

The Hidden Side of Digital Transformation: Environmental Impact and Regulatory Gaps in Peruvian Digital Public Infrastructure

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Abstract

[Purpose] This article examines a critical omission in Peru's public digital transformation policies: the absence of environmental impact assessments (EIA) and sustainability criteria in the acquisition and implementation of digital public infrastructure (DPI). Although other sectors incorporate EIAs, the state's digital ecosystem is still governed by a 2004 decree that ignores these standards. In the context of climate crisis, this omission is particularly worrying.

[Methodology/approach/design] Using an exploratory qualitative methodology, the current legal framework was analyzed. This included the 2023 AI Law and its 2025 Regulation, the National Digital Transformation Policy, the General Public Procurement Law, and environmental legislation, to identify relevant gaps in sustainability and transparency. In parallel, recent technological acquisitions were reviewed through journalistic sources, transparency portals, and public information access requests.

[Findings] The results reveal a concerning dissonance: while the country celebrates the approval of the first AI Law in Latin America and the recent adoption of its regulation with ethical principles, the rules governing software acquisitions remain outdated and do not consider environmental impact criteria. Furthermore, transparency obligations are focused solely on public entities, without requiring disclosure about the environmental impacts of private providers. This inconsistency limits the possibility of building an environmentally responsible DPI.

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[Practical implications] The study proposes updating procurement regulations, incorporating specific EIAs for digital technologies, and guaranteeing environmental transparency as a principle. This approach not only has potential for the country but also represents a concrete starting point for advancing toward more robust regional technology regulation.

[Originality/value] The article is innovative in proposing that DPI should be treated like any other public infrastructure: with environmental impact assessments and sustainability standards throughout its lifecycle. Starting with the demand for sustainability from state-contracted providers can pave the way for more robust, cross-cutting regulations in the technology sector.

Keywords: Digital public infrastructure. Environmental impact. AI regulation. Public procurement. Sustainability.

I. INTRODUCTION

The notion of digital public infrastructure (DPI) has gained increasing relevance in international debates on digital governance, particularly as a framework for articulating identity systems, digital payments, data-sharing mechanisms, and more recently, artificial intelligence (AI). While countries such as India or Estonia have advanced consolidated DPI agendas, in Peru the concept remains absent from the language of public policy. Nevertheless, different layers of what international literature identifies as DPI are being deployed, including the expansion of digital identity systems, the consolidation of digital payments, and the approval of the first regulation on artificial intelligence which explicitly incorporates sustainability among its guiding principles.

This scenario raises a fundamental question: to what extent is Peru developing digital public infrastructures without explicitly naming them as such, and how are environmental sustainability standards incorporated—or neglected—within this process? Addressing this question is not only relevant for understanding the Peruvian case, but also for assessing how emerging economies are negotiating the so-called twin transitions (digital and green).

This paper makes two main contributions. First, it documents the incipient construction of DPI layers in Peru despite the absence of a unified terminology, showing how public institutions, regulations, and projects already form a digital ecosystem with long-term implications. Second, it analyzes the weak integration of environmental standards into digital policy, emphasizing the risks of deploying DPI without mechanisms to internalize their ecological externalities.

While the international debate has emphasized the opportunities of DPI for development, less attention has been paid to the environmental standards guiding their deployment, especially in the Global South. This study addresses that gap by

examining how Peru is simultaneously constructing DPI layers and neglecting to internalize their environmental externalities, positioning the country as a crucial case study for understanding the intersection of digital governance and environmental sustainability in the Global South.

II. THEORETICAL FRAMEWORK

2.1. Digital Public Infrastructure

2.1.1. Background

For over two decades, the idea that technology can play a key role in generating public value has been consolidated. For example, between 2003 and 2005, the World Summit on the Information Society (2005) led to an important agenda for the time. The Tunis Agenda, also known for creating the mandate for the Internet Governance Forum (IGF), highlighted the potential of Information and Communication Technologies (ICT) in terms of opportunities for developing countries. It also recognized the need to leverage this key role in national strategies as an integral part of national development plans.

In turn, organizations like the OECD introduced the term “e-government” to describe the use of ICT as tools to improve governance and achieve public policy goals (Finn and Giovannini, 2003). While these tools had been used between 1970 and 1990 for disseminating government activities through websites, their potential is even greater. Thus, the OECD understands that they could primarily provide the necessary support to achieve a government that provides greater and better value, through the development of electronic public processes and services. It considered their potential to maximize efficiency, good governance, and political effectiveness while minimizing costs and maximizing value for citizens and businesses (OECD, 2005).

A significant conceptual step was taken in 2014, with the publication of the OECD's *Recommendation of the Council on Digital Government Strategies*. This recommendation marked the transition from “e-government” to “digital government,” redefining the use of ICT as an integral part of government modernization strategies aimed at creating public value. The recommendation highlights that this type of government relies on a digital ecosystem composed of various actors who support the production of and access to information, services, and content through interaction with governments. It also suggests three axes or pillars to ensure the strategic use of ICT by governments: (i) openness and engagement to secure public trust; (ii) governance and co-ordination; and (iii) capacities to support implementation (including the regulatory framework that enables this) (OECD, 2014).

For its part, the European Union approved the EU eGovernment Action Plan 2016-2020, whose vision is to make public administrations “open, efficient and inclusive, providing borderless, interoperable, personalised, user-friendly, end-to-end digital public services to all citizens and businesses” (European Commission, 2016). Subsequently, agreements like the Tallinn Declaration on eGovernment promoted the adoption of action lines to operationalize principles such as “digital by default,” “inclusiveness and accessibility,” and “openness & transparency,” among others (EU Ministers, 2017).

Later, frameworks such as GovTech emerged: a comprehensive governmental approach for public sector modernization, aimed at increasing efficiency, effectiveness, transparency, and accountability, and consequently, improving service delivery outcomes (The World Bank, 2020). In 2022, the GovTech Maturity Index (GTMI) was launched, which measures key aspects of four areas or axes: (i) core government systems, (ii) public service delivery, (iii) citizens engagement, and (iv) GovTech enablers, defined as cross-cutting drivers of the digital transformation agenda (The World Bank, 2020; The World Bank, 2021).

The OECD, meanwhile, understands this concept as the collaboration between the public sector, start-ups, innovators, government “intrapreneurs,” and academia on digital government solutions (OECD, 2024). This proposal includes GovTech as one of the concepts measured in the Digital Government Index, as it is a component of the “Government as a platform” dimension (OECD 2023). The idea of government functioning as a platform (Ga-a-P) is a proposal by O'Reilly, who presented it as an improvement on the “vending machine government” model. Instead of people paying taxes and receiving public services in return, the government as a manager of a successful platform allows the participation of an entire ecosystem (O'Reilly, 2010).

At the same time, the focus was also on digital transformation: a concept centered on incorporating ICT to improve service delivery, change organizational culture and processes, and impact value creation (Mergel, Edelmann, and Haug, 2019). Although there are various theoretical approaches, most come from frameworks that highlight (i) the impact that technologies can generate at an institutional level (Fountain, 2001), and (ii) the cultural and organizational change that this transformation implies, including the new ways in which society relates to information and demands new types of public services (Dunleavy, et al. 2006). In recent years, this concept has influenced multiple national strategies or public policies; for example, Chile, Spain, and Peru incorporate the term into their digital agendas.

Most of these approaches have a common focus on how the digitalization of processes or services can make government operations more efficient. Consequently, even when they adopt ideas like open standards or shared

infrastructures (O'Reilly 2010), the framework they propose is still limited, as they do not fully explore the potential of ICT and governments to create other large-scale values. In this sense, other proposals have emerged that go beyond the paradigm of digital services to focus on a large-scale transformation capable of maximizing the creation of public value, addressing deeper layers (Mazzucato, Eaves, and Vasconcellos, 2024). This is precisely the case of Digital Public Infrastructure (DPI).

2.1.2. The Emergence of DPI

DPI is an emerging concept in digital governance and public administration studies, with a greater presence from 2020 onward. It refers, mainly, to shared digital systems that enable the provision of services, accelerate innovation, and allow for social and economic development (Eaves and Rao, 2025). Despite being a relatively new term, it has gained relevance with remarkable speed and has already been incorporated by organizations such as the OECD, the World Bank, the World Economic Forum, the G20, and the United Nations in their respective work agendas, which has an evident impact on the public agendas of countries globally.

Even though its appearance in global policy is recent and its spread rapidly, its academic definition is still in process. Despite this, it is possible to find relevant theoretical bases in various disciplines. As systematized by Eaves & Rao, the concept rests on contributions from fields of study such as economic theory, public administration, digital governance, media studies, and innovation studies (2025). From a public administration perspective, concepts such as e-Government or digital transformation discussed in section 2.1.1 provide a relevant contribution to what is now known as DPI. While they often refer to the integration of ICT into various processes or organizational aspects, it is also pertinent to explore their potential to enable civic involvement and participation or address social exclusion.

From a public value perspective, these studies have highlighted, above all, values such as transparency, efficiency, and civic involvement. Public value theory also allows for deeper discussion of how ICT can offer innovative ways to plan, design, and implement digital government initiatives, so that they not only maximize public value but are also designed with that purpose (Eaves and Rao 2025).

From an economic perspective, the study of the role of ICT in the economy has a long history: for at least the last decade, the consensus around the “digital economy” has been relatively broad. The digital economy corresponds to the aspect of the economy that is derived primarily from ICT with business models

based on digital goods or services. Digital infrastructure, in this case, refers to the fundamental (or foundational) ICT and essential systems for modern economic activities, such as hardware, software, networks, storage, etc. While this may seem like a very narrow field, it has set the tone for the subsequent development of the DPI concept.

In addition, according to the Digital Public Goods Alliance's GovStack Community of Practice, DPI ecosystems are made up of digital public goods (Digital Public Goods Alliance 2022). In this sense, it is also relevant to look at the theory of public goods, a proposal from neoclassical microeconomic theory that characterizes them based on two main attributes: (i) their non-excludable nature, according to which it is very costly or practically impossible for one person to prevent others from enjoying the good; and (ii) their non-rivalrous nature, where their consumption by someone does not reduce the “amount” of the good available to others (Mazzucato, Eaves, and Vasconcellos, 2024).

Furthermore, the theory of public goods is linked to the concept of externalities. In fact, when a public good has positive externalities, there is usually underinvestment, since its effects make it difficult for private returns to be appropriated. Conversely, when there is overinvestment in areas with negative externalities, governments must adopt public measures that encourage private actors to internalize those costs, as is the case with polluting industries (Mazzucato, Eaves, and Vasconcellos, 2024). This idea will be taken up throughout this article, as it provides a valuable theoretical foundation regarding the mitigation of damages around those goods with broad public value.

2.1.3. Characterization of DPI

So far, this paper has reviewed how the global conversation about government and ICT has gone through various concepts to focus on DPI, as well as the theoretical background that supports this concept. But what exactly is digital public infrastructure?

First, the reference to “infrastructure” stands out, a term used to refer to what is “underneath” or what supports a structure (Desai and Manoharan 2024). Infrastructures, normally taken for granted, allow things to function normally. Although we don't always notice them, they support other more visible systems (Zuckerman 2020). Consequently, they are not built as ends in themselves but so that other systems can be built upon them. In addition, infrastructures generate externalities (both positive and negative), so they generally operate as costly public goods, as it cannot always be trusted that markets will build and maintain them.

In light of these characteristics, infrastructure is understood as a “shared means to many ends” (Frischmann, 2012), highlighting its community use and the numerous possibilities it offers for private, social, and public goods and services (Desai and Manoharan, 2024). This definition includes three main criteria: (i) its non-rival consumption; (ii) the social demand for the resource, which requires it as an input; and (iii) the possibility that this input can be used for a multitude of goods and services (Mazzucato, Eaves, and Vasconcellos 2024).

In the digital sphere, the reference to infrastructures is not strange: it has generally been used to refer to the physical telecommunications infrastructure. It is also associated with the Internet, in relation to its protocols, cabling, and servers. In the literature, certain characteristics also emerge that will become relevant for the definition of DPI: interoperability, heterogeneity, or functioning through networks. However, as Mazzucato correctly points out, the “public” nature is what offers a new understanding of the concept (2024). This characteristic highlights normative values implicit in these infrastructures, as they are aligned with the creation of public value in the form of rights, obligations, and principles (Bozeman, 2007). The idea of public value can be read through the various definitions of DPI (even with possible disagreements).

In this regard, the T20 Task Force “Our Common Digital Future” systematizes a series of definitions (Task Force 2 - T20, 2023), in which it can be seen that DPI technological solutions or systems enable the provision of essential functions and services for the entire society across various sectors (Digital Public Goods Alliance GovStack Community of Practice 2022; World Bank, 2022). Furthermore, the Task Force emphasizes that the DPI approach goes beyond technological aspects to take a broader perspective regarding the ecosystem of governance, capacities, innovation, and multi-stakeholder participation (Task Force 2 T20, 2023). The Center for Digital Public Infrastructure, for its part, refers to this approach as one that combines open technology standards with robust governance frameworks to incentivize community innovation that allows addressing large-scale social challenges (such as financial inclusion, quality education, accessible health, etc.) (2023).

Consequently, three relevant dimensions can be seen to characterize DPI. On the one hand, regarding its *technical attributes*, interoperability, the use of reusable building “blocks,” and the use of open-source software licenses, among others, stand out. These have implicit values such as scaling or efficiency (Mazzucato, Eaves, and Vasconcellos 2024). In this aspect, the idea of “stacks” or blocks that make up the layers of DPI is notable. Each is connected to the adjacent ones, so that the more superficial layers benefit from the resources created in the deeper ones (Eaves, Pope, and McGuire, 2019). These standards give DPI a powerful capacity for innovation and scalability, given that the

building blocks can be reused for various other goods, services, and infrastructures.

On the other hand, regarding its *functions*, its ability to help shape community life (and not just at an individual level) is highlighted by allowing citizen involvement in civic life in digital environments (Zuckerman, 2020). This is an important characteristic of infrastructures in general, which generate social value by promoting intra- and inter-community relationships. DPI also plays an important role in economic development and growth. All of this has effects on improving the quality of life, with the consequent impact on the full exercise of human rights.

Finally, regarding its main *manifestations* or *core layers*, the literature recognizes three: digital identity, digital payments, and data-sharing systems (UNDP, G20, 2023; World Bank, 2022). Some other frameworks also add electronic signatures and digital transactions (Task Force 2 T20, 2023). The OECD, for its part, proposes six key components: digital identity, digital payments, data-sharing systems, digital post, digital notifications, and base registries (OECD 2025, p. 102). Other theoretical frameworks also recognize how Artificial Intelligence, which constitutes a general-purpose technology, can be integrated into various DPI systems (Nagar and Eaves, 2025).

2.2. A Safe, Inclusive, and Effective DPI

As seen in the previous section, DPI has a sensitive relationship with human rights. Given its purpose of addressing large-scale social challenges, the way DPI is built (both technically and in terms of governance) can have important impacts in these environments. This is the case, for example, with digital identity: depending on the regulatory, technological, and practical frameworks, a DPI could place marginalized communities that do not get a digital identity in a situation of greater exclusion and lack of access to public services. In this sense, contemporary social challenges—marked by inequality in access to technology, the growing dependence on digital systems in the provision of public services, and the risks associated with surveillance or exclusion—make it essential that DPI is not limited to a purely technical discussion.

Beyond its architectural design or functional components, DPI must be conceived as an institutional and social framework that requires guarantees of security, transparency, and inclusion from its initial stages. In this sense, academic and normative reflection agrees that the sustainability and legitimacy of these infrastructures depend on their ability to respond to principles of equity, accountability, and human rights protection. This gives way to a closer examination of what we mean by a safe and inclusive DPI. In this context, the

recent formulation of the Universal DPI Safeguards Framework by the United Nations is a relevant milestone to operationalize these aspirations (UNDP, UN Tech Envoy, 2025). This framework is the result of multi-stakeholder consultations to ensure that countries' DPI implementations mitigate risks at both individual and social levels, while also promoting the advancement of the Sustainable Development Goals. To do this, the framework organizes its content into key components: 18 principles, 13 interrelated risks, and practical recommendations distributed across five phases of the DPI lifecycle: conception, design, development, deployment, and operation/maintenance.

The Framework's principles are divided into foundational and operational. The foundational principles include: do no harm, do not discriminate, do not exclude, uphold the rule of law, focus on future sustainability, reinforce transparency and accountability, promote autonomy and agency, and foster community engagement. The operational principles include: build and share open assets, sustain financial viability, practice inclusive governance, respond to gender, ability or age, ensure data protection during use, assure data security by design, ensure data privacy by design, evolve with evidence, and leverage market dynamics (UNDP, UN Tech Envoy, 2025). Together with the practical recommendations, they seek to offer guidance to governments to promote reliable and inclusive DPI.

In fact, the “lexicon” of inclusive DPI has transcended more than one United Nations process. For example, the Global Digital Compact (GDC) approved within the framework of the Pact of the Future (September 2024, UNGA79) recognizes that digital public goods (which include open-source software, open data, open artificial intelligence models, open standards, and open content) empower societies and individuals to direct digital technologies to their development needs and can facilitate digital cooperation and investment. In addition, the GDC highlights the potential that DPI has to deliver services at scale and increase social and economic opportunities for all. Because of that, Member States commit to “develop and decide on a set of safeguards for inclusive, responsible, safe, secure and user-centred digital public infrastructure that can be implemented in different contexts” (United Nations General Assembly, 2024).

For its part, the latest Draft Political Declaration of the II World Summit for Social Development, published in July, also highlights the need to strengthen equitable, safe, reliable, and affordable access to digital technologies, digital public goods, and DPI (United Nations, 2025). Although it does not expressly mention safeguards, it does emphasize the goal of achieving a safe and reliable DPI for all people, with a focus on social inclusion, hand in hand with access to rights such as education, health, and decent employment.

2.3. Digital Sustainability and DPI

The interest of the United Nations and various multi-stakeholder actors in DPI also articulates with the 2030 Agenda, a global commitment to poverty eradication and planet protection through 17 Sustainable Development Goals (SDG). The Pact of the Future (along with the Global Digital Pact) is a renewal of this agenda and represents a renewed commitment to be able to take actions that allow the SDGs to be achieved, given that the current outlook suggests that, without new actions, these goals cannot be met (Sostenibles.org 2024). This is exacerbated by the emergence of new risks and challenges of the 21st century, for which new institutions may be necessary (United Nations, 2024).

In this sense, DPI is being understood as a key piece to accelerate progress toward these SDGs. This idea, from the G20, suggests that DPI can maximize opportunities for digitalization, based on a person-centered approach (United Nations 2023). In fact, the G20 and the UNDP have already documented a compendium of more than 50 technological solutions (some of which, in the words of the report, might “deviate slightly from the definition of DPI”) key to the SDGs (G20, UNDP 2023). By way of case studies with an indication of the maturity level of each DPI example, initiatives such as FarmStack (Ethiopia) to end hunger, PayNow (Singapore) to eliminate inequalities, or ABDM (India) to promote health and well-being are presented.

In this vein, DPI initiatives with the capacity to address the triple planetary crisis through scalable solutions, alongside frameworks for transparency and green financing, have generated interest (United Nations 2023). Since decision-making against the environmental crisis requires accessible, timely, insightful, and credible information, DPI could play an important role by providing data exchange mechanisms. For example, mechanisms such as (i) open data discovery for environmental sustainability; (ii) privacy-enhancing technologies to enable the flow of environmental sustainability information; (iii) data markets for environmental sustainability-related data; (iv) computational law and data integration of green and circular economy policy measures; (v) using Large Language Models to dialogue with green and circular economy policy; and (vi) tools and techniques for human-centered artificial intelligence in environmental sustainability decision-making stand out (United Nations Environment Programme 2024).

The relationship between information and the environment has been gaining attention even before the DPI concept itself. The United Nations Environment Programme has highlighted that innovative tools driven by various datasets can be key to addressing current challenges. However, existing barriers due to a lack of interoperability, fragmentation of the digital ecosystem, and limited access

pose significant challenges. In response, resolution 04/23 was approved for the development of the Global Environmental Data Strategy (GEDS), focused on data quality, interoperability, access, governance, and capacity-building (United Nations Environment Assembly of the United Nations Environment Programme, 2019).

Subsequently, the idea that DPI, through standards such as transparency, interoperability, and governance, can support the environmental decision-making process has continued to gain strength. At the policy level, it is suggested that we may be facing two key transitions (“twin transitions”): the digital and the green (Farooqi and Vora 2023). These proposals focus mainly on the scaling attribute of DPI and its capacity to be leveraged by various systems or services simultaneously. However, current case studies and action proposals are more oriented toward improving data. For example, Nature ID has emerged as a shared platform that allows for the integration of local information, remote sensing outputs, and insights from Indigenous Peoples and local communities (UNDP, 2025).

However, beyond looking at the *function* that ICT in general and DPI in particular can have to fight against the planetary crisis, it is also important to consider the environmental impacts that these technologies themselves have. Unfortunately, as has been observed, this is not the main focus highlighted by those who propose DPI as an alternative to achieve sustainability. Nevertheless, to comprehensively understand the relationship between digital sustainability and the 2030 Agenda, it is also essential to look at the environmental impacts of the very technologies that are promoted as solutions.

The deployment of digital infrastructures, the rise of artificial intelligence, large-scale data storage and processing, as well as accelerated technological obsolescence, bring with them growing environmental risks that have been documented by various research studies. These impacts are not secondary: from the intensive energy consumption of data centers and the carbon emissions associated with training AI models, to the extraction of critical minerals for devices and the increase in e-waste, the ecological footprint of the digital ecosystem poses serious challenges to sustainability.

This is particularly serious if, in addition, the inequality between countries in the Global North and South is taken into account, even though DPI is supposedly accompanied by technological sovereignty. Thus, countries in Latin America, for example, do not offer much added value in the value chain of technologies like AI, while they face their environmental impacts to a greater extent (Peña, 2025). This has been called an unequal ecological exchange by UNCTAD, detrimental to those resource-rich countries. These inequalities must be corrected while minimizing negative environmental and social impacts, including those related to

human rights, in order to achieve a more inclusive and environmentally sustainable digital economy (UNCTAD, 2024).

Particular attention has been given to AI technologies and the infrastructure that supports them (i.e., data centers), due to their energy and water consumption, carbon footprint, production of electronic waste, among others (UNEP 2024). Although various studies attempt to estimate these impacts, complete information is still lacking regarding all the variables that make up the phases of the AI lifecycle (Cowls, et al., 2023). For this reason, the United Nations Environment Program has emphasized the need for robust information (UNEP, 2024).

Currently, the UN's DPI Safeguards Framework includes a recommendation regarding this problem. With respect to oversight to anticipate and limit long-term damages, such as environmental impacts, the Framework suggests conducting environmental impact assessments and demanding the adoption of measures that can accelerate progress toward carbon neutrality. Some practical examples of this include awareness campaigns, public forums, collaboration with environmental experts to create guidelines articulated with carbon neutrality, monitoring the adoption of green technologies, etc.

III. METHODOLOGY

The study employed a qualitative, exploratory methodology aimed at identifying regulatory gaps and tensions between digital policy and environmental policy in Peru. An interdisciplinary approach was chosen, combining elements of law, public administration, economics, and technology studies.

Data collection was organized into two main axes. The first consisted of a legal-normative analysis of key instruments in digital transformation, public procurement, and environmental management. This included the Digital Government Law, the National Digital Transformation Policy, the Artificial Intelligence Law and its regulation, the General Public Procurement Law, and the National Environmental Impact Assessment System. The second axis corresponded to the documentary analysis of implementation cases, using journalistic sources, transparency portals, institutional reports, and public information access requests.

The selection of regulations was guided by two criteria: (i) transversality, in that their approval generates substantial changes for multiple entities or sectors, and (ii) foundational character, by introducing standards or principles intended to endure over time. As for the cases, those linked to the core layers of DPI identified in the literature —digital identity, digital payments, and artificial intelligence— were prioritized in order to contextualize their development in Peru. More than quantifying impacts, the methodological objective was to map the coherence — or lack thereof— between the expansion of the digital ecosystem and existing

environmental sustainability frameworks, as well as to highlight the absence of transparency mechanisms in the relationship with private providers.

IV. FINDINGS

4.1. Digital Transformation and DPI in Peru

The Peruvian digital ecosystem is characterized by significant contrasts at both regulatory and practical levels. Peru was among the first countries in the region to establish a stable Internet connection in the 1990s (USAID, 2022), and by 2005 the telecommunications sector was already regarded as dynamic and attractive to investors (CODESI, 2005). Yet, universal connectivity remains an unfinished task, particularly for vulnerable populations. A study conducted by Universidad del Pacífico for the Ministry of Economy and Finance, with support from the IDB, estimated that investments of S/12 billion would be required in the short term (2019-2024) and S/20 billion in the long term (2019-2038) to achieve basic levels of telecommunications access. The OECD further projected that nearly 50% of GDP (approximately S/360 billion at 2019 prices) would be necessary for Peru to converge with the OECD average in infrastructure provision (OECD, 2023).

As a result, public policy over the past two decades has focused primarily on reducing the telecommunications gap, promoting technological innovation and scientific research, and encouraging the adoption of ICT across productive and service sectors. This orientation is evident in the Plan for the Development of the Information Society (the “Peruvian Digital Agenda”), approved in 2005 (CODESI, 2005). Since then, the country has issued more than 2,000 digital-related regulations, with legislative activity accelerating over the last decade (Iriarte, 2023). Many of these measures targeted the modernization of public administration and the delivery of digital services, beginning with the launch of the State Portal in 2000.

The institutionalization of e-government began in 2003 with the creation of the National Office of Electronic Government and Information Technology (ONGEI), under the Secretariat of Public Management. Early initiatives included the adoption of the Technical Standard for Software Lifecycle Processes (2004) and the approval of the National Electronic Government Strategy (2006). The latter, derived from the 2005 Digital Agenda, emphasized institutional competitiveness through ICT, promoted open architectures for interoperability, and introduced projects such as electronic signatures, electronic procurement (SEACE), public key infrastructure, and the electronic national ID card.

A further milestone was the National Electronic Government Policy 2013-2017 (Supreme Decree N° 081-2013-PCM), which consolidated previous strategies and linked them with broader frameworks such as the Bicentennial Plan: Peru toward 2021. This Policy highlighted the need to enable secure electronic means for citizens, through a redesign of processes in state entities, as well as ensuring technological standards in interoperability. Another of its strategic guidelines is infrastructure, in order to have an information and telecommunications network that integrates all dependencies and their public officials, including hardware, software, systems, networks, Internet connectivity, databases, infrastructure for online training (e-Learning) and specialized human resources. Other sections of the document are also dedicated to digital literacy, information security, and transparency.

Regulatory development intensified with the creation of the Secretariat of Digital Government in 2017 (which replaced the former ONGEI), followed by the enactment of the Digital Government Law in 2018. In this regulation, digital government was defined as “the strategic use of digital technologies and data in Public Administration for the creation of public value.” This concept encompasses the set of principles, policies, norms, procedures, techniques, and instruments used by Public Administration entities in the governance, management, and implementation of digital technologies for the digitalization of processes, data, content, and digital services of value to citizens (Article 6). In addition, the law recognizes a series of guiding principles, including: privacy by design, digital by design, digital cooperation, and open data by default. The law is also important because it establishes the Digital Identity Framework, the Peruvian State's Data Governance and Management Framework, the Peruvian State's Interoperability Framework, and the Peruvian State's Digital Security Framework.

A particular mention is warranted for the law's understanding of interoperability. In this regard, the regulation recognizes four levels of interoperability: (i) organizational, referring to the objectives, processes, responsibilities, and relationships among Administration entities; (ii) semantic, referring to the use of data and information from one entity, ensuring that the format can be understood by any other; (iii) technical, related to the interfaces, interconnection, integration, exchange, and presentation of data and information, as well as defining communication and security protocols; and (iv) legal, so that technical guidelines are consistent with legislation.

The same law also establishes that public entities must ensure they obtain exclusive ownership rights over the assets of Peruvian Public Software. Furthermore, it regulates that they have the obligation to share Peruvian Public Software under free or open licenses that allow for (i) its use or execution, (ii) its copying or reproduction, (iii) access to the source code, object code, technical

documentation, and user manuals, (iv) its modification or collaborative transformation, and (v) its distribution, for the benefit of the Peruvian State (Article 26).

Subsequently, the National Digital Transformation System was created (Urgency Decree 006-2020-PCM). From then on, the country's digital policy lexicon was framed in terms of “digital transformation.” The SNTD is thus proposed as a functional system of the Executive Branch that allows for the organization of public administration activities in the field of digital transformation, as well as the participation of businesses, civil society, and academia in achieving the objectives in this area. In addition to the areas covered in the Digital Government Law, this regulation also includes topics of digital connectivity, digital education, digital citizenship and inclusion, digital health, digital justice, digital talent, e-commerce, and any other matter that has an impact on the country's digital transformation process.

Finally, the third relevant milestone in public policy was the approval of the National Digital Transformation Policy in July 2023. This Policy responds to a 2019 OECD recommendation (prior to the mainstreaming of the term “digital transformation” in the country) for it to develop and implement a broad and detailed national digital government strategy (OECD, 2019). The PNTD is a public policy instrument that articulates activities and services from both the SGTD and the different sectors (education, telecommunications, production, etc.) to achieve the organizational and cultural change that allows for a true digital transformation with public value for citizens (León, 2023). Like any public policy, the PNTD identifies and formulates a public problem upon which it builds its intervention. In this case, the problem is as follows: “there is a low exercise of digital citizenship in Peru.” Unfortunately, the diagnosis on which this conclusion is based is pre-pandemic, and it takes the connectivity gap as a reference. Given that in 2019, 41% of people had not used the Internet in the last month because they had no connection, it was estimated that this percentage of people did not exercise digital citizenship (even though the percentage changed a lot after the health emergency).

Putting aside the problems of diagnosis and baseline, it is important to note that the PNTD is one of the most important instruments that Peru currently has in the field of digital transformation. Furthermore, as a National Policy, it has guidelines, services, indicators, and success percentages, which make its tracking and monitoring much more feasible (unlike, for example, the 2006 Strategy previously reviewed, whose composition was much more narrative and incipient).

The PNTD defines digital transformation in Peru as the continuous, disruptive, strategic, and cultural change process that is based on the intensive use of digital technologies, systematization, and data analysis to generate economic, social, and

value-creating effects for people. To this end, it deploys 82 public services (many of which were already ongoing projects) across six priority objectives:

1. Guarantee inclusive, secure, and quality access to the digital environment for all people.
2. Link the digital economy to the country's sustainable productive processes.
3. Guarantee the availability of inclusive, predictive, and empathetic digital public services for citizens.
4. Strengthen digital talent in all people.
5. Consolidate digital security and trust in society.
6. Guarantee the ethical use and adoption of exponential technologies and innovation in society.

Although none of these regulatory instruments refer to “digital public infrastructure,” some of its attributes examined previously are evident, such as interoperability, open data, open-license software, etc. In addition, it is possible to identify 3 particularly important areas, in light of the core layers of DPI reviewed in the theoretical framework, that are relevant to contextualizing the state of DPI in Peru.

4.1.1. Digital identity

The national identification system in Peru has one of its main milestones in the 1993 Constitution. Until then, there was no governing body that unified a standardized model for civil or electoral registries, or that provided them with security measures that made them reliable. However, with the Constitution, the Single Persons Registry was created, and the National Registry of Identification and Civil Status (RENIEC) was designated as an autonomous entity in charge of unifying and concentrating all existing public personal identification systems (Guerrero, 2020). The successive years were critical for the formation of the centralized identification model existing in the country, and for its evolution in terms of digital identity.

In this path, the Law on Digital Signatures and Certificates (2000) and its Regulation (2008) are of particular importance. Not only is legal validity granted to electronic signatures (with an emphasis on digital signatures), but the Official Electronic Signature Infrastructure emerges, and the electronic National Identity Document (DNI-e) is mentioned for the first time as the “only identity document that allows for accreditation of identity in person and electronically.” In addition, RENIEC is granted the status of National Certification Entity for the Peruvian State, which in practice means that it issues all root digital certificates for public entities that require or seek to provide digital signature services. In view of this, RENIEC deploys the Public Key Infrastructure (PKI), that is, the set of hardware,

software, procedures, and personnel in charge of supporting the operation of the IOFE.

An important change comes with the previously described Digital Government Law (2018). Normally understood as a right, digital identity is now understood as a component of digital government. In this way, it is defined as “that set of attributes that individualizes and allows for the identification of a person in digital environments.” These attributes are granted by various Public Administration entities. In addition, with the creation of the Peruvian State Digital Identity Framework, the Secretariat of Digital Government is established as the governing body for digital identity in the country, so it is responsible for issuing guidelines, specifications, guides, directives, technical standards, and standards for the application of digital identity by entities.

The Regulation also proposes a Digital Identity model that includes: (i) principles; (ii) digital citizens; (iii) digital identity managers; (iv) the National Digital Identity Identification and Authentication Platform (ID GOB.PE); (v) digital identity attributes; (vi) digital identity attribute providers; and (vii) authentication credentials.

At the center of this new architecture is the National Digital Identity Identification and Authentication Platform (ID GOB.PE). This Platform is a service designed so that public and private entities can verify the identity of people, using three levels of trust. Although it is managed by RENIEC, its terms of use and integration protocols, according to the regulation, are defined by the Secretariat of Government and Digital Transformation.

The electronic National Identity Document (DNI-e) also occupies a central place: a version of digital identification that, in its composition, stores the digital certificates issued by RENIEC, through which citizens can authenticate themselves and also sign documents with legal value (Huaranga, 2020). More than 10 years after it began to be issued, from August 2025 RENIEC will only issue DNI-e, even though traditional DNIs retain their validity until the expiration date (RENIEC, 2025a). To date, more than one million DNI-e 3.0 have been issued (RENIEC, 2025b), which has 64 security keys and was awarded as the best new identity document of 2025 in Latin America at the “High Security Printing Latin America” conference, held by the Reconnaissance International institution from the United Kingdom (RENIEC, 2025c).

4.1.2. Digital Payments

In addition to digital identity, another key area of DPI is related to digital payments. In Peru, this dimension is articulated through the National Payments System (SNP), a set of regulations and infrastructures that allow consumers,

businesses, government, and financial entities to transfer funds efficiently. The main infrastructure of the SNP is the Real-Time Gross Settlement System (LBTR, in Spanish), administered by the Central Reserve Bank of Peru (BCRP), complemented by the Electronic Clearing House (CCE, in Spanish), payment agreements with electronic money and cards, and innovative payment services such as digital wallets or 24/7 immediate payments (Banco Central de Reserva del Perú, 2023).

In recent years, the sector has shown notable progress. Although financial inclusion grew from 35% in 2015 to almost 50% in 2021 (Castillo, Vega and Aurazo 2023), cash remains the main means of payment, especially among the unbanked population (mostly informal workers). The pandemic, however, spurred a turning point: Yape, one of the most popular wallets, alone allowed 2.2 million people to access the formal financial system for the first time (Perú21, 2022).

A central focus of the digital payments agenda has been interoperability, aimed at eliminating barriers between banks and wallets. Since 2022, the BCRP's Retail Payments Interoperability Strategy has had significant impacts: the first phase connected Yape and Plin, generating 119 million transactions by December 2024. The second phase, focused on immediate transfers and payments via QR codes, incorporated the Banco de la Nación, expanding the reach to rural sectors and historically excluded users. As a result, the total number of digital payments in 2024 quadrupled the number recorded in 2021 (Presidencia de Consejo de Ministros, 2025).

More recently, the BCRP announced an alliance with the Reserve Bank of India and the National Payments Corporation of India to implement a retail payments platform in the country inspired by the Unified Payments Interface (UPI). This system, which in India processes more than 117 billion annual transactions and reaches more than 410 million people and 340 million businesses, allows multiple bank accounts to be linked and transfers to be made in real-time via cell phones, QR codes, or virtual payment identifiers. In the Peruvian context, the adoption of this model seeks to consolidate the sustained growth of digital payments, reduce the dependence on cash, and expand access for the unbanked population to secure, interoperable, and low-cost payment services. By incorporating an open banking and international connectivity approach, the new infrastructure will not only expand options for users and businesses but also foster innovation and resilience in the country's payments ecosystem (Banco Central de Reserva del Perú 2024).

This collaboration, announced in June 2024 and reaffirmed in August 2025, establishes that the BCRP will launch a digital payments platform based on UPI technology by the end of 2026, which would correspond to phase 4 of the Interoperability Strategy (El Peruano, 2025). With this, Peru would align itself

with one of the most paradigmatic international experiences of DPI, considering that it is a concept driven from India precisely because of the milestone it represents.

4.1.3. Artificial Intelligence

Peru is one of the countries in Latin America with one of the most advanced public agendas regarding Artificial Intelligence. In 2023, it became the first country in the region to have an “AI Law,” and more recently (September 2025) it also became the first country in the region to have a Regulation. In addition, Peru is one of the five countries in Latin America that already has a completed assessment of its artificial intelligence readiness (Unesco's RAM methodology).

Since 2021, the Secretariat of Government and Digital Transformation promoted a process to design a National Artificial Intelligence Strategy. Although this strategy was never approved, it did go through a collaborative process in which experts were convened, the internal and external context for AI was defined, and certain strategic objectives were established. The document was heavily influenced by the potential use of AI in comparative experiences regarding the provision of public services; for example, it cites its use in Copenhagen municipalities to analyze and sort citizens' emails, or the use of AI in courtrooms for legal proceedings in China concerning commercial disputes, e-commerce liability claims, and copyright infringements (Presidencia de Consejo de Ministros 2023).

Subsequently, with the appearance of Chat-GPT and the popularization of various generative AI systems, the interest of the Legislative Branch in regulating the matter increased. Thus, after multiple debates and feedback from the Secretariat of Digital Government to Congress, in July 2023 the text of the Law that promotes the use of artificial intelligence for the economic and social development of the country (Law 31814) was finally enacted. According to its content, the law aims to promote the use of AI within the national digital transformation process, highlighting its use in public services such as education, justice, health, citizen security, social programs, etc. In addition, the law introduces an AI definition that becomes part of the regulatory development on the matter, despite being a deficient technique, as it defines it based on its potential to improve people's well-being, instead of adequately characterizing the technology. For the rest, it is a law of limited scope: in addition to declaring the promotion of AI to be of national interest, the law designates the Secretariat of Government and Digital Transformation as the national technical-regulatory authority responsible for directing, evaluating, and supervising the use and promotion of the development of artificial intelligence and emerging

technologies, in order to achieve the country's objectives in digital transformation and the sustainable development goals in accordance with current regulations (Article 4).

The approval of this Law was followed by a long process of regulation, with two draft texts, an opening for receiving comments, and discussion and feedback sessions with multiple interested parties (private sector, academia, public entities, civil society, etc.). Finally, on September 9, 2025, the Regulation of the Law (Supreme Decree 115-2025-PCM) was published. This normative instrument seeks to promote the safe, responsible, and ethical use of AI-based systems. To this end, it establishes a series of principles, among which the principles of non-discrimination, protection of fundamental rights, sustainability, human supervision, and transparency stand out. The Regulation also follows the risk model of the European Union's AI Law and establishes two levels of risk: one unacceptable, which is prohibited, and another of high risk, which can only be used by complying with certain conditions.

In addition, the Regulation incorporates two provisions that deserve special attention. On the one hand, it establishes the obligation of developers or implementers of AI-based systems to establish mechanisms to guarantee algorithmic transparency, allowing users to be informed, in a clear and simple way, about the purpose or use of the AI-based system, its main functionalities, and the type of decisions it can make (Article 25). The Secretariat's next task is to approve the guidelines on Algorithmic Transparency. On the other hand, Public Administration entities also have the obligation to publish the source code of AI-based systems funded with public funds, with a free or open license on the National Platform for Peruvian Public Software (PNSSP), in accordance with current regulations on public software, and transparency and access to public information.

Currently, there is no active and proactive transparency measure through which citizens can know what AI systems are being used for the provision of public services in Peru. However, various entities have been advertising the use of these systems. For example, the Judicial Branch, through its different Courts, has reported at least six AI systems used in the administration of justice, of which five are related to family and/or gender cases (León and Gaspar, 2025).

The diagnosis made by Unesco based on the Readiness Assessment Methodology (RAM) also allows for the identification of various incipient uses of AI by public and private entities, civil society, and academia in areas such as health, competitiveness and productivity, environmental protection, among others (Unesco, 2025).

Finally, although it is a modest effort, the Presidency of the Council of Ministers has also systematized a list of entities that use AI in their applications.

There is a list published as a “catalog” of 22 public entities using different systems. However, a cross-reference between these three sources makes it clear that this is an incomplete list. In addition, other problems are that it is a closed list in PDF format, which does not offer the dynamism required of a catalog of this type, and that it does not collect information from varied sources in real time (Presidencia de Consejo de Ministros, 2025).

4.2. Environmental Standards in the Digital Transformation Process

Peru has its own environmental regulations, which have evolved in parallel to the process of digital transformation. This sector has developed with specialized legal frameworks and institutions, though its institutionalization is relatively recent: in fact, the Ministry of Environment was only created in 2008, meaning that the first Peruvian Digital Agenda (2005) actually predates it.

The environmental sector is responsible for the formulation, planning, direction, execution, and supervision of the National Environmental Policy, one of the country’s most important public policy instruments in environmental matters. This Policy includes more than sixty public services and is organized around priority objectives that aim to address the “decrease of goods and services provided by ecosystems that affect the development of people and environmental sustainability” as a public problem. Among these objectives, Priority Objective 7 is particularly relevant: “Improve the environmental performance of the productive and consumption chains of goods and services, applying the circular economy.” Within this objective, Indicator OP7.I2 measures the percentage of public entities that improve their levels of eco-efficiency. While the Policy does recognize the intensive use of low-efficiency, carbon-intensive technologies as a driver of unsustainable production and consumption, it does not provide further guidelines or public services directly oriented toward this factor.

The Ministry of Environment also directs the National Environmental Impact Assessment System (SEIA), the main instrument of environmental management, created by Law N.º 27446. The SEIA requires that any investment project with potentially significant environmental impacts undergo prior evaluation to ensure that project owners adopt adequate mitigation, rehabilitation, or compensation measures before execution (Mora, Ancieta and Morveli 2025). Before the enactment of this law, each sectoral authority defined its own requirements for environmental impact studies. The SEIA created a unified framework; however, it remains fragmented, as many sectors retain authority over approvals. Although competencies are gradually being transferred to the National Environmental Certification Service (Senace), the process has been inconsistent: since the first

schedule was approved in 2013 (Supreme Decree 003-2013-MINAM), successive modifications have postponed deadlines and expanded scope. For instance, the Communications Sub-sector of the Ministry of Transport and Communications is not scheduled to begin its transfer until the second half of 2026 (Supreme Decree 006-2025-MINAM).

In contrast to the environmental sector, there is no formal “sector” in charge of digital transformation. The governing body is the Secretariat of Government and Digital Transformation (SGTD), a functional unit of the Presidency of the Council of Ministers, rather than a sectoral authority. Consequently, there are no mechanisms that subject digital transformation projects led directly by the SGTD to environmental assessment processes.

Another challenge concerns the identification of projects requiring environmental impact assessments. Until 2023, Senace was responsible for determining which projects required an EIA, based on sectoral submissions and criteria such as location in protected areas, investment scale, or the use of unconventional technology. However, Supreme Decree 005-2024-MINAM modified this framework, assigning the identification of prioritized projects exclusively to sectoral authorities and removing these criteria. As a result, Senace’s role has been reduced to merely receiving instructions from the sectors (Mora, Ancieta and Morveli 2025).

An additional barrier is the lack of proactive transparency. Senace’s portal is neither user-friendly nor regularly updated, which makes it difficult for the public to access reliable information. Project lists are published through amendments to previous decrees and remain fragmented across sectors, with no consolidated database. This opacity makes it particularly challenging to identify potential investment projects relevant to the digital sphere.

This gap can also be understood in light of the theory of public goods. As previously noted, DPI ecosystems may be conceptualized as digital public goods (Digital Public Goods Alliance, 2022), characterized by their non-excludable and non-rivalrous nature, which makes them prone to overinvestment in the presence of negative externalities (Mazzucato, Eaves, and Vasconcellos 2024). The environmental dimension of DPI is particularly linked to this second scenario: without regulatory measures that internalize environmental costs, digital infrastructures risk consolidating unsustainable practices whose impacts extend across society. In this sense, the absence of explicit environmental standards in Peru’s digital policy framework illustrates a broader failure to address the negative externalities of digital transformation as a public good.

4.2.1. DPI as Investment Projects

As previously noted, every investment project is susceptible to generating environmental impacts. Sectoral authorities are therefore responsible for identifying such projects and ensuring that their implementation complies with environmental regulations, including conducting environmental impact assessments (EIA) with citizen participation and mitigation measures. In the case of digital transformation projects—particularly those linked to core DPI layers such as digital identity, digital payments, data-sharing, and artificial intelligence—the challenge is greater, since they are not concentrated under a single sectoral authority. As a result, there is no consolidated list of DPI-related projects subject to environmental assessment, which creates a degree of regulatory opacity.

Nevertheless, sectoral lists do contain projects relevant to the Peruvian digital ecosystem. For example, in the Communications Sub-sector (Ministry of Transport and Communications), Ministerial Resolution 076-2021-MINAM expanded the list of projects subject to SEIA to include: (i) deployment of access networks through wired or optical means; (ii) telecommunications infrastructure providing wireless services (voice, data, fixed and mobile video), such as poles, rooftops, or Greenfield sites; and (iii) projects involving the installation of telecommunications networks through transport, distribution and/or access nodes. More recently, the draft update published in March 2025—currently pending approval—adds a significant provision: “Projects that include the installation of telecommunications networks through transport, distribution and/or access nodes or a Data Center.” This first explicit mention of data centers in Peruvian legislation reflects international concern over their environmental impacts, especially energy and water consumption. While still at the regulatory stage, this innovation could have far-reaching implications depending on how it is implemented (Ministerial Resolution 00139-2025-MINAM).

By contrast, in the field of digital identity, no specific sectoral list or register of investment projects was identified. Nonetheless, a review of Reniec’s ongoing initiatives highlights the Project for the Improvement of Access to Quality Civil Registry and Identification Services at a National Level, financed under Loan Agreement 4297/OC-PE with the Inter-American Development Bank. One of its components is the incorporation of technologies for service provision. The project manual states that “there are no environmental and social risks associated with the activities proposed in the project,” implying that no impact assessments are required. Yet, this statement lacks an explicit justification, and it is not possible to corroborate it with existing public information (Reniec 2022).

Procurement records under this project further illustrate the absence of environmental considerations. Calls for goods and services include, for instance, contracts for the installation, configuration, and hosting of e-learning platforms

(CONV-PROC-11-2024-CP-2024-MCSR-1), and for the implementation of an Information Technology Governance model under the COBIT Framework (CONV-PROC-1-2024-SBCC-2024-MCSR-1). None of these processes incorporate requirements related to environmental certification in their Terms of Reference, reflecting the fact that current regulations do not yet identify such obligations.

The regulatory landscape for Artificial Intelligence provides a more explicit, though still limited, reference to environmental sustainability. The recently approved AI Regulation establishes sustainability as one of its guiding principles, stipulating that: “In the development, implementation, and use phases of an AI-based system, its human, social, economic, cultural, and environmental repercussions are analyzed and evaluated comprehensively, ensuring that they are aligned with the objectives of the National Policies and the United Nations Sustainable Development Goals (SDGs). Likewise, the adoption of sustainable practices that minimize energy and resource consumption is promoted, encouraging technological solutions that are responsible with the environment, as well as their components, and committed to sustainable development.”

While this language represents a notable advance, it also reveals regulatory inconsistencies. The Regulation refers to “repercussions” rather than “impacts,” which makes it difficult to align with the Environmental Impact Assessment framework. Moreover, the principle of sustainability is not translated into binding obligations, unlike other areas such as algorithmic transparency. As it stands, the Regulation only requires developers or implementers of high-risk AI systems to inform users about their purpose, functionalities, and decision-making capacities. Other dimensions of corporate transparency remain unaddressed—for instance, disclosure of training data sources, security measures, or environmental and social impacts across the AI lifecycle.

In addition, the absence of a centralized portal of AI-based projects in the public sector hampers systematic monitoring of environmental provisions. Compliance will likely need to be tracked at the sectoral level once implementation advances. At present, however, the regulatory framework does not demonstrate that the environmental impacts of AI are a priority for assessment.

Finally, a review of software development practices within public entities illustrates this gap. The Judiciary, for instance, has issued the Directive Software Lifecycle Processes in the Judiciary (Administrative Resolution 00105-2022-GG-PJ), which establishes technical guidelines for the development, support, and security of software and applications. Although particularly relevant for future AI deployments, the Directive does not include provisions for environmental or human rights impact assessments. Ideally, this and similar regulations in other

entities should be updated to ensure coherence with the AI Regulation's principles, moving beyond aspirational commitments to enforceable standards.

In sum, the current regulatory framework treats digital public infrastructure projects unevenly: while telecommunications and, more recently, data centers are potentially subject to environmental evaluation, other key components such as digital identity systems or AI deployments remain largely outside the scope of environmental assessment. This fragmented approach reinforces one of the central challenges of DPI governance: although DPI generates collective benefits and should thus be managed as a public good, the environmental externalities it produces are not adequately internalized in existing regulation. The absence of comprehensive mechanisms to assess and mitigate these impacts not only weakens accountability but also risks transferring environmental costs to society at large. Bridging this gap requires aligning the principles already recognized in emerging regulations, such as sustainability in AI, with enforceable obligations across sectors, ensuring that the development of DPI contributes to public value without reproducing hidden ecological harms.

4.2.2. Environmental Standards in Software Acquisition

In addition to the regulations on environmental impact assessment, it is possible to analyze whether current legislation sets requirements or standards for entities when acquiring technologies relevant to the deployment of DPI, or if there are incentives or certifications when a certain level of compliance with these standards is met.

For example, the National Digital Transformation Policy analyzed previously creates two certifications: the Digital Accessibility Seal and the Digital Security Seal. Similar mechanisms could be explored regarding the sustainability of DPI components, although they do not exist at the moment.

On the part of Law 32069, the General Public Procurement Law, the main regulation on the matter, the “sustainability of procurements” is established as one of the guiding principles of public procurement. According to this principle, “contracting entities must promote responsible practices in the processes of acquiring goods, services, and works, considering economic, social, and environmental aspects, which contribute to achieving sustainability objectives in every public procurement process.”

In addition, the standard establishes that the Specialized Agency for Efficient Public Procurement (OECE) will be in charge of administering a performance valuation mechanism for providers registered in the National Registry of Providers. This mechanism considers certain data as positive valuation and merit information for providers, including their “adaptation to environmental,

economic, and social sustainability standards in accordance with international treaties and agreements ratified by the Peruvian State.”

However, a review of the calls for proposals published by the State's Electronic Procurement System has not identified any call in which this axis has been particularly valued. In fact, it has not been identified as a requirement in the call for proposals for the selection processes reviewed in relation to digital identity. In addition, since there is no environmental certification for the digital or software environment, it is not clear how this information could be accredited.

Specifically, it is also pertinent to analyze the text of Law 28612, the Law that regulates the use, acquisition, and adaptation of Software in Public Administration, and its regulation approved by Supreme Decree N°024-2006-PCM. These regulations establish that the use or acquisition of software licenses in public administration requires a Prior Evaluation Report from the Office of Informatics. This report must contain a comparative analysis of market values, as well as the short, medium, and long-term costs and benefits of existing licenses. A review of the structure of this report makes it possible to identify that it must include (i) a comparative technical analysis, as established in the Technical Guide on Software Evaluation for Public Administration; and (ii) a comparative cost-benefit analysis that gathers information on licensing, necessary hardware, support and maintenance, etc.

For more details, the aforementioned Technical Guide, approved by Ministerial Resolution N°139-2004-PCM, is applicable in every evaluation of proprietary software considering comparative schemes with free or open-source software and vice versa, highlighting advantages and disadvantages. In general, the said Guide includes a quality model and establishes guidelines for its measurement both internally and externally, using six main criteria for this: (i) functionality; (ii) reliability; (iii) usability; (iv) efficiency; (v) maintainability; and (vi) portability. As can be seen, the Guide lacks a sustainability perspective, with the criterion of resource efficiency being the only one that comes close. However, it is not enough to affirm that the Guide has an environmental and impact assessment perspective.

In general, since there is no specific regulation that establishes requirements or gives value to voluntary certifications for software providers, including AI-based systems, these considerations are not transferred to public acquisition and purchase processes. This is consistent with the absence of ethical certifications in the same area (Unesco 2025).

V. DISCUSSION

The findings demonstrate that, although Peru has not yet explicitly adopted the term digital public infrastructure (DPI), there are multiple indicators of an incipient deployment of its core layers. Digital identity, digital payments, and, more recently, artificial intelligence emerge as domains where the State is investing resources, creating institutional frameworks, and generating public value. It is possible to assert, therefore, that a public agenda is under construction, even if it is not formally articulated in these terms.

The absence of a common conceptual language, however, is not trivial. A lack of awareness that what is being developed are, in practice, layers of DPI also entails the absence of critical reflection on the need to “build them as well as possible” from the outset. International experiences highlight that such layers are often reusable and provide the foundational basis for subsequent digital services. When initial design processes fail to incorporate principles of governance, interoperability, transparency, or sustainability, deficiencies become embedded and are subsequently reproduced across the entire digital ecosystem.

This conceptual void directly connects to the second major finding: the weak incorporation of environmental standards into Peru’s digital policy. Precisely because these infrastructures are long-term in nature, it is critical that their design processes account from the beginning for the environmental and social impacts they generate. Nonetheless, a review of the relevant normative and regulatory frameworks reveals an incipient and fragmented landscape. The National Digital Transformation Policy, the principal public policy document in this domain, does not integrate an environmental perspective. In contrast with other areas, such as accessibility or digital security, there are no guidelines—mandatory or voluntary—that orient the sustainability of digital infrastructures.

Moreover, there is no clear articulation with existing environmental instruments. The debate over whether data centers should be subject to Environmental Impact Assessments (EIAs) remains unresolved, and although the Ministry of Transport and Communications appears to recognize this concern, no approved regulatory framework is yet in place. The Artificial Intelligence Regulation constitutes progress to the extent that it incorporates the principle of sustainability; however, its language diverges from environmental legislation by employing the term “repercussion” instead of “impact,” thereby complicating integration with EIA frameworks.

Public procurement regulations reveal a further tension. While the AI regulation is recent, procurement processes remain governed by legislation dating back to 2006, a period when the environmental impacts of digital infrastructures were not under consideration. This regulatory obsolescence prevents the

systematic incorporation of environmental standards into the acquisition and deployment of digital technologies.

The disjuncture between the normative advances in AI and the persistence of outdated procurement frameworks exemplifies a broader regulatory incoherence. Although ethical and sustainability principles are increasingly emphasized at the discursive level, the mechanisms through which these could be operationalized—particularly procurement processes—remain anchored in outdated logics. This is compounded by the absence of transparency obligations for private technology providers, which restricts the possibility of requiring information about environmental impacts across the digital value chain.

In sum, the analysis suggests that Peru is at a critical juncture: it is deploying the core layers of DPI without labeling them as such and without articulating a holistic vision that embeds environmental sustainability into their design. This misalignment not only jeopardizes the quality and resilience of future digital infrastructures but also widens the gap between international narratives on the “twin transitions” (digital and green) and the reality of domestic policymaking.

VI. CONCLUSION

This study demonstrates that, while the term digital public infrastructure is not yet part of the vocabulary of public policy in Peru, there is considerable evidence that the State is advancing in the construction of its core layers. Digital identity, digital payments, and artificial intelligence are the focus of institutional and regulatory efforts and already operate as reusable foundations for future digital services. Nevertheless, the absence of explicit recognition of these initiatives as DPI constrains the possibility of strategically reflecting on how such infrastructures should be designed, governed, and managed.

The analysis of a second dimension—environmental standards—reveals an even greater gap. Despite the growing international prominence of the “twin transitions” (digital and green), Peru’s digital policy has yet to substantively integrate environmental sustainability into its design. Neither the National Digital Transformation Policy nor procurement frameworks include environmental criteria, and while the Artificial Intelligence Regulation introduces sustainability as a principle, it remains insufficient to align with existing instruments such as Environmental Impact Assessments.

Taken together, the findings point to a scenario in which Peru is actively constructing its digital ecosystem without fully recognizing its character as public infrastructure and without ensuring its environmental sustainability. This misalignment risks consolidating a technological foundation that, rather than

supporting the Sustainable Development Goals, may exacerbate inequalities and generate new negative externalities.

Looking forward, it is imperative to update the public procurement framework, introduce specific Environmental Impact Assessments tailored to digital technologies, and extend environmental transparency obligations to private providers. Such measures would lay the groundwork for an environmentally responsible DPI and could position Peru as a regional leader in integrating sustainability into digital governance.

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