. Environmental and Social Management

Mitigation of Socio-Environmental Impacts: International practices are recommended to minimize the impacts of offshore wind farms on marine ecosystems and coastal communities. Recommendations include:

- Use of strategic environmental assessments (SEA) in the early planning phase to identify impacts on biodiversity and communities, ensuring effective public consultation and consideration of locational alternatives, as well as public access to the resulting database as a means of streamlining licensing procedures;
- Constant monitoring of effects on marine fauna and adoption of mitigation measures, such as seasonal restrictions on construction and operation during critical periods of reproduction and migration;
- Application of technologies to minimize underwater noise emissions, turbidity, exposure to electromagnetic fields, sonars, and light, and other ecosystem interferences.

Engagement and Consultation with Local Communities: Free, prior, and informed consultations with traditional communities should be ensured, as regulated by international instruments such as the ILO Convention and the Escazú Agreement. This process should be participatory, transparent, and continuous, fostering open dialogue and sensitivity to local needs.

Implementation of Compensation Schemes and Community Benefit Programs: Inspired by the Danish model, the creation of financial and social compensation schemes is recommended. This includes:

- Individual compensation for affected landowners and fishers;
- Community benefit funds, financed by developers, for investments in local infrastructure, professional training, and social development projects.

3. Infrastructure and Logistics

Development of Port Infrastructure: Adapted ports are essential to support the logistical operations of transporting and assembling offshore wind farm components. Recommendations include:

- Incorporating port investments into project planning.
- Identifying strategic ports that can be modernized and converted to meet the needs of the offshore wind industry.
- Integrating port policies into the bidding processes for offshore projects, optimizing costs and ensuring logistical efficiency.

Planning of Transmission Infrastructure: Expanding and modernizing electricity transmission networks is critical to integrating offshore energy into the *National Interconnected System* (SIN). A long-term plan is recommended in order to insure coordinated investments in transmission lines, substations, and connection systems.

Fostering National Industry: Encouraging the local supply chain to meet the demand for components, equipment, and services required for offshore wind installations is essential. This includes technical training programs and investments in innovation and research, particularly in green hydrogen and energy storage technologies.

4. Economic and Financial Incentives

Mechanisms to Support Economic Viability: Introducing support schemes like Contracts for Difference (CfD) can reduce market risks and attract investors, ensuring stable financial returns for developers. We recommend evaluating them.

Promotion of Industrial Demand: Policies should be articulated to boost demand for renewable electricity and green hydrogen, particularly in sectors like steelmaking, fertilizers, and maritime transport, which require decarbonization. The production of green steel and synthetic fuels, for example, can directly benefit from offshore wind energy.

Public-Private Partnerships (PPPs): Adopting PPPs can be an effective tool to enable investments in infrastructure and technological innovation, as well as to promote international cooperation and attract foreign capital.

5. International Cooperation and Innovation

Knowledge Exchange and Best Practices: Denmark's experience offers valuable lessons, particularly in integrated planning, environmental impact mitigation, and community engagement models. Strengthening technical cooperation agreements with leading countries in the sector is recommended. Specialists emphasized the importance of sharing not only successful experiences but also failures and the creative solutions developed to overcome those failures.

- The Danish Energy Agency highlighted that cooperation with various countries reveals that the challenges faced in these projects are often the same globally. International cooperation provides opportunities to pool efforts, investments, and technical knowledge to overcome these obstacles. While Denmark accounts for just 0.1% of global carbon emissions, it is ingrained in the country's DNA to cooperate and contribute to reducing emissions worldwide.

Development of New Technologies: Research and development of emerging technologies, such as green hydrogen solutions and hybrid energy systems (offshore wind with storage), must be encouraged. International cooperation can facilitate technology transfer and accelerate the implementation of these solutions in Brazil.

Continuous Monitoring and Evaluation: Systematic project monitoring and periodic regulatory framework reviews will ensure that necessary adjustments are made swiftly, avoiding bottlenecks and implementation delays.

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