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Digital Transformation for a Sustainable Future

Insights from Brazil's Civil Service

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Abbreviations

ANATEL	Agência Nacional de Telecomunicações (National Agency of Telecommunications)
AI	artificial intelligence
BC	background conversation
BI	business intelligence
BRICS	Brazil, Russia, India, China, South Africa
CAR	Cadastro Ambiental Rural (Rural Environmental Registry)
COP	Conference of the Parties
COR	Centro de Operações Rio (Rio Operations and Resilience Center)
EMPREL	Empresa Municipal de Informática (Municipal Informatics Company)
ENAP	Escola Nacional de Administração Pública (National School of Public Administration)
ESG	environment, social and governance
FG	focus group discussion
FGV EBAPE	Fundação Getulio Vargas - Escola Brasileira de Administração Pública e de Empresas (Brazilian School of Public and Business Administration)
GDP	gross domestic product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GTMI	GovTech Maturity Index
IBAMA	Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute of Environment and Renewable Natural Resources)
ICMBio	Instituto Chico Mendes de Conservação da Biodiversidade (Chico Mendes Institute for Biodiversity Conservation)
IDOS	German Institute of Development and Sustainability
INSS	Instituto Nacional do Seguro Social (National Social Security Institute)
	(Curitiba Research and Urban Planning Institute)
IT	information technology
LGPD	Lei Geral de Proteção de Dados Pessoais (General Data Protection Law)
MGG	Managing Global Governance
PEN	Proceso electronico nacional (National Electronic Process)
PIX	Pagamento Instantâneo (instant payment system)
PRODIGEES	Promoting Research on Digitalisation in Emerging Powers and Europe towards Sustainable Development
SDG	Sustainable Development Goal
SEI	Sistema Eletrônico de Informações (electronic information system)
SERPRO	Serviço Federal de Processamento de Dados (Federal Office for Data Processing
SGD	Secretaria do Governo Digital (Secretariat of Digital Government)
SUAP	Sistema Unificado de Administração Pública (Unified Public Administration System)
WBGU	Wissenschaftliche Beirat der Bundesregierung Globale Umweltveränderungen (German Advisory Council on Global Change)
WCED	World Commission on Environment and Development

Executive summary

Digitalisation and sustainability are shaping businesses, economies and societies worldwide, offering both opportunities and challenges for global development and the achievement of the 2030 Agenda and its 17 Sustainable Development Goals. Although digital technologies can potentially bring tremendous benefits to sectors such as education, health care, commerce, food security, energy efficiency and electronic government, their rapid development also poses risks related to security, privacy, human rights, electronic waste and carbon emissions.

Civil servants' understanding of the usefulness (and risks) related to digital tools and processes for sustainability matters. In shaping future innovations and changes, civil servants occupy a central function. Governments set the framework for the use of digital technologies, also by systematically considering sustainable development in policy-making. In this, civil servants usually are the ones preparing policies and national strategies, which allows them – within a given political frame – to initiate actions also in the area of digitalisation and sustainability, and to steer digital transformations towards a more sustainable path. A focus on the perceptions and actions of the civil service is thus highly relevant when exploring the application of digital tools for sustainable development on a national level.

By examining Brazil, the research provides context-specific findings that potentially deepen our understanding of the twin transitions of digitalisation and sustainability. The country is at the forefront of digitalisation in public services and has achieved notable rankings in digital core government systems and enablers, according to the World Bank's GovTech Maturity Index. As a global partner for German development cooperation and the largest economy in Latin America, Brazil shapes regional development. Despite setbacks in recent years, Brazil has made progress in developing and implementing a sustainability agenda, with a particular political focus on ecological sustainability under the Lula III government since January 2023.

Against this backdrop, this discussion paper investigates the overall governance and understanding of digitalisation for sustainability among civil servants in Brazil. The research aims to identify country-specific characteristics in the discourse of digitalisation for sustainability and discuss the priorities in Brazil. Thereby, it aspires to highlight the importance of the perceptions of civil servants and their role in shaping policies and driving sustainable digital transformations. The analysis examines the discussed opportunities and challenges of digitalisation for sustainable development in the Brazilian context, with specific attention being given to the variations between the federal and municipal levels and the influence of the recent governmental change on civil servants' understanding of digitalisation for sustainability.

Adopting a social constructivist approach for the analysis of our data, our research draws upon well-established governance concepts while exploring specifically the perceptions and experiences of civil servants in Brazil. The findings are based on both qualitative and quantitative data collected in different research sites throughout Brazil (Rio de Janeiro, Brasília, Recife and Curitiba) from February to April 2023. In analysing this data, we apply a mixed methods approach in this study. We combine qualitative data obtained through background conversations with experts in the field, focus group discussions and semi-structured interviews with civil servants as well as quantitative data attained through a survey sent out to civil servants across the country thanks to the gracious support of our research partners ENAP and FGV EBAPE.

This mixed methods approach enables a comprehensive and nuanced understanding of the research topic at hand. We derive in-depth insights into the prevailing governance approaches regarding digitalisation for sustainability in Brazil and civil servants' understanding of digitalisation for sustainability. We do so by analysing the structural setup in which the topics are embedded and its potentials for steering a sustainable digital transformation in the country. Additionally, we exploratively consider the training needs of civil servants in the fields of digitalisation and sustainability, aspiring to identify gaps and derive recommendations for

training institutions on where to engage more or differently. In order to analyse the civil servants' sense-making, we investigate how they conceptualise digitalisation and which purposes they ascribe to it, the potentials and challenges they recognise at the interconnection between digitalisation and sustainability, and the ways in which civil servants work with digitalisation. The research – predominantly based on the perceptions of civil servants and higher government officials and own observations – explores the prevalent narratives on the interconnection between digitalisation and economic, social and ecological sustainability, shedding light on potential synergies and trade-offs in Brazilian policy-making.

Our research findings show that digitalisation is a prominent topic in Brazil, with impressive initiatives at the municipal and federal levels and a high potential for digital sustainable transformation. Brazil's size and its federal organisation require a multi-level approach to digital governance, coming with challenges such as systems' interoperability and arguably a need for overall guidelines. On the governance level, positive elements in institutional setups are striking when looking into the drive for and implementation of the digitalisation of the civil service. Brazilian civil servants perceive the nexus between digitalisation and sustainability as offering potential for advancements in all sustainability dimensions, overall adopting a largely positive attitude towards digitalisation. In this, discussions about security in Brazil appear to focus predominantly on securing functionality, whereas protecting personal data seems to be a somewhat lower priority. Although civil servants are aware of digitalisation-related challenges in the realms of sustainability, especially social sustainability, this awareness appears to be rather superficial in the field of ecological sustainability. Lastly, civil servants often appear to acquire knowledge through personal interest and on-the-job learning, with recognition of the need for a mindset change as well as further training on digitalisation and its interconnection with all sustainability dimensions.

Our findings highlight the potential benefits of digitalisation for sustainability, as well as challenges such as inclusion, data handling and misinformation in Brazil. Moreover, the insights gained from our study have practical implications for policy-makers, training institutions and international development agencies. By shedding light on the opportunities and challenges faced by Brazilian civil servants, our findings provide a solid foundation for future studies and policy-making efforts in pursuit of a more sustainable and digitally enabled future.

Key recommendations for improving digitalisation and sustainability in Brazilian public governance include the need for training programmes to address the challenges of digitalisation, promote interoperability, enhance data protection and set uniform standards. Additionally, we suggest strengthening data protection guidelines for the Brazilian government. For international partners such as Germany, the paper highlights the potential for policy and knowledge exchange, public–private partnerships, and opportunities for cooperation and funding in the fields of sustainability and digitalisation.

1 Introduction

Digitalisation and sustainability are two main factors in shaping businesses, economies and societies. Higher levels of digitalisation will create new opportunities and challenges for global development and thus have implications for the 2030 Agenda and the attainment of its 17 Sustainable Development Goals (SDGs) (Hochschild, 2020). Digital technologies will play an increasingly important role regarding the alignment of a sustainable development path over the coming years. They can bring tremendous benefits in areas such as education and health care as well as commerce, food security, energy efficiency and electronic government. Nonetheless, the rapid development of these technologies also poses risks and challenges in areas such as security, privacy, human rights, resource use and electronic waste, as well as carbon emissions and social inequalities (Hochschild, 2020).

Digitalisation simultaneously yields opportunities and challenges for greener development and the achievement of the SDGs. Consequently, Western literature often describes the interconnectedness of both transformations as a twin transition (BMZ Digital.Global, 2022; Muench et al., 2022), offering prospects for greener development and the achievement of the SDGs (del Rio Castro, Camino Gonzales Fernandez, & Uruburu Colsa, 2021; Lichtenthaler, 2021). The success of these transitions relies on their interdependence: Computational infrastructure hinges on prior resource and energy transformation (Rosol, Steininger, Renn, & Schlögl, 2018). Digitalisation also holds promise for societal equality through UNESCO's guidelines, emphasising user-centric approaches and inclusive digital solutions (UNESCO, 2018). Leveraging digital technologies can bridge gaps, enhance government efficiency, provide widespread access to information and create economic opportunities (Fusiek, 2022). Yet, challenges in implementing the twin transition, such as consistency, strategic priorities and accountability, underscore the need for further investigation into this interconnected relationship between digitalisation and sustainability.

When it comes to harnessing digital technologies for sustainable development, governmental institutions assume an important role in ensuring the respective planning and implementation on the policy level (Fountain, 2001; Jaeger & Thompson, 2003). In this regard, civil servants, in particular, have a central function in shaping future innovations and changes. Administrative staff are intermediaries between the government and civil society and receive information from both sides (Tummers & Bekkers, 2014). Tasked with preparing and formulating policy papers and national strategies, civil servants may leverage the translation of both digitalisation and sustainability into policy, and thus may have considerable potential to steer digital transformations towards a more sustainable path. Consequently, although political office holders decide on the overall direction, it can be assumed that the deeper the understanding of digitalisation and sustainability among elected office holders *and* civil servants, the better the concepts are anchored in national policies. The civil service is thus highly relevant when investigating the application of digital tools for sustainable development objectives on the national level.

Brazil holds a pivotal position in shaping regional and global advancements towards digitalisation and sustainability. The country is a frontrunner in the digitalisation of public services, ranking among the leaders in digital core government systems and enablers in the World Bank's GovTech Maturity Index (Dener, Nii-Aponsah, Ghunney, & Johns, 2021). Moreover, it ranks highly within the areas of online service provision and e-participation (EGOVKB [UN E-Government Knowledge Base], 2022a, 2022b). Brazil's influence extends both regionally as the largest economy in Latin America – making it a "Global Partner" in German development cooperation – and domestically, where it excels in digital public services and online engagement, ranking among the leaders in key indices (AYA Earth Partners, 2022; Dener et al., 2021; EGOVKB, 2022a, 2022b). Exploring the use of digitalisation for sustainability, Brazil's sustainability policies and performance is also relevant. Although Brazil only occupies the 53rd

position out of 163 countries in achieving the SDGs (Sachs, Lafortune, Kroll, Fuller, & Woelm, 2022), the country has shown considerable progress in developing and implementing a sustainability agenda. Political observers expect the current administration to set a particular focus on ecological sustainability. During the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27), the then recently elected president, Luiz Inácio "Lula" da Silva, announced Brazil's comeback to climate negotiations and promised to adhere to the goal of zero deforestation of the Amazon rainforest (Maslin, 2022). Brazil's economic capability, its substantial achievements in digitalisation and its high potential for sustainable transformation make the country specifically pertinent for this research.

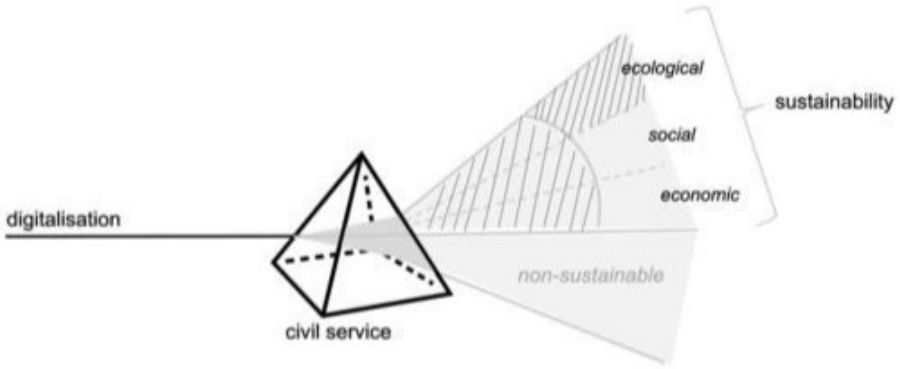
Policy analysis in Brazil on any topic – including sustainability and digitalisation – needs to consider the polarised nature of the country's political climate. Virtually any topic can become politically loaded if it is successfully charged rhetorically as "a topic of the opposing side". "Sustainability" was one such vilified term under the former president, Jair Bolsonaro. Yet, although the president holds significant constitutional power and substantially impacts political debates, his or her actual strength is less robust than perceived at first glance. Despite Lula's electoral victory in the presidential race, his Workers' Party (Partido Dos Trabalhadores) holds only 12 per cent of seats in Congress and just under 9 per cent in the Federal Senate. Consequently, the president of the political left had to form a coalition with centre-right parties, providing them with positions of power ("Brazil's new president", 2023). Anticipated tensions and rivalries among the various political groups within Lula's governing coalition could further constrain their political manoeuvrability, while the extreme right-wing movement – known as "Bolsonarism" – retains political influence (Brenner & Stuenkel, 2023). Given this highly polarised context, it will be challenging for the government to pursue a clear and cohesive political agenda, particularly in terms of advancing sustainability efforts on the federal level.

This discussion paper presents findings from research conducted in Brazil between February and April 2023, with the aim of enhancing our understanding of the interplay between digitalisation and sustainability, as perceived by civil servants. The objective of this investigation is to address the existing knowledge gap surrounding the nexus of these two fields. Brazil's civil service has witnessed a proliferation of digitalisation initiatives alongside a resurgence of sustainability efforts. Given the distinct trajectories of both topics in isolation, comprehending how these transformations intersect and mutually reinforce each other is crucial for harnessing synergies at both the national and municipal levels. Against this backdrop, our primary focus is to explore the opportunities and challenges that digitalisation presents for sustainable development within the Brazilian context. The analysis is structured along the following research question:

What is the understanding of digitalisation for sustainability in the Brazilian civil service?

To investigate this question, we consider understandings at both the federal and municipal levels, paying particular attention to the ecological dimension of sustainability. Arguing for the relevance of our question, we draw the analogy of an optical prism. Digitalisation's advancement is an external trend that impacts the civil service. In our analogy, technology's transformative influence ("digitalisation") is akin to a beam directed (inter alia) at the civil service. The civil service interpret the external "beam"; in our image, it is the prism that dissects the beam into components. Depending on which of the resulting aspects is perceived as the relevant path, civil servants' perspectives guide digital transformation towards either (politically, socially, economically, ecologically) sustainability or a non-sustainable route (see Figure 1). (Combinations are certainly possible; this is predominantly a question of perspective.)

Figure 1: The research approach illustrated (highlighting the deepened interest in ecological sustainability)



Source: Authors

Overall, the civil service's stance (the position of the prism) is shaped by policies and political discourse, with administrations mandated to adhere to political leadership and their push for certain directions. By altering the prism's angle (meaning: the civil service's perspective) – often through political directives – digitalisation can be moulded into either a non-sustainable or sustainable course. Yet, as civil servants are not an impassive mechanical element; their compliance will vary, as personal interpretations of viability (*their* perspectives on the topic) will come into play – hence, the focus on governance and the civil servants' perceptions, with the latter potentially influencing the pace of processes, if not the direction.

This paper proceeds by first providing an overview of Brazil, setting the scene for our case study, and describing the ongoing developments in the country's digitalisation and sustainability agenda. In a next step, we present our conceptual framework, which encompasses the concepts of "understanding" and social constructivism, along with our research question. This is followed by details on data collection, outlining our methodology for a survey, semi-structured interviews, background conversations and focus group discussions. Following that, we present our findings, organised into two main subchapters covering first the governance, and secondly, the understanding of digitalisation for sustainability in the civil service of Brazil. Finally, we conclude the paper with an analytical discussion of our findings and recommendations.

2 Conceptual framework

This research is interested in civil servants' understanding of digitalisation and its inter-connection with sustainability. The research is motivated by the underlying assumption that actors' understanding of the interconnectedness of digitalisation and sustainability can positively or negatively affect whether sustainability concerns are anchored in digital policies, and, vice versa, digital tools in sustainability-oriented policies. As digitalisation is a major topic touching upon many areas of the daily and professional lives of civil servants, this research explores which specific elements of digitalisation civil servants notice, how they make sense of them, and if and how they prioritise certain aspects of digitalisation over others. Following these assumptions, it is crucial to define the term "understanding" and how it is assessed in this research. To do so, we draw upon academic discussions on understanding and perception and elaborate on what elements of those we build on and why.

2.1 The meaning of "understanding" in this study

Academic literature in epistemology, often defined as the "theory of knowledge", has shifted from focusing on propositional knowledge to looking at "the epistemic state or states of understanding, asking questions about its nature, relationship to knowledge and [the] connection with explanation" (Gordon, 2023, p. 1). Literature suggests that there are different types of understanding, consequently leading to the definition being a complex matter. Therefore, we narrow our focus to those concepts of understanding most prominently discussed in epistemological literature.

Pritchard and Hills argue that understanding comes into play when knowledge is combined with the ability to answer closely related questions (Hills, 2015; Pritchard, 2008). This type of understanding includes an element of why, meaning that an individual not only has specific knowledge but also understands why it matters, what it entails and what follows from it (Pritchard, 2008). Another element that is associated with understanding in academic writings is coherence and proposition. Kvanvig (2003) points out that

> understanding requires, and knowledge does not, an internal grasping or appreciation of how various elements in a body of information are related to each other in terms of explanatory, logical, probabilistic, and other kinds of relations that coherentists have thought constitutive of justification. (Kvanvig, 2003, p. 192)

Following the theoretical considerations above, we define "understanding" as the way to comprehend, interpret and synthesise information, concepts and ideas in a meaningful way. It involves more than just memorising information and requires the ability to integrate knowledge, draw connections between concepts, apply knowledge to new situations and assess the use of this applied knowledge. In other words, "understanding" is a sensitive, learnt, memorised, perceived, emotional, attentive, cognitive and attitudinal process. With this complexity in mind, we conceptualise "understanding of digitalisation for sustainability" as building on the following elements, which we address mainly through our interviews with civil servants:

1. Contextualisation and Purposes of Digitalisation for Sustainability (sense-making)
2. Perceived Potentials of Digitalisation for Sustainability
3. Perceived Challenges in Digitalisation for Sustainability
4. Attitude towards Digitalisation for Sustainability (i.e. personal balance between potentials and challenges)
5. Application of Digitalisation for Sustainability (i.e. degree of first-hand experiences)

In our research, we (1) investigate how civil servants make sense of the term "digitalisation" and which connections they draw between digitalisation and distinct sustainability dimensions. Consequently, we assess the deeper meaning that civil servants ascribe to digitalisation, looking beyond their mere definitions of the term by also including the purposes they link to digitalisation. Connecting purpose to digitalisation can add to the analysis of civil servants' understanding, as it is fundamental for the motivation to initiate and adopt digitalisation. Through enquiring about the associated context and purpose of digitalisation, we seek to not only assess to which extent civil servants naturally combine considerations concerning both digitalisation and sustainability, but to also grasp the foundation on which the extended understanding of digitalisation for sustainability is based.

By (2) examining where civil servants perceive potentials of digitalisation for sustainability purposes, we aim to find where contributions of digital technologies and tools are discerned within each of the three sustainability dimensions, namely economic, social and ecological sustainability. In contrast to the section on perceived potentials, this aspect delves deeper into

the concrete areas where opportunities through digitalisation are recognised and potentially harnessed.

To complete the picture, we (3) investigate where civil servants detect the challenges that digitalisation may pose for sustainability purposes. This aids with making an assessment of the depth of civil servants' understanding of digitalisation towards sustainability – recognising potential challenges is essential as it allows civil servants to proactively address and mitigate potential negative environmental and societal impacts, ensuring that digitalisation truly contributes to a more sustainable future.

In relation to the perceived potentials and challenges, we also take into account (4) the attitudes of civil servants towards digitalisation for sustainability. Attitudes are important for the application of digital tools, as they are guiding choices and actions (Briñol, Petty, & Stavraki, 2019). In line with this, we assume that a positive attitude towards digitalisation favours an open mindset towards making use of digitalisation. In brief, digitalisation can be perceived as a transformative process towards sustainability (and in which dimension: social, economic, ecological?), whether personally hoped for or feared – and thus likely to lead to either more engaging or more hesitant attitudes. Alternatively, digitalisation can also be seen as a mere tool for "better" (i.e. quicker, more efficient, more transparent or more effective) governance, leading to more or less supportive attitudes of civil servants, depending on personal assessment.

Any of the previous assessments will need to also consider civil servants' understanding of digitalisation for sustainability by looking at (5) their reports of how and in what contexts they apply digital tools or actively shape digital processes. Through this, we seek to find out how civil servants perceive the existence and availability of digital solutions for their work, and if they are willing and capable of applying those. This way, we go beyond assessing (potentially abstract or hearsay) perceptions by also including reports on individuals' experiences. This constitutes a starting point for the following analysis on governing digitalisation for sustainability.

2.2 Exploring the social constructs of reality

To grasp civil servants' understanding of digitalisation for sustainability in depth, different viewpoints must be incorporated to encompass the subjective constructions of individual realities. Simultaneously, governance concepts facilitate a better understanding of the conditions and ways in which the Brazilian civil service operates. Against this backdrop, we borrow arguments from two debates and theoretical approaches to establish a conceptual basis for our research. As a starting point of the present work, we use social constructivism to foster an in-depth understanding of civil servants' experiences and perceptions of digitalisation and its links to sustainability. Secondly, we draw upon governance concepts, as our interest is predominantly in the civil service, and the conditions and ways under which it operates.

Scrutinising the modes through which both the social and physical worlds can be analysed is fundamental in the research emerging from the social sciences (Easterby-Smith, Thorpe, & Jackson, 2018). Social constructivism is based on the idea that people – rather than external, neutral factors – determine what is considered "reality" by making sense of the world they are living in (Creswell, 2014; Easterby-Smith et al., 2018). Regarding the present research, social constructivism aids to conceptualise how Brazilian civil servants build their understanding of digitalisation and sustainability as socially constructed phenomena that are shaped by a variety of contextual factors and institutional practices.

Social constructivist approaches place the active roles that different individuals assume in developing a social reality at the centre, making humans and their interests the main drivers of scientific inquiries (Bryman, 2012; Easterby-Smith et al., 2018). Human behaviour is presumed to be based on the logic that people obtain from different situations, instead of emerging as

responses to external stimuli. Individuals continuously assign various subjective meanings to the experiences they make, which requires researchers to ensure an incorporation of different views, instead of merely reducing different meanings by categorising them into a few concepts (Creswell, 2014). Consequently, we take on all possible varieties of individual perspectives and experiences of digitalisation for sustainability into account in this research. As knowledge is considered rather vague or ambiguous (Bryman, 2012), we alter the design of our research methods accordingly, applying mostly qualitative data collection methods to ensure an in-depth comprehension of civil servants' understanding.

2.3 Governing digitalisation for sustainability within the civil service

Applying the governance concept to the civil sector establishes a basis to understand the conditions and ways in which the civil service works. Operating in a politically defined direction, civil servants shape administrative processes while implementing policies and delivering public services. Therefore, governing digitalisation for sustainability within the civil service is an essential concept for our research.

Taking Katamunska's (2016) definition of governance as a point of departure, we understand the concept as the structured ability of public organisations to efficiently deliver requested public and other essential services while adhering to principles of transparency, impartiality, accountability and effectiveness, all within the confines of resource limitations. In line with this understanding, we assume that governance plays a critical role in analysing the management of digitalisation within public administrations, as it provides a framework for evaluating decision-making processes, the implementation of policies and resource allocation mechanisms.

Governance shapes the dynamic relationship between digitalisation, sustainability and government practices. Governance concepts are thus instrumental in analysing the direction of digitalisation and its implications for sustainability within public administrations. This also aligns with the concept of social constructivism, which implies that the different settings surrounding individual research subjects largely affects them (Creswell, 2014). As we draw upon social constructivism as our analytical lens, incorporating the circumstance in which the understanding of civil servants is formed, that is, governing structures, is of particular importance. In line with social constructivism, which posits that individuals interpret their world based on their perceptions and experiences, the diverse understandings held by civil servants are equally important. Varied perspectives can significantly influence the behaviour of civil servants and, consequently, have an impact on policy-making.

Although the overarching stance of the civil service is largely governed by established policies, given that administrations must ultimately align with political leadership, it is essential to recognise that civil servants occupy a central and influential position in the realm of governance. They are the individuals operating within the governmental machinery responsible for implementing policies, delivering public services and performing various administrative functions (O'Toole, 2000), and – in ministerial administration – civil servants play an important role in drafting policies, too. More specifically, civil servants assume crucial roles in various governance spheres, which can be summarised as follows:

Policy implementation: Civil servants carry the responsibility of executing the policies and decisions crafted by elected officials and governmental leaders. They are tasked with the operationalisation of legislation and regulations, ensuring that they are put into practice effectively and efficiently (Grindle, 2017).

Administrative functions: Civil servants are further charged with the day-to-day administrative operations of government agencies, encompassing activities such as budget management,

human resources administration and procurement. Their efforts are geared towards maintaining the seamless operation of government institutions (Kettl, 2000).

Public service delivery: Many civil servants further engage directly with the public to furnish essential services, including education, health care, transport and social services. Their role is pivotal in guaranteeing that these services are aligned with the needs and expectations of citizens (O'Toole, 2000).

Advisory services: In addition, civil servants function as advisors, contributing their expertise and insights to elected officials and policy formulators. Their knowledge base and experience empower them to offer recommendations that inform effective policy-making (Bardach, 2012).

Policy development: In certain instances, civil servants actively contribute to policy formulation and development. They provide technical expertise and research support to facilitate evidence-based policy-making processes (Howlett, Ramesh, & Perl, 2015).

Consequently, civil servants possess important leverage for the governance of central topics nationally, including digitalisation for sustainability. Against this backdrop, accountability, neutrality and professionalism as well as the upholding of the rule of law constitute essential characteristics, so as to ensure "government of the people, by the people and for the people" (Lincoln). Given that civil servants are held accountable for their actions and decisions, operating under established codes of conduct and ethics to maintain integrity and transparency in their duties, accountability plays a key role in this regard (Mulgan, 2000). Moreover, the hallmark of civil service is its non-partisan and impartial nature. Civil servants serve the interests of the government in power, irrespective of political affiliations, with their primary loyalty directed towards the public interest (Weber, 1968). Lastly, civil servants are instrumental in upholding the rule of law by ensuring the consistent and equitable enforcement of statutes and regulations. They may be involved in various legal and regulatory matters (Kaufman, Kraay, & Mastruzzi, 2008).

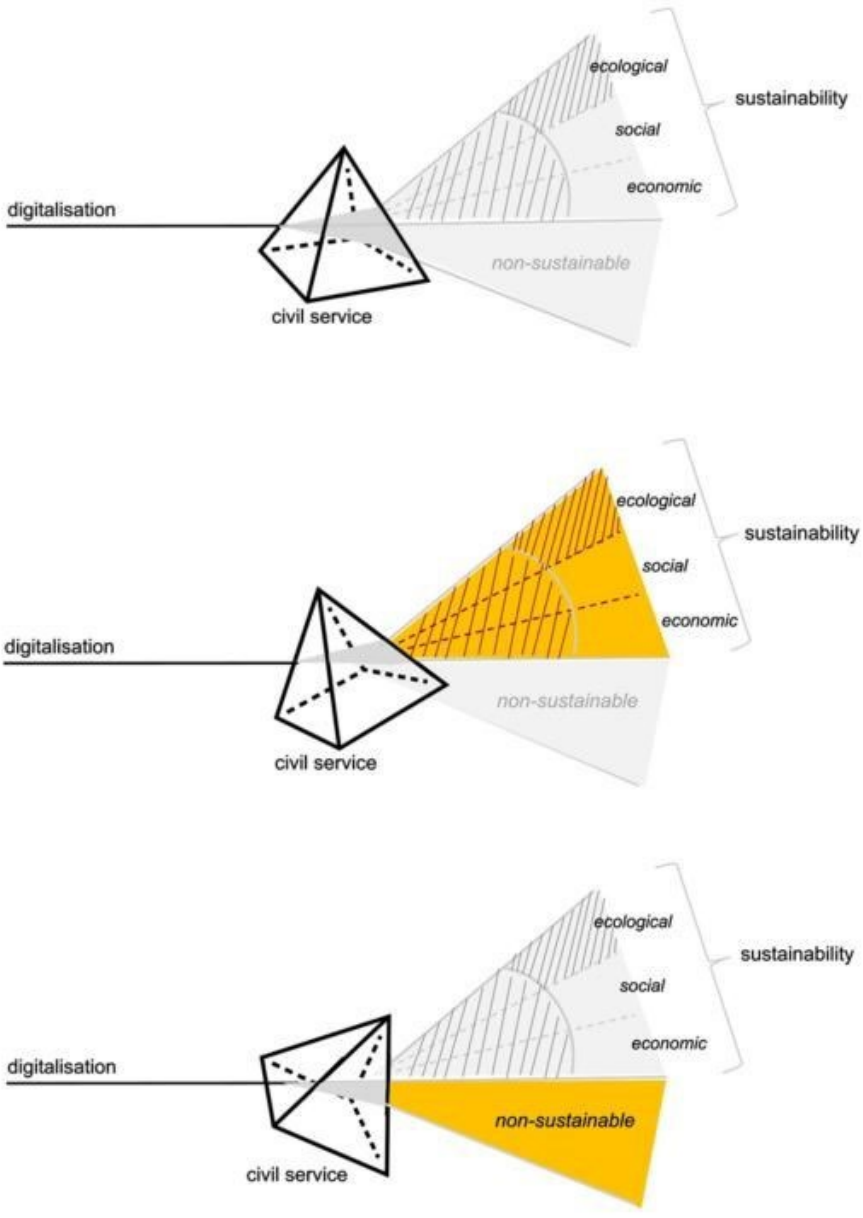
Ultimately, and of relevance for the present research, there are various aspects and conditions of governance influencing the understanding of and approach towards digitalisation. Among those, the national policies of different governments constitute drivers for the civil service. Similarly, institutional setups – decisive for the inter- or (in-)dependence of different institutions and the resulting room for manoeuvre – are relevant in this regard. Although civil servants are considered implementers of the respective legislation, they also exert an influence on government from within – be that through the manners in which they make sense of different concepts and legislations, or through the ways in which they may influence decision-makers. Consequently, civil servants – and their attitudes and professional training – are an important factor in governance. Referring to the prism analogy applied in this research, a bundle of factors shape the prism, both from outside and within.

2.4 Research question

The above discussions on digitalisation, sustainability, as well as their linkages to the Brazilian context and the civil sector's role within both, provide the backdrop to our research concept and question. Figure 2 below displays our research concept, which is effectively depicted through the analogy of a prism. In this analogy, digitalisation as a transformation reaches the civil service. Civil servants make sense of it by interpreting or dissembling the beam into its aspects (the civil service as prism). Depending on which of these aspects are perceived as the (predominant) path to follow, civil servants' perceptions steer digital transformation towards either a more sustainable or less (i.e. non-)sustainable pathway; thus, building on the role of civil servants in governance, they possess some leverage to tilt the direction of the "digitalisation beam". In short, the orientation of the beam is determined by both the understanding of

digitalisation (for sustainability) that civil servants possess, as well as by the governance setup in which they operate. Regarding the latter, the civil service is clearly positioned by policies and the political discourse; administrations are required to follow political leadership. Yet, they do so more or less wholeheartedly, for example speeding up processes or slowing them down, emphasising certain aspects or neglecting others. Depending on how the prism angle – that is, the understanding of digitalisation for sustainability adopted by the civil service – is tilted, not least through political directives, digitalisation can be moulded into either a non-sustainable or a sustainable pathway.

Figure 2: Digitalisation for sustainability through the lens of civil servants



Source: Authors

In light of scientific debates highlighting the considerable potential of digitalisation to achieve the SDGs (see WBGU [German Advisory Council on Global Change], 2019), we have decided to focus on the following main research question:

RQ: What is the understanding of digitalisation for sustainability in the Brazilian civil service?

Taking the governance element into account, we break this main question into two subquestions that ask (1) how "the prism" is titled, and (2) how "the beam" is dissected:

Q1: Can we identify governance mechanisms in Brazil that provide the civil service with a framework that is conducive for digitalisation?

Q2: Do Brazilian civil servants see interrelations of various dimensions of sustainability and digitalisation? If so, where is the emphasis, where are "blind spots"?

In seeking answers to the questions above, we are interested in drawing conclusions for key lessons about digitalisation processes that might provide learnings for other contexts, too. As an additional result, we might also be able to identify training needs for the civil service with the aim of better harnessing the potential of digitalisation for sustainability.

The question about the role of the civil service in digitalisation and sustainability has additional pertinence, as Brazil experienced a change of government on 1 January 2023, adding impetus to questions of sustainability, and thus raising the question about the link to sustainability with renewed vigour. Furthermore, diverse socio-political challenges, likely in digitalisation policy with regard to sustainability, will be explored. To capture impressions from different socio-economic regions and different political levels, we answer our research question on the basis of investigations in four sites in Brazil, namely Brasília (for the federal level) as well as the municipalities of Rio de Janeiro, Curitiba and Recife. This is explained in more detail in the following, where we justify our choice of locations and sites in order to answer our research question.

Choice of research sites, government levels and agencies

We chose Brazil as our case study due to two main reasons. Firstly, Brazil holds significant geopolitical importance as the largest economy in the Latin American subcontinent and a designated "Global Partner" of German development cooperation. Secondly, Brazil stands out as a leading nation in its offering of digital public services, evident in its notable ranking on indices such as the GovTech Maturity Index. This dual status – as a robust economic player and a digitalisation frontrunner – underscores the country's capacity for sustainable transformation on a global scale. Consequently, enquiring about Brazil's role in shaping worldwide transitions becomes particularly relevant.

For our data collection, we opted for prominent urban centres in Brazil due to their feasibility and the access they provide to a substantial number of civil servants. In the end, we chose four sites: three distinct Brazilian cities – Rio de Janeiro, Recife and Curitiba – and the federal capital of the country, Brasília. These were the focal points for our investigation into sustainable digitalisation within Brazil, complemented by a survey among civil servants across Brazil. Each of these selected cities possesses specific traits that add value to our analytical framework.

Besides Brasília, Rio de Janeiro stands out as a pivotal political hub. These two cities house our partner institutions, Fundação Getulio Vargas - Escola Brasileira de Administração Pública e de Empresas (FGV EBAPE in Rio) and Escola Nacional de Administração Pública (ENAP in Brasília), respectively. While Rio de Janeiro is among the five "smartest" cities in Brazil (Smartcity, 2019), Recife and Curitiba offer diverse and interesting insights on the municipal level, as they are located in socio-economically different regions of the country. Recife has midrange performance in achieving the SDGs (IDSC [Índice de Desenvolvimento Sustentável das Cidades], 2022) and is affected by climate change, while Curitiba performs relatively better, particularly in SDG 13 (Climate Action) and SDG 14 (Life Below Water) (IDSC, 2022), and it also features among the top five smart cities (Smartcity, 2019). Although all three cities

accommodate various digital initiatives, they all face challenges in achieving different SDGs, particularly in the areas of good health and well-being, quality education and reduced inequalities, making them important case studies for our research.

While conducting semi-structured interviews in the four research sites, we acquired additional background information and examined civil servants' understanding of digitalisation as a supporting tool (or otherwise) for sustainability. Moreover, we occasionally gained access to grey literature and other publications and tested our research concept through the collected data.

Within the broad field of sustainability-oriented digitalisation aspects, we have a focus on the ecological dimension of sustainability. Based on our review of literature, policy documents and the expert conversations we conducted for the conceptualisation of this research, we assumed that sustainability in Brazil was mainly seen through an economic and social lens, and that ecological sustainability had thus far received less attention from the civil service, despite its relevance for domestic and global development. At the same time, Brazil is advanced in certain areas of digitalisation (EGOVKB, 2022a, 2022b), while simultaneously carrying considerable potential in the field of ecological sustainability, not least in view of its goal to achieve carbon neutrality by 2050 (Federative Republic of Brazil, 2022).

3 Research methodology

To explore our research question on how digitalisation for sustainability is perceived among civil servants in Brazil, we apply both qualitative and quantitative research methods, thus using a mixed methods approach. Applied methods include a literature review, the use of semi-structured interviews, background conversations (BCs), focus group discussions (FGs), participant workshops and a survey among civil servants in Brazil. The latter collected numerical data from a large sample of civil servants at different governmental levels from all over Brazil. Using standardised open and closed questions, patterns and trends applying to a larger number of participants can be collected and compared. Interviews and focus group discussions, for their matter, provide insights into dynamics, and thus help with the interpretations of patterns. They also offer in-depth insights into the (Brazilian) interpretations of causal relations and about exploring the policy context.

By using mixed methods, we contribute towards improving the validity and reliability of our findings. Through the integration of data from multiple sources and methods, thus engaging in triangulation, we enhance the credibility of our study by verifying the consistency and convergence of the results obtained both qualitatively and quantitatively. Consequently, the application of mixed methods not only offers a more nuanced interpretation of the data collected but it also allows us to mitigate the limitations resulting from the exclusive use of either qualitative or quantitative data. Nonetheless, despite offering several advantages, the use of mixed methods is not devoid of limitations. Among those, the potential for researcher bias in selecting and interpreting data may possibly apply to this research and will therefore be covered in the section below on limitations, which is presented in the positionality statement.

3.1 Data collection and analysis

We have employed a range of complementary methods to investigate how civil servants in Brazil make sense of digitalisation for sustainability, namely a literature review, background conversations, workshops and focus group discussions, as well as semi-structured interviews and a survey.

Review of literature and collection of context data

To gain comprehensive insights into the present status of digitalisation in the Brazilian civil service, we have carried out an in-depth qualitative review and analysis of both primary and secondary literature on the topic. Drawing upon pertinent research papers, journals and reports on the subject has enabled us to identify major themes revolving around digitalisation in Brazil. Furthermore, we have gathered information on the structure of the Brazilian civil service, the level of attainment of the sustainable development agenda in Brazil, as well as the implementation modalities of the agenda through an examination of the relevant literature.

We gathered information regarding formal institutions at the state, federal and municipal levels by studying primary literature, in particular policy papers, as well as through expert talks with colleagues from our research partners, ENAP and FGV EBAPE, and members of the Managing Global Governance (MGG) network. As active participants within the Brazilian civil service, we strategically selected these points of contact to facilitate our expert conversations, aiming to harness the wealth of existing expertise in our specific research area. In doing so, we recognised the diverse backgrounds, thematic specialisations and regional perspectives among our research partners, which significantly enriched our research efforts.

By evaluating policies such as the Digital Transformation Strategy (Salvadori Martinhão et al., 2018), the National Green Growth Programme and the Multi-Year Development Plan (Gov.br, 2023d), we sought to collect data on the digital transformation and sustainability initiatives in Brazil. This involved an analysis of extant policies and regulations on digitalisation in the civil service, as well as the identification of potential challenges to the implementation of digitalisation for sustainability in Brazil.

Background conversations, focus group discussions and workshops

Engaging in preliminary discussions with experts in the realms of digitalisation, sustainable development and their intersection proved valuable in providing us with insights and pathways into effective linkages between these two domains. We achieved this by initiating background conversations with proficient individuals in Brazil who specialised in digitalisation, sustainable development or the convergence of these areas. We reached out to the respective experts through networking, expert research at institutions such as Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and KfW, and snowballing. In addition, we received support from our partner institutions in identifying both experts for background conversations and interviewees. Hence, our consultations encompassed a diverse range of perspectives, including those of government officials, academics and industry specialists. These dialogues played a pivotal role in shaping the scope of our research and identifying potential interviewees.

Throughout the conversations, we briefly explained our research topic and asked for insights on digitalisation for sustainability in Brazil. When conducting background conversations with specific institutions, we also asked experts to explain their area of work, their projects and their personal insights into the subject at hand. Altogether, we conducted 19 background conversations, employing diverse formats that spanned online channels and in-person meetings during our research stay in Brazil. These initial interactions facilitated the identification of pivotal issues and focal points for our subsequent data collection efforts. Moreover, they aided the establishment of rapport and the cultivation of relationships with research participants. These relationships, in turn, proved instrumental in gaining support and expanding our research base, thereby enhancing the depth and quality of the collected data.

The conversations also provided us the opportunity to scrutinise and mitigate potential biases and limitations within our research design and methodology. This proactive approach allowed us to address these concerns during the subsequent stages of our study, bolstering the overall rigour and reliability of our research outcomes.

In addition, we facilitated focus groups in Brazil at our partner institutions as well as with members of the MGG network and influential stakeholders within Brazilian government organisations and ministries. A total of four focus group discussions were conducted and encompassed two sessions with the Ministry of Education and Brazil's telecommunications agency, ANATEL. This qualitative research approach enabled us to gather data through group dynamics and discussions, thereby unveiling insights into attitudes, opinions, beliefs and experiences concerning the convergence of digitalisation and sustainability. This process allowed us to discern recurring patterns and thematic trends, fine-tune our research inquiries when applicable and enhance the efficiency of our subsequent survey design. Moreover, the focus groups provided participants the opportunity to share their viewpoints within a collaborative setting, while also offering a channel for valuable feedback. As illustrated in Annex 1, the number of participants varied between 4 and 18 for each focus group. Whereas the focus group discussion conducted at the Ministry of Education was more closely aligned to the interview guidelines, focus group discussions held within our workshops were more flexible, while at the same time zooming in on topics relevant to the participants' backgrounds, such as working with the digital platform of the Brazilian government, called Gov.br.

Additionally, we facilitated two workshops. The first workshop, hosted at the Federal Court of Accounts (Tribunal de Contas da União), brought together participants from the MGG network to deliberate on the interplay between digitalisation and sustainability within the framework of the Brazilian government. This session encompassed a collective exploration of the way the government platform addresses and influences various dimensions of sustainability and provided a platform for presenting compelling digitalisation projects or contacts deserving of further attention. The primary objective was to extract insights and perspectives on the subject of digitalisation for sustainability in the Brazilian context.

During the research analysis phase, we organised a three-day workshop in Paraty, in collaboration with FGV EBAPE and ENAP, where experts from partner institutions and representatives from pertinent Brazilian ministries gathered. This event aimed to align the research with the Brazilian context, ensuring its policy relevance. The participants engaged in in-depth discussions and small group exchanges, provided constructive feedback, identified potential biases or limitations, and contributed to the formulation of meaningful policy recommendations. Their insights enriched the research by incorporating key takeaways from digitalisation and sustainability processes. Interactive discussions among experts diversified perspectives and experiences, enhancing the applicability of the research within the Brazilian context.

Semi-structured interviews

Qualitative interviews – mainly with civil servants working for different governmental bodies and institutions relevant to our research topic – constitute a key data collection instrument for our research to help us understand rationales and contexts in more depth. In line with the social constructivist approach, we conducted semi-structured interviews to understand individual interviewees' perceptions and experiences holistically. In this regard, semi-structured interviewing enables the degree of flexibility necessary to properly adapt to different interviewees and the direction they take throughout the conversation (Bryman, 2012), thus allowing us to grasp a variety of individual realities.

We conducted interviews from 24 February 2023 to 21 March 2023. Interviews took place at the Ministry of Environment, the Secretariat of Digital Government (SGD) in Brasília, as well as at other institutions relevant to our research topic based in Brasília, Rio de Janeiro, Curitiba and Recife. In total, we conducted 36 interviews, 22 of them at the federal level with participants from six ministries and four governmental institutions, including the following:

Table 1: Breakdown of interviews at the federal level

Institution	Number of interviews conducted
Ministry of Environment and Climate Change	7
Ministry of Management and Innovation in Public Services	4
Ministry of Labour and Employment	1
Ministry of Health	1
Ministry of Social Security	1
Ministry of Science, Technology and Innovation	1
Chico Mendes Institute for Biodiversity Conservation (ICMBio)	2
Brazilian Institute of Environment and Renewable Resources (IBAMA)	2
National Social Security Institute (INSS)	2
Central Bank of Brazil	1

Source: Authors

Moreover, 13 of the interviews were conducted on the municipal level in different locations throughout Brazil, as well as online. Out of the 13 interviews conducted,

- 4 interviews were conducted with civil servants from Rio de Janeiro,
- 5 with civil servants from Curitiba and
- 4 with civil servants from Recife.

Institutions where we conducted interviews included city halls, different municipal secretaries, governmental agencies, audit offices, governmental initiatives and state government offices. We held the interviews at the interviewees' preferred locations, which, in most cases, was their workplace. However, in cases where this procedure was not possible, we moved the conversations online, conducting the interviews through Microsoft Teams. In most cases, two interviewers participated in the same conversation and took turns in asking questions and complementing each other. Although we typically talked to one interviewee at a time, some interviews had two participants, with one of them being a translator or assistant. A full list of interviews is available in Annex 2.

We reached out to relevant stakeholders at the mentioned institutions, both via our partners at ENAP and FGV EBAPE working in the respective areas and through internet research, contacting individuals with backgrounds relevant to our research via email or WhatsApp, whenever possible. In addition, we made use of snowballing, asking background conversation partners, focus group participants and interviewees to provide us with further contacts. It often proved necessary to identify a key actor to provide us with the relevant networks.

Our approach to conducting interviews has been inspired by Bryman (2012). We based our interviews on a previously drafted interview guide that contained the most important questions organised by the topic area to be covered. Prior to starting the interview process, we informed all interviewees about the purpose and focus of our research as well as the anonymisation of their responses. We further asked for written consent regarding the recording of interviews, the collection of their data and the possibility of quoting them. Since no interviewee had objections to being recorded, all of our 36 interviews were taped. Our research was conducted in line with good research practice and ethics in compliance with relevant EU standards, including informed consent.

Depending on the final target groups, we slightly adapted our interview guide to different groups of interviewees. Hence, we complied with the interview guide while adjusting questions and their order based on the respective responses received as well as pursuing individual leads provided by interview partners. The strategy of asking rather broad questions while also ensuring that questions fit the interviewees' personal contexts allowed for the generation of both generic and in-depth participant knowledge (Charmaz & Belgrave, 2012). Thereby, we made different views comparable while simultaneously ensuring the preservation of the same overall focus. Upon completion of the interviews, we noted down impressions made throughout the interviews, as suggested by Bryman (2012), and documented successes and challenges encountered throughout the process to consider during upcoming interviews. Regarding ourselves as outsiders rather than experts, the use of open questions also served to encourage interviewees to openly share their experiences without leading them into a predefined direction. During the interviews, we ensured sensitivity to characteristics such as gender and age, both on our side and on the side of the interviewees.

Online survey

In addition to the semi-structured interviews, we conducted an online survey targeting civil servants from different career levels across Brazil. The survey allowed us to reach a bigger, geographically more diverse group of people and aim for a broader understanding of issues from the actors' perspective, thereby providing a larger data sample. It helped to contextualise the answers from individual interviews with stakeholders at our research sites. We used the online software Alchemer as the tool to carry out the survey, as it allows for different types of questions and offers multiple evaluation tools that are helpful for our research. The survey, developed in dialogue with research partners, was disseminated in Portuguese language to lower hurdles for answers and ensure that the questions would be understood by all participants. An original English version of the survey was translated in collaboration with a Portuguese native speaker. Thereafter, the Portuguese draft was validated by representatives from our partner institutions.

The survey complements the findings made in our interviews, which were conducted exclusively in English, with occasional assistance from interpreters. Hence, the aim of the survey was to complement the picture and to at least partly capture the diversity of the country. Therefore, we aimed at distributing the survey link to as many civil servants as possible. It reached around 20,000 Brazilian civil servants through our partner institutions FGV EBAPE and ENAP, who used their internal databases to forward the survey link. In addition, we reached out to interview contacts in Curitiba and Recife, and we asked them to pass on the survey link to their colleagues in the civil service.

The survey contained 25 questions, clustered in four thematic sections (see Annex 3 for the full survey outline):

(1) Understanding of Digitalisation

(2) Linking Digitalisation and Sustainability

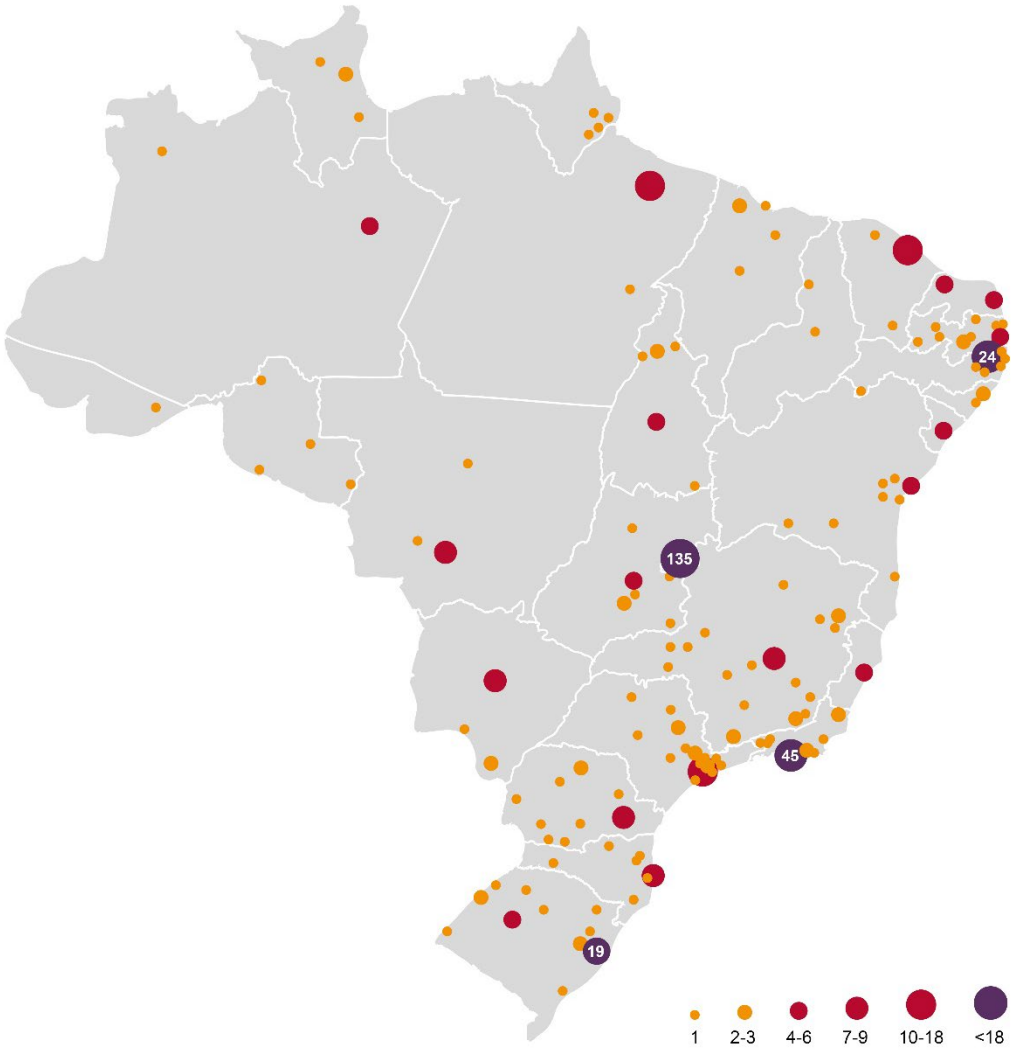
(3) Potential of Digitalisation for Sustainability

(4) Knowledge and Training for Sustainable Digitalisation

While we aimed to grasp civil servants' knowledge base on digitalisation per se through (1), section (2) on the nexus between digitalisation and sustainability aimed to reveal to what extent civil servants draw and perceive links between digitalisation and different sustainability dimensions in their country. Zooming in on the potentials (3), we sought to assess civil servants' estimations regarding the pursuit of digital initiatives for sustainability purposes within the Brazilian administration in the near future. Finally, section (4) was dedicated to understanding

how civil servants acquired their knowledge related to sustainability and digitalisation. Simultaneously, it aimed to pinpoint knowledge gaps, providing a foundation for recommendations on refining training materials and curricula for schools of public governance.

Figure 3: Geographical locale of survey respondents across Brazil



Source: IDOS, based on survey conducted by authors in April 2023

To enable easily comparable assessments, we combined both open questions as well as sliders that allowed participants to express their level of (dis-)agreement to chosen statements concerning the current state of digitalisation for sustainability in Brazil. The response rate of the survey was 3 per cent, with 460 complete responses and 224 participants who answered the survey partially. Respondents came from all federal states, across Brazil (see Figure 3). Around 53 per cent of the participants were female, 46 per cent male and fewer than 1 per cent identified as diverse. The majority of participants (56 per cent) were mid-career civil servants between 39 and 52 years old, but we also received answers from early-career civil servants between 18 and 38 years of age (18 per cent) and senior civil servants above 53 years of age (26 per cent). It is also reflected in the number of years of working experience, whereby more than 78 per cent of participant worked in the civil service for more than 10 years. With 85 per cent, the vast majority of civil servants participating in the survey work on the federal level, while 8 per cent work on the municipal level and 7 per cent on the state level. Overwhelmingly (97 per cent), the participants work in the executive, with the judiciary (2 per cent) and the legislative spheres (1 per

cent) being so small as samples that they do not provide a basis for broader statements. Answers came from civil servants in different career levels, ranging from high-level managing positions to lower administrative staff positions. Most of the participants of the study were located in the federal district Brasília (30 per cent), followed by the state of Rio de Janeiro (13 per cent) and the state of Rio Grande do Sul (6 per cent).

We were able to reach civil servants with different levels of education ranging from “school leaving certificate” to “PhD”. The main portion of civil servants participating in the study, namely 34 per cent, held a master’s degree. Figures 4 to 8 below provide a graphical overview of the (socio-)demographic information on survey participants.

Figure 4: Work experience of survey participants

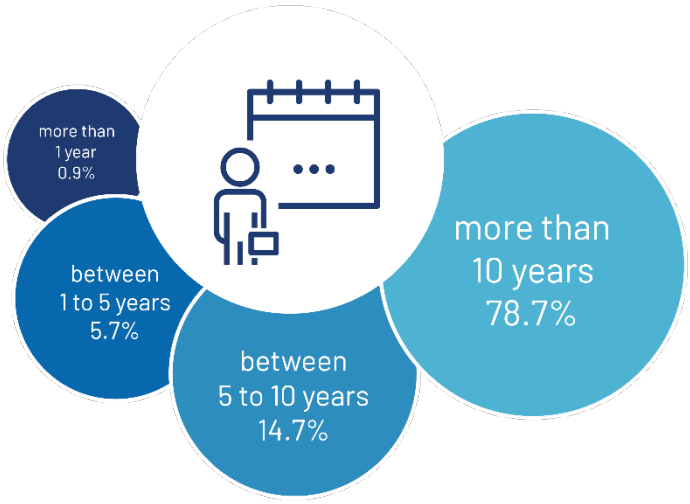


Figure 5: Gender distribution of survey participants

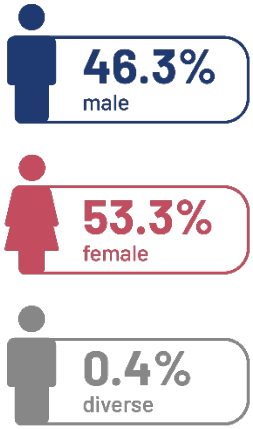


Figure 6: Age distribution of survey participants

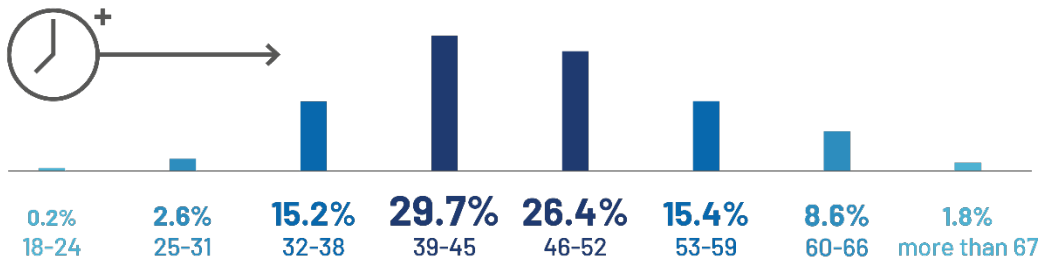


Figure 7: Governmental levels survey participants work at

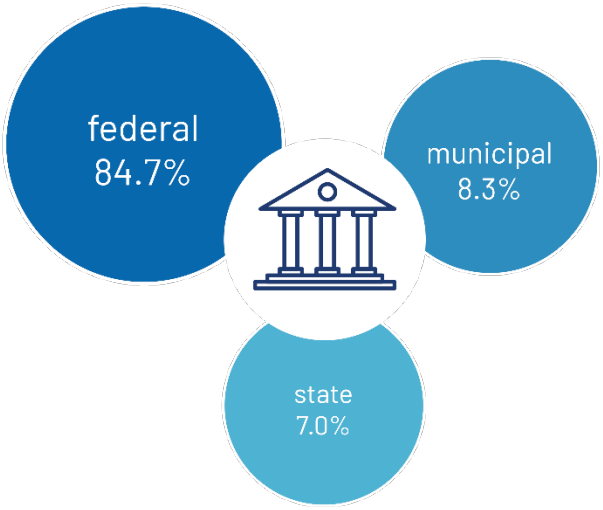
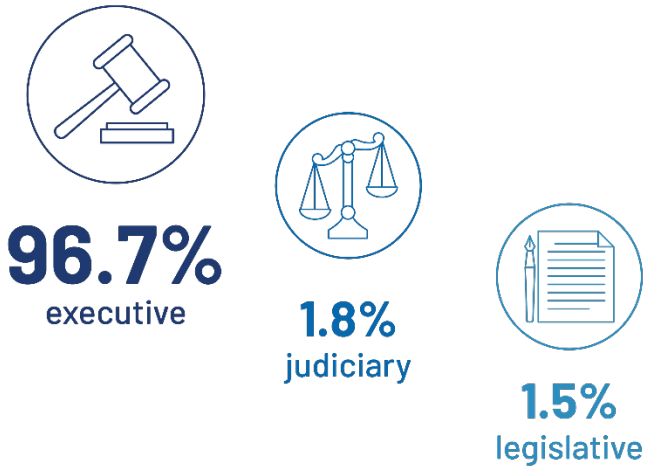


Figure 8: Sphere of power survey participants work in



Source: Survey conducted by authors in April 2023

Analysing collected data

As we applied a mixed-methods approach to our research, we carefully considered the different types of data collected and analysed them accordingly. For the qualitative data from background conversations, focus group discussions and semi-structured interviews, we used two methods, either summarising, highlighting and organising the data based on pre-defined themes, or transcribing and coding it. To evaluate the quantitative data, we used Alchemer and Excel to process and interpret our data.

To provide an accurate analysis of the qualitative data gathered from the background conversations and focus group discussions, we utilised a combination of techniques. Firstly, we created brief summaries of our notes, ensuring that we captured all essential information from the discussion by discussing these summaries within the team. Secondly, we scanned the summaries for any recurrent themes, highlighting them for easy identification. Finally, we linked the summaries to their respective topics, ensuring that the findings included in this discussion paper were well organised and easy to understand.

Regarding the semi-structured interviews, we took notes throughout the conversations while also recording the same before uploading the recorded data into the software f4transkript to create transcripts of the interviews afterwards. To ensure equal levels of knowledge, we briefed our team members not involved in individual interviews about the process and findings. After cleaning up and correcting the transcripts, we uploaded them into the software ATLAS.ti, which enabled us to code our qualitative data in a structured way.

In line with our interview guide, we engaged in discussions to identify potential codes, drawing upon recurring themes that emerged from the interview data. Subsequently, we systematically organised these themes into a comprehensive codebook, which served as our reference for coding each interview. The coding process involved scrutinising every interview through the lens of this codebook, which facilitated the analysis of recurring themes, their frequencies and their interconnections. Our codebook comprised both overarching code groups and individual codes. These codes were thoughtfully selected based on higher-level topics we derived from our research question and interview frameworks. These encompassed key areas such as digitalisation, sustainability, their intersection, training, and anticipated shifts due to governmental changes and attitudes. To delve into the specifics, we assessed the interviewees' grasp of digitalisation by exploring its application, gauging attitudes towards it, uncovering perceived potentials and challenges, and identifying the underlying purposes attributed to it.

All in all, we used a total of 40 codes, which included additional code groups such as understanding of sustainability, nexus digitalisation for sustainability, topics in digitalisation, topics in sustainability, training and government.

For the quantitative data collected through the survey, we used the software Alchemer to ensure the accuracy and reliability of our findings. The software enabled us to design a customised survey and easily distribute it to our target group, while also allowing us to automatically collect and analyse the survey data in real time.

3.2 Limitations of our research

Research design

The limitations of the study at hand include the fact that it was restricted to visits to four major cities in Brazil, namely, Brasília, Rio de Janeiro, Curitiba and Recife. As such a limited number of places cannot be representative of the entire country, the scope of the findings is limited. Regions located more inland, such as those covering the Amazon, were not included in our study. The same applies to the northern part of the country, which may exhibit differences in the fields of digitalisation and sustainability, especially in comparison to the rather southern cities covered in our study. Although we chose Recife and Curitiba as research sites to investigate the municipal level more closely – given their advanced positions in the field of sustainability and digitalisation – the endeavours and progress of these municipalities in these areas may not necessarily apply to other municipalities in Brazil. As a result, the generalisability of the findings may be limited.

Further limitations regarding the semi-structured interviews include the fact that we conducted interviews in English, which may have led to misunderstandings or difficulties in expressing nuanced opinions by some interviewees who were more comfortable speaking in Portuguese, their mother tongue. This language barrier may have limited the scope of the research and the ability to capture more detailed and accurate data. We further note that civil servants not feeling confident about their English language skills may have decided against participating in our study despite the option to arrange interpreters. To minimise potential risks resulting from conducting the interviews in English, we ensured interviewees agreed to participate in English prior to the

implementation of the interviews and created an encouraging atmosphere throughout the same. For the survey, we set up a Portuguese version that was sent out to civil servants.

Additionally, although a variety of ministries were covered in our study, some were not given as much attention as others – for instance, a considerable share of interviewees were employed at the Ministry of Environment. This may have resulted in a bias towards certain aspects of the research, especially the ones related to (ecological) sustainability. This way, the picture of the state of digitalisation for sustainability across all governmental agencies in Brazil obtained through the collected data may not be entirely devoid of limitations. Both the focus on certain ministries and the limited geographical scope were due to logistical and time constraints and were not deliberate exclusions. Given our focus on ecological sustainability, however, attention on the Ministry of Environment was nonetheless standing to reason. To mitigate potential bias stemming from these factors, we enhanced the interview data with insights gained from the survey. This approach effectively eliminated the potential influence of language barriers and prevented the disproportionate overrepresentation of specific governmental institutions and regions, as the survey was broadly administered to civil servants across the entire nation. However, not all institutions and regions are equally represented in the survey, primarily contingent on civil servants' willingness to engage in the survey process. This willingness may have been more pronounced among institutions and areas already familiar with or working in areas closely related to our research objectives.

In addition to the aforementioned limitations regarding the overall setup of our research, it should be noted that the sample of civil servants interviewed and surveyed in this study may not be representative for all civil servants in the country. Moreover, the study relies on self-reported data from the interviewees, which could be subject to bias or inaccuracies. To address these limitations, we have undertaken several steps to minimise the risks potentially resulting from the same. While the sample of civil servants was carefully selected to ensure a diverse representation of different departments and levels of government, we made sure to complement the data obtained through semi-structured interviews with the Portuguese-language survey sent out to civil servants all over Brazil, thus reaching a considerably larger pool of about 20,000 civil servants and minimising the risk of unrepresentative results and language limitations. The use of an interview guide, which facilitated comparability of the questions asked, as well as the standardisation of the set of questions asked in the survey additionally ensured consistency while also reducing the risk of selection bias. Regarding the latter, we further validated self-reported data by cross-referencing it with external sources such as public records and reports. Despite all considerations made, we cannot exclude the risk that our research is subject to a certain bias, which is taken up in the positionality statement below.

Researchers' positionality

A reflection on the extents to which our own backgrounds may influence how we make sense of our research surroundings and the ways in which we interpret our data is essential to our study. We are five white German postgraduate research fellows at the German Institute of Development and Sustainability (IDOS) with backgrounds in social sciences, economics and development, as well as two white research team leads with backgrounds in political sciences. Although we have immersed ourselves deeply into issues related and relevant to the study of the Brazilian public service and its handling of digitalisation- and sustainability-related matters, our own realities of life and cultural backgrounds may differ to significant extents from those of our research partners and interviewees. Led by our own interests and beliefs when choosing our research question, our aim is to contribute to the production of knowledge on civil servants' perceptions of digitalisation and sustainability in Brazil, while at the same time learning from the respective practices applied in the country.

In this regard, we further acknowledge our own privileges in carrying out this research. Whereas we are part of a protected research environment as participants of the postgraduate training programme at IDOS, more may be at stake for our interviewees and research partners in the case of inadvertent outcomes. To avoid the latter, we aimed to include Brazilian civil servants and their inputs to the best possible extent within the planning and implementation of our study, while at the same time ensuring that the data is properly anonymised and no conclusions to different individuals can be drawn.

4 Potential and gaps: Brazil's digital transformation towards sustainability

Sustainability and digitalisation have shaped the public debate for several years, but with varying dynamics in public discourse. Digitalisation has become a force for change driven not least by enterprises and private (consumer) use, creating demands to structure (if not shape) the course of action in the political sphere. On the other hand, sustainability – and specifically climate change effects – have arguably remained somewhat more abstract in debates, though more fundamental, with longer chains of causality. However, renewed public interest in both topics has occurred in the face of the Covid-19 pandemic, high human resource demand, climate change and its consequences, as well as environmental problems such as increasing bio-diversity loss and soil degradation (Fowler & Hope, 2007; Lichtenthaler, 2021; Lohrmann, 2017).

Digitalisation carries considerable transformative potential. Similarly, sustainability is a big-picture idea that frames all aspects of life as well as those in businesses, public affairs and academic settings (see definitions in boxes below). The digital technological change that humankind is currently undergoing has transformed interactions in society, the economy and the environment, and it has many additional indirect effects. Its impacts range from changed communication practices to new types of industrial manufacturing processes and business models to "smart" energy use and mobility (Reiners, 2021).

Box 1: Definition of digitalisation

The German Advisory Council on Global Change (WBGU) understands "digitalisation" broadly as the "development and application of digital and digitised technologies that augmented and dovetail with all other technologies and methods" (WBGU, 2019, p. 1). In distinction from this encompassing understanding of "digitalisation", the term "digitisation" refers to the transformation of an analogue process into a digital one (WBGU, 2019).

The definition of sustainability, for its part, highlights that progress can only be considered truly sustainable when the interlinked aspects of economy, environment and social well-being are simultaneously addressed.

Box 2: Definition of sustainability

The notion gained momentum in 1987, when the concept of "sustainable development" was first widely articulated in the report *Our Common Future* by the World Commission on Environment and Development (WCED). The WCED defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987, p. 16).

With its creation in 2015, the 2030 Agenda with its 17 SDGs created momentum for rethinking development. Based on the definition of sustainable development by the WCED and principles such as “leaving no one behind”, it provides guidelines for sustainable development in its economic, social and ecological dimensions. These guidelines are widely described as universal, inclusive and indivisible (Kakar, Popovski, & Robinson, 2022). These goals are defined globally and should inform national actions. They were formulated at a time when digitalisation was less prominent in public discussions, and they somewhat neglect this development and its opportunities for – and connected challenges to – sustainability.

Relevant to both sustainable development and digitalisation, Brazil’s geography and population size position it as a pivotal factor in the regional success and shaping of both agendas. Should the Brazilian economy embrace green and digital initiatives, it would wield substantial regional influence and potentially extend its impact globally, given its status as one of the world’s largest economies. Furthermore, as a part of BRICS, a club of emerging economies, Brazil additionally has the potential to shape the club’s dialogue on digitalisation and sustainability. Nonetheless, current efforts such as Brazil’s climate policies and actions are deemed insufficient to achieve carbon neutrality by 2050, and the country is considered to be one of the greatest polluters globally (Climate Action Tracker, 2022; Mulhern, 2020). Challenges especially arise from illegal logging, agricultural expansion and deforestation. The enormous size of the region makes it difficult to monitor deforestation thoroughly in the first place, and preventing deforestation, illegal logging and mining was not prioritised under the previous administration. To the contrary: A controversial bill was passed in 2019, understood to encourage deforestation and fuel land conflicts by incentivising land grabbing (Nelson, 2021).

Besides ecological considerations, the (interrelated) social dimension of sustainability is highly relevant in Brazil. Although the country was able to reduce the poverty rate from 28.4 per cent in 2021 to 24.3 per cent in 2022 through social transfer programmes such as Bolsa Família (World Bank, 2023a), it is facing inequality challenges, which especially affect vulnerable communities such as indigenous groups and Afro-Brazilian citizens. Inequality is compounded by differences in education, access to health care and employment opportunities. Digitalisation can have a profound impact on social inequality, be that through contributing towards overcoming some aspects of marginalisation, or through both amplifying existing disparities and creating new ones.

4.1 The structural setup for sustainability policy: Brazil’s governmental system

Brazil is a federative republic, and consequently, political initiatives on digitalisation for sustainability can be decentral. However, when considering political realities, major political dynamics unfold at and depend on the federal level. Presidential support for major political initiatives is imperative, as it pushes “grand narratives”, and thus provides political direction and shapes narratives in the entire administration. This has less to do with reasons concerning formal power arrangements, and more to do with the resources available to the federal government; the national executive is comparatively resource-rich in the Brazilian setup. At the same time, Brazil’s president, who is directly elected by the people, is both head of state and head of government, making the system highly personalised. In addition, policy analysis in Brazil, which encompasses topics such as sustainability and digitalisation, must take into account the deeply polarised political climate in the country. Specifically, the latest Brazilian presidential race was largely polarised, with two candidates from strongly opposing political camps (“Brazil’s new president”, 2023). At the end of 2022, after a narrow run-off election, the Brazilian people elected the left-wing Luiz Inácio “Lula” da Silva as president. He was sworn in on 1 January 2023, and began his four-year term as president – his third one, overall.

President Bolsonaro's political legacy of political polarisation is significant. On 8 January 2023, violent riots erupted against Brazil's democratic institutions, providing evidence of a divisive election campaign. Just one week after President Lula's inauguration, thousands of extremists stormed the Presidential Palace, the National Congress and the Supreme Federal Court with the aim of provoking a military coup (Czymmeck & Leimann-López, 2023). Since then, a policy of restoring the state's institutions through the rule of law has prevailed, with ex-president Bolsonaro facing legal prosecution for his role in the attempted overthrow of the constitutional order (by court verdict, he was ultimately barred from standing in elections). Under any circumstance, the transition from a politically extreme-right government to a more centrist-left one led by a president of the political left can be expected to result in substantial changes in policy-making.

Although presidents in Brazil hold substantial powers, particularly with regard to agenda-setting, they must govern within a coalition, which tends to have internal divisions over narratives. The proportional system in attributing seats in the Chamber of Deputies (the lower house of Congress; see next paragraph) requires intense brokering of compromises in order to find majorities in parliament. This can turn into horse-trading and have negative effects on policy coherence, and even result in corrupt practices. The Lula III government created 14 new ministries, providing a glimpse of the expected process of negotiation and coalition-building ("Brazil's new president", 2023), likely complicating coherent government policy-making. Tensions and rivalries between different political groups within Lula's governing coalition are anticipated. This could further restrict his political manoeuvrability, while allowing the extreme right ("Bolsonarism") to retain political influence. Notably, candidates closely aligned with former President Bolsonaro secured victories in the governor elections in three key states: São Paulo, Minas Gerais and Rio de Janeiro (Brenner & Stuenkel, 2023). In this ongoing polarised context, the new government faces significant challenges in pursuing a clear and cohesive political agenda, especially in areas such as education, health and – particularly relevant to this study – environmental protection, including efforts to combat illegal deforestation and promote reforestation in the Amazon rainforest (Brenner & Stuenkel, 2023).

Despite personalisation at the helm, though, the system has substantial decentralised and checks-and-balance elements. Laws and, importantly, budget priorities are debated and decided mostly by the legislative branch, the National Congress, which consists of two chambers: the Federal Senate and the Chamber of Deputies. The Federal Senate, with 81 members (3 from each state), represents the 26 states and the federal district of Brasília, while the Chamber of Deputies, with 514 seats, represents the population through proportional representation (Pariona, 2019). As in other democracies, ensuring the rule of law is the task of the judicial branch, including the interpretation of laws and basic rights (Jusbrasil, 2012). In addition to the federal government, each of the 26 states and the federal district of Brasília has its own independent government structure and can shape state policies, including in the area of the digitalisation of its public services and aspects of sustainability. The 5,579 municipalities, their mayors and city councils are responsible for local administration and policy-making (Pariona, 2019).

Sustainability, in particular, has become a politically sensitive term, as mentioned; politically appointed government officials considered it a project of the left (Capelari, Milhorance, & de Araújo, 2023). With President Lula, the topic of sustainability is back on the political agenda. Not only did he announce plans to host the COP30 in the Amazon region (in 2025), but he also pushed for more (foreign) investments in protecting the Amazon (Rannard, 2022).

The field of digital public administration, on the other hand, seems to be less politically charged and is handled more consensually. In this policy area, the new government is building on progress made by the previous administration and continuing the path of the country's Digital Transformation Strategy, even if policies might differ in direction and detail, which is to be expected after a democratic change of government.

4.1.1 Brazil's digital transformation champions

The digital development achieved by the previous government seems likely to continue under the new administration. According to interviewees from different ministries, the previous administration's policy on digitalisation was perceived as an agenda without strong political opposition. Unlike environmental or social agendas, in which political appointees often exercise a veto power in the administration, digitalisation apparently was considered an area that offered benefits. Thus, digital transformation could progress steadily and is likely to continue, carried by a bureaucratic push behind it (Interview 2, 24.02.2023; Interview 9, 03.03.2023). This is no small feat in a politically torn country such as Brazil.

The digitalisation discourse in the country comes with particular emphasis on the provision of digital public services and on economic prospects. Digitalisation is primarily associated with the hope of higher economic growth through more productivity (Weller, 2019) and is thus predominantly an optimistic discourse, focusing on opportunities and change for the better. Aiming at the digitalisation of the country's economy – and seeing government as a catalyst, if not the tool, for this purpose – the Brazilian government issued its Digital Transformation Strategy in 2018. The strategy was an initiative led by the federal government and coordinated by the then Ministry of Science, Technology, Innovation and Communications. It focuses on the role of the government as an enabler of the digital transformation in the economy's productive sector and aims to coordinate different governmental initiatives on digital issues within a coherent framework (Salvadori Martinhão et al., 2018). The strategy's priorities are to improve connectivity, increase the adoption and use of digital technologies, enhance trust in the digital environment, unleash digital innovation and promote the digital transformation of the economy (OECD [Organisation for Economic Co-operation and Development], 2020). Brazil's Digital Transformation Strategy primarily focuses on the digitalisation of the country's economy.

Digitalisation has had – and continues to have – a dedicated champion within the ministerial administration. Brazil has made significant strides in recent years to enhance its digital infrastructure and services, particularly in the areas of e-government and open data (Salvadori Martinhão et al., 2018). In the GovTech Maturity Index (GTMI) 2022, Brazil scores considerably and is mentioned as a "well-known good-practice country" (World Bank, 2022, p. 57). The GTMI is an annual study by the World Bank that assesses the maturity of digital government services in various countries around the world, focusing on factors such as the availability and quality of online public services, digital infrastructure and the use of emerging technologies.

The Secretariat of Digital Government – a unit within the Ministry of Management and Innovation in Public Services (previously located in the large and powerful Economic Ministry) – works on the digitalisation of the public sector (Interview 12, 06.03.2023). The SGD's role is to help different units and agencies within the federal government to advance and leverage digital government more effectively, efficiently and with fewer costs. The SGD provides tools and platforms (prominently among them: Gov.br) to facilitate the digitalisation of government services, especially those related to interaction and communication with citizens and companies. The goal is to improve the delivery of public services, increase transparency and foster innovation in government operations through the adoption of digital technologies (Interview 6, 02.03.2023). At the same time, digitalisation is also taken up by different ministries individually, thus ensuring the issue is broadly distributed across the governmental apparatus.

The Digital Government Law, which came into force under the previous government in 2021, requires the definition of a national strategy that provides guidelines and defines capabilities for federal entities to advance in the field of digital public administration (Gov.br, 2023a). Although states and municipalities have the autonomy to develop their own digital strategies, the federal government leads the process of developing this strategy. In implementation, it collaborates closely with states and municipalities to align the strategy with local needs. The role of the federal government is to provide technological tools and support for capacity-building, but not

to solely execute solutions. Instead, it is acknowledged that solutions are to be developed through a partnership approach that recognises the shared responsibilities of all levels of government in driving digital transformation (Interview 6, 02.03.2023). At the same time, a central unit can coordinate, provide overall direction and might ensure the interoperability of different initiatives.

The establishment of digital services requires that there be civil servants in the administration with technical skill. In Brazil, three state-owned companies – SERPRO, Dataprev and ANATEL – are primarily responsible for supporting the implementation of digital public service provision. Working with state-owned enterprises, in the best case, allows for some flexibility with regard to finding digital solutions and fixing flaws in pilot or early-use schemes (i.e. without lengthy procurement processes through framework agreements), and with competitive salary schemes in a sector with much-sought-after and scarce expertise (see Box 3).

Box 3: State-owned enterprises working on digital public service provision in Brazil

1. SERPRO: Advancing Brazil's digital transformation

Established in 1964, the Serviço Federal de Processamento de Dados (SERPRO), the federal data processing service, stands as a cornerstone of Brazil's technological evolution. Its primary mission revolves around furnishing the Brazilian government, citizens and businesses with an array of information technology (IT) services. SERPRO has been instrumental in modernising the country's public-sector operations. SERPRO's services range from software development and data centre management to cybersecurity and digital identity solutions. With more than 10,000 employees and a vast network of clients across the public sector, SERPRO presents itself as "a crucial player in Brazil's digital transformation journey" (BC 11, 01.03.2023). In the area of environmental sustainability, the company is engaged in supporting management and monitoring as well as environmental enforcement, quality and licensing. According to estimations of the employees, 7 per cent of the employees are working on social services and around 1 per cent (1,000 staff) in environmental services (SERPRO, 2023; BC 11, 01.03.2023).

2. Dataprev: Information technology and communication for social policy

The company is part of the institutional landscape of profit-oriented state-owned companies in the technology segment. It was established in 1970 with the aim to provide IT and communication solutions to the Brazilian government's social policy-making (BC 12, 06.03.2023). With a workforce between 800 and 1,000 employees, Dataprev is dedicated to the digitalisation of social security services and the automation of processes (BC 12, 06.03.2023), with a special focus on social security and employment services such as pensions and unemployment (e.g. with the Meu INSS platform).

3. ANATEL (Agência Nacional de Telecomunicações)

ANATEL is the Brazilian national agency for regulating and supervising the telecommunications sector. The profit-oriented company was founded in 1997 with the goal of promoting fair competition, ensuring quality services and protecting consumer rights in the telecommunications market, and it is linked to the Ministry of Communication (FG 2, 02.03.2023). The company is responsible for regulating a wide range of services, including landline and mobile telephony, internet access and satellite communications. ANATEL's original aim was to improve the telecommunication infrastructure in Brazil, and it is now concentrating on connectivity (FG 2, 02.03.2023). The agency also plays a crucial role in ensuring the security of the telecommunications infrastructure in Brazil.

Source: Authors

Brazil's digital transformation policies have the stated aim to optimise and simplify the relationship between the government and citizens so that Brazilians can interact with the entire government structure through digital means (Brazilian Government, 2022). This seems to be having a certain level of success, as the mentioned World Bank's GTMI rank illustrates: Brazil is among the leaders in core government systems and enablers (Dener et al., 2021). Accordingly, the Online Service Index, which measures the scope and quality of digital services offered by the public sector, ranks Brazil 14th out of 193 countries, ahead of major European economies such as the UK (17th), France (20th) and Germany (44th) (EGOVKB, 2022a). However, in a more comprehensive measurement, such as the E-Government Development Index, the leading position is not that clear. Here, Brazil ranks only 49th out of 193 countries, behind most European countries, and its Latin American neighbours Uruguay (35th), Chile (36th) and Argentina (41st) (EGOVKB, 2022b). The main reason for the discrepancy between the two indices is that the use of digital public services requires not only adequate offerings on the part of the public sector, but also corresponding access opportunities for the population, which are more limited in Latin America than in the OECD countries (Weller, 2019).

Opportunities for the population were meant to be addressed with the Brazilian Civil Rights Framework for the Internet, a Brazilian federal law that describes access to the internet as a prerequisite for exercising civil rights (Brazilian Government, 2014). However, it seems that further policies are needed to ensure that potential benefits from the digital transformation are shared throughout the economy and society (OECD, 2020). Challenges mainly persist with the connection infrastructure, access to hardware devices and deficits on digital literacy in the education system (PwC, 2022). Consequently, the current digital transformation may exacerbate existing inequalities, in particular between high- and low-skilled individuals, large and small firms, as well as urban and rural regions.

Access to digital technologies has become a crucial factor in determining individual opportunities in society. Those who have access to the internet, computers and digital skills are better positioned to access information, education, job opportunities and services. If access is not provided equally, this can result in a digital divide (Cullen, 2001), with particularly marginalised communities, low-income individuals, and rural areas facing significant barriers in accessing and benefiting from digital opportunities and resources (West, 2015). Addressing these challenges requires concerted efforts to ensure equitable access to digital technologies, digital literacy programmes, regulatory measures to prevent the concentration of power and ethical frameworks for the use of digital tools to ensure a more inclusive and fair society.

4.1.2 Policy change? Government approach to address sustainability

Although the thrust for digital transformation by the Brazilian government is likely to continue, sustainability and climate-related policies are areas in which major policy changes are anticipated in the Lula III administration's approach (Interview 6, 02.03.2023). The awaited shift towards policies that are related to sustainability is expected with the political administration that was inaugurated in 2023, and some early observations point in this direction, for example the strengthened role of the Ministry of Environment in the new administration. The Ministry, led by the former activist Marina Silva, works in a transversal manner to articulate initiatives with subnational governments, city councils and state governments to implement national environmental policy.

Efforts in the area of sustainability could connect again to the considerable progress Brazil has shown in recent decades with regard to conceptualising and implementing a sustainability agenda promoting matters such as environmental governance and social protection (Gomes Barbosa, 2021; Portela Fernandes de Souza, Damasceno de Barros, & Lima Barreto, 2019). More recently, however, under the Bolsonaro administration, Brazil has fallen short of upholding its initially commendable sustainability performance, particularly concerning environmental

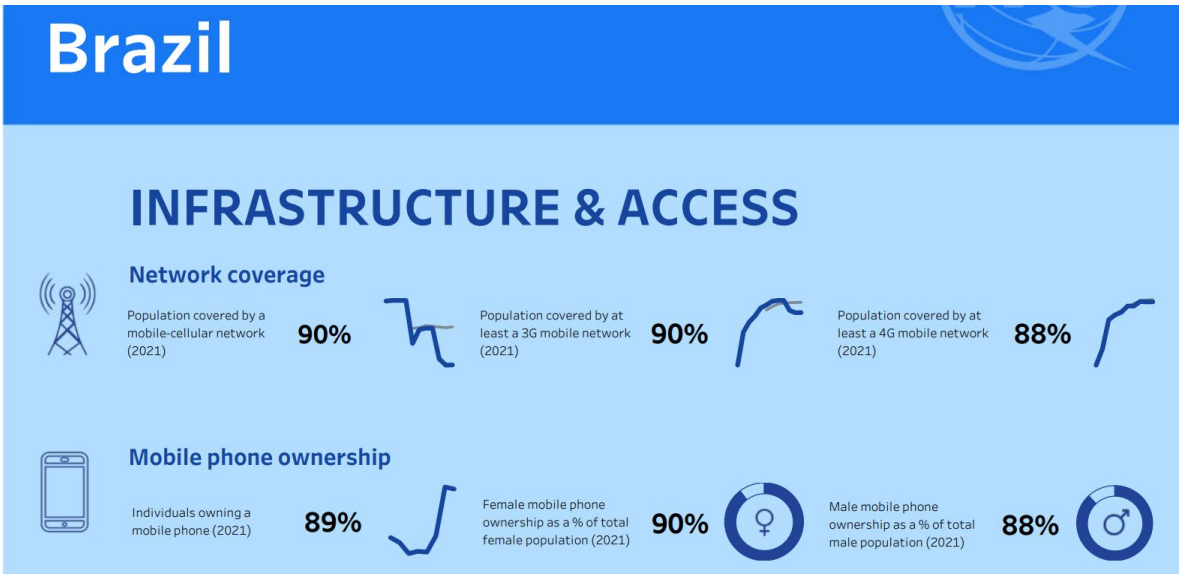
conservation (Gomes Barbosa, 2021). This observation aligns with scholarly criticisms that environmental conservation in Brazil declined considerably under the Bolsonaro administration, and that the country has failed to comply with climate agreements, combat deforestation, and conduct proper environmental governance and law-making in recent years, fortified through the previous administration (Gomes Barbosa, 2021). On the one hand, the country has upheld its commitment to reduce greenhouse gas emissions by 50 per cent between 2005 and 2030, while striving to reach its long-term goal of becoming carbon neutral by 2050 within its Nationally Determined Contribution, in line with the Paris Agreement (Federative Republic of Brazil, 2022). Yet, Brazil has become the thirteenth largest greenhouse gas emitter globally, and its climate policies and actions under the previous administration were insufficient in terms of moving towards achieving carbon neutrality by 2050 (Climate Action Tracker, 2022; Mulhern, 2020).

4.2 Digitalisation's transformative potentials in Brazil

Digitalisation is a major cross-cutting topic in Brazil and an integral part of former and present governmental strategies. The country has implemented several initiatives to drive digitalisation and technology adoption across different regions. Some key themes of Brazil's digitalisation strategy are digital inclusion, open data and transparency, digital government services, cybersecurity and data protection as well as fostering the growth of startups (OECD, 2020).

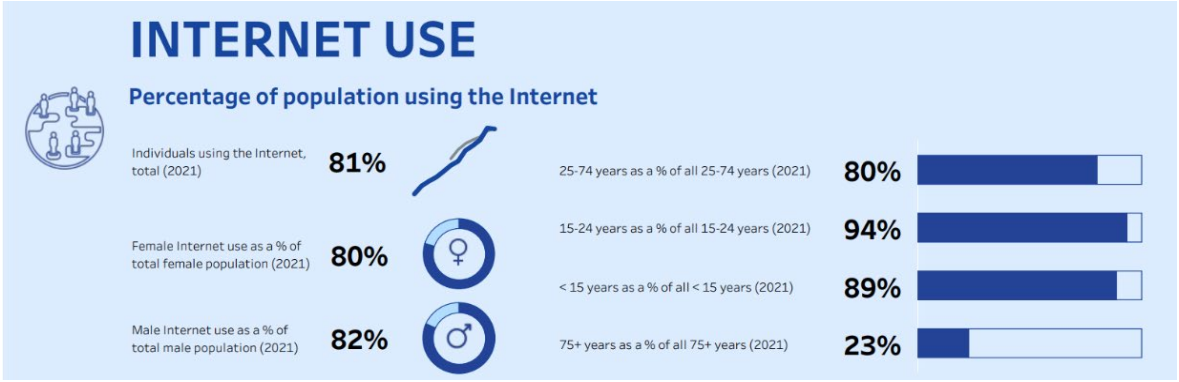
Regarding Brazil's infrastructure and access to the internet, the country has relatively high network coverage, with 90 per cent of the population covered by a mobile cellular network. As shown in Figure 9, mobile phones are relatively common, with 89 per cent of Brazil's population owning one. Nonetheless, the access it provides to the internet still depends on network coverage, which is not shown in this overall figure. This aspect constitutes a notable concern in terms of Brazil's potential to leverage the digital transformation, since a significant share of the population lacks regular access to the internet.

Figure 9: Digital development dashboard: infrastructure and access in Brazil



Source: International Telecommunication Union (2023)

Figure 10: Digital development dashboard: internet use in Brazil



Source: International Telecommunication Union (2023)

Figure 10 displays internet usage in Brazil. With 81 per cent of the population using the internet, Brazil finds itself in a favourable position to leverage the digital transformation happening in the country (even though numbers indicate a certain plateau having been reached). Looking at the percentages of internet users of different age ranges, the rather low share of 23 per cent of internet users over the age of 75 sticks out. This impression was also represented in our research, with multiple interviewees mentioning that elderly people often struggle to use the internet and are therefore not able to access digital services or information on the internet (BC 7, 16.02.2023; Interview 18, 08.03.2023).

Nonetheless, digitalisation meets favourable conditions in the Brazilian country context: The nation has emerged as a digital frontrunner, implementing successful initiatives to improve public service delivery and promoting digital government and citizenship. This is explained in the subsequent subchapter.

4.2.1 Taking up digital transformation in the civil service: digital initiatives

As a frontrunner in digitalisation, Brazil has implemented many successful digital initiatives in recent years on various levels of government. This success can somewhat be attributed to the political structures that digitalisation is embedded within. It has resulted in several digital initiatives, which are introduced in this section.

On the federal level, the focus is on the provision of public services through digital means – this provision is anchored in Brazil's Digital Transformation Strategy (2018-2021). The strategy aimed to improve the delivery of public services using digital technologies, foster digital government and citizenship, and facilitate coordination between different governmental initiatives on digital issues (OECD, 2020). Three digital initiatives of the civil service should be highlighted for facilitating both public interactions and internal processes:

(1) ***Gov.br.*** The government's online platform Gov.br can be seen as a major success of Brazil's administration in offering digital services. In August 2022, the Brazilian government announced that, in the previous two years, 84 per cent of public services provided by the federal government had been digitalised and could be accessed via the website Gov.br, which serves as a one-stop shop (Brazilian Government, 2022). The platform was launched in 2019 and allows citizens to interact with their government digitally. Gov.br serves as a central portal for citizens to access more than 3,000 government services and more than 1,800 digital documents, including birth certificates, tax declarations and driver's licences. The website is intended to be user-friendly and accessible, with a simple and intuitive interface that allows users to easily find the information and services they need, and a unified registry according to taxpayer ID. By early 2023, around 89 per cent of all public

services were claimed to have been digitalised on Gov.br (Interview 6, 02.03.2023). This includes both services specifically tailored to the work context of civil servants (e.g. scheduling leave and receiving payment information) as well as services accessible for all citizens (e.g. permissions or fines) (Interview 6, 02.03.2023). With more than 144 million accounts, most of the Brazilian population is registered on Gov.br and uses the more than 4,700 services offered by 460 integrated public entities (BC 11, 01.03.2023).

(2) ***PIX.*** The Brazilian instant payment system PIX (Pagamento Instantâneo), developed by the Brazilian Central Bank and launched in November 2020, is a second major digitalisation topic with broad public adoption in Brazil. It enables users to send or receive payment transfers within a few seconds at any time. According to the Brazilian Central Bank, PIX operates with few intermediaries and is therefore cheaper than regular banking processes (Interview 31, 17.02.2023). While it is free-of-charge for individual payers, the costs for merchants are also comparably low (Duarte, Frost, Gambacorta, Wilkens, & Shin, 2022). As key for the success of PIX – for which 67 per cent of adults in Brazil have signed up over the first two years – researchers identified "the mandatory participation of large banks to kick-start network effects [and] […] the central bank's dual role as infrastructure provider and rule setter" (Duarte et al., 2022, p. 3).

(3) ***Sistema Eletrônico de Informações.*** As a third key initiative in digitalisation in Brazil's civil sector, the electronic information system (SEI) relates to internal linkages of government administration. It was established as a governmental tool for managing documents and electronic processes for more efficient administration and is part of the National Electronic Process (PEN) (Gov.br, 2023b). It allows for documents to be produced, edited, signed and processed, while individual information is kept within a shielded-off part of the Gov.br system itself. On the one hand, by using SEI, processes can be handled faster and more transparently while, on the other hand, paper becomes redundant, which simplifies storage and saves resources (ENAP, 2018). Initiated by the Executive Secretariat of the Ministry of Planning in 2013 (ENAP, 2018), SEI has been compulsory in the Brazilian government since 2018, and every process goes through the system (Interview 34, 07.03.2023).

4.2.2 Digital transformation initiatives in different sustainability dimensions

The full transformative potential of digitalisation in the context of sustainability hinges on dedicated and purposefully designed initiatives, as elucidated in the preceding section. These initiatives play a pivotal role in driving forward the agenda of sustainability through digital means. In Brazil, a nation endowed with abundant natural resources and unique ecosystems, the significance of these initiatives takes on an even greater magnitude.

The Brazilian Amazon rainforest, which serves as a vital carbon sink with profound global climate-regulating effects, finds itself as one of the habitats at the forefront of ecological sustainability. As underscored by Haywood (2023), the Amazon's role in mitigating global carbon dioxide emissions is indisputable. However, this ecological treasure faces several challenges from illegal logging, deforestation and the expansion of agriculture, disproportionately impacting vulnerable and indigenous communities. These pressing environmental concerns are inextricably intertwined with Brazil's deeply rooted social issues of poverty and inequality.

Although it is true that digitalisation could potentially exacerbate these challenges, primarily due to disparities in access to digital tools and the electronic waste it creates (Wuppertal Institut, 2023), digitalisation comes with many positive effects on sustainability in its various dimensions. In the intricate web of ecological and social dilemmas, digitalisation emerges as a powerful tool with the potential to simultaneously address social inequality and environmental degradation. Social welfare schemes, for instance, could be digitalised in an inclusive manner in order to reach marginalised and vulnerable groups by addressing the elements of the digital divide. Meanwhile, digital platforms and technologies may help monitor and consequently address

environmental degradation. Besides the above highlighted three governmental initiatives in digitalisation, we therefore also find good examples for the link between digitalisation and social and environmental sustainability. As an illustration, we again highlight three specific initiatives in Brazil.

(1) ***Bolsa Família*.** Bolsa Família is a government-sponsored social welfare programme aimed at assisting low-income families. It seeks to combat both short-term and long-term poverty in Brazil through conditional cash transfers. In exchange for financial support, disadvantaged families with children commit to ensuring their children's consistent school attendance, thus curbing the cycle of poverty for future generations (World Bank, 2023b). The administration of this programme – including contribution collection and benefit distribution – falls under the jurisdiction of the INSS.

(2) ***Cadastro Ambiental Rural.*** Brazil's renewed environmental protection efforts – specifically of its vast rainforest – hinge on digital tools and solutions designed to monitor and track logging activities. Technology, not least digitalisation and thus broader (quicker and more reliable) availability of data, could enhance the system significantly. A significant milestone in this endeavour is the establishment of the Rural Environmental Registry (CAR), a compulsory electronic registry for rural properties (Roitman et al., 2018). CAR serves the dual purpose of mapping and overseeing the country's rural properties, while also fostering the conservation and restoration of native vegetation on these lands. Under the Brazilian Forest Code, all rural property owners are obliged to register their properties in CAR, providing information about property dimensions, locations, land usage, native vegetation areas, protected zones and water resources. Through CAR, the Brazilian government aims to detect and monitor deforested areas, enforce environmental laws and facilitate the rehabilitation of degraded zones. The CAR system has been pivotal in advancing sustainable land practices and safeguarding Brazil's natural resources (Gov.br, 2023c).

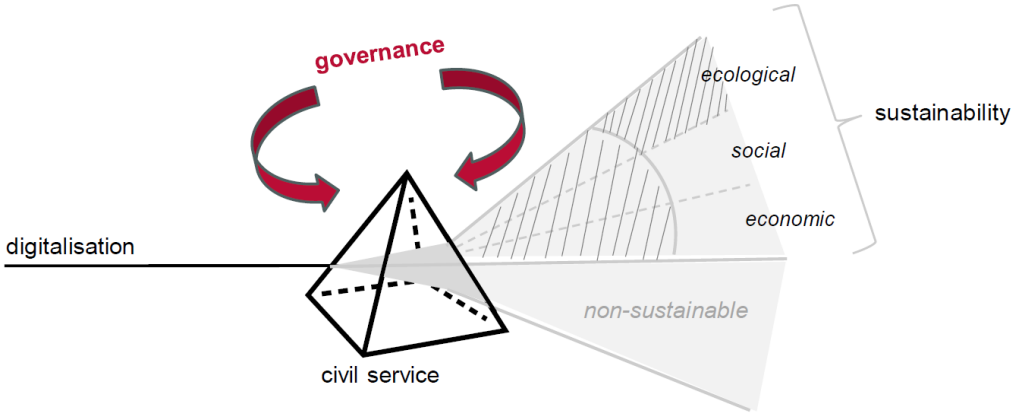
(3) ***AdaptaClima.*** Given the pressing challenges posed by climate change, Brazil launched the AdaptaClima digital platform in 2017 under the auspices of the Ministry of Environment. This platform acknowledges Brazil's rich environmental diversity and the urgent need for sustainable solutions to climate-related issues. AdaptaClima endeavours to enhance adaptation and resilience, acting as a central hub for accessing vital climate change adaptation resources and tools. Through collaborative engagement with governmental bodies, civil society organisations and academic institutions, AdaptaClima aims to bolster local communities and decision-makers in effectively countering climate change impacts. The platform's consolidation of scientific research, best practices and actionable insights empowers users to implement climate adaptation strategies across diverse sectors, including agriculture, water resources, energy and biodiversity. AdaptaClima's commitment to bridging the gap between scientific knowledge and practical action positions it as a crucial catalyst in propelling Brazil towards a more sustainable and climate-resilient future (AdaptaClima, 2023).

5 Governing the digital transformation in Brazil

Brazil has been actively embracing digital initiatives in recent years. One notable development is the provision of digital public services through the Gov.br platform, which aims to streamline interactions between citizens and the government. Additionally, the introduction of the E-wallet and digital identity systems has marked significant progress in enhancing digital transactions and personal identification processes. The Brazilian Ministry of Environment has been particularly engaged in promoting ecological technologies, including those focused on detecting deforestation and registering land ownership. These efforts link to the country's sustainability agenda, which emphasises addressing deforestation, mitigating climate change and promoting social inclusion (Interview 3, 27.02.2023; FG 4, 05.04.2023 and 07.04.2023).

This section, while elaborating on how digitalisation processes are governed, also sheds light on official digitalisation and sustainability processes and discourses, including an investigation of the topic at the municipal level and the identification of training needs, as voiced by civil servants. Looking at our prism model, we regard governance as the element that rotates the prism, and thus influences the direction of the digitalisation beam (see Figure 11). Central digitalisation politics and narratives on the federal level play a major role in how digitalisation is perceived and implemented. Yet, although they provide a common direction for digitalisation efforts, those narratives are "filtered" by civil servants' realities and perceptions. How digitalisation is shaped is therefore an interplay of both governance and the civil servants' perceptions.

Figure 11: Governance in our prism model



Source: Authors

The discussion will initially focus on the federal level, highlighting initiatives and policies that have contributed to Brazil's digital transformation and sustainability efforts. Considering the findings from our survey, we provide insights into governance elements frequently mentioned and compare them to the ones obtained through semi-structured interviews. We put special emphasis on questions regarding data and IT governance, civil servants' attitudes towards the administration in general and perceived potentials for changes due to the recent change of government.

5.1 Data and IT governance

The topic of data and IT governance was not prominent in the Brazilian discourse. However, there are governance mechanisms in place that provide a framework for governing data and IT-related aspects, and therefore present a tool to influence the digitalisation beam. Still, we discovered that, in the perceptions of civil servants, these mechanisms are not comprehensively applied in Brazil.

Data governance involves the development and implementation of policies, procedures and guidelines to ensure the proper use, availability, integrity and security of data throughout its lifecycle. The primary goal of data governance is to ensure that data is managed effectively, in accordance with regulatory requirements and industry best practices. With the emergence of big data technologies to deliver public services come requirements for governments to design data policy and governance.

When governing digitalisation processes, regulation and policies, their implementation as well as their impediments are important aspects shaping the digital transformation of a country. In this regard, the Brazilian Civil Rights Framework for the Internet (Federal Law No. 12.965/2014)

and the Brazilian General Data Protection Law (LGPD, Federal Law No. 13,709/2018) are two important laws establishing the basic principles that govern user rights, government directives and the liabilities of the suppliers providing the connections to and application of digitalisation processes. The former is a law that governs the use of the internet in Brazil with principles, guarantees as well as rights and duties for users and providers. It came into effect in 2014 and is a one-of-a-kind example of guaranteed rights of citizens to internet access. Established in 2018, the Brazilian LGPD is similar to the European General Data Protection Regulation (GDPR), but it can be interpreted as being more flexible and less restrictive, as there are more legal authorisations for data processing in the Brazilian legislation (Monteiro, 2018).

At the federal level, ANATEL, as a governmental institution, assumes responsibility for the enforcement of rules and regulations pertaining to communication infrastructure, particularly in the domain of networks. The overarching objective of this agency is to enhance the quality of services and ensure connectivity for all Brazilians. The challenges associated with digitalisation in Brazil were discussed in a focus group with ANATEL representatives in Brasília. Several key topics emerged, including cybersecurity, the proliferation of fake news and the intricacies of market regulation (FG 2, 02.03.2023). Notably, our discussions with ANATEL's interviewees underscored that cybersecurity looms as a significant overarching challenge on the political landscape of Brazil (FG 2, 02.03.2023; see also the legal spat with the messenger platform X in the year 2024, "Top Brazil court", 2024). In addition, ANATEL employees highlighted another pressing concern, namely the taxation of digitalisation. This issue presents a formidable challenge, given the current absence of a comprehensive approach to effectively taxing digital tools (FG 2, 02.03.2023).

Another aspect that came up on the municipal level is the need for the federal government to provide a more structural approach in digitalisation that can be followed by municipalities. A representative of Empresa Municipal de Informática (EMPREL) mentioned that there are common challenges in digitalisation for every city and that they are struggling to address them due to limited resources. At the same time, the federal level lags behind in providing solutions, so municipalities have to become creative to address these topics (BC 13, 09.03.2023).

In Brazil, in some cases the private sector partly takes up public duties, for example by outsourcing certain IT tasks (Interview 23, 15.03.2023) due to a lack of financial and personal capacity in the public sector. This can be explained due to the difficulty of attracting IT experts to the public sector (BC 13, 09.03.2023), according to employees from EMPREL. There are also several partnerships between governmental institutions and private companies such as Microsoft, for example (Interview 15, 07.03.2023). An interviewee from the Ministry of Environment mentioned partnerships in the area of data transparency (Interview 16, 07.03.2023). This has even gone so far that some interlocutors criticised that "the digital transformation is in the hands of big technology firms" (BC 6, 16.02.2023). Interviewees from the Ministry of Science, Technology and Innovation appreciated that they are "bringing together public and private sector for collaboration, for example on training needs" (Interview 12, 06.03.2023) and beginning to "develop a digital strategy" (Interview 12, 06.03.2023). Nevertheless, interviewees from the Oficina Municipal in Rio also expressed "concerns regarding a dependence on private firms" (BC 9, 23.02.2023).

Overall, about six survey respondents mentioned training needs in the area of security (Survey Question 48, 2023), for example confidentiality, information security and data security. The low number of respondents mentioning aspects related to data security indicates that this does not seem to be an important issue in Brazil, yet (Survey Question 37, 2023). However, with the new government, about twice as many respondents expected changes in the coming years in the field of information and data security as well as more secure processes (Survey Question 45, 2023). Although this number is comparatively low, it might indicate that the topic will become more important in the coming years. In line with these survey impressions, data security as a

topic was little mentioned in our interviews (Interview 3, 27.02.2023; Interview 6, 02.03.2023; Interview 12, 06.03.2023; Interview 22, 15.03.2023). Interviewees identified further potential for the Brazilian government to use available data for informed and evidence-based decision-making. This is, however, not a widely discussed topic among interviewees. An interviewee elaborated on questions of trust when it comes to the government handling citizens' data, as it has access to considerable amounts of data due to the provision of online services. In this regard, the interviewee highlighted the need to conscientiously use and analyse data in order to develop good, data-based public policies (Interview 22, 15.03.2023).

5.2 Perceptions from within administration on sustainability and digitalisation

The interviewed civil servants in Brazil, overall, exhibited concerns about a range of issues that might hamper effective governance of digitalisation in their country. Concerns largely revolved around problems related to the mindsets of civil servants, power imbalances between and within ministries and different governmental levels, as well as bureaucratic hurdles and budget cuts. On a more positive note, interviewees claimed that civil servants' mindsets were gradually changing, with more consideration being given to environmental and social factors in daily operations, while concerns about economic issues were often predominant (Interview 3, 27.02.2023). In this regard, the interconnectivity of institutional spaces and integrated policy-making were considered necessary to facilitate this change (Interview 26, 16.03.2023).

On the one hand, factors such as a perceived lack in the coverage of and proper approaches to environmental and digital issues and their interconnection, bureaucratic inefficiencies and political interference in administrative processes may contribute towards a perception that the environment is challenging, which leads to frustration. On the other hand, the sceptical perspective of civil servants towards their own administration can also be interpreted as a reflective, critical lens through which they view the structures they are a part of. This perspective may foster constructive approaches that will improve the system. It is important to note that the insider perspective is often more critical than the external image projected by the civil service in Brazil. The (self-)critical attitude might also be due to remnants of frustration from recent years, during which many civil servants did not dare to stick their necks out.

Among the concerns voiced by civil servants, a considerable number of them can be summarised under mindset issues. Although the operation "within boxes", that is, in clearly defined spaces and mandates, is part of an administration's task, the criticism by civil servants also shows that civil servants are (or claim to be) open to changes. Both at the municipal and the federal level, civil servants complained about individual employees and departments drawing (too) few links to other fields and departments – a compartmentalisation that was seen as creating bureaucratic hurdles in project implementation. This perception of little cooperation beyond the narrow remit referred both to the thematic areas they are working in, as well as to a more general exchange of ideas and information, partly because of a rather competitive atmosphere between different departments within one ministry or municipality, or even between entire institutions (Interview 36, 13.03.2023; Interview 28, 17.03.2023). Although mentioned as "a very structural problem of bureaucracy" (Interview 32, 23.02.2023), this boxing-up was seen as a "chronic" illness of Brazil's administration and as an impediment to successful governance in Brazil.

Concerns were voiced regarding the mindset towards (politically charged) sustainability. Several interviewees criticised what they felt was a lack of proper coverage of environmental issues. This criticism might well be based specifically on experiences during the previous administration, whereby environmental and sustainability concerns were non-issues to the political leadership and regarded as "leftist" political ideas; being too explicit about them was consequently

endangering civil servants' positions and careers. Interviewees described the struggle with policies to address environmental issues – these struggles were partly ascribed to a lack of clearance from above and a focus on the attribution of funds rather than policy implementation. Others, more cynically, claimed the existence of an "environmental hypocrisy" among responsible civil servants who speak publicly of their concerns but then do not include them sufficiently in their work (Interview 3, 27.02.2023).

With regard to perceptions of digitalisation, interviewees stated that a mindset change was uniformly required from civil servants at different levels in the governmental hierarchy. Although outnumbered, a few participants also expressed concerns about the national approach towards data protection in Brazil, claiming that the government neglected the Brazilian LGPD, while simultaneously driving citizens into a relationship of dependency on US technology giants, for example by offering many digital services via platforms such as WhatsApp (Interview 8, 02.03.2023). Others, though, praised the co-working options provided by technology firms. Digitalisation was felt to require better ministerial coordination, and challenges in implementing data-based policies were mentioned.

Lastly, interviewees at both the municipal and federal levels voiced their doubts with regard to the use of digitalisation for sustainability purposes. They expressed concerns that digitalisation and sustainability would be approached iteratively instead of simultaneously, and that the relevance of the nexus between both had not reached the relevant political levels.

Interviewees also described challenges in a multi-level system, as is typically the case in decentralised and federal entities. More fundamental critical comments revolved around power imbalances between administrative levels and ministries. Moreover, not only were there remarks about a power gap between conservative civil servants who wanted to keep their mandates and those pushing digitalisation, but there were also descriptions of threats of corruption and clientelism. It was felt that lobbying and the subsequent vetoes by congressmen can hinder the progress of sustainability initiatives; winning support of the public was crucial – and challenging (Interview 9, 03.03.2023).

Challenges of digitalisation within the Brazilian government include capacity-building, mainstreaming and the provision of digital infrastructure. The absence of a shared and integrated database was a particular concern. Additionally, communication between secretariats and IT departments were deemed essential, and there was a perceived need for digital skills and understanding among the population. Furthermore, the interviews highlight the importance of recruiting skilled individuals and having effective leadership to drive a mindset change that fosters an adaptive culture as a significant driver for a successful digital transformation which simultaneously advances sustainability in Brazil (e.g. Interview 3, 27.02.2023). These summarised points demonstrate that many interviewees understood digitalisation as a complex and interconnected process that requires collaboration, effective communication and inclusive design. They recognised the significance of promoting interoperability and ensuring equitable access to digital services.

5.3 Guiding the process? Discourses in Brazil's federal administration

The digital transformation is a cross-cutting topic in Brazil's federal as well as municipal administration. Our research indicates that initiatives on the federal level, such as Gov.br and PIX, contribute greatly to the country's efforts of going digital on all levels. However, civil servants working at the municipal level discussed the lack of federal guidelines to develop digitalisation, while simultaneously highlighting the limited autonomy in being able to implement municipal-level initiatives due to disparities in power and budgets. Thus, cities needed to

develop digitalisation on their own and foster intra municipal exchanges to identify best practices. The federal government was expected to issue a guideline for digital administration targeting states and cities in 2023, and it was meant to define the needed capabilities to further develop digitalisation. Although states and municipalities could not expect financial support from the federal government in this regard, they could benefit from digital infrastructure such as Gov.br, a unified platform for the entire country. However, institutions at the municipal level, particularly in Curitiba, continued to use their own platforms. Interviewees at the municipal level did not perceive Gov.br as fully integrated at their level, where platforms such as Curitiba.pr.gov.br were employed. This was surprising, considering that the Gov.br unified platform is utilised almost everywhere at the municipal level.

With the change in government in early 2023, sustainability seemed to gain greater significance on the federal level, particularly in terms of environmental dimensions. Interestingly, the concept of environmental, social and governance (ESG), typically associated with the private sector, had gained prominence within governmental bodies at the federal level. Considering the polarised nature of the SDGs, there is a potential benefit in establishing new terminology to address sustainability effectively. However, at the municipal and state levels, changes in government at the federal level often have few implications for sustainability approaches, which primarily depend on local policies. Cities operate with more independence, for example the focus on the SDGs in Curitiba and the state of Paraná.

5.3.1 Digitalisation frameworks and discourses in the views of civil servants

The consolidation of digital services in easily accessible online platforms such as Gov.br is crucial, particularly once they become the norm. Initially in the Brazilian administration, each public organisation embarked on developing its own analogue and digital services, but since 2020 the federal government has started to consolidate these services into a single platform, Gov.br, which serves as a one-stop-shop and is accessible through a single login (Interview 5, 01.03.2023). However, the evolution of digitalisation varies across sectors, with some ministries ahead of others in providing comprehensive digital public services (Interview 22, 15.03.2023). In some areas, physical services become the exception (Interview 8, 02.03.2023).

In August 2022, the Brazilian government announced that 84 per cent of public services provided by the federal government had been digitalised (Brazilian Government, 2022). The introduction of the E-wallet and the integration of a National Digital Identity system with the Cadastro de Pessoas Físicas (a Brazilian individual taxpayer registry that is used for various purposes, including digital purchases and activities) in 2023 have been notable advancements (Interview 6, 02.03.2023). Before, each federal state had the authority to issue an identity card for its citizens. The integration with other administrative levels, such as digital identity and the consolidation of services offered by states and municipalities with federal services, is also being pursued (Interview 22, 15.03.2023). Furthermore, the digitalisation efforts in Brazil encompass improving data-based decision-making (Interview 22, 15.03.2023), implementing digital signatures (Interview 35, 07.03.2023), promoting e-participation and digital mandates (BC 16, 14.03.2023), as well as exploring the implementation of AI in chat and voice functions within the government sector (Interview 12, 06.03.2023). Here again, it shows that there is a clear understanding of the task as digital transformation, not a mere digitisation of existing processes.

The nexus of digitalisation and sustainability encompasses a range of topics at the federal level. Regarding the ecological dimension of sustainability, key areas that were brought up in discussions include the CAR system, which promotes the maintenance of at least 20 per cent forest cover on land, presenting potential opportunities to develop a specific market for forest cover, which is key for Brazil's ecological sustainability and its reduction of CO_2 greenhouse gas emissions. Brazil's (renewed) commitment in this regard has gained international recognition (Interview 9, 03.03.2023), as demonstrated by the revival of the Amazon Fund (GIZ [Deutsche

Gesellschaft für Internationale Zusammenarbeit], 2021) by international donors immediately after the change of government in early 2023 (“Germany pledges funds”, 2023). Digital records of land ownership play a crucial role in increasing accountability and reducing the risks of land grabbing and deforestation (Interview 9, 03.03.2023). The use of Internet of Things technologies is also being explored for planning the construction of charging stations for electric vehicles for example, contributing to sustainable transport infrastructure (Interview 12, 06.03.2023).

Besides the monitoring of (un)desirable trends, the better prediction of and preparation for natural disaster events (e.g. floods, landslides) is an additional focus of digitalisation efforts (Interview 3, 27.02.2023; Interview 9, 03.03.2023; Interview 24, 16.03.2023), as highlighted in the above section on municipalities. Since these digital tools are utilised for alerting and informing people residing in these areas, this aspect further intersects with the social dimension of sustainability and access to digital services. These include the implementation of e-health systems, virtual medical consultations and the utilisation of applications for medical records, such as vaccination registries (Interview 36, 13.03.2023). Moreover, digital literacy and e-schooling initiatives are related. Additionally, advancements in digital technologies have facilitated improvements in social security systems, making it easier for individuals to access and obtain the necessary documents required to apply for these services (Interview 6, 02.03.2023). Lastly, the introduction of PIX and the Digital Brazilian real in the financial sector promote financial inclusion (Interview 31, 17.02.2023).

Rarely, but occasionally, digital security concerns were also raised by survey participants as well as some interviewees. These concerns include hacker attacks (Interview 22, 15.03.2023; Interview 35, 07.03.2023), inadequate levels of personal data protection in government services (Interview 8, 02.03.2023) and the widespread dissemination of fake news (Interview 34, 07.03.2023). This was, however, not a focus of discussions.

Overall, while our interviewees placed particular emphasis on utilising digital tools for the ecological dimension of sustainability, survey respondents supported this view and also highlighted the importance of the economic dimension. Participants in the survey expressed high expectations about the role that digitalisation can play in driving economic and ecological sustainability. However, respondents had relatively low expectations for the role of digitalisation in the social dimension of sustainability.

5.3.2 Awareness of sustainability issues and discourses among civil servants

Sustainability-related topics encompass a large number of politically contested governance issues in Brazil. The range of critical sustainability topics is broad, including climate change mitigation, halting deforestation, fostering social inclusion and safeguarding vulnerable groups. Work on a comprehensive sustainability agenda has often taken a back seat in Brazil, with a rather compartmentalised understanding of “development”. Despite the previous federal government’s reluctance to engage in discussions about the SDGs, some state governments had continued to work with them. The new federal government since January 2023 seemed to be tangibly more open to embrace sustainability-related topics, as explicitly mentioned in numerous interviews and background discussions (e.g. FG 4, 05.04.2023 and 07.04.2023). Some civil servants perceived a growing movement to change this mindset, also among leaders and managers, encouraging them to integrate sustainability and ecological considerations into their daily work (Interview 3, 27.02.2023). Civil servants in the new administration were readjusting the importance of sustainable practices and working towards creating a more environmentally conscious and inclusive society. Brazil was felt to be able to play a leading international role in this area because of the Amazon and its symbolic significance for the environmental agenda, and due to its potential to lead by example (Interview 3, 27.02.2023). As one interviewee pointedly put it, it was necessary to recognise that sustainability should not only be a *value* but also a *priority* (Interview 20, 10.03.2023).

The range and relevance of issues on **ecological sustainability** is staggering. Key goals included calculating carbon footprints and reducing emissions, with the hope that the environmental minister of the Lula III administration would drive the climate agenda across the government (Interview 3, 27.02.2023). Halting deforestation is vital, as over half of Brazil's carbon emissions stem from deforestation (Interview 9, 03.03.2023). However, balancing agricultural production with forest preservation poses a challenge (Interview 3, 27.02.2023), and initiatives such as CAR play a critical role in monitoring land ownership and increasing accountability among landowners (Interview 9, 03.03.2023; Interview 16, 07.03.2023). The country also prioritised a national adaptation agenda to decrease disaster risks in vulnerable areas and municipalities (Interview 15, 07.03.2023). Furthermore, waste management, particularly in the ocean, is considered essential (Interview 15, 07.03.2023), and efforts to conserve biodiversity – including preventing the unnecessary exploitation of conservation areas and animals for scientific purposes – are of high relevance (Interview 5, 01.03.2023; Interview 34, 07.03.2023).

Many interviewees highlighted issues related to the **social dimension of sustainability**. In this regard, several pressing issues need attention to promote social inclusion, improve education and health outcomes, and safeguard the rights and well-being of vulnerable groups. The indigenous Yanomami people, for instance, were reported to have been facing significant challenges, including starvation due to insufficient government support (Interview 17, 08.03.2023). In this context, it was interesting to hear the point that miners also experience vulnerability, with a pressing need for job opportunities and recognition of their rights and dignity (Interview 17, 08.03.2023; Interview 31, 17.02.2023). It is often clashes between different groups – not least miners and indigenous groups – that require government action, as indigenous communities living within protected areas face complex dilemmas concerning the preservation of traditions versus exploitative activities such as gold mining (Interview 2, 24.02.2023; Interview 3, 27.02.2023). Remote areas suffer from inadequate infrastructure and limited access to health care, disproportionately affecting older generations and hindering inclusivity (Interview 12, 06.03.2023). Education inequalities and cultural imbalances persist between regions and ethnic minorities (Interview 4, 28.02.2023). Basic needs such as food security and sanitation remain unmet for many, highlighting the urgency to address these issues (Interview 3, 27.02.2023). Social programmes such as Bolsa Família play a vital role in providing support (Interview 8, 02.03.2023), but there is a need for broader social security coverage, particularly in rural areas such as the Amazon (Interview 1, 24.02.2023). Emphasising the importance of basic education is crucial to empower individuals and bridge societal gaps (Interview 7, 02.03.2023). Additionally, the impact of the environment on health, including issues such as air quality, must be addressed comprehensively (Interview 18, 08.03.2023). Initiatives such as implementing nutrition projects in schools (Interview 18, 08.03.2023) and improving sewage systems (Interview 20, 10.03.2023) are essential steps towards creating suitable conditions for school pupils to learn effectively in a healthy environment. Given these challenges, several interviewees emphasised the need for improving basic infrastructure, such as in schools or remote communities, as a priority before delving into digital topics and more technological advancements (Interview 3, 27.02.2023; BC 16, 14.03.2023).

While not making a statement about prioritisation, there appeared to be notable linkages between a number of digital and sustainable topics at the federal level in Brazil. Digitalisation efforts that are focused on providing digital public services, e-health and e-schooling could contribute towards bridging societal gaps and fostering inclusivity. Simultaneously, the use of digital tools to address ecological issues, such as deforestation detection and enhancing landowner accountability, illustrates the potential for tackling pressing environmental challenges. However, it is important to acknowledge that some interviewees advocate for prioritising basic infrastructure projects, such as sewage systems in schools, before fully emphasising digital advancements.

5.4 Digitalisation for sustainability at municipal level

At the time of research, there was no established guidance from the national level for digitalisation efforts on the municipal and state levels. Consequently, each city has to develop its own path and independently work towards achieving its digitalisation goals (Interview 26, 16.03.2023). While the Gov.br platform offers digital public services on a federal level, state and municipal services, which constitute the majority (Interview 3, 27.02.2023), are available on separate platforms (Interview 23, 15.03.2023).

In a large and federal country such as Brazil, discourses are not only shaped at the central, federal level, but are also conducted in different states and locations in the federation. Municipalities share the common trait that they exhibit a number of projects which employ digital tools to improve sustainability goals, for example in urban planning and environmental monitoring. Rio de Janeiro, the second largest city and former capital of Brazil, for instance, is among the five "smartest" cities in Brazil, according to various development indicators such as mobility, accessibility, energy and innovation (Smartcity, 2019). This "global city" with complex and unique conditions for digital and sustainable urban development makes for an interesting case, not least due to the application of digital means in disaster risk reduction (see Box 4).

Box 4: Rio de Janeiro's use of digital tools for disaster risk reduction

Brazil's second-largest city, Rio de Janeiro, faces a host of sustainability challenges, currently ranking 444th out of 5,570 Brazilian cities when assessed against approximately 100 indicators related to the SDGs (IDSC, 2022). While the city excels nationally in areas such as affordable and clean energy, industry, innovation and infrastructure, it grapples with issues in the social sphere in particular, including good health and well-being, quality education and gender equality, which represent opportunities for improvement (IDSC, 2022).

Rio de Janeiro's distinctive geographical location, nestled between mountains and the sea, makes it uniquely scenic – and very susceptible to natural hazards exacerbated by climate change and global warming. These hazards encompass heat waves, storms, rising sea levels and floods. Compounded with social challenges due to rapid population growth and the need to accommodate its 6.7 million residents, housing expansion increasingly encroaches upon vulnerable slopes prone to flooding and landslides. Stemming from the significant floods of 2010, which resulted in a substantial loss of life, the Rio Operations and Resilience Center (COR) has made it its mission to safeguard lives through continuous monitoring and the integration of actions to mitigate the impact of incidents around the clock (Rio Operations and Resilience Center, 2022). COR employs 2,500 cameras situated throughout the city, with plans to expand to 10,000 within the next three years. It monitors meteorological conditions, urban traffic, high-impact disasters and events. Additionally, it offers a mobile application that supplies users with geo-referenced data indicating the city's current status, ranging from "normal" to "crisis".

In addition to COR serving as a central hub, Rio has introduced a number of digital initiatives aligned with ecological and social objectives, possibly leading to challenges in visibility to users, need to address accessibility for marginalised (offline) populations, and keep an eye on consolidating or connecting the various data. These initiatives include, but are not limited to, Portal Rio 1746, a mobile application enabling users to report detected city faults to the municipality and the commendable initiative of a Carioca Digital portal, which consolidates all city services for citizens into a single app.

Source: Authors

Yet, this research focuses on Recife and Curitiba, which are two smaller cities with the goal of gaining insights that can be transferred more easily to other, similar urban areas.

5.4.1 Recife in the north east: digitalisation as a tech hub

Recife is an interesting case from the perspective of both digitalisation and sustainability debates. With digitalisation as a driving force of the city's economy, initiatives and approaches emerged that are not only tackling digitalisation-related questions, but are also able to contribute towards sustainability efforts. The city claims to have embraced technology more readily than the national average (Interview 36, 13.03.2023), which aligns with our impressions made on site.

As the capital of Pernambuco State with a population of 1.5 million (4.3 million in the urban area), it holds significance as the largest city in the north east (PopulationStat, 2023). This location features in the region's major product output, including software capabilities. Recife boasts the third-largest economy in the north east after Salvador de Bahia and Fortaleza, driven by a rising gross domestic product (GDP) (Prefeitura Recife, 2023). Universities contribute to a strong IT education (BC 14, 10.03.2023). However, environmental vulnerabilities, such as flooding and heavy rain due to its coastal and riverside location, intersect with its economic opportunities (BC 18, 14.03.2023). In terms of SDGs, Recife ranks 1,445 out of 5,570 in the Brazilian Sustainable City Development Index (IDSC, 2022). Although it excels in industry, innovation and infrastructure, challenges persist in social realms, for example promoting good health and well-being and eliminating hunger. Hence, measures such as a resilience plan and a sustainable low-carbon strategy are in place for further advancement. Moreover, the Agency for Innovation and Strategy supports innovative and sustainable long-term city development (Smartcity, 2019).

A significant initiative at the municipal level is Porto Digital, an innovation hub established in 2000 to bolster the local tech industry's growth (Porto Digital, 2023). The hub was established in 2000 with the aim of promoting the development of the local technology industry and contributing to the economic and social growth of the region (Porto Digital, 2023). It was developed as a response to the brain drain of IT workers, successfully reversing trends by attracting tech companies with tax incentives (Digital Transformation Decree) to settle in the area (Interview 21, 14.03.2023). At the time of writing, Porto Digital was home to more than 300 companies and startups in the fields of software development, gaming, animation and digital marketing, among others, making it the largest and most relevant technology park in Latin America (Interview 21, 14.03.2023). In addition to providing physical infrastructure and support services for startups and companies, Porto Digital also offers training programmes and education opportunities in technology and entrepreneurship. The city has played a significant role in transforming Recife into a hub for technology and innovation and has helped to create jobs in the region (Porto Digital, 2023).

EMPREL, a municipal company founded in 1986, advances technological development in public administration (EMPREL, 2023). It pioneers digitalisation in services to citizens while upholding sustainability and social responsibility principles, according to its own claims (making no statement about the nexus between, relevance of or possible focus on digitalisation and sustainability). As a Recife municipal company with a mission to promote the development and modernisation of the (local) public administration using technology (EMPREL, 2023), the company can work for public organs in Brazil without tendering, similar to the two federal companies SERPRO and Dataprev. EMPREL claims to provide almost 600 services to citizens, of which 62 per cent are digitalised, including software development, network management and system integration (BC 13, 09.03.2023). The company is also responsible for managing the city's data centres and ensuring the security and integrity of its digital infrastructure. EMPREL claims to have played a key role in the digital transformation of Recife's public administration,

implementing various technological solutions to improve the efficiency and effectiveness of government services (EMPREL, 2023). The company has also been recognised for its commitment to sustainability and social responsibility and has implemented various initiatives to reduce its environmental impact and promote social inclusion (EMPREL, 2023). With initiatives such as Go Recife (employment), Recife Limpa (waste management), Recifeando (tourism) and its vaccination campaign during Covid-19, Recife has made substantial use of digitalisation in its political actions.

In Recife, the eligibility of projects is considered with a specific focus on addressing challenges arising from climate change and tackling social inequality. Eligible projects must align with the mayor's agenda and demonstrate a favourable cost–performance ratio, and, additionally, they must contribute towards addressing sustainability issues and bridging the gaps related to gender and race disparities (Interview 25, 16.03.2023). The city utilises databases to allow citizens to report homes affected by natural disasters, facilitating a more efficient response and support system (Interview 36, 13.03.2023). Sensors are deployed in bridges and lamp posts to monitor and measure sea level rise, providing valuable data for climate change adaptation measures (Interview 36, 13.03.2023). To enhance preparedness for natural disasters, the necessary construction works across various districts are monitored and mapped digitally, enabling better adaptation strategies in response to heavy rainfall events (Interview 36, 13.03.2023). By implementing alert systems for natural disasters through digital channels, the city aspires to promptly inform and safeguard specifically vulnerable communities (Interview 26, 16.03.2023; Interview 36, 13.03.2023).

Recife aims to establish databases that can be utilised by every citizen for registration. During the Covid-19 pandemic, those databases were highly effective in tracking vaccinations, ensuring an organised and equitable distribution process (Interview 36, 13.03.2023). Digital literacy programmes are also implemented in schools to foster digital skills (Interview 26, 16.03.2023). Regarding digital public services, Recife identifies the areas that require digitalisation, with a particular focus on providing services for underserved populations. Overall, Recife claims to have a strong commitment of leveraging digital technologies for ecological and social issues, promoting a higher level of sustainability and inclusivity in the city (Interview 26, 16.03.2023).

5.4.2 Curitiba in the south: championing sustainability

The municipality of Curitiba in the south of Brazil is considered a pioneer in sustainability, especially regarding sustainable urban planning (Krosofsky, 2021). Consequently, there are various initiatives in Curitiba aiming to link digitalisation and sustainability. Every project in Curitiba has to link to sustainability and the SDGs. Internationally, Curitiba participates in various collaborations, including partnerships with the United Nations, the C40 city network and the Smart City Expo (BC 15, 10.03.2023).

Ranking eighth in the Human Development Index and excelling in GDP per capita, Curitiba surpasses the national average (Transformação Curitiba, 2018). Its status as the eighth largest Brazilian city and capital of the socio-economically advanced Paraná State drives economic activities. Notably, its sustainable restructuring distinguishes it from other fast-growing cities (Lundqvist, 2007). Curitiba ranks 104 out of 5,570 in the sustainability comparison of Brazilian cities (IDSC, 2022), thereby scoring considerably higher than Recife. Its SDG performance equally shines in industry, innovation and infrastructure, while additionally performing well in environmental aspects, namely climate and life below water. Like Recife, room for improvement remains in social realms such as combating hunger and fostering good health and well-being, as well as quality education.

Curitiba has a long track record of focusing on sustainability issues, even if at times under different labels. With its geographically central location and regional transport network, Curitiba has become a centre for economic activities and therefore showed rapid growth rates especially

from the 1950s to the 1980s. Despite the pressure from rapid growth and unlike other Brazilian cities, Curitiba took a sustainability-driven path to restructure the city (Lundqvist, 2007). The cornerstone of the city's reputation is its Master Plan of 1966, carried out by the Curitiba Research and Urban Planning Institute (IPPUC). The plan emphasises transport and land-use development, demographic control, improvement of the infrastructure as well as preservation of the historic city centre. For instance, the city has gained international recognition for its Bus Rapid Transit System (Rede Integrada de Transporte), which was introduced in the 1970s and served as a role model for other municipalities. The system was initially implemented as a cost-effective alternative to building an urban metro system (BC 15, 10.03.2023). Embracing the concept of a 15-minute city, Curitiba has implemented decentralised mini city halls to ensure that all public services can be easily accessed within a 15-minute radius, drawing inspiration from a similar initiative in Paris (Interview 23, 15.03.2023; Interview 27, 16.03.2023). In Curitiba, the overall impression is that sustainability is part of the city's image and self-perception, and consequently it is a pertinent governance topic.

Although a front-runner in sustainability, in terms of digital administration, the municipality of Curitiba strives to keep pace with other cities. In the municipality, the Curitiba App serves as a platform for digital public services, connecting more than 700 services. Remarkably, approximately 80 per cent of public processes have already been digitised (Interview 23, 15.03.2023). The municipality of Curitiba aims to implement a national ID card system alongside Gov.br, but it also intends to maintain its own solutions, avoiding over-reliance on federal government systems. This decision is rooted in the municipality's experience with cyber-attacks, which have rendered federal services temporarily inaccessible in the past (Interview 23, 15.03.2023). The objective is to create a unified login system for all municipal services. The municipality portal is seen as the primary means of interacting with the municipal government (Interview 23, 15.03.2023). Another noteworthy initiative is the launch of the Curitiba Card, which is connected to a unique login solution. This card not only grants access to various services, but also enables registration at multiple locations and encourages participation in city activities, somewhat gamifying the urban experience. Furthermore, the physical card ensures accessibility for elderly residents (Interview 23, 15.03.2023). Notably, Curitiba took a step forward in promoting connectivity by implementing WIFI Curitiba, which provides free internet access not only in bus stations, parks and health facilities, but also within *favelas*, making the *favela* Parolin the first one to have such access (Interview 23, 15.03.2023; Interview 27, 16.03.2023).

Curitiba's interest in digital and sustainable topics is evident in its innovative strategies and aspirations for a more interconnected and environmentally conscious urban environment. In 2017, Curitiba introduced the Pinhão Valley initiative (Vale do Pinhão), designed to promote innovation throughout the city with a strong emphasis on sustainability (Interview 27, 16.03.2023; Transformação Curitiba, 2018). Vale do Pinhão is a startup and innovation hub in Curitiba, with an aspiration to foster economic development and sustainability in the city. Launched in 2017 by the municipal government, the Vale do Pinhão initiative seeks to create an ecosystem of innovation and entrepreneurship in Curitiba, with a focus on sectors such as technology, design and sustainability. It claims to have contributed to the development of new businesses and startups in the city, as well as the creation of co-working spaces, incubators and accelerators to support their growth (Vale do Pinhão, 2023). The initiative mandates that every project in Curitiba must be linked to sustainability, reflecting the city's recognition of its importance (Interview 28, 17.03.2023). The current mayor continues to address sustainability issues, and the SDGs remained a relevant concept in the city even during their absence on the national level during the Bolsonaro administration (Interview 26, 16.03.2023; BC 15, 10.03.2023; FG 4, 05.04.2023 and 07.04.2023).

With its track record, becoming a "smart city" is a relevant concept for Curitiba, as this has extended the focus on sustainability to link areas such as mobility, climate change and energy design (Interview 28, 17.03.2023). The city faces challenges posed by climate change, including heavy rains and rising rivers, as well as water scarcity. To address these issues, initiatives such

as the Curitiba App have been introduced to connect services and provide news updates. Additionally, circular economy and waste reduction projects aim to promote recycling and reduce garbage (Interview 28, 17.03.2023). Efforts to promote environmental conservation encompass various initiatives, one notable example being the Bairro Novo da Caximba project. This project specifically targets the issue of illegal housing, aiming to rectify housing infractions and ensure adherence to regulations concerning proximity to water bodies (Interview 26, 16.03.2023). Furthermore, Curitiba is actively exploring the adoption of photovoltaic systems for municipal use to promote clean energy (BC 15, 10.03.2023) and plans to transition to electric buses within the next decade (Interview 27, 16.03.2023). The city also aims to achieve carbon neutrality through the implementation of carbon-neutral zones, particularly addressing traffic congestion (Interview 28, 17.03.2023). Leveraging the power of technology, Curitiba utilises AI-equipped cameras installed in Uber vehicles to map potholes, streamlining the identification and assessment process without the need to commission external companies (Interview 23, 15.03.2023). Curitiba has shown a persistent commitment to sustainability with a comprehensive understanding and traditional focus on the environmental dimension, proactively drawing a connection to digitalisation.

6 Understanding of the digital transformation among civil servants

Investigating Brazilian civil servants' understanding of digitalisation for sustainability, our study showed that participants mostly drew connections to "digitisation" when confronted with the term "digitalisation" (or "*digitalização*" in Portuguese), that is, thinking about the translation of analogue data into digital formats. The terminology used within the Brazilian civil service was instead "digital transformation" ("*transformação digital*"). When narrowly considering digitisation, civil servants recognised a significant advantage, especially in the resulting reduction in the use of paper, and they showed a largely positive attitude towards digitalisation as well as a broader awareness of its potential contributions for sustainability-related purposes, especially in ecological realms. They considered challenges to be mostly manageable and, additionally, largely showed awareness of the transformative power of digitalisation, partially in connection to sustainability goals. Nevertheless, the negative implications of digitalisation on sustainability, such as increased energy consumption and e-waste, were only occasionally mentioned, suggesting a lack of awareness in the full spectrum of digitalisation implications. Digital tools and processes were deemed to play an essential role in the daily work of Brazilian civil servants, partially in connection with achieving greater economic, social and ecological sustainability.

Our research results on the understanding of digitalisation for sustainability examine various aspects related to the adoption and implementation of digital tools for different sustainability dimensions. We have assessed this understanding by considering four key aspects: (1) experiences with the application of digital tools in Brazil's civil service, (2) the way civil servants contextualise digitalisation and the (sustainability) purposes they ascribe to it, (3) the perceived potentials and (4) challenges of digitalisation for sustainability. These aspects offer a comprehensive view of how Brazilian civil servants perceive and approach digitalisation for sustainability.

6.1 Experiences: areas of applied digitalisation in the civil service

When asked about the role digitalisation plays in their work, the vast majority of survey respondents (80.7 per cent) stated that the use of digital tools is important in their daily work. These entailed document management systems, including the use of electronic signatures and secure repositories, electronic processes, communication tools and data analysis software. As one survey participant confirmed, “Systems, applications, smartphones are absolutely necessary for my work today” (Survey Question 37, 2023). Utilisation of different kinds of basic digital equipment included, but was not limited to, hardware such as mobile phones, digital cameras, computers, printers and scanners, as well as software such as Office 365, Google Workspace, Adobe, Scrum, cloud services and communication platforms such as Teams and Zoom, as well as (government) websites, portals and professional social networks, illustrating that administrative work in Brazil takes place predominantly in a digital format. A mere 8.8 per cent of respondents stated that the use of digital tools played a minor role in their professional life. These numbers are a rather unsurprising result, but the utilisation methods described were not the only ways in which civil servants understood and leveraged digitalisation.

The understanding went beyond the mere use of numeric data via equipment (“digitisation”). Digitalisation, as transformative change, could be found indirectly in civil servants cherishing the possibility of remote work, and directly, as explicitly stated contributions towards the formation of digital procedures. Almost a quarter (23.7 per cent) considered themselves to be shaping digital processes in their professional environments. Of the 5 per cent choosing neither of the two previous answers and choosing “other” (which required an explanation), almost everyone still reported how they work with digitalisation, ascribing an important role to it in different professional realms, which ranged from graphic design to academia and energy. In a number of instances, civil servants drew links to sustainability and the transformative character of digitalisation.

The above-mentioned applications were ascribed economic benefits and considered to facilitate efficient communication, data management and process automation, not least through enhanced accessibility, reduced paper usage and document sharing. Although respondents occasionally mentioned that they still needed to scan documents, taking up considerable amounts of their working time, they were outnumbered by civil servants explaining that all of their work is conducted digitally.

Government’s digital tools

Among the mentioned tools, Gov.br also frequently came up in the survey and interviews alike as a digital system for administrative work. It is a widely adopted system that not only contains citizens’ individual documents (e.g. national ID, driver’s licence) in a digital format, but also offers modules concerning public management services for civil servants such as scheduling holidays and checking information about payments. It links all systems from the federal government through a single sign-on solution (Gov.br, 2023e).

Interestingly, participants also mentioned internal government tools, such as the government platform sougov.br, SUAP (Unified Public Administration System) and compras.gov.br, which facilitate administrative work in the civil sector. The described use of digital tools also extended to digital systems, including SEI*,* which is used for administrative processes and is the most frequently mentioned digital system and internal university systems (see Table 2).

Table 2: Introduction to government-specific tools and platforms reported about

System	Definition
Sougov.br	Sougov.br is an online application providing personnel management services exclusively for active federal civil servants, retirees, pensioners and politically amnestied individuals within the civil Federal Executive branch. The platform is said to act as a centralised hub that caters to various essential functions customised to the requirements of these groups. Allegedly, users can access vital services, including financial data inquiries, payslip generation, income tax certificates, payroll deductions, holiday information and functional details. The platform enables access via its website or the Sougov.br mobile application, with authentication being linked to the user's Gov.br account, ensuring a seamless and secure user experience. Sougov.br professes to not only simplify access to vital personnel information, but also provides informative resources such as video tutorials and digital guides, making it a comprehensive tool for federal public servants to efficiently manage their personnel-related affairs (Gov.br, 2023f; UFSC, 2023).
SUAP	The Unified Public Administration System is an automated system designed to streamline administrative and academic processes in Brazilian institutions. One of its notable advantages is the ability to leverage existing software code and processes from various institutions, incorporating established best practices from different regions. Moreover, SUAP offers flexibility to accommodate specific administrative and education requirements when necessary. The system is organised into modules, with each module dedicated to managing specific aspects of an institution's operations (Manuais IFSP, 2023).
Compras.gov.br	Compras.gov.br is presented by the government as a comprehensive government procurement system that is designed to simplify procurement processes across federal, state and municipal levels. It claims to act as a vital link between suppliers and public administrations, streamlining procurement operations. The platform offers opportunities for suppliers aiming to expand their businesses by connecting with government agencies seeking market solutions. It also extends its services to public organisations at different governmental levels, offering an efficient and compliant procurement framework. The platform claims to support price registration, maintain transparency standards and facilitate electronic bidding, thereby enhancing efficiency and accessibility (Gov.br, 2023g).
SEI	SEI is an electronic document and process management tool aimed at enhancing administrative efficiency in Brazil. SEI is part of the National Electronic Process (PEN), a collaborative initiative involving various public-sector entities. Its goal is to establish a public infrastructure for electronic administrative processes and documents (Gov.br, 2023h).

Source: Authors

The usage of different digital tools also extended to ecological realms, especially geo-processing. Interviewees in particular mentioned different systems to monitor and manage environmental processes, including systems for deforestation identification, sustainable forest management, and flora and fauna databases. When reporting about their digital works, both survey participants and interviewees believed that digital technologies help them to work more efficiently and effectively, while also enabling them to provide better services to citizens.

Survey participants and interviewees alike explained that the surge in digital collaboration was, as in other places, strongly influenced by the rise of remote work, propelled not least by the Covid-19 pandemic. Communication platforms and virtual collaboration environments gained prominence, allowing teams to continue collaborating, regardless of physical location. These digital tools were considered to be emerging as crucial facilitators of efficient teamwork and project management, underscoring their role in maintaining productivity amidst changing work dynamics. Interviewees further suggested that remote work has led to a better understanding of digitalisation.

Overall, survey and interview responses reflected a multi-faceted engagement with digital processes across diverse sectors, converging with the common aim of improving efficiency, accessibility and collaboration through digital tools. The respondents underscored the significant role of digital tools in streamlining administrative procedures, while also emphasising the importance of digital preservation strategies and ongoing training in digital literacy.

Shaping digital processes

Interestingly, education-related processes emerged as a recurring theme among survey participants actively involved in shaping digital processes. Considering that a significant proportion of survey respondents have professional backgrounds in education, it appears natural that this field was referred to in civil servants' answers. Mentioned examples include the creation and handling of virtual learning environments, which feature online teaching tools such as simulators and electronic communication channels to interact with students – tools that were reported to have gained prominence in academic settings. These technologies were deemed to facilitate flexible learning experiences, transcending traditional boundaries and enabling learners to engage with educational materials remotely, thus also carrying social implications.

In the context of digital tools, respondents further emphasised their utilisation for enhancing human resource management, streamlining payment systems and automating various processes. More specifically, civil servants repeatedly mentioned their involvement in the creation of digital citizen services, the development of tools for digital information provision and the automation of workflows. Accordingly, AI and automation constituted pivotal elements in the endeavours of survey respondents. The integration of AI was considered to expedite processes, but also to foster the development of adaptive and responsive systems. In this regard, some mentioned collaborating with specialised IT departments, illustrating the anchoring of digitalisation as a cross-cutting issue in the civil service. This concerted effort towards increased administrative efficiency was assumed to lead to smoother organisational operations and resource allocation. Whereas some saw their responsibility in digitising physical products, others claimed that their entire work environment is already digital and has been this way for several years. This may demonstrate Brazil's striving towards fully digitalising its public administration and explain the predominantly digitisation-oriented understanding among civil servants.

Working with data, for example, through data analysis and business intelligence (BI) emerged as a crucial aspect. Respondents illuminated their reliance on advanced tools such as Power BI, leveraging data analysis, and BI reporting for well-informed decision-making and the continuous refinement of operational processes. These tools were seen as empowering organisations to harness data-driven insights, optimising their strategies and enhancing overall performance. Interviewees equally described the various methods through which they worked

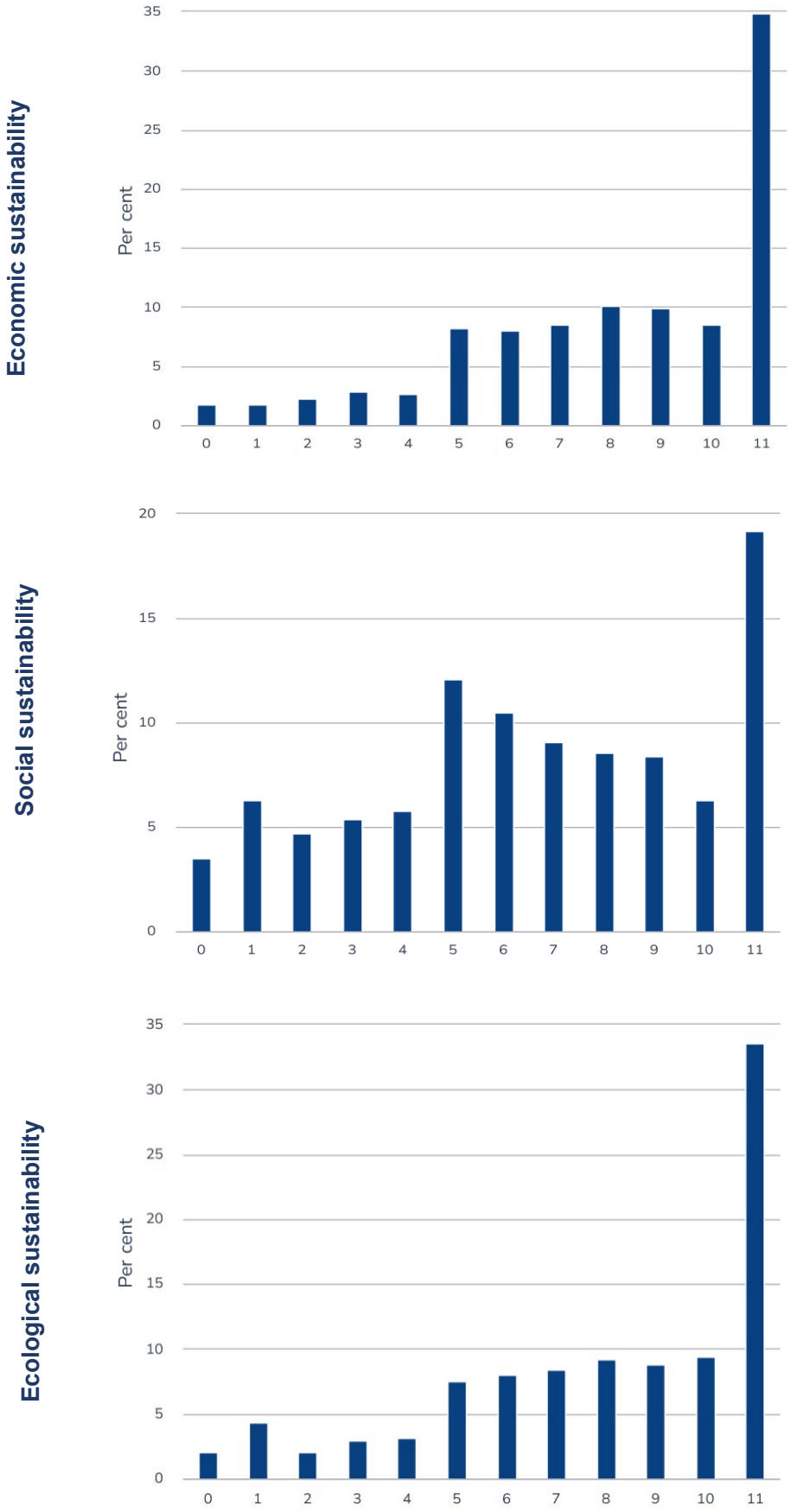
with data, such as code-based data analysis, machine learning and creating databases for the exchange of information. As one interviewee from an institute in the area of biodiversity explained, “when it comes to simple data […] there is no need of human analysis, a computer or an artificial intelligence (AI) system can do it in a matter of minutes or hours” (Interview 5, 01.03.2023). Interviewees mentioned the use of data in numerous aspects, particularly with regard to ecological sustainability, for example to measure current trends, prioritise action against deforestation and for risk management. However, a prominent obstacle frequently cited specifically in this dimension of sustainability revolved around the limited availability of environmental data, and explicitly also the constraints in accessing the data. Having to request it by email or even letter was believed to hamper civil servants’ decision-making ability. To overcome this, some suggested gathering data from all departments to guide decision-making and planning, and designing systems to monitor targets to better utilise the available data.

6.2 Sense-making: contextualisation and purposes

In Brazil’s civil service, a notable and substantial recognition of the interplay between the digital realm and sustainability transformation is a given. This acknowledgment underscores civil servants’ grasp of technology’s potential in propelling sustainable progress within the country. Furthermore, our survey showed civil servants discerned the intersections of digitalisation across all three dimensions of sustainability, with the economic and ecological facets emerging as the most salient, followed by social sustainability.

When asked about which sustainability dimension they connect with digitalisation in Brazil, answers to our survey reveal that 34.9 per cent of respondents firmly perceive a robust correlation between digitalisation and economic sustainability, with more than 80 per cent indicating a connection that ranges from moderate to strong. Concurrently, 33.6 per cent attested to a distinct correlation, and more than 77 per cent to a somewhat strong correlation between digitalisation and ecological sustainability. In contrast, the weakest association was between digitalisation and social sustainability. Merely 19.2 per cent of participants agreed that they saw substantial ties, whereas 62 per cent acknowledged a connection that surpassed the moderate threshold. Notably, almost 40 per cent said they perceived a feeble connection, likely stemming from the respondents’ recognition of there being substantial room for enhancement with regard to this particular nexus (Survey Question 40, 2023). This is depicted in Figure 12, with the value 0 expressing “no connection”, and 11 standing for “strong connection”. Irrespective of whether participants noted positive or negative correlations, these numbers collectively underscore the comprehensive nature of the respondents’ perceptions. These insights emphasise their intricate understanding of the interdependence between the dual transformations of sustainability and digitalisation.

Figure 12: Links perceived between digitalisation and sustainability dimensions in Brazil



Source: Authors

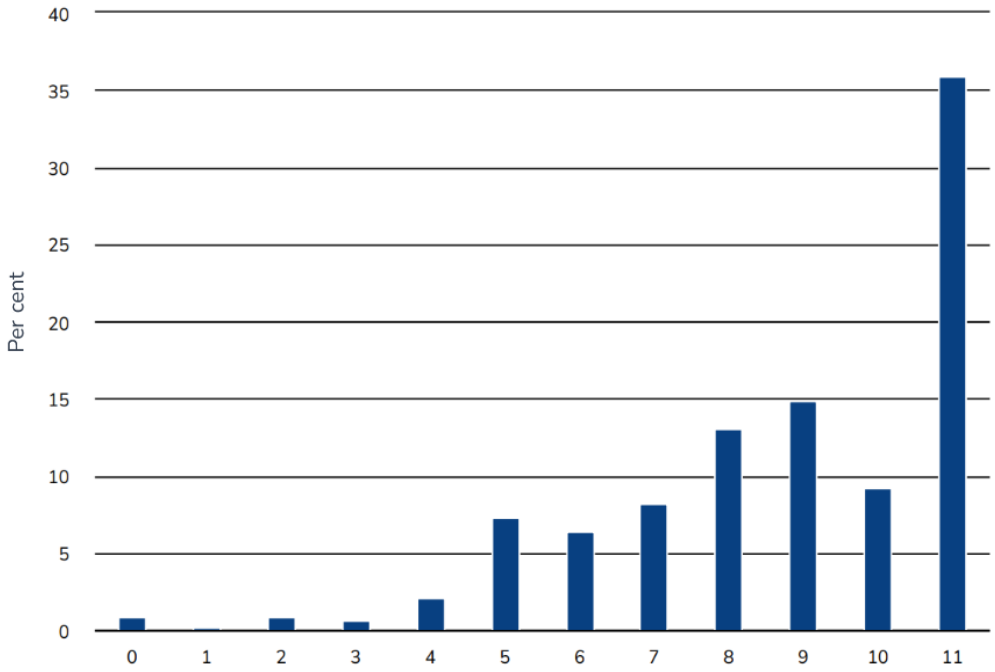
When asked about what they understand by digitalisation specifically, most survey participants answering this question (69.7 per cent) provided clear definitions of digitisation, describing it as the transformation of physical data into digitalised formats. Although this may hint at a narrow understanding of the term at first glance, it may have to do with the choice of the word "*digitalização*" (digitalisation) used in the question. As civil servants explained during a workshop, "*digitalização*" is indeed used to describe digitisation in Brazil, whereas people use the term "digital transformation" to talk about the development and dynamic use of digital tools, which corresponds to the definition for digitalisation used in this paper. Nonetheless, about a quarter of survey participants providing a definition for digitalisation (25.8 per cent) demonstrated a broader understanding of the term, writing descriptions that matched digitalisation (or digital transformation) rather than digitisation. Among these respondents, a few included both concepts in their descriptions, thereby offering a delineation of the two terms.

Additional comments by both survey participants and interviewees illustrated the recognition of a clear purpose of digitalisation. Although not specifically asked to do so, respondents tended to include an evaluation of digitalisation in their responses, showing consciousness of its deeper significance. The main purposes ascribed to digitalisation can broadly be classified into the categories of sustainability and service provision – while 6.8 per cent of survey respondents mentioned aspects such as efficiency gains as well as environmental and social benefits, 13.8 per cent structured their answers around digital service provision, repeatedly mentioning improvements in terms of speed and access compared to physical service provision. If rated, the mentioned aspects were largely seen as adding value – either economically or from a social and environmental perspective.

6.3 Perceived potentials

Showcasing a predominantly positive perspective on digitalisation and the transformative possibilities it may usher in, civil servants in our study detected a range of digital potentials in their country. When asked about the effects that digitalisation yields for sustainability in Brazil, survey participants generally embraced a positive outlook. The vast majority (87.8 per cent) of respondents rated digitalisation as enabling for sustainability goals in the country, with 35.9 per cent viewing it as highly enabling. The number of civil servants adopting a more critical stance by rating it as rather harmful to harmful equalled 4.9 per cent. A mere 0.9 per cent indicated that digitalisation actually harms sustainability in Brazil. Among these more critical survey respondents, they repeatedly mentioned concerns related to the necessary social and environmental improvements. Interestingly, two-thirds (66.7 per cent) of critical respondents were female, and about one-third belonged to a rather high age segment of 60-66 years. The distribution of answers to the question "Overall, how do you assess the effects of digitalisation on sustainability in Brazil?" is illustrated in Figure 13. Answers range from "very harmful" (0) to "very enabling" (11) (Survey Question 41, 2023).

Figure 13: Estimation on the effects of digitalisation on sustainability in Brazil from very harmful (left) to very enabling (right)



Source: Authors

In terms of evaluating how digitalisation was seen to enhance sustainability, survey participants and interviewees recognised a multitude of potentials.

6.3.1 Views on digitalisation for economic sustainability

Although this dimension was not always labelled specifically as such, both interviewees and survey respondents recognised the considerable economic potentials offered by digital endeavours, thus drawing predominantly positive connections between digitalisation and economic sustainability.

Cost reductions

The most prominent of the several benefits civil servants saw in the connection between digitalisation and economic sustainability was that digitalisation allows for a reduction of costs in various areas of life. Respondents frequently referred to saving public money, especially by replacing physical documents with digital ones (e.g. Interview 3, 27.02.2023). Yet, lower costs through digitalisation were not only linked to decreases in paper use, but also to a reduction in printing documents and bureaucracy in general, as well as savings on costs for various kinds of transport. Interviewees repeatedly mentioned the option of remote work, facilitated through the digital transformation, which led to a drop in commutes both by car and public transport, as well as inland travel via airplane, consequently saving money (Interview 20, 10.03.2023).

Cost reductions were further linked to the transition from analogue public services to digital service provision, which was seen to bring about potentials for time savings – for example by citizens avoiding long lines in front of a public service provision institution. The effects of digital transformation on the administration were described as “making it faster, [...] making it simpler, [...] making it cheaper” (Interview 4, 28.02.2023). At the same time, the costs resulting from

digitalisation, for example for energy (Vishnevsky, Harkushenko, Zanizdra, & Kniaziev, 2021), were hardly taken into account by interviewees.

Efficiency gains

Survey participants and interviewees at both the federal and municipal levels consistently highlighted the optimisation of workflows and public services. Interviewees argued that the use of digital technologies helped to connect producers and consumers, simplified tax records and reduced bureaucracy. Interestingly and somewhat counterintuitive, a prominent point was that digitalisation may foster closer relations between citizens and public service providers, inter alia, as it facilitated research on and connection to the Brazilian population through digital tools. This, it was felt by some, would open new possibilities to tailor services more specifically to the individual needs of citizens, hence not only improving public services but also designing policies to be more citizen-oriented (Interview 22, 15.03.2023).

Specific examples for such policies and digital initiatives largely referred to the Gov.br platform and associated services such as the digital tax statement, the virtual driver's licence and the living proof required for senior citizens to obtain their pensions in Brazil. Similarly, digitalisation was frequently seen as a driver for the reduction of bureaucracy. Interviewees mentioned the role of digital tools in rationalising work processes, both by facilitating transactions and reducing the scope and complexity of processes previously conducted offline.

Better financial services

The potential benefits identified at the intersection of digitalisation and economic sustainability encompassed various financial aspects. These included the prospect of a more inclusive, secure and cost-effective banking system. Interviewees argued that Brazil's fintech industry had grown considerably in the past decade. This, it was felt, was mainly due to policies conducive to the reduction of entry barriers for fintech companies, and thus to fostering the creation of startups, thereby boosting innovation and financial inclusion. Moreover, PIX, the national instant payment system in Brazil, was frequently mentioned as a financial success story propelled by digitalisation. As one interviewee working in the field summarised,

> PIX, the financial payment system here in Brazil [...] makes the costs lower or access to digital products [...] innovation and digitalisation [are] the main drivers, at least for the last several years [...] We are trying to think about innovation [...] regarding the regulatory framework, to foster innovation, to reduce barriers, to facilitate access. (Interview 31, 17.02.2023)

Interviewees frequently considered Brazil to be a forerunner in different fields of technology, not only in fintech but also in areas such as blockchain. This focus on technology, innovation and science reportedly enhanced Brazil's economic performance and competitiveness, thereby spurring national development – not least through the creation of new markets. Potentials were recognised, especially in the field of climate finance, carbon credits and different kinds of bonds. As explained by an interviewee:

> This is an opportunity to place the digital [...] platform [....], the central bank as a provider, an operator of critical infrastructure for ESG markets. So that's why we're not only focused on financial products, financial markets [...], we could leapfrog and maybe try to create some kind of common infrastructure for these ESG markets. (Interview 31, 17.02.2023)

Through aspects such as public services, citizen-oriented policies and PIX, the nexus between economic sustainability and digitalisation intersects with the nexus between social sustainability and digitalisation, presenting a complex interplay of factors that shape Brazil's sustainable

development landscape. This calls for closer scrutiny of the nexus between digitalisation and social sustainability.

6.3.2 Views on digitalisation for social sustainability

Social sustainability was a key topic among Brazilian civil servants with regard to digitalisation and inherent potentials. Interviewees drew strong connections between the use and application of digital tools and their potentials for social sustainability in Brazil, as might be expected in a country that has shown considerable progress in developing and implementing a sustainability agenda which features social matters to a significant extent (Gomes Barbosa, 2021; Portela Fernandes de Souza et al., 2019). Furthermore, not least due to the Covid-19 pandemic, investments have been channelled towards social policies and health issues (Portela Fernandes de Souza et al., 2019). And thirdly, the government has introduced programmes that align with SDG-compatible social targets (Brazilian Government, 2017). In this context, digitalisation was seen as fostering ties between society and the government, promoting inclusivity and addressing inequality. At the municipal level, “smart cities” became a keyword for digitalisation, which is expected to improve efficiency and reduce costs for public transport, while also enhancing housing allocation and urban planning.

Better public services

The nexus between digitalisation and social sustainability was frequently considered a driver for more inclusive public services and policies. However, civil servants also noted that those implementing digital solutions must consider the needs of all populations, including those that may not have access to hardware or software.

In accordance with the findings in the section on the economic dimension, the implementation of tax operations through Gov.br was seen as a positive development, as it was understood to lead to increased efficiency and reduced costs for citizens. Overall, interviewees frequently adopted an appreciative stance towards Gov.br, especially with regard to increasing the level of accessibility to governmental services. Similarly, digitalisation was argued to foster both the design and monitoring of public policies aimed at the Brazilian population by allowing for the collection and connection of data. As one interviewee summarised,

> it’s much easier for us to do research and to listen to the population using digital tools […]. We did that like a couple of times to get some feedback […and…] had answers in a small amount of time. So, it’s very easy to do that. (Interview 25, 16.03.2023)

Moreover, digital solutions such as digital doctor’s appointments, psychological counselling, and health or vaccination education were mentioned to potentially improve the quality of life for both poor and middle-class populations.

Social schemes, opportunities and digitalisation

Interviewees also mentioned social assistance and social security programmes such as the INSS and Bolsa Família, which, they felt, could benefit from digital solutions, not least because the latter can facilitate the monitoring and impact evaluation of such social programmes. Digital tools such as machine learning allowed for the evaluation of initiatives organised by interviewees’ own ministries as well as those introduced by other public policies.

Regarding their work environments, interviewees further argued that digital solutions help with job matching and search, learning programmes and apprenticeships. They reported that this can be achieved, for instance, through digital platforms matching the skills of individuals with the different requirements of job vacancies. Despite potentially posing challenges related to

social inclusion, digital solutions were overall considered to have potential for better work time management and work–life balance, not least through the option of having a home office (Interview 14, 07.03.2023).

Financial inclusion

Digital solutions were mentioned to potentially also help with financial inclusion. In this regard, interviewees mentioned initiatives such as PIX and Caixa Tem, the latter being an app devoted to welfare benefits, which has reached high levels of adoption since its release. In particular, PIX was seen by many as a turning point in the history of financial inclusion in Brazil, changing the lives of many citizens who lacked the resources to open a bank account, and with PIX were offered the possibility of online banking access through the digital payment system. Respondents' pride in the social gains achieved through PIX was evident throughout several interviews, as also visible in the following quote:

> We are pretty happy with the results of the PIX instant payment system. [It is] a very high-profile product and we were very successful when we deployed PIX. […] Digital payments usually are the first entry door there for the financial citizenship and financial inclusion […] Everyone, [every] adult citizen […] has a cell phone, internet connection, they […] probably already have a bank account. (Interview 31, 17.02.2023)

However, the implications of digitalisation on ecological sustainability cannot be – and were not – overlooked by civil servants.

6.3.3 Views on digitalisation for ecological sustainability

The responses obtained from civil servants indicated a growing interest in the role of digitalisation in promoting ecological sustainability. This might also reflect a certain selection bias, as interviewees' work contexts were often environment-related. Against the backdrop of a recent governmental change to a government claiming to prioritise environmental protection and to push matters revolving around ecological sustainability on the political agenda (Rannard, 2022), it seems natural that civil servants recognised a range of potentials of digitalisation for ecological sustainability. Brazil's potentials to become a global leader in guiding the way towards a low-carbon economy in general (AYA Earth Partners, 2022) was unquestioned.

Many understandings of digitalisation for ecological sustainability did go beyond paper reduction as a very common first association to also include more process-driven applications of digitalisation. For instance, civil servants in Brazil were considering various ways in which digital tools can be used to monitor and address environmental challenges, including energy savings, enhanced waste management and awareness-raising. Another area concerned the monitoring of carbon and biodiversity markets, more specifically, for transparency and more efficient regulation. Overall, the points raised revealed a generally optimistic stance towards the various possibilities that digitalisation was felt to offer for ecological purposes.

Better monitoring of environmental regulation

Digitalisation was estimated to make a difference in monitoring. Civil servants mentioned the technology to detect deforestation, monitor forest cover, wildlife, carbon inventory, flood risks, landslides, wildfires and other environmental issues. This also included governmental policies and guidelines and related digital initiatives – such as the CAR, a tool for environmental monitoring in Brazil – which were felt to provide opportunities for environmental regulation and monitoring risk areas. Interviewees further expected the use of digital tools to monitor environmental matters in order to provide the potential for enhancing decision-making and policy development.

At the same time, transparency through better digital monitoring was highlighted both at the municipal and federal levels. Interviewees mentioned inventories displaying municipal emissions, thus establishing a basis for initiatives aimed at the reduction of greenhouse gases. Civil servants saw examples of panels at the federal level that provided information to the public about both climate change and sustainability legislation. Specifically, AdaptaBrasil[1] and AdaptaClima were mentioned, digital platforms (co-)initiated by the Ministry of Environment with the goal of providing information. They were felt to increase transparency about issues such as water management, agriculture, environmental risks and disasters in Brazil as well as the country's national adaptation agenda.

Energy savings through better control and planning

Energy savings constitute another area where digital tools were mentioned to be beneficial for ecological sustainability, with examples such as automated sanction tools, for instance speed controls, used to lower emissions in transport. At the same time, digitalisation was argued to contribute towards lower energy consumption in transport, since better planning reduced the number of commutes and car trips undertaken. Yet, the increased need for energy due to an acceleration of digital processes in the country was hardly touched upon by interviewees.

There were large expectations about the creation of smart cities, which were argued to be characterised by lower energy consumption, less pollution, and better air and water quality. The 15-minute city is a concept relevant to the idea of smart cities, as it was described to promote the idea of compact, walkable communities with easy access to services and amenities. This was relevant both at the municipal level, especially in Curitiba, where several interviewees mentioned competitions related to climate smart cities that the municipality participates in. An interviewee from the federal Ministry of Environment summarised the different sustainability-related benefits that smart cities spawned through the use of digitalisation in the following way:

> When we talk about smart cities, […] digitalisation, […] we're talking about increasing efficiency of public transport, increasing the allocation of housing, of diminishing distances between housing [and] workplaces. Now the idea of the 15-minute city, for instance, I think using digitalisation to design smart cities, improve urban planning, can greatly increase sustainability. (Interview 9, 03.03.2023)

Improved waste management

Both at the federal and municipal levels, interviewees further highlighted the contribution of digital initiatives and applications towards improving the environmental performance of municipalities. In this regard, waste management and recycling constituted popular examples that were repeatedly mentioned. At the federal level, the importance of digitalisation to provide indicators and information that is relevant for all steps in the solid waste management process was stressed by an interviewee from the Ministry of Environment:

1 AdaptaBrasil, also known as the Sistema de Informações e Análises sobre Impactos das Mudanças do Clima (Climate Change Impact Information and Analysis System), is an initiative established by the Ministry of Science, Technology and Innovation in Brazil. Its primary objective is to consolidate, integrate and disseminate information to advance the analysis of climate change impacts, both observed and projected, within the national territory. The platform claims to serve as a vital tool for authorities responsible for adaptation efforts, researchers, civil society and the private sector. AdaptaBrasil operates under the auspices of the Ministry of Science, Technology and Innovation, with governance overseen by a Managing Committee consisting of representatives from these three institutions. The platform's core function is to facilitate the accessibility and dissemination of integrated and up-to-date climate-related information and risk assessments, covering areas such as water resources, food security, energy security, port infrastructure, health and geo-hydrological disasters in Brazil (AdaptaBrasil, 2023).

> Because we have information from municipalities, […] the whole cycle of solid waste management like generation and transport, collection and collection transport and treatment […] we have different indicators and we have different information being provided for different institutions or governments. And there is no other way if not digitalisation […] to provide good information to improve solid waste management. (Interview 35, 07.03.2023)

Interviewees both in Curitiba and Recife introduced digital initiatives devoted to recycling at the municipal level, for example through specific applications for mobile devices. Similarly, interviewees reported about mobile applications that are designed to denounce environmental crimes and incidents with the goal of keeping the number of adverse impacts on the environment as low as possible.

Other, cross-cutting findings

Lastly, repeatedly mentioned among interviewees was the potential of digitalisation to facilitate the dissemination of information on environmental topics, helping to sensitise the broader public and increase awareness about environmental sustainability in Brazil. In this context, however, civil servants occasionally mentioned the threat of fake news, which was considered to have polarised Brazilian society and drawn attention from environmental issues. At the same time, the use of digital tools for environmental monitoring and denunciations was seen as a strong measure to counteract the spread of fake news.

Occasionally, interviewees discussed the more negative effects of digitalisation, mentioning for example, the disposal of electronic scrap metal or – occasionally – increased energy consumption, accelerated by the digital transformation in Brazil. What was noticeable throughout the interviews is that a considerable number of interviewees tended to mainly link digitalisation with the ecological dimension of sustainability. Only a smaller portion drew links between several or all dimensions, such as an interviewee from the Ministry of Management and Innovation in Public Services, who stated vividly: “[T]he board that we have to use to surf the digitalisation wave, it is the board built by environmental and social perspective. That’s the best way” (Interview 3, 27.02.2023).

The quote also illustrates how the economic dimension tends not to be explicitly featured when asked about sustainability. It appears instead to serve as a beneficial component when talking about the advantages of digitalisation, such as speed, lower costs and efficiency. This may be explained by a perception that economic gains per se were contradictory to sustainability, or that economic gains were linked exclusively to the notion of digitalisation. In any case, experts from our partner institutions pointed to the recentness of the change in government around the time of our interviews, with attitudes towards sustainability likely to have just begun to undergo substantial changes in Brazil.

6.4 Perceived challenges of digitalisation for sustainability

Although Brazilian civil servants recognised the potential benefits of digital solutions in various domains, including public services, social programmes and financial inclusion, they were also keenly aware of the associated challenges. Particularly in the dimension of social sustainability, participants detected considerable room for improvement; this dimension was considered the least connected to digitalisation in Brazil in the survey and interviews. Social inequalities and the digital divide were critical concerns, emphasising the need for inclusive design and bridging the gap in digital literacy.

Although some acknowledged the ecological challenges posed by digitalisation, there was less of a focus on these concerns, indicating a potential oversight in understanding the full spectrum

of the effects of the digital transformation. The latter was confirmed throughout several interviews, wherein interviewees answered “no” if asked explicitly whether they saw any challenges resulting from digitalisation.

In the realms of economic sustainability, civil servants doubted if it was feasible to quantify the cost reductions. Although digitalisation was perceived to cut costs at various points, interviewees considered it difficult to calculate and showcase the monetary savings achieved through the transition to digitalisation, as they were counterfactual. As one interviewee explained:

> [E]very [digital] initiative […] will make us save billions of Reais [...] sometimes it’s hard to get that into accountability. For many reasons. First, it’s money you save. It’s not money that you want. So it is really [in] no bank account and nobody sees this money. (Interview 22, 15.03.2023)

Civil servants flagged concerns mostly about social inequalities and obstacles to digital inclusion, such as limited access and internet connectivity, and concerns that digital systems consequently were reinforcing exclusionary structures and inequalities. Access to the necessary hardware and software for utilising digital services was argued to pose a significant hurdle, particularly for marginalised communities and those living in rural areas. Many respondents emphasised the importance of ensuring that digital solutions benefited all segments of the population, including vulnerable groups. A crucial question was how to actively include segments of the population with lower levels of digital literacy. As one interviewee from the Rio de Janeiro City Hall aptly stated,

> You have to give access to the people and I think one of the main challenges in modern democracies are these of access. Because we provide services and many times services for the middle class and upper class, because the lower class doesn’t know how to ask for the service, take advantage of the services. (Interview 22, 15.03.2023)

Civil servants further pointed out that the digital divide remains a formidable obstacle, with technologically literate individuals more likely to embrace digital solutions. As one interviewee from Curitiba Municipality noted:

> We have to be careful because we have […] this social side that the private sector doesn’t have. […] We have very literate people working with technology and citizens that are very fond of technology. But we still have people that have to go in person because they don’t deal with technology […] or they don’t want to deal with technology. (Interview 23, 15.03.2023)

Interviewees consistently stressed the importance of maintaining physical service provision alongside digital offerings to ensure accessibility for the entire Brazilian population. The aspiration to leave no one behind also created tensions concerning the use of AI in job applications and which data are fed into the system, as an interviewee pointed out (Interview 17, 08.03.2023). Some interviewees noted the importance of combining different sustainability dimensions with digital solutions to address these challenges, as well as democratising access to technology through programmes that benefit vulnerable populations.

Adverse impacts on the environment resulting from an increased uptake of digital tools and technologies was rarely mentioned by civil servants. Only few recognised related challenges such as the need for equipment, energy and rare minerals that were considered to not be recyclable or sourced sustainably. Some interviewees expressed the views that the share of energy used for digitalisation was minor compared to industrial energy uses, while others felt they would not know how to quantify digitalisation-related effects. Criticisms in this dimension of sustainability were few, and if brought up, they predominantly came from employees of the Ministry of Environment.

7 Conclusion

Our research provides insights into the governance of digitalisation for sustainability in Brazil's civil service as well as the understanding civil servants possess regarding the topic. The findings indicate that digitalisation holds substantial potential for transformative change in Brazil. This optimism is rooted in a conducive governance structure that has led to impressive digital initiatives at the federal and municipal levels, combined with a supportive civil service. We found a broad understanding of digitalisation for sustainability that was underpinned by positive attitudes – the Brazilian civil service generally maintains an optimistic attitude towards digitalisation for sustainability, with the perceived benefits outweighing any concerns. Consequently, the interplay of internal and external factors that guide the direction of digitalisation is propitious for advancing ecological, social and economic sustainability in Brazil's civil service. Nevertheless, challenges remain and will play a pivotal role in determining the success of digitalisation for sustainability in the long term.

7.1 Factors for success

Concerning the external factors influencing the trajectory of digitalisation, Brazil's good record of harnessing digital technologies for sustainability can partly be attributed to its governance structures for digitalisation. The creation of a dedicated government entity, the SGD, operating in parallel and in cooperation with digitalisation departments across various ministries, establishes digitalisation as a cross-cutting priority within Brazil's civil service, enabling effective implementation across diverse departments, governmental levels and institutions. As a federal republic, governance in Brazil encompasses various levels of government: federal, state and municipal. Federal policies set the tone and provide a framework within which other institutions and municipalities develop their digitalisation strategies. Consequently, central digitalisation policies and narratives at the federal level have a profound influence on how digitalisation is perceived and implemented throughout the country. While these policies lay the foundation, the reality of digitalisation often varies, as it is filtered through the perspectives and priorities of civil servants operating at different levels of government.

At the federal level, digital governance in Brazil is characterised by a set of initiatives and policies aimed at advancing the country's digital transformation and sustainability goals. These include the promotion of digital identity systems, electronic payment platforms and e-participation initiatives that foster engagement between citizens and government. In this regard, it became evident in our research that Brazil has made significant strides in embracing digital initiatives. Notably, the Gov.br platform has streamlined interactions between citizens and the government, enhancing digital transactions and personal identification processes. The introduction of the E-wallet and National Digital Identity systems further marks a substantial leap in this regard. At the intersection of digitalisation and sustainability, the Brazilian Ministry of Environment has been active in promoting ecological technologies, focusing on detecting deforestation and registering land ownership. These efforts align with Brazil's sustainability agenda, which emphasises combating deforestation, mitigating climate change and working on social inclusion. Since the recent change of government, the concept of sustainability has regained considerable traction within Brazil, with an increasing emphasis on ESG principles being integrated into government institutions.

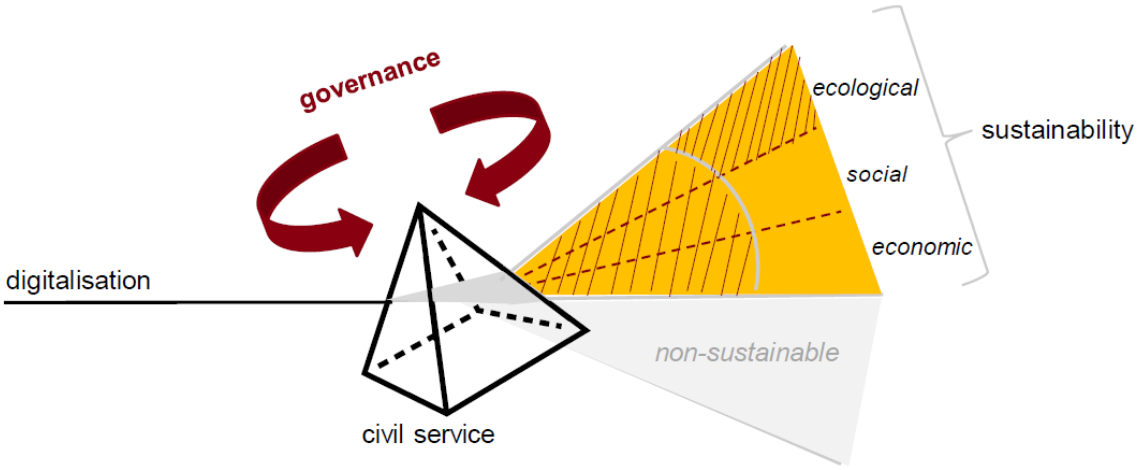
The municipal level equally plays a crucial role in shaping Brazil's digital transformation. The municipalities of Rio de Janeiro, Curitiba and Recife offered insights into practices pioneering at the intersection of digitalisation and sustainability. Rio de Janeiro is deploying advanced technologies to monitor and mitigate natural hazards and urban challenges, while introducing digital initiatives such as Portal Rio 1746 and Carioca Digital to enhance city services. In Recife, technology plays a vital role in economic development, with Porto Digital serving as a massive

technology and innovation hub, fostering sustainability through a multitude of start-ups and other companies that position the city as a significant technology park in Latin America. Curitiba, for its part, known for its strong sustainability efforts, demonstrates a commitment to digitalisation with the Curitiba App and other initiatives, aiming to create a unified login system while maintaining independence from federal systems, emphasising technology's role in addressing both environmental and social challenges.

Furthermore, a collaborative relationship between the public and private sectors for the implementation of digitalisation endeavours is evident in different municipalities, but it also extends to the federal level through institutes and companies such as ANATEL and EMPREL. These public–private partnerships offer the advantage of leveraging private-sector expertise and flexibility, which accelerate innovation and the adoption of cutting-edge technologies while maintaining adaptability to evolving digital trends, as the variety of projects continuously introduced by these entities suggests.

In brief, governance appears to be conducive in tilting digitalisation into a sustainable direction, as illustrated in Figure 14.

Figure 14: Governance structures in Brazil tilting digitalisation into a sustainable direction



Source: Authors

7.2 Perceptions of Brazil's civil servants

The understanding of civil servants regarding digitalisation for sustainability – the prism through which digitalisation is administratively filtered, so to say – was our second element for enquiry.

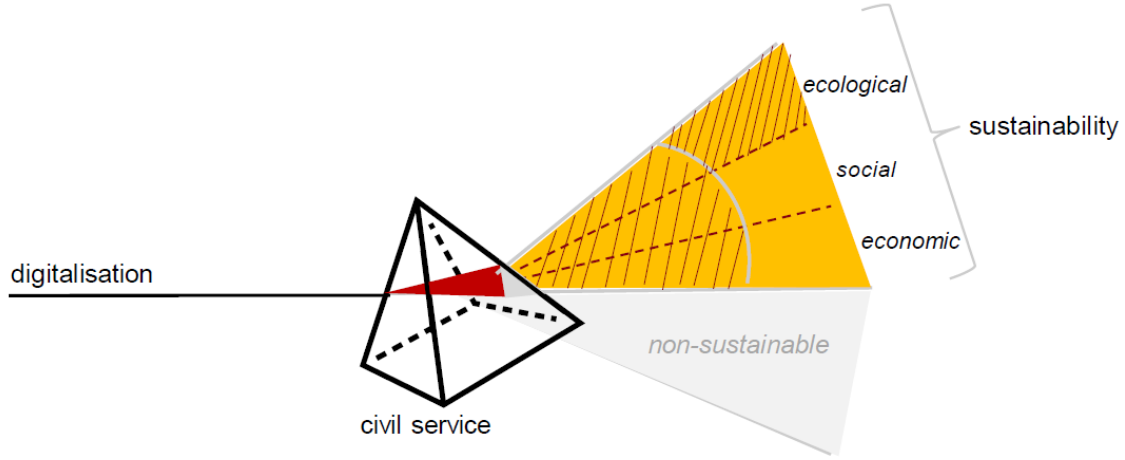
Our research had to cope with a slight confusion regarding the terminology around "digitalisation" and "digitisation", which was often clarified during the interviews. Civil servants mostly professed a broad understanding of the interplay between digitalisation and sustainable transformation, linking the former to all three dimensions of sustainability.

The discussion paper highlights that civil servants primarily and positively associate digitalisation with efficiency gains, environmental benefits and improved service delivery. Actors in Brazil's administration see digitalisation as a means to enhance decision-making, law enforcement and administrative processes, impacting public administration and governance comprehensively. The overwhelmingly positive stance towards digitalisation as an enabler of sustainability in survey results showcases a consensus among civil servants in this regard. More specifically, the multifaceted benefits of digitalisation in automation, efficiency, environmental

monitoring, resource conservation, citizen engagement and inclusivity, are viewed as contributing to the economic, ecological and social facets of sustainability. At the same time, the recognition of challenges illustrates that civil servants are not blind to the challenges; they expressed concerns about the digital divide, access limitations, potential inequalities arising from digital systems, particularly in the realm of social sustainability, and, to a more limited extent, ecologically negative effects.

Altogether, the prevailing outlook on digitalisation for sustainability in Brazil remains positive, contributing to civil servants' optimistic perspective, which is potentially conducive to leveraging digitalisation for sustainability goals. Civil servants revealed that they actively embrace digital tools and processes. They also frequently assume the lead in the shift towards innovative digital practices, and thus ascribe themselves with a proactive role in adopting digitalisation. This bodes well for successfully further integrating AI and automation in transforming workflows and decision-making. Tools such as Power BI might enhance data-driven insights while addressing data accessibility challenges in ecological sustainability.

Figure 15: The civil servants' understanding tilting digitalisation into a sustainable direction



Source: Authors

All dimensions of the "understanding" construct drawn upon in this discussion paper – contextualisation and purposes, potentials, challenges, attitudes and applications – are predominantly present in the minds of civil servants and frequently associated with positive aspects. Translated to the depiction of our research question, we find a good indication that civil servants make positive sense of digitalisation for sustainability. This, combined with relatively widespread experiences with existing digital tools, offers favourable conditions for digitalisation in a country that is being moulded in a sustainable direction (see Figure 15).

7.3 Challenges in the process: structures, perceptions and training needs

Although both governance structure and civil servants' understanding and experiences are conducive to steering digitalisation in a sustainable direction in Brazil, challenges remain and need to be addressed in order to ensure that Brazil's civil service continues to steer digitalisation in a sustainable direction over the long term.

Among the key challenges, data protection and security constitute a major challenge in Brazil's civil service – one critical aspect of digital governance in Brazil is data and IT governance, which

involves the development and implementation of policies that ensure proper data management, integrity and security. The Brazilian Civil Rights Framework for the Internet and the Brazilian General Data Protection Law are significant regulations governing data protection and privacy in the digital sphere. These regulations serve as the foundation for secure and responsible data practices within the country. In reality, though, discussion about security in the country revolve more around securing functionality than data protection. Although concerns about potential hacker attacks were repeatedly voiced, the country's dependence on US technology giants, predominantly, was mentioned as a concern only in isolated cases. Prioritising data protection alongside securing functionality will be essential for the country's digital governance and the overall security of its civil service.

Moreover, structural challenges in Brazil's civil service remain. Although civil servants exhibit a predominantly positive attitude towards digitalisation, critical statement about their own institutions within the Brazilian administration highlighted issues such as power imbalances and bureaucratic inefficiencies. The challenges of digitalisation in Brazil extend to capacity-building, mainstreaming and the provision of digital infrastructure. There is the need for a structured approach to digitalisation at the federal level, which includes improving data security and trust-building regarding data handling by the government. Although the involvement of private companies helps address limitations in the civil service's capacity, the overall use of software, tools and applications from US technology firms also raises questions about potential dependence on private firms for digital transformation, as described above.

In terms of governing digitalisation for sustainability at the municipal level, our study showed that, despite the breadth of projects initiated in these cities, municipal civil servants tend to be dissatisfied with their limited leeway in implementing desired digitalisation endeavours, claiming that the monetary resources and power needed to steer such developments are concentrated at the federal level. Yet, the existence of a core driver for digitalisation at the central level was one of the key initial strengths in the Brazilian system.

The overall – often rather narrow – awareness of challenges, in particular within environmental realms, leaves room for improvement and the development of deeper knowledge about the full spectrum of implications that digitalisation may yield for all aspects of sustainability. The latter is essential for ensuring that digitalisation is truly steered in a sustainable direction in the long term. Zooming in on the different sustainability dimensions, our data indicates strongly perceived correlations between digitalisation and economic sustainability, while ecological sustainability is also seen as being closely linked to digitalisation. Although social sustainability is considered a major issue among study participants, there is more room for improvement, as there is less resonance in this area with survey participants, in particular. This is also of high importance considering Brazil's status as a country with high levels of inequality. Hence, there is room for a more comprehensive understanding of the potential challenges and implications across ecological, economic and social dimensions.

A holistic approach that addresses these facets is essential for ensuring a sustainable digital future in Brazil. Notably, respondents exhibit varying interpretations of digitalisation, with some adopting a broader perspective that encompasses digital transformation beyond mere digitisation. This underscores the necessity of clear communication on this subject. Training emerges as a possible means to address various deficiencies. Civil servants express a strong desire for training, especially in the intersection of digitalisation and sustainability.

Future research may complement this discussion paper by conducting a long-term sustainability assessment, for example through a longitudinal study assessing the sustainability outcomes of digitalisation efforts in Brazil. Measuring the respective impacts on ecological, economic, and social sustainability dimensions and monitoring progress over time could prove to be valuable additions to this present research, which is based predominantly on the experiences and perceptions of civil servants, and thus comes with potential shortcomings related to possible

inaccuracies of self-reported data. Moreover, closer scrutiny regarding the effectiveness of data protection and cybersecurity measures in Brazil's civil service may be a valuable supplement that we were not able to focus on in more detail in this paper. Assessing the implementation of regulations such as the Brazilian Civil Rights Framework for the Internet and the Brazilian General Data Protection Law in more depth, and exploring ways to improve data security may help ensure and safeguard the security and privacy of both public and private data in the digital sphere. Lastly, comparative studies looking at digitalisation efforts of other countries with both similar and more varied governance structures and digitalisation/sustainability challenges as those in Brazil, may prove to be valuable. To enhance this perspective, expanding the number of countries and conducting a comparative analysis of their efforts in digitalisation for sustainability alongside those in Brazil could offer novel insights. These insights may facilitate the identification of best practices and lessons that can be adapted and shared across diverse country contexts, thus enhancing the efficiency and sustainability of leveraging digitalisation for sustainability.

7.4 Recommendations

These findings suggest that Brazil's progress with digitalisation stands out on the international stage, particularly in the group of middle-income countries, but also in comparison with the endeavours of some high-income countries. Nevertheless, there is room for improvement by adopting a comprehensive, well-coordinated strategy that integrates both digitalisation and sustainability objectives, and thus has the potential to unlock transformative changes within the country. In this final section, we delve further into these insights.

Brazilian schools of public governance

Public governance institutions in Brazil should place greater emphasis on sensitisation to the challenges posed by digitalisation for sustainability. This could be achieved through the implementation of dedicated training programmes. Such efforts are crucial in guiding the civil service in Brazil towards a sustainable trajectory for digitalisation in the long term.

Schools of public governance may further inform and train civil servants at the federal and municipal levels about the benefits of cooperation and interoperability and equip them with the necessary technical skills. Better coordination between different institutions may ultimately increase efficiency, save time and resources, and create synergies between digital projects through information-sharing and interdisciplinary collaboration. Given the rather superficial discussions on security, sensitisation on the importance of data protection would also be beneficial to ensure data security in the civil service and for citizens as well as decrease dependency on foreign technology corporations.

The Brazilian government

The Brazilian government has a role in setting uniform standards for data and processes that ensure seamless information exchange between different levels of government and institutions. This might include the development of shared IT systems and databases, thus approaching challenges related to interoperability. The promotion of best practice and experience-sharing may foster learning effects between different states and municipalities, which tend to have similar projects and may thus create synergies or replicate successful models.

The Brazilian government may also benefit from strengthening its guidelines regarding data protection and security. Although sensitising for the importance of this topic is one important aspect, ensuring that laws and policies are properly followed through in practice may be a necessary addition. In this regard, the establishment of evaluation and monitoring mechanisms

may be beneficial to make sure that data is handled confidentially and the risks of data and identity theft are minimised.

Lessons learnt for other nations

As shown throughout this discussion paper, Brazil offers a highly interesting case for studying digitalisation, in particular its interconnection with sustainability. The country is a frontrunner in digital endeavours such as the digitalisation of its public services, and it implements a wide range of digital projects with the goal of achieving different sustainability goals at various levels of government. Although Brazil is a pioneer in various aspects, it also faces several challenges. Despite offering a different setup, other countries can certainly learn from the Brazilian case. At the same time, international cooperation – not least with Germany, a partner country of Brazil – may contribute towards furthering the discourse, both nationally and internationally.

Among the lessons learnt, other countries may bear in mind that, from a structural and governance perspective, establishing a central coordinating body devoted to digital ventures – in addition to introducing digitalisation as a cross-cutting issue at different ministries and governmental institutions – may facilitate a holistic and effective approach towards digitalisation. This may ensure that the topic is properly rooted in country contexts with similar federal systems, while also protecting the interoperability of systems.

Public–private partnerships may help propel the implementation of digitalisation projects, as initiatives both at the federal and municipal levels in Brazil have shown. Private firms specialised in digitalisation may fill the gaps that the civil service has in different areas, and thus push projects that would otherwise be lacking the proper resources. As they tend to face fewer bureaucratic hurdles, public–private companies could further help accelerate the speed of projects that might experience more delays if they were to be implemented exclusively by public institutions. At the same time, considerations regarding data protection and digital security should not be neglected for the sake of faster project implementation.

Germany, in particular, may – as a partner of Brazilian development cooperation – engage in policy and knowledge exchange in addition to facilitating access to international funding sources and grants for the sustainability and digitalisation of projects in Brazil. Although Germany (as part of the EU) excels in data protection but lags in the digitalisation of its civil service (Fahrenholz, 2023), Brazil presents the opposite scenario. Therefore, both countries could benefit from exchanging policies and regulatory frameworks related to digitalisation and sustainability to refine their policies and adapt them to the respective contexts. Additionally, facilitating forums, conferences and networking opportunities between German and Brazilian civil servants, policy-makers and experts could encourage the exchange of ideas and foster partnerships.

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Annexes

Annex 1: List of conversations

(Agenda: yellow=background conversation; blue=focus group discussion held at a workshop; green=focus group discussion)

Date	Conversation type	Institution	Number of participants
8/12/2022	Background Conversation	Ministry of Economy	1
9/12/2022	Background Conversation	WBGU	1
14/12/2022	Background Conversation	GIZ	3
30/01/2023	Background Conversation	KfW	1
31/01/2023	Background Conversation	Konrad Adenauer Foundation	1
16/02/2023	Background Conversation	ENAP	1
16/02/2023	Background Conversation	Rui Barbosa House Foundation	1
17/02/2023	Background Conversation	City Hall Rio de Janeiro	1
23/02/2023	Background Conversation	Oficina Municipal	2
27/02/2023	Background Conversation	GIZ	1
28/02/2023	Focus Group Discussion / Workshop	Ministry of Environment / Ministry of Education / FGV / Oswaldo Cruz Foundation / Federal Audit Office / ENAP / MPOR (National Civil Aviation Secretariat) / IBAMA / Movimento Brasil Competitivo / Ministry of Labour and Employment	18
01/03/2023	Background Conversation	SERPRO	8
02/03/2023	Focus Group Discussion	Ministry of Education	9
06/03/2023	Background Conversation	Dataprev	5
09/03/2023	Focus Group Discussion	ANATEL	9
09/03/2023	Background Conversation	EMPREL	2
10/03/2023	Background Conversation	FGV Projetos	1
10/03/2023	Background Conversation	Prefeitura de Curitiba	1
14/03/2023	Background Conversation	State of Paraná	1
14/03/2023	Background Conversation	3WINGS	3
14/03/2023	Background Conversation	ARIES	1
16/03/2023	Background Conversation	AMA (Agentes do Meio Ambiente)	1
05/04/2023 & 07/04/2023	Focus Group Discussion / Workshop	Ministry of Education / FGV EBAPE / ENAP	4

Annex 2: List of semi-structured interviews

Date	Institution
24/2/2023	INSS
24/2/2023	ICMBio
27/2/2023	Ministry of Management and Innovation, Secretariat of Digital Government
28/2/2023	Ministry of Management and Innovation
1/3/2023	ICMBio
2/3/2023	Ministry of Management and Innovation, Secretariat of Digital Government
2/3/2023	INSS
2/3/2023	Ministry of Management and Innovation
3/3/2023	Ministry of Environment
3/3/2023	Ministry of Environment
3/3/2023	Ministry of Environment
6/3/2023	MCTI (Ministry of Science, Technology and Innovation)
6/3/2023	IBAMA
7/3/2023	Ministry of Environment
7/3/2023	Ministry of Environment
7/3/2023	IBAMA
8/3/2023	Ministry of Labour
8/3/2023	Ministry of Health
9/3/2023	Pernambuco Government
10/3/2023	Instituto de Tecnologia e Sociedade de Rio de Janeiro
14/3/2023	Porto Digital
15/3/2023	City Hall Rio de Janeiro
15/3/2023	Municipal Secretariat for Administration, Personnel Management and Information Technology in Curitiba/ Instituto das Cidades Inteligentes
15/3/2023	City Hall Recife
16/3/2023	Centro de Operações do Rio de Janeiro (COR)
16/3/2023	City Hall Recife
16/3/2023	Curitiba Urban Secretariat (SMU)
17/3/2023	Curitiba Agency of Innovation
17/3/2023	Secretary of Environment, Curitiba
16/2/2023	Audit Office Rio de Janeiro State
17/2/2023	Brazilian Central Bank
23/2/2023	Casa da Moeda
24/2/2023	Chamber of Deputies – School of Parliament
7/3/2023	Ministry of Environment
7/3/2023	Former Ministry of Environment
13/3/2023	PARANACIDADE

Annex 3: Survey outline (English translation)

Page 1 – Information on the survey

Thank you for collaborating with our research project! It will only take 10-15 minutes to complete the survey.

As a group of young researchers from the German Institute of Development and Sustainability (IDOS), which is co-leading the project, we are currently investigating how digitalisation can contribute to sustainability in Brazil. You can find a detailed description of our team and our topics here.

Although you will be asked to disclose some personal information such as your job position and work location, all data will be anonymised and cannot be linked to your person. All information will be treated highly confidential and in line with the Brazilian General Data Protection Law (Law No. 13,853/19), and, as required by the funder, in line with the European Union's General Data Protection Regulation (GDPR; you can find details here). By answering our survey, you agree to these guidelines.

Page 2

Question 1

Do you work in the Brazilian civil service?

Options:

- Yes
- No

Page 3

If participants select "no" as the answer in the question before, they are not relevant for our study. Therefore, they are directed to this finishing page and cannot answer the rest of the survey questions.

Page 4 – Personal Information

Question 2

At what administrative level do you work?

Options:

- Federal
- State
- Municipal

Question 3

In which sphere of power do you work?

Options:

- Executive
- Judiciary
- Legislative

Question 4

What is the level of your commissioned position?

Options:

- Lower than or equal to DAS-3, FCPE 3, CCE level 10,11,12 or FCE level 10,11,12
- DAS-4, FCPE 4, CCE level 13, 14 or FCE level 13,14
- DAS-5, FCPE 5, CCE level 15,16 or FCE level 15,16
- DAS-6, FCPE 6, CCE level 17 or FCE level 17
- FCE level 18
- Other, please specify (with open textbox)

Question 5

In which state is your workplace located?

Options: Dropdown menu with all 26 states

Questions 6 to 32

Please select the city that you are located in.

Options: A dropdown menu with all cities of the respective state selected in question 5.

Question 33

In which institution or company do you work?

Option: open textbox

Question 34

What is your main area of work (e.g. environmental protection, education, public health)?

Option: open textbox

Page 5 – Digitalisation

Question 35

What do you understand by digitalisation?

Option: open textbox

Question 36

What role does digitalisation play in your work (tick all boxes that apply)?

Options:

- A) Digitalisation plays a minor role in my daily professional life
- B) Digitalisation plays a significant role in my daily professional life
- C) I shape digital processes (e.g. policies, tools, solutions)
- D) If other, please specify (with open textbox)

Question 37 (displayed if previous answer was B) or C))

If the answer is B) or C): Which digital tools or processes do you mean (please describe)?

Option: open textbox

Page 6 – Linking Digitalisation and Sustainability

Question 38

What do you associate with sustainability in Brazil? (multiple choice possible)

Options:

- Economic development
- Social development
- Ecological development
- None of the above (please specify, open textbox)

Question 39

Do you agree with the following statement: Digitalisation and sustainability are currently interlinked in Brazil (please tick one of the four options)?

Options:

- Strongly disagree
- Disagree
- Agree
- Strongly agree

Question 40

What aspects of sustainability do you see linked to digitalisation in Brazil?

Options: One slider for each dimension (economic, ecological, social), ranking from “no connection” to “strongly connected”

Question 41

In general, how do you assess the effects of digitalisation on sustainability in Brazil?

Option: slider ranking from “very harmful” to “very enabling”

Page 7 – Potentials of Digitalisation for Sustainable Development

Question 42

Statement: Digitalisation will be high on the agenda in Brazil in the next 3-5 years.

Options:

- Strongly disagree
- Disagree
- Agree
- Strongly agree
- I don’t know

Question 43

Statement: Sustainability issues will be high on the agenda in Brazil in the next 3-5 years.

Options:

- Strongly disagree
- Disagree
- Agree
- Strongly agree
- I don't know

Question 44

What sustainability dimension do you see digitalisation strongly connected to in the next 3 to 5 years?

Options: One slider for each dimension (economic, ecological, social), ranking from "no connection" to "strongly connected"

Question 45

What changes do you expect for the fields of digitisation and sustainability in the next 3-5 years?

Option: open textbox

Page 8 – Knowledge and Training in Digitalisation for Sustainable Development

Question 46

How familiar are you with the following topics?

Options: sliders for "sustainability", "digitalisation" and "interconnectedness between digitalisation and sustainability", ranking from "unfamiliar" to "very familiar"

Question 47

On what topic would you like to receive training to (be able to) meaningfully connect digitalisation and sustainability, if applicable? (please elaborate)

Option: open textbox

Question 48

Do you see training needs for civil servants on digitalisation for sustainability? (if yes, please specify)

Option: open textbox

Page 9 – Personal Information

Question 49

What gender do you identify with?

Options:

- Masculine
- Feminine
- Divers

Question 50

What is your age group?

Options:

- 18-24
- 25-31
- 32-38
- 39-45
- 46-52
- 53-59
- 60-66
- 67 and older

Question 51

What is your highest level of education?

Options:

- High school diploma
- Bachelor
- Master
- PhD
- Apprenticeship
- If other, please specify (open textbox)

Question 52

Work experience: How long have you been working in the civil service?

Options:

- Less than 1 year
- Between 1 and 5 years
- Between 5 and 10 years
- Over 10 years

Page 10 - Thank you

Thank you so much for taking the time to participate in our research, your contribution is very important to us. If you have any questions about our project, feel free to contact us at any time [mail address provided].