UCL IIPP Institute for Innovation and Public Purpose

Leveraging digital public infrastructures for the common good to promote inclusive and sustainable economic development in Brazil

Working Paper

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About The Project

The Institute for Innovation and Public Purpose (IIPP) is collaborating with the Ministry of Management and Innovation in Public Services (MGI) to enhance the public sector's capacity to implement Brazil's commitment to sustainable and inclusive economic growth. This transformation requires the government to shift from correcting market failures to shaping markets through a mission-oriented approach. This approach aims to provide a clear direction for innovation, investment, and growth, addressing society-wide challenges. It also necessitates a new collaborative framework between the public and private sectors, focused on shared risks and rewards and maximizing public value.

The implementation of mission-oriented innovation policies will demand changes in the design of government tools and institutions and the development of new capabilities, such as state-owned enterprises, digital public infrastructure and public procurement. This working paper synthesizes preliminary challenges and opportunities in how digital transformation, and particularly digital public infrastructures can leverage Brazil's economic transformation, based on research conducted from March 2024 to August 2024. It aimed at fostering dialogue at the workshop "Leveraging digital public infrastructures for the common good to promote inclusive and sustainable economic development in Brazil" held with 29 public, academic and civil society organisations to help inform digital transformation, and particularly digital public infrastructures design to potentialize Brazil's sustainable economic transformation.

Reference

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1. Introduction

The Brazilian government has set an ambitious agenda for economic transformation, focusing on climate resilience, equity and inclusion, alongside robust economic growth. Key initiatives like the Growth Acceleration Plan (PAC), Ecological Transformation Plan (PTE) and New Industrial Policy (NIB) are central to this agenda. In addition, as the host of the COP30 summit in 2025 — the world's biggest forum on climate change — Brazil will have a unique opportunity to highlight the convergence of its green and digital agendas, and to position itself as a leader in both green and digital diplomacy.

Achieving alignment between economic, social, and environmental goals requires extensive inter-ministerial coordination and investments to enhance the state's capacity to shape markets and guide growth (Mazzucato, 2021, 2024). **In this context, digital public infrastructure (DPI) — shared digital systems that are secure, interoperable, based on open standards and promote access to services for everyone — is essential** (Eaves and Sandman n.d.).

To support this agenda, DPI must align with the government's policy priorities and be designed in line with the common good (Mazzucato, 2023a). Fostering a new economy that emphasises inclusive and sustainable outcomes requires the foundational principles of economics to be reassessed, with the common good placed at the forefront of economic activity. Governments must invest in their capacity to engage with businesses and civil society, guided by principles such as purpose and directionality, co-creation, collective learning, access for all and transparency.

To address Brazil's grand challenges, a mission-oriented approach is essential. It helps shape the economy by turning challenges into investment opportunities and fostering collaboration across sectors and stakeholders (Mazzucato, 2023b). DPI supports these missions by facilitating coordination across government and sectors, driving success through digital capabilities that promote access, transparency, and collective learning.

Over the past five years Brazil has established foundational DPI — digital payments, consent-based data-sharing and digital identity — and the country is now entering a new phase of its digital transformation journey. The focus is on how specific use cases for DPI can bolster development while promoting broader coordination between ministries and across federal, state and municipal levels. However, there are many challenges, such as developing DPI-specific capabilities at subnational levels, and in various sectors.

One example that illustrates the potential of thoughtfully designed DPI to promote inclusive and sustainable development is the Rural Environmental Registry (CAR). CAR is particularly relevant to Mission 1 of the National Council for Industrial Development (CNDI) Action Plan for the NIB, which aims to promote sustainable agro-industrial chains. Additionally, common good framework, applied in the context of CAR, can serve as a model for assessing DPI design, governance, and capabilities, and generating insights for broader digital infrastructure implementation.

2. Digital capabilities and digital governance

2.1 What are digital public infrastructures?

Data and technology are not neutral or created in isolation. They emerge from socio-political contexts and are shaped by specific guiding principles. Literature on purpose-driven innovation and technology governance emphasizes that the direction of technological development proceeds with different trajectories depending on such drivers, including demand side factors introduced by the government or other agents (Perez, 1986). The principles underlying this development — whether they prioritize private value, public value, or the common good — can significantly shape both the design and impact of these technologies (Eaves, Mazzucato, and Vasconcellos, 2023). In the case of digital public infrastructure (DPI), it is crucial to explore what the 'public' dimension entails, as it can be interpreted in multiple ways.

In 2023, DPI emerged as a central topic in global policy discussions. For the first time, G20 leaders collectively endorsed the creation of DPI that is ‘safe, secure, trusted, accountable, and inclusive.’ This definition described DPI as shared digital systems that are secure, interoperable, built on open standards, and designed to provide universal access to services, with governance and community at the core (United Nations Development Programme, 2023a).

To understand the potential of DPI, it is essential to recognise its core attributes, which are consistently present across foundational public infrastructure, with an emerging consensus identifying three components — digital payments, consent-based data sharing and digital identity — as their foundational elements (Eaves and Rao, 2024). These attributes encompass technology, governance and adoption aspects, and can be summarised as follows: serving society-wide functions, striving for interoperability and extensibility, and being governed by principles that prioritise the interests of individuals and communities. The following table elaborates on DPI’s six core attributes.

Table 1. The core attributes of DPIs according to Eaves and Rao (2024)

Attribute	Description
Interoperability and extensibility	Interoperability ensures diverse digital systems can communicate through standardised protocols, while extensibility allows for easy updates and integration of new functionalities. These attributes keep DPI relevant and adaptable, enabling other actors to build on this infrastructure for efficient service delivery
Transparency, accountability, and oversight	Accountability in DPI is maintained through governance frameworks that include transparent policies, monitoring protocols and independent oversight mechanisms. Regular evaluations and feedback loops help adapt to potential risks, ensuring efficient and responsible use of DPI
Privacy, protection and security	Protecting user data and maintaining public trust are crucial in the DPI ecosystem, which is vulnerable to high-level risks and threats. Robust system design and operational channels to identify, report and manage threats foster confidence in digital services, and encourage broader participation
Inclusion and non-discrimination	Inclusive design in DPI ensures that access to basic services is equitable, addressing both digital and non-digital access needs. Investing in digital literacy and keeping inclusive design central helps prevent exacerbating existing access issues and curtailing human rights
Capacity and coordination	Building DPI requires consistent capacity-building and coordination among the government and its partners. This involves skill management strategies backed by responsive budgets, and collaboration with the private sector and civil society to ensure effective implementation
Scale of adoption	Assessing DPI's adoption involves evaluating how well other actors use it as infrastructure, beyond just its owners. This includes public disclosure of technical standards, open standards adherence and introducing incentives to encourage broader use and interoperability in service delivery

Source: Authors' elaboration

2.2 Brazil's shift towards digital public infrastructure

Brazil's history of leveraging digital resources began in the 1960s with the creation of federal IT SOEs focused on data collection, storage and processing, laying the groundwork for electronic government[1] (Filgueiras and Lui 2022). In December 1964, the Federal Data Processing Service (SERPRO) was created, a public company responsible for modernising public administration processes, especially those related to the Internal Revenue Service. Ten years later, the second federal IT state-owned company, the Social Security Data Processing Company (DATAPREV), was established. It was formed by merging the data processing centers of several former social security institutes, with its main responsibility being the management of the benefits payroll for the National Social Security Institute (INSS). The rise of IT SOEs marks Phase 1 of Brazil's digital transformation journey, which can be described by six key phases (Eaves, Vasconcellos, and Rao, 2024), as detailed below.

1 SERPRO (Federal Data Processing Service) was created to lead data processing and information management for the Ministry of Finance, while DATAPREV (Company for Technologies and Information on Social Protection) was established to manage the payroll for the National Institute of Social Security (INSS), the largest payroll in Latin America. Federal agencies and departments adopted their technological infrastructure, centralising data collection and processing operations.

- **Phase 1 – 1960s to 1980s: Building foundational IT capacity in early institutions**
  This phase was characterised by the introduction of key systems by IT SOEs, such as the Registration of Individuals and the Individual Taxpayer Registry (CPF), which works currently as the credential for the national identity card. These SOEs laid the groundwork for long-term technological capabilities in the public sector, forming a foundation for future DPIs.

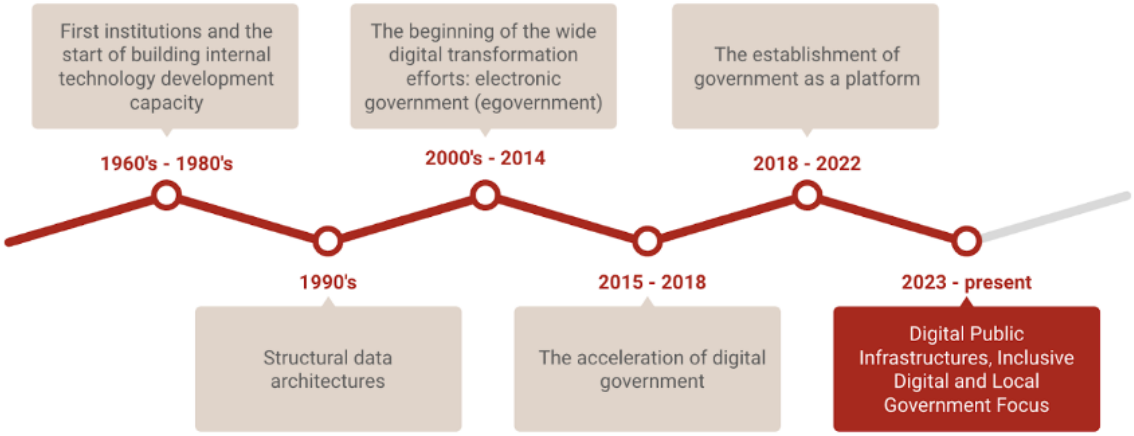
- **Phase 2 – 1990s: Establishing structural data architecture**
  In the 1990s, Brazil's public technology policies began to shift from insular efforts to more comprehensive data systems structuring. This period marked the transformation of the Individual Taxpayer Registry (CPF) into a national register, resolving long-standing conflicts about its purpose. The creation of the Information and Computer Resources Administration System (SISP) in 1994 also organized the management of IT resources across federal institutions.

- **Phase 3 – from 2000s to 2014: Enhancing digital transformation through e-government**
  Brazil's most comprehensive digital transformation efforts began in the early 2000s under the banner of e-government, emphasizing transparency, accountability, and participation. Early initiatives aimed to strengthen democracy and citizen engagement, with inclusion at the forefront, demonstrated by the launch of the Digital Inclusion Portal in 2004 and the Libras translator in 2010. Key policies, such as the E-gov policy (2000), the Access to Information Act (2012) and the Internet Bill of Rights (2014) laid the political and legal groundwork. This era also saw the creation of coordination mechanisms, like the Electronic Government Executive Committee (CEGE) in 2000 and interoperability standards (ePing) in 2004.

- **Phase 4 – 2015 to 2018: Accelerating digital transformation**
  Starting in 2015, Brazil's digital transformation shifted from e-government to digital government, focusing on redesigning internal processes and citizen interfaces. The Ministry of Planning launched the Digital Governance Strategy (EGD) in 2015, implemented in 2016, to accelerate this shift. The EGD, built on three pillars — access to information, service provision, and social participation — set ambitious goals, including expanding digital services, and increasing citizen engagement. In 2016 President Michel Temer's presidency started, following the impeachment of President Dilma. Amid a fiscal crisis, the focus expanded to emphasize efficiency and de-bureaucratisation as key drivers of digital transformation.

- **Phase 5: 2019 to 2022: Establishing government as a platform**
  Starting in 2019, Brazil accelerated the development of shared digital infrastructure under the Government as a Platform (GaaP) vision. Maintaining the emphasis on efficiency and de-bureaucratisation, the Digital Government Secretariat was created in 2019, overseeing initiatives like the GOV.BR platform, which unified federal government services and information. By 2020, 89% of federal services had been digitized. During the pandemic, digital transformation accelerated with the launch of the GOV.BR account, electronic signature, Conecta GOV.BR data exchange, and PIX payment system. The Digital Government Law introduced the Once Only Principle for data sharing, though digital sovereignty would gain prominence in the following years.

- **Phase 6: 2023 to the present: Accelerating Digital Public Infrastructures and integrated digital government**
  In 2023, the Ministry of Management and Innovation in Public Services (MGI) was created, incorporating the Digital Government Secretariat and the IT SOEs SERPRO and DATAPREV. The Ministry's goal is to equip federal bodies for state transformation and better public policy execution, with new priorities like local capacity building. Digital sovereignty, inclusive service access, and strengthening digital public infrastructures are positioned as goals of the new National Strategy for Digital Government, published in 2024. Other key initiatives include the New National Identity Card (CIN), the National Data Infrastructure Programme (IND), the Brazilian AI Plan (PBIA) and enhanced privacy and security governance through the launch of the Integrated Cybersecurity Centre for Digital Government (CISC GOV.BR) and the Centre of Excellence in Privacy and Security.



Source: Digital Public Infrastructures: Global Development and Brazil's Position (Eaves, Vasconcellos and Rao, 2024).

It was during the transition from the Government as a Platform moment to the infrastructure centered phase that Brazil started building policies which are currently perceived as the country's foundational DPIs — digital payments, data exchange and digital identity:

- **PIX, introduced by the Brazilian Central Bank, is an instant payment scheme** that allows individuals, companies and government entities to make or receive payments within seconds at any time with no transaction costs for users. It includes a payment mechanism and a set of regulations governing its ecosystem, enhancing convenience, competition, efficiency, financial inclusion, digitisation, security and customer experience in the payments market. According to the Brazilian Central Bank (2022), by December 2022, PIX had onboarded 71.5 million Brazilians, about 43% of the adult population, and saved an estimated US$ 5.7 billion in 2021. It is projected to contribute US$ 37.9 billion to Brazil's GDP by 2026, equivalent to 2.08% of forecast GDP (Banco Central do Brasil, 2024).

- **Conecta.gov is a federal initiative promoting automatic and secure data and service interoperability among federal agencies.** It provides an API Catalogue and an API Manager for data and services. As of August 2024, around a thousand public services had adopted the programme, with estimated combined savings of US$ 800 million for both citizens and public agencies (Ministério da Gestão e da Inovação em Serviços Públicos, 2024).

- In 2024, states started issuing the new **National Identity Card (CIN)**[2], which now uses the taxpayer number (CPF) as a National General Registry, eliminating duplicate citizen identification. **Combined with the authentication feature from the government services platform (GOV.BR), this forms the foundation for Brazilian digital identities**. Following an environmental tragedy in Rio Grande do Sul state in May 2024, which affected 90% of the district and 94.3% of its economic activity (FIERGS, 2024), the federal government and the IT SOE DATAPREV used CIN to quickly reclaim affected citizens' identities. They cross-referenced this with address databases to identify displaced or homeless families, providing a reconstruction assistance payment in a single installment, totaling more than R$ 1.5 million.

Beyond foundational DPI, domain-specific DPIs are now emerging, mainly related to education, climate, social and health policy priorities (Centro de Inovação para a Educação Brasileira 2024). During the COVID-19 pandemic, for instance, the National Network for Health Data (RNDS) enabled timely sharing of exam results between federal, state and municipal levels. More recently, the Ministry of Education has created an innovation department which is now dedicating to the development of DPI-like initiatives.

Amongst these emerging DPI, the Rural Environmental Registry (CAR), closely aligned with the Government of Brazil's economic transformation and sustainability agendas, stands out. Although it primarily serves as a tool for environmental regularisation, it also has the potential to function as a DPI for implementing transversal policies, which will be explored in the third section of this paper.

In contrast to countries like India, most Brazilian DPIs have originated and developed with a focus on digital *governmental* infrastructure, rather than digital *public* infrastructure. An exception is PIX, which was co-designed in partnership with representatives from various societal groups. However, the engagement of civil society, the private sector, citizens and other relevant stakeholders has not always been considered in the design of digital infrastructure. The emergence of new DPIs is an opportunity to rethink how this engagement can be systematically prioritised, informing their design, implementation and constant evolution, while ensuring countries maintain their sovereignty over DPI, preserving institutional memory and implementation capacity in the long run.

2 Brazil began by integrating the authentication process into its government services platform (GOV.BR) rather than reinventing identification. Three security levels (bronze, silver and gold) were established. Silver and gold use biometrics from databases like voting and driver's licenses. Silver includes facial recognition and two-step verification from banks. Gold requires facial recognition with a new ID card or digital certificate. A digital ID is equivalent to a golden GOV.BR account (Eaves and Rao, 2024).

Infrastructure thinking gained more traction in 2024 (Eaves, Vasconcellos and Rao, 2024). For example, Brazil's 2024 G20 presidency is bringing DPI to the centre of discussions in the digital economy working group (DEWG).

In 2024, the federal government also published the National Strategy for Digital Government (NSDG), positioning DPI as a core element. This strategy aims to create secure, scalable and resilient infrastructure aligned with sustainability principles. It emphasises shared foundational solutions, common standards and integration among federated entities.

NSDG is guided by the following principles (Decreto N° 12.069 2024):

- Universal access to innovative and inclusive solutions focused on people's needs.
- Adopting interoperable, secure, scalable and economically sustainable technological standards.
- Promoting secure data sharing and transparency.
- Integrating digital and physical channels.
- Ensuring privacy, data protection and information security by mapping and mitigating risks throughout the DPI lifecycle.

The NSDG establishes strategic recommendations to guide digital government initiatives for the federal, state, district and municipal governments, encompassing governance and capacity-building. Federal, state and municipal strategies are expected to outline specific goals and initiatives for both national and subnational levels. These strategies will push policymakers to rethink the foundations of state capacity and its relationship to infrastructure as the cornerstone of digital transformation.

Although the NSDG is relatively recent, initiatives from various ministries demonstrate the infrastructure thinking has been emerging in Brazil, while also revealing underlying governance and capabilities challenges.

The Ministry of Education (MEC) is developing a unified system to connect data for 47 million students across diverse systems in states and municipalities. Known as the Present Management System (SGP), it will support educational processes and be available to schools at no cost. Initially focused on student enrollment, the SGP's vision is to evolve into a tool for automating and optimizing both academic and administrative workflows. This evolution aims to ease the burden on teachers, assist in decision-making, and enhance transparency in school management. By transforming the SGP into a DPI, MEC intends to enable seamless data sharing across all educational systems in Brazil, making information exchange and management more efficient. For this to succeed, MEC is applying efforts into expanding SGP's capabilities as a central data hub, creating standardized protocols and participation guidelines while promoting open data APIs to encourage adoption throughout the educational sector.

Given the variety of systems used across states and municipalities — ranging from proprietary solutions to systems managed by local education secretariats — the project focuses on building

APIs to integrate with existing platforms. This flexible approach respects local autonomy, enabling states and municipalities to address their unique challenges and access customized support from the federal level. With this foundation, intergovernmental collaboration can thrive, as ministries and local entities develop a shared understanding of each other's data requirements, ultimately enhancing the effectiveness of mutual support initiatives.

2.3 Brazil's digital governance and capabilities challenges

Brazil's digital transformation journey has faced various challenges and developments that have shaped its progress. Early efforts were hindered by a lack of clear strategies for digital capabilities, rigid recruitment processes, and insufficiently specialized IT roles. However, key advancements, such as the publication of the General Strategies for Information Technology in 2008, gradually increased capacity. During the digital government phase, public sector organizations initially undervalued digital skills, but the 2016 Digital Governance Strategy marked a shift toward focusing on information access, service delivery, and social engagement. The establishment of state-owned enterprises as technological capacity aggregators, and the prioritization of digital capabilities in the 2020 and 2024 Digital Government Strategies, have laid the groundwork for strengthening digital public infrastructures and addressing governance gaps in the diverse ecosystem of stakeholders.

When particularly considering the challenges in the infrastructure thinking phase, a key issue is the need for skills that can effectively engage public servants — and even citizens — in data reporting. To create databases that other institutions can reuse, the government must ensure not only that data is collected, but that the data gathered is accurate. This raises important concerns about user engagement and service design, which are critical factors in Digital Public Infrastructure (DPI) development.

Again, take the education sector, for example: the Ministry of Education (MEC) mandates bi-monthly reporting of student attendance data. While this data is crucial for meeting compliance requirements, teachers often perceive it as having limited practical value. The process imposes a high administrative burden. This example highlights the importance of user-centered infrastructure design, ensuring that data collection methods benefit both policymakers and those responsible for implementation.

As we transition from historical challenges to the current strategic framework, it becomes evident that the **NSDG brings an opportunity to establish governance models and enhance capabilities that accelerate sustainable, inclusive and effective digital public infrastructure**. Bridging the gap between policy design and technological execution requires a collaborative approach, where policymakers are equipped with a foundational understanding of technology or work closely with experts who possess this understanding.

The role of IT SOEs in skills building is also central. Operating as capacity aggregators, they bring the necessary experience to accelerate public sector capabilities and flexibility to mediate with the private sector, promoting innovation through diverse partnerships.

A clear example comes from an initiative led by DATAPREV. In the early 2000s, a process was established to manage consigned credit for retirees and pensioners under the National Institute of Social Security (INSS). Initially, the consigned credit model functioned as a centralized solution, with DATAPREV overseeing the entire process. However, over time, the IT SOE transitioned to a more collaborative and ecosystem-oriented approach. Rather than adding more functionalities to a centralized system, DATAPREV prioritized enabling the data to integrate with external systems more easily, to meet the bespoke needs of various banks. As banks adapted by developing their own systems within this ecosystem, competitiveness increased, and overall costs decreased significantly, benefiting all stakeholders.

Today, half of DATAPREV's revenue is generated from this model, which also subsidizes 70% of its contract with the INSS. This approach not only reduced the cost of credit for borrowers but also expanded the availability of consigned credit for banks, fostering a more sustainable and efficient financial environment. This case also exemplifies how IT SOEs could approach DPI design.

In the next sections, this paper proposes a framework for DPI development and analyses case studies, highlighting the ongoing evolution of infrastructure thinking and its alignment with social and economic value generation for sustainable, inclusive economic and state transformation in Brazil.

2.4 Forward thinking: advancing governance and capabilities for digital public infrastructure

The new NSDG provides a legal framework for developing DPI and presents guidelines for subnational governance in Brazil. However, operationalising this strategy will be challenging, requiring well-defined frameworks to inform digital infrastructure implementation, as well as standards for digital governance and capabilities.

Alongside the aforementioned SOEs, the Secretary of Digital Government (SDG), housed within the Ministry of Innovation and Management in Public Services (MGI), plays a crucial role in this equation. It is not only responsible for the NSDG, but also for enhancing governance and capabilities government wide. Priority policy goals such as the ones showcased by the new strategy, which can also be materialised through missions (Mazzucato, 2021), create transformative pathways that can guide the design of key tools as DPI, consequently driving the development of the capabilities required for effective governance in the digital age.

Digital capability, a multidisciplinary concept, includes strategy, leadership, workforce skills, delivery and organisational effectiveness. It is defined as an organisation's ability to achieve outcomes through the expertise of its people and its capacity to apply that expertise effectively (Melhem and Jacobsen, 2021). **The development of these capabilities is crucial for managing DPI, which is essential for modern society, especially as demonstrated during the COVID-19 pandemic**, where bureaucratic professionalism emerged as a key factor in the successful deployment of government-owned digital tools (Cingolani 2023).

Governance of DPI is broadly defined as a driver of public value, aiming to prevent misuse of infrastructure while maximising benefits, aligning policies, and ensuring accountability (Eaves, Mazzucato and Vasconcellos, 2024). In this regard, the 'economics of the common good', developed by Mazzucato (2023), offers a framework for enhancing public value creation and guiding the governance of DPI.

The common good is a concept that extends beyond merely achieving common goals. **When applied to economics, it emphasises that the process of reaching a goal is as important as the goal itself.** And the development of public-governed digital infrastructure not only aids the achievement of specific policy outcomes, but also builds the necessary state capabilities to operate effectively in the 21st century, as the COVID-19 example shows. The common good framework further enhances such initiatives through its five pillars (Mazzucato, 2023a).

1. The first pillar, purpose and directionality, promotes outcomes-oriented policies in the common interest, ensuring that efforts are aligned with societal goals.

2. The second pillar, co-creation and participation, allows citizens and stakeholders to engage in debate and consensus-building, incorporating diverse perspectives into decision-making processes.

3. Collective learning and knowledge-sharing, the third pillar, fosters true purpose-oriented partnerships, driving collective intelligence and the exchange of knowledge.

4. The fourth pillar, access for all and reward-sharing, ensures that the benefits of innovation and investment are distributed among all risk-takers through equity schemes, royalties, or collective funds.

5. Lastly, transparency and accountability, the fifth pillar, maintains public legitimacy and engagement by enforcing commitments and aligning evaluation mechanisms across all actors.

One key example of applying the common good framework to DPI is the development of PIX by the Brazilian Central Bank (BCB). The BCB adopted a process that prioritised taking risks, collaboratively building solutions with society, and experimenting with user-centric design practices to create a new payment system and drive societal change. They established new relationships by initially forming a working group that evolved into the PIX Forum, a collaborative governance practice involving representatives from various societal groups, including credit card operators, banks, fintechs, civil society organisations and small business associations. Rather than aiming for a neutral technology, they set a clear direction. Competition was essential, but it had to meet an additional public purpose principle: transaction costs needed to be zero or near zero for citizens. This sense of directionality informed policy and design decisions, ensuring that the system would be accessible to everyone and that the benefits would be shared collectively.

This concept of the common good offers a useful framework for assessing DPI and generating insights that can inform digital infrastructure implementation. The next section applies this framework to examine the case of the Rural Environmental Registry (CAR).

Figure 1. Common good principles from Mazzucato (2023)

Source: Governing the economics of the common good: from correcting market failures to shaping collective goals (Mazzucato, 2023a).

3. Case study: transforming CAR into a DPI for the common good

3.1 Challenges and opportunities in CAR's implementation as a cornerstone for Brazilian economic development

The Rural Environmental Registry (CAR) is a key tool for aligning the green transition with inclusive and sustainable economic development in Brazil. As a strategic tool, it connects environmental, economic, and industrial agendas. To achieve these ambitious goals, it must be designed as a digital public infrastructure.

Meanwhile, CAR provides a valuable case study for exploring the potential of DPI implementation in Brazil. While it has not yet been developed as one, it demonstrates the opportunities that could arise from its evolution into a DPI. Established by the Forestry Code, CAR is a nationwide public electronic register for rural properties[3] (Lei N° 12.651 2012). It requires a governance arrangement that effectively integrates subnational and federal levels, offering valuable insights into broader DPI implementation strategies. Furthermore, the involvement of SOEs like DATAPREV, which currently holds CAR's database, adds another layer of complexity to this governance model. Additionally, a successful implementation of the registry requires careful consideration of the capabilities for policy design and execution at the subnational level, and the role of the federal government in coordinating these efforts. The following section explores the limitations and potential of CAR, particularly with respect to capabilities, governance and alignment with a potential priority use case.

Initially overseen by the Ministry of Environment (MMA), CAR's governance shifted to the Ministry of Agriculture and Livestock (MAPA) before its recent integration by the MGI, in 2023. **CAR is pursued and operates primarily as an environmental policy tool.** The integration of several registries results in a powerful database, which supports environmental and economic planning, control and monitoring, while helping to combat deforestation.

3 The Rural Environmental Registry (CAR) is an electronic public registry that integrates environmental data at a national level within the National Environmental Information System (SINIMA). It supports the conservation and sustainable use of forests and native vegetation through decentralized management involving the federal, state, and municipal levels. While CAR registration occurs at the state or municipal level, the integration of this data is managed nationally through the Rural Environmental Registry System (SICAR), established by Decree No. 7,830/2012. SICAR oversees the reception, integration, and public availability of CAR data and monitors forest restoration and vegetation suppression efforts. The decree mandates that subnational agencies responsible for CAR must offer a registration program integrated with SICAR to register, consult, and monitor the environmental regularization status of rural properties. Agencies without their own system may use SICAR through a cooperation agreement with the Ministry of Environment, while those with existing systems must integrate their data into SICAR.

Table 3. Overview of CAR's data collection, management and usage

Data aspect	Description
Legal framework	CAR was established by the Forestry Code, as the law 12.651/2012 is known. According to this regulation, it is mandatory for all rural properties across the country to be registered through CAR. Additionally, the decree 7.830/2012 sets the standards for the registry.
Collection	The following information is self-declared by rural property owners: 1. Information on property owners 2. Georeferenced property maps 3. Social and public utility areas, such as sustainable agroforestry practiced on small properties or rural family holdings, infrastructure works for concessions, public transport and basic sanitation services, and many others 4. Native vegetation remnants 5. Consolidated areas[4] 6. Permanent Preservation Areas (APP) 7. Restricted Use Areas (AUR) 8. Legal Reserves (RL) 9. Land ownership information
Management	Data from all rural properties in 16 states and the Federal District are collected, integrated, and managed by the Rural Environmental Registry System (SICAR) within the National Environmental Information System (SINIMA). Other 5 states (BA, ES, MS, MT, TO), utilize their own systems to collect and manage data, and integrate it daily to SICAR, while 5 other states (AC, PA, RO, SC, SP) utilize customized versions of SICAR modules and integrate to SICAR.
Usage	Currently, CAR's data serves three primary purposes: enabling properties that have any environmental debt to comply with the Environmental Regularization Program (PRA)[5], enabling processes of forest management and authorization of vegetation suppression (legal deforestation)[6] and providing access to agricultural credit from financial institutions.

Source: Authors' elaboration

4 Consolidated areas are characterised by human activities, such as buildings, improvements, or agricultural activities, existing before 22 July 2008. In the case of agricultural activities, the practice of fallow periods is allowed. Note: the date 22 July 2008 refers to the approval of Decree No. 6,514, which addresses environmental infractions and administrative sanctions, and regulates the environmental crimes law published in 1998.

5 The Environmental Regularisation Programme (PRA) consists of actions and initiatives for rural property owners and tenants to ensure their property complies with environmental regulations. This includes commitments to maintain, restore or reforest Permanent Preservation Areas, Legal Reserves, and restricted use areas on their property, or to compensate for Legal Reserve areas when needed.

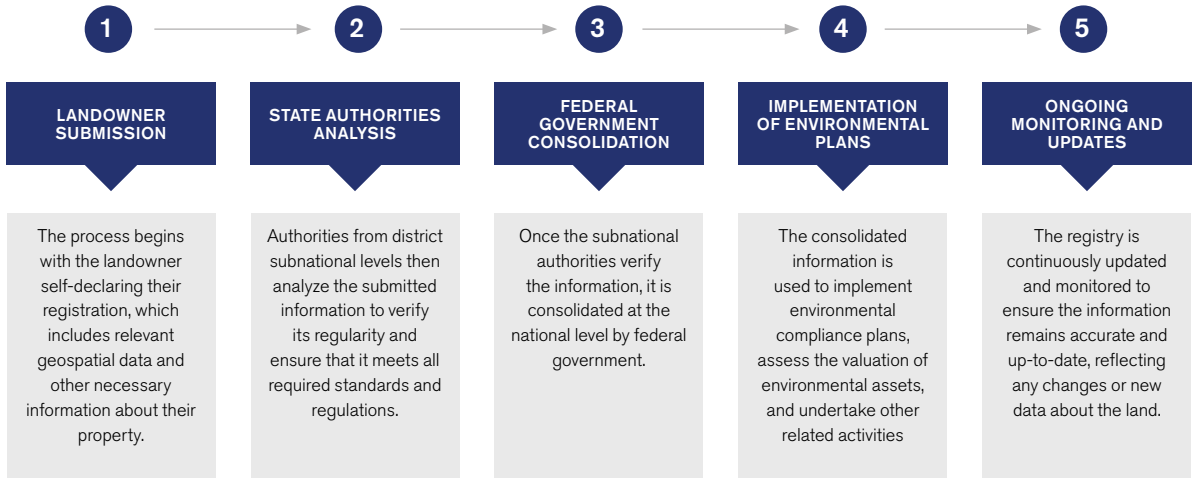
6 Some state governments use SINAFLOR (National System for Controlling the Origin of Forest Products), provided by IBAMA (Brazilian Institute of the Environment and Renewable Natural Resources), for these processes. SINAFLOR is integrated with SICAR, ensuring that projects are located on rural properties registered in CAR. States with their own electronic systems, similar to CAR, must integrate data from authorizations and licenses for forest product transportation and ensure that projects are situated on CAR-registered properties.

With responsibility for CAR shifting to MGI, however, it is increasingly seen as a registry with an underlying multidimensionality and the potential to become a policy-enabler beyond the environmental agenda. It has the potential to support various applications, such as hydrographic basin recovery, payments for environmental services, financial instruments for agricultural supply chains and traceability of agricultural products. This versatility bolsters environmental sustainability, regulatory adherence, and market transparency. **However, despite the various possibilities, a successful DPI approach suggests one primary and robust use case**, which ideally would have the potential to mobilise stakeholders across different areas, as discussed in the next section, which highlights the use of the registry for traceability purposes.

Adopting a DPI approach for CAR holds promise, but entails overcoming significant challenges. One major challenge is overcoming information asymmetry. For instance, identifying those responsible for environmental crimes while supporting compliant farmers and promoting sustainable agro-industrial chains requires the integration of diverse, normally disconnected information (Observatório do Código Florestal et al. 2023).

But among various bottlenecks, such as data fragmentation and lack of interoperability with other ministries' databases, the analysis and validation of the registry stand out as the most significant. Since CAR data is self-declared, data submitted by landowners must be validated by district-level agencies. Even though all registrations pass through automatic filters in the system to check if they overlap protected areas, other verifications are still necessary. **Although validation is crucial for CAR's accountability and its widespread use across different policies, only about 3% of registrations have been fully verified nationwide.** Streamlining approvals introduces both operational and political complexities.

Figure 2. The main steps towards registering in CAR



Source: Authors' elaboration

The low incentives for validating CAR data are due to the complex balance between expanding productive land and complying with the Forest Code, with states often hesitant to promote validation to avoid alienating rural support for political bases. **Consequently, states that have**

succeeded in implementing CAR have demonstrated not only a combination of strong capacity and coordination, but also a commitment to advancing their environmental agendas. To ensure CAR's legitimacy and establish it as a DPI, the federal government must not only strengthen these capacities and coordination, but also create a commitment to investing in these aspects at the federal level by acting as an orchestrator.

Espírito Santo and Pará are recognised for their advanced implementation of CAR (Lopes et al. 2023). Both states have developed automated processes to validate small properties[7]. In Espírito Santo, the Institute of Agricultural and Forestry Defense (IDAF) supported the process by delegating validation to external providers. In Pará, investments from the Amazon Fund were used to align state requirements with the Federal CAR system. Additionally, the Petrobras Fund contributed to a more than 370% increase in the number of temporary public servants implementing the policy tool. In both states, other strategies included providing accurate digital reference data for property and environmental information registration and involving qualified professionals skilled in geographic information systems and remote sensing technologies to prepare and submit data for CAR registration.

The current models for funding capacity and coordination for CAR's implementation are inherently unsustainable, as they are susceptible to political changes. For instance, the Amazon Fund, a key funding source for CAR's implementation, has enabled the submission of 1.1 million rural registries since its inception in 2008 (BNDES 2024). Managed by the National Bank for Economic and Social Development (BNDES), it is the primary national mechanism for financing efforts to reduce emissions from deforestation and forest degradation. However, its suspension in June 2019 by the previous government and subsequent reactivation in 2023 after Lula's election highlights the vulnerability of such funding to shifts in political leadership.

The Amazon Fund should be regarded as a key capital source to establish CAR as a DPI. It supports capacity-building at both state and municipal levels, which can enhance validation and monitoring — two significant bottlenecks for the registry. To date, the fund has enabled the training of 11,197 public servants in environmental management and deforestation monitoring technologies across the country (BNDES 2024). However, less than half of those trained are considered to be actively using the skills acquired.

Despite these efforts, hiring specialised and permanent staff with grants from the fund is not permitted, making it difficult to build sustainable capacity. Take the state of Pará as an example. Professions such as cartographic engineers, geoprocessing technologists and environmental technologists are relatively new and not yet recognised within existing legislation. Therefore, even if there were an intent to create such positions, legal restructuring would be necessary. Additionally, once trained, these professionals are often recruited by private companies or consultancies offering better conditions.

7 The federal government has invested in the dynamic analysis module, an automated CAR validation tool already available to some states. Initial results, which processed CAR validations in bulk, show the tool's potential. However, its effectiveness depends on access to digital reference data at appropriate scales, a limitation for most states and the Federal District. Additional challenges include the need for corrections and rectifications, with many rural property owners lacking the capacity or willingness to complete these steps due to concerns over fines, costs of regularization, and the expenses associated with obtaining necessary licenses, all of which hinder broader adoption of the tool.

To ensure CAR's legitimacy and efficacy as a DPI, the federal government must strengthen these capacities, foster coordination, and commit to sustained investment. This approach will not only enhance CAR's utility, but also support Brazil's broader economic transformation agenda. The following section explores how traceability — tracking and documenting the origin, movement, and health history of cattle throughout the supply chain — emerges as a key use case with the potential to enhance cross-sector coordination and advance this agenda.

3.2 Traceability as a key use case for CAR as a DPI

Brazil is the largest meat exporter in the world. **Although farming and cattle breeding are among the country's leading economic activities, they are also the primary drivers of deforestation.** Over the past five years, more than 97% of native vegetation loss in Brazil has been attributed to deforestation driven by agricultural expansion (Lama et al. 2023).

Without a shift in this trend, the farming, and cattle industries risk exclusion from foreign trade markets due to non-compliance with emerging environmental regulations, particularly the European Union Deforestation Regulation (EUDR) (European Union 2023). The absence of traceability systems that rely on trustworthy data presents significant challenges for sustainable development and threatens agricultural exports. A considerable portion of Brazil's cattle production is exported, yet the market for traceability solutions is dominated by consultancies. This dominance leads to high transaction costs for small farmers and complicates compliance for large commodity producers.

To address these challenges, there is a need for a comprehensive solution that ensures transparency and sustainability in the livestock industry. The National Council for Industrial Development (CNDI) has introduced the Action Plan for the New Industry Brazil, which aims to promote sustainable agro-industrial chains. Mission 1 of this plan focuses on creating sustainable and digital agribusiness chains that balance environmental preservation with economic growth. CAR has the potential to be designed to prioritise this use case, in alignment with mission 1. However, to realise this potential, it must be designed accordingly, adhering to common good principles, with clear mission-alignment and a DPI approach.

CNDI's 2024–2026 Action Plan for New Industry Brazil

The National Council for Industrial Development (CNDI) has released its 2024-2026 Action Plan for the New Industry Brazil. This plan is centered around six missions, with mission 1 dedicated to promoting sustainable agro-industrial chains.

The goal is to balance environmental preservation with economic growth by creating sustainable and digital agribusiness chains that ensure food, nutritional and energy security. A key objective of mission 1 is to increase the agribusiness sector's contribution to agricultural and livestock GDP from 23% to 50%, while maintaining environmental sustainability.

One of the key guidelines for implementing DPI is to start with a first use case that serves as a proof of concept (Centre for DPI 2024). This use case should have the potential to align stakeholders from various sectors, government areas and individuals, driving broad adoption and facilitating the scaling up of the initiative.

Using CAR as infrastructure for traceability to enable sustainable agro-industrial chains has significant potential. This approach can mobilise key players in the deforestation debate:

- Farmers and cattle breeders who rely on exports could benefit from improved access to key markets, in Europe
- Smaller producers seeking certification for their environmentally compliant products could have their transaction costs decreased by the accountable and publicly owned traceability mechanisms, helping them access new markets
- Citizens would benefit by being able to verify the origins of the products they purchase
- Civil society organisations could enhance their ability to monitor and enforce regulations on production practices

Table 4. National and global policy triggers incentivising a traceability use case

Institution	Policy or regulation	Nature	Description
European Union	Regulation for Deforestation-Free Products (Regulation (EU 2023/1115)	Mandatory	Prohibits the importation of products from areas with any level of deforestation (including deforestation considered legal according to the Brazilian Forest Code)
Brazilian Federation of Banks (FEBRABAN)	Normative for Managing the Risk of Illegal Deforestation in the Beef Supply Chain (Normative SARB 026/2023)	Voluntary	Defines guidelines and procedures for signatory financial institutions to promote credit operations only with slaughterhouses and beef processing plants free from illegal deforestation
German Government	German Spatial Due Diligence Law	Mandatory	Imposes legal obligations on companies to prevent human rights and environmental violations in their global supply chains
Brazilian Ministry of Development, Industry, Commerce and Services	Green Label Programme (Decree 12.063/2024)	Voluntary	The programme develops a national strategy for certification and compliance, unifying various environmental labelling requirements. This certification acts as an export passport, ensuring Brazilian products meet global environmental standards, reducing bureaucratic obstacles and costs for exporters. The Green Seal Brazil will be granted by certifiers accredited by the National Institute of Metrology, Quality and Technology (Inmetro)
Brazilian Ministry of Agriculture and Livestock	AgroBrazil+Sustainable Platform	Voluntary	It will be a voluntary, universal and free government digital tool designed to enhance transparency in production processes and reduce risks and costs across the value chain. Developed by SERPRO, it integrates various data sources to provide certifications at three levels: eligibility, which ensures legal compliance and monitors deforestation and violations; sustainability, which evaluates production techniques for grains and animal proteins; and traceability, which tracks product journeys from production invoices to ports. This initiative should be integrated with CAR under a DPI approach, enabling different ministries to streamline and align various goals — such as combating deforestation and improving exports — under the same use case

Source: Authors' elaboration

To enhance the implementation of CAR as a DPI, its interoperability with policy solutions from various public institutions should be considered. A solid traceability system mandates, for instance, individual cattle traceability from birth to slaughter. The use of GTAs[8] (Guia de Transporte Animal), a service from the Ministry of Agriculture and Livestock to track animals' movements, can theoretically link each step to the CAR, excluding suppliers from illegal or irregular properties, notably those involved in deforestation. Additionally, the system could benefit from enabling CAR's integration with the Deter system, a federal government initiative that generates rapid alerts for changes in forest cover in the Amazon and Cerrado regions. The system utilises satellite images to provide daily alerts to expedite and improve the quality of environmental and police inspections in the forest.

Building CAR as a DPI would also require shifting from a logic of sharing all data to providing trusted evidence by sharing minimal, case-specific data. A minimalist building block approach can simplify the process by reducing the high transactional costs of reporting all the complex data layers about a property (Mukherjee and Maruwada 2021). Instead, it would allow it to focus on specific aspects, such as deforestation, allowing an owner to confirm compliance with that particular element only.

Transparency and data access is another crucial factor in ensuring the success of CAR as a DPI. One the one hand, citizens may have expectations of privacy around personal data, such as the CPF (Taxpayer Identification Number), which can be used to identify landowners. On the other hand, one key challenge with CAR is its use in the illegal appropriation of public lands, something that greater data transparency could help mitigate.

The data handling issue in CAR contrasts with cases like PIX or digital identity, where civil society organizations often argue that excessive data is being shared. In CAR's case, the concern is that too little data is shared, leading to calls for greater transparency and increased data sharing to enhance oversight.

The law currently permits the disclosure of personal data when it serves the public interest, and consent is only one of several legal bases for processing such data (Vergili et al., 2023). Other legal alternatives allow for safe data disclosure. A key consideration is the need to conduct a Data Protection Impact Assessment (DPIA), which should be integrated from the outset. This process ensures that all risks are thoroughly mapped, and that public participation is encouraged, contributing to a robust data governance framework.

Table 5 presents key questions that can help to develop a clearer understanding of how to leverage those aspects, alongside digital capabilities and governance frameworks effectively, ultimately contributing to the common good and supporting Brazil's economic transformation agenda.

8 Mandatory individual traceability for cattle, beginning at birth and continuing through their entire lifecycle, is crucial for ensuring transparency and sustainability in the livestock industry. By identifying each animal at the farm of origin and documenting its journey through various stages, such as rearing, fattening and slaughter, we can achieve comprehensive traceability. GTAs (Guia de Transporte Animal) facilitate this by tracking the path animals take from birth to the fattening farm, theoretically allowing verification of the CAR of each link in the chain. This verification can help exclude animal suppliers from illegal or irregular properties, particularly those involved in illegal deforestation.

Table 5. The common good outcomes applied to the CAR case study

COMMON GOOD OUTCOMES		
Public values	**Public value elements**	**Key questions for CAR**
Public values associated with functional purpose	Guarantee essential capabilities	How does CAR create value at the economic and societal levels?
	Create social values	
	Foster economic value	
	Guarantee a better quality of life	
Public values associated with technical attributes	Interoperability	How does the design of CAR comply with DPI technical attributes and how can its use by different stakeholders and sectors be leveraged?
	Reusability	
	Open-source software	
Public governance	**Public Governance Elements**	**Key questions for CAR**
Transparency and accountability Winning and retaining citizens' trust in tracking progress through practices that show commitment to transparency and accountability	Data consent and audit	▪ Can citizens and companies consent or audit how and when their data is being used? ▪ Are key decisions (technical and management) about CAR available in an accessible language and format? ▪ Could CAR be governed by a public interest entity?
	Public interest entity	
	Accessible and transparent decisions	
Access for all and reward-sharing Ensuring that public value is distributed equitably (inclusive growth)	Universal access	▪ Is there a proactive effort to make CAR universally accessible? ▪ Are the benefits of CAR data being socialised? ▪ Could the cost of using the infrastructure be lowered or eliminated?
	Public interest data regulation	
	Socialisation of data benefits	
	Low usage cost	
Collective learning and knowledge-sharing Rethinking institutional practices that support collective learning and build long-term capabilities and capacities	Learning documentation	▪ Are there processes for documenting learning? ▪ Are insights based on what is and is not working publicly shared? ▪ Is the code base available for others to reuse?
	Publicly shareable learnings	
	Codebase available for reusability	
Purpose and directionality Setting an ambitious direction towards which policies may be designed, public-private partnerships formed, and citizens engaged	Priority use cases	▪ Is traceability the right use case to focus on initially? Beyond traceability, are there other priority use cases to be taken into account while building CAR as a DPI, in the short or longer term? ▪ Should civil society organisations or other stakeholders be involved in defining the purpose of CAR?
	Broad societal participation	
	Government as orchestrator	
Co-creation and participation Defining the rules and mechanisms for co-investment, collaboration, and coordination, involving a diverse group of societal actors	Public value-led decision-making	▪ How can civil society, private players and farmers be involved in defining the design, implementation and governance of CAR as a DPI? ▪ How can the government leverage funds from different sources to design and implement CAR as a DPI?
	Iterative and diverse feedback process	
	Public funding or co-funding	

Source: Authors' elaboration

3.3 Lessons from CAR for domain-specific DPI implementation

The Rural Environmental Registry (CAR) case provides valuable insights for the broader implementation of DPI in Brazil, particularly in terms of design, governance and capabilities. It underscores the necessity for a coordinated and structured articulation between the federal government and subnational levels. Currently, about 65% of Brazilian states and the federal district rely on the federal government's SICAR system for data collection and management, while the remaining states operate their own systems, which are integrated daily into SICAR. Aligning state-level actions with national goals — such as mission 1 and the New Strategy for Digital Government — enhances coordination not only across ministries and SOEs, as previously stated, but also between states and municipalities. The CAR case also underscores the federal government's vital role in establishing sustainable funding models, particularly for capacity-building, and emphasises the importance of design principles that prioritise compelling use cases, actively engaging diverse stakeholders and helping to overcome political barriers to implementation.

Pé-de-Meia Program

Launched by the Ministry of Education (MEC) in 2024 to provide stipends to public high school students who are socioeconomically vulnerable (CIEB 2024). This financial-educational benefit aims to reduce dropout rates, offering £30 a month to students registered in the Unified Registry for Social Programmes (CadÚnico), managed by the Ministry of Social Development (MDS), which gathers data from Brazilian families living in poverty. The programme also includes bonuses for academic approval and participation in the National High School Exam (ENEM). Starting in 2025, federal, state, district or municipal public education networks will report student data to MEC, which will identify eligible beneficiaries and forward payrolls to the public bank, Caixa Econômica Federal, for payment.

These insights can inform the implementation of other domain-specific policies, which, when reframed as DPIs, can enhance public value, for example, the Pé-de-Meia Programme (Nest Egg Programme, in free translation). Adopting a DPI approach can minimise errors in identifying students while integrating the programme with the GOV.BR digital identity, standardising data collection and enhancing interoperability between ministries, and opening avenues for new policies (CIEB 2024).

Ideally, educational data could be linked to data from Meu SUS Digital, a digital health platform that allows users to monitor their clinical history, vaccination records, test results and more. Integrating these data sources would enable the development of transversal policies that address both education and health in a coordinated manner.

This solution was made possible by the National Health Data Interoperability Platform (RNDS), established in 2020. **Often misunderstood as a mere information system, the RNDS is a platform that connects various information systems, storing 1.8 billion health records** (Ministério da Saúde 2024b). It facilitates the exchange of health information across digital health applications, such as electronic health records, hospital management systems and citizen-facing apps. Currently, the RNDS supports the sharing of COVID-19 test results, vaccination records, hospital admissions and dispensed medications. The Digital SUS Programme brings opportunities for a DPI approach in Brazilian public health, as it brings guidelines to promote digital transformation into the Unified Health System (SUS), including governance at subnational levels, and its aim is to promote the interoperability of health data (Ministério da Saúde 2024a).

A further step would be to envision what a national health stack that integrates services, shared infrastructure, data and hardware might looks like. In the logic of the stack, each layer is interconnected, with upper layers building on the resources of lower ones (Eaves, Mazzucato and Vasconcellos 2024). The infrastructure layer serves as a bridge, connecting data and hardware to various services and use cases. This shared infrastructure can be developed by public and private organisations or through collaboration between institutions.

4. Conclusion

Brazil is currently undergoing an economic transformation that directs the country toward achieving goals related to inclusion and sustainability. Within this transformation, a mission-oriented approach is key, as it helps turn grand challenges into opportunities for investment and collaboration across sectors and ministries. Digital technology, and specifically digital public infrastructure (DPI), plays a central role in facilitating the coordination and innovation needed to achieve these missions.

Additionally, the country has made notable strides in its digital transformation, positioning itself as a leader in DPI initiatives. The recent National Strategy for Digital Government (NSDG) represents a significant opportunity to further this agenda by aligning DPI development with key policy goals and principles of the common good. However, realising this potential will require innovative approaches to governance, design and capability-building across government and society.

The Rural Environmental Registry (CAR) offers a practical example of how DPI can be leveraged to achieve broader policy objectives. Initially established as an environmental management tool, CAR's potential as a DPI is vast, particularly for supporting sustainable agro-industrial chains and addressing challenges such as deforestation. This case underscores the need for a DPI framework that prioritises public value and ensures alignment with national priorities.

Looking forward, the successful implementation of this agenda will depend on several key factors. **These include designing DPI governance structures that adhere to the common good framework.** As outlined in this discussion, these principles include **purpose and directionality, co-creation, collective learning, access for all and reward-sharing, and transparency and accountability.** Each of these pillars – drawn from Mazzucato 2023a – supports a holistic approach to leveraging DPI for sustainable development:

1. **Purpose and Directionality:** Brazil's DPI journey underscores the need to align digital initiatives with societal goals. The intersection of green and digital agendas is particularly relevant here, as highlighted by the **COP30** opportunity. CAR, as a **digital public infrastructure**, can help drive Brazil's sustainability agenda by supporting agro-industrial supply chains, environmental monitoring, and access to rural credit. As this transformation continues, the government must ensure that digital initiatives serve the broader mission of climate resilience and economic inclusion.

2. **Co-creation and Collaboration:** The development of DPIs requires robust engagement with multiple stakeholders, including civil society, the private sector, and government agencies. As the **Ministry of Education's project to create a unified school database** demonstrates, the co-creation process should involve building APIs to integrate existing systems, rather than imposing new solutions. In the case of CAR, similar co-creation efforts can help ensure that its governance structure reflects the needs of diverse actors, from landowners to financial institutions.

3. **Collective Learning and Knowledge Sharing:** DPI governance must prioritize **learning and knowledge exchange**. A cultural shift is needed among public managers, who often prioritize control over user needs. By fostering a learning-oriented approach — one that encourages data collection to benefit users rather than just serve administrative purposes — CAR and other DPIs can drive more meaningful outcomes. **Inter-ministerial collaboration**, as seen with the Ministry of Health's efforts, is critical for enhancing mutual understanding and support across governmental data systems.

4. **Access for All and Reward Sharing:** Building an ecosystem where all participants benefit is central to the success of DPIs. In the case of CAR, it is essential to clearly define the **roles and benefits** for each stakeholder—whether states, banks, or landowners—ensuring a **win-win relationship** for all involved. By tailoring benefits to the needs of each actor, such as improving access to rural credit for landowners or enhancing data quality for states, CAR can become a **sustainable DPI**. This approach not only distributes the rewards equitably but also helps reduce risks for individual participants and the broader system.

5. **Transparency and Accountability:** Ensuring that **transparency** remains at the core of DPI governance is crucial. For CAR, this means addressing both the challenges of data protection and the need for greater **data sharing**. As the General Data Protection Law (LGPD) establishes, data disclosure must be carefully managed to safeguard individual privacy while promoting public interest. By conducting **Data Protection Impact Assessments (DPIAs)**, CAR can enhance its role as a trusted, transparent tool for environmental monitoring and economic development.

Looking forward, the successful implementation of Brazil's **digital public infrastructure agenda** will depend on several key factors. These include designing DPI governance structures that adhere to the **common good framework**, fostering **inter-ministerial collaboration**, and engaging stakeholders from various sectors. Starting with clear and impactful **use cases**, like CAR's role in traceability, will help ensure that DPIs are both scalable and adaptable. Additionally, sustained investment in digital capabilities at all levels of government is essential for realizing the full potential of DPIs. By addressing these considerations, Brazil can continue to lead in the digital transformation space, ensuring that its digital infrastructure supports inclusive and sustainable development.

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