

Data for the Environment: How the European Union's Data Strategy Can Facilitate the European Green Transition

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Abstract

This article explores the dual relationship between data and the environment in the European Union law context and argues how the potential synergies between them can be harnessed through EU data regulation. Within this framework, the article discusses the EU's evolving approach to data and analyses to what extent the current European data strategy contributes to the EU's green transition.

In its analyses, the author refers to the Common European Data Spaces, Data Governance Act, Data Act, and Open Data Directive as the main pillars of the strategy and examines whether these recent instruments on data provide an effective framework to leverage the power of data for the European green transition.

Keywords: European green transition; data regulation; EU data strategy

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1. Introduction

The European Union (EU) has recognised the green transition as a key priority to create a clean and resource-efficient Europe by switching to more environmentally sustainable practices and mitigating the impact of climate change on the European economy and society. To lay down a roadmap for the green transition, the European Commission presented the European Green Deal in 2019, a package of environmental policy initiatives aiming to cut emissions by at least 50% by 2030 and realising climate neutrality in Europe by 2050 (European Green Deal, 2019). The Green Deal was declared among the six focus areas of the European Commission for 2019-2024 (Commission Political Guidelines) and has been followed by several financial, policy, and regulatory initiatives towards the EU's green transition. Data and how it is regulated can play a critical role in the EU's green transition despite its seemingly counterintuitive connection to the environment.

Against this backdrop, this article first explores the complex link between data and the environment and discusses how data can be harnessed for green transition through regulation. Based on this foundation, the article analyses the EU's data strategy from the perspective of its contribution to the European green transition by focusing on data sharing and re-use and with reference to the Data Governance Act, Data Act, and Open Data Directive as the legislative pillars of the EU's shifting approach to data.

2. The Role of Data in Green Transition

The interplay between data and green transition is two-sided and characterized by a mutualistic yet simultaneously adversarial dynamic. On one hand, the generation, collection, use, transfer, and storage of data require large volumes of energy. Data centres consume enormous amounts of electricity to power the servers, storage systems, and networking devices, as well as water to cool them down, which heightens the energy demand and substantially contributes to the global carbon footprint. Embodied emissions of data centre hardware add up to the operational greenhouse gas (GHG) output and make up around 20% of total lifecycle emissions, in addition to causing large piles of electronic waste (e-waste) with their short replacement cycles (Technology Carbon Standard).

According to recent estimates, data centres account for approximately 3% of global electric consumption and 2% of total GHG emissions (D. Thangam et al., 2024). Real emissions of big-tech-owned data centres, however, are suspected to be much higher than officially reported (I. O'Brien, 2024). Between 2015 and 2021, the workloads of data centres were found to have grown by more than 260%, with a higher than 50% increase in their energy use (International Energy Agency, 2022). If not acted on, data centres are expected to produce around 2.5 billion tons of carbon dioxide (CO₂) through 2030 (International Energy Agency, 2022).

Meanwhile, ever-growing digitalisation constantly increases the ecological impact of data by prompting a rise in the demand for data and thereby in its carbon footprint. Data powers all advanced digital technologies such as artificial intelligence (AI), high-performance computing, blockchain, and robotics, which exacerbate environmental degradation and climate change by fuelling overconsumption of natural resources, creating new resource dependencies, and aggravating global warming (D. Tanzler et al., 2022). The share of the information and communications technology

(ICT) sector in the world's total GHG emissions was predicted to range between 1.5% and 4% (World Bank, 2024) and is expected to reach up to 6-7% of the global emissions by 2040 (L. Belkhir & A. Elmeligi, 2018).

Nevertheless, data is a critical asset for the EU's green transition, with the potential to notably accelerate the process despite its compounding effect on environmental deterioration. As a non-rivalrous, renewable, and versatile resource of productive value, data can facilitate a measurable, transparent, and efficient shift to a climate-neutral Europe. Timely and aggregated environmental data can serve as an effective tool in environmental protection and climate change combating (R. Vinuesa et al., 2020) by improving the accuracy and efficiency of environmental monitoring, waste management, and prediction of natural disasters (G. Onyango & J.O. Ondiek, 2021). Fostering green innovation, from smart production and distribution systems to energy optimisation tools and simulation technologies such as digital twins, data facilitates long-term sustainability and eco-friendly innovation simultaneously and generates multiplier effects across various dimensions.

Standardised collection, publication, and dissemination of sustainability data across sectors can help understand sector impacts, track and mitigate environmental externalities, and improve resource allocation decisions, contributing to the reduction of the overall negative impact of production and service processes on the environment. Greater information transparency can further enable better-informed government decision-making and support the implementation of green policies and achievement of sustainability targets. When shared with the public, such data can promote citizen participation in environmental protection by increasing consumers' awareness of their ecological footprint (M. Coeckelbergh, 2021) and directing them towards more eco-friendly choices.

That said, harnessing these synergies between data and the environment for a green transition depends on the successful management of data

through regulation. How data is created, shared and used is pivotal to cultivating the green potential of data (R. Dubey, 2019). The asymmetry in data availability and access, along with disparate processing capabilities of actors, hinders the cultivation of the maximum benefit from data. In that respect, data sharing breaks the temporal, spatial, and economic constraints of data and expands the value creation by enabling optimum reuse. The part data sharing could play in green transition has several dimensions with strategic, technical, and legislative aspects, which intertwine and complement each other.

A data strategy promoting and enabling data sharing is the first step in that direction. It reflects the policy approach to data and maps out the objectives and priorities, laying the foundation for the execution and functioning of technical and legislative measures. A successful data strategy must strike a balance between green transition goals and other data-related legal and ethical considerations, with particular importance paid to the protection of data subjects' rights. Achieving that would require the incorporation of the concept of environmental sustainability into the equation of the principles and imperatives to be balanced in the data regulation framework, including innovative progress, data protection, and fundamental rights. In the next section, the article will explore how successful the EU's data regulation strategy is in implementing such a balanced approach towards the facilitation of the European green transition.

3. A Green Transition Approach to the European Strategy for Data

Recognising the green potential of data, the EU data strategy has been built upon the objective of creating a single market for data in Europe, a data union as the European Commission put it, where vast amounts of high-quality data freely move and drive competitiveness (Data Union

Strategy, 2025). This change of approach that promotes data availability was first introduced in the European Commission's Communication "A European strategy for data," which set forth the EU's former strategy on data and has been taken one step further with the Commission's new "data union strategy" comprising the proposed EU Digital Omnibus package (Digital Omnibus, 2025). The former strategy adopted a human-centred, "open but assertive" approach that proposed to remove barriers to data while respecting the existing data regulation rules and safeguards. This approach focused on growth generation through data abundance, aiming to extract the optimum value from data in a manner compliant with European rules and tenets, particularly those related to personal data, consumer protection, and competition law. Environmental sustainability considerations, along with data protection principles and fundamental rights, were more explicitly pronounced and taken into account in the former EU data strategy compared to the current one, which is heavily centred on increasing digital competitiveness and AI development in Europe.

Data scarcity has been recognised by the Commission among the main challenges to the EU's overarching goal of creating a strong European data economy in both strategies. To address this challenge and unlock the power of data, the Commission highlighted the necessity of increasing data availability formerly by means of regulation, investments in standards, and infrastructures, and presently, through regulatory simplification. Accordingly, the former strategy set out to develop a cross-sectoral governance framework promoting data sharing, establishing high-standard data infrastructures in strategic areas, and empowering individuals regarding their data by equipping them with the required literacy and skills, whereas the current one is yet to be unfolded.

The former strategy signalled a profound change in the EU's approach to data, with a shift in focus from data protection betokened by the EU General Data Protection Regulation (GDPR) to transitioning into a pio-

neering data economy by channelling the power of data, which was made evident by the recent developments. While the protection of personal data and data subject rights were still an important pillar of the European approach to data, the focal point of priorities was shifted to data-driven economic growth and global leadership. To that end, the EU has embarked on loosening the regulatory restrictions on the transfer and the use of data by launching several legal and technical initiatives promoting the free flow and use of data. The newly proposed EU Digital Omnibus, presented by the Commission to “simplify” the digital rulebook of the EU, is a direct reflection of the EU’s changing position towards data and how it is regulated.

From a green transition aspect, this change of focus is promising. The new open and simplified approach to data movement may promote transparency, circularity, and efficiency by removing barriers to data sharing and re-use, and “re-cycle” data for optimal output from both environmental and economic perspectives. Whether the strategy will be able to deliver its promise and to what extent this new perspective will prove beneficial for the EU’s green transition, however, will depend on its implementation.

In that regard, one of the centrepieces of the EU data strategy is Common European Data Spaces (CEDSs) (Commission Working Document, 2024). CEDSs have been designed to provide safe, reliable, and privacy-preserving platforms for pooling, sharing, and using personal and non-personal data and are meticulously regulated based on “European values.” They are open to the participation of all organisations and individuals and grant them control over their data.

In its Communication “A European strategy for data,” the Commission named nine main areas in which CEDSs are to be created, encompassing manufacturing, Green Deal, mobility, health, finance, energy, agriculture, public administration, and skills. Together with the data spaces later developed in the fields of cultural heritage, language, media, research and innovation, and tourism, CEDSs span across 14 domains and will grad-

ually become interconnected to form a single European market for data (Common European Data Spaces).

Green Deal Data Space (GDDS) is particularly prominent from a green transition lens, along with those operating in the sectors of agriculture, energy, and mobility. GDDS provides an interoperable and trusted digital ecosystem for sharing high-value environmental data towards achieving the green deal objectives, including climate neutrality, emission reduction, biodiversity protection, zero pollution, renewable energy, smart mobility, and transition to a circular economy. GDDS is still under development, with the projects GREAT, AD4GD, B-Cubed, FAIRiCUBE, USAGE, DS4SSCC, and SAGE building on the foundations to shape and govern GDDS for cultivating the synergies between data and the Green Deal.

On the legislative front, Regulation 2022/868 on European data governance (Data Governance Act) and Regulation 2023/2854 on harmonised rules on fair access to and use of data (Data Act) are the flagships of the European data strategy with their mutual objective of removing barriers to data. The Data Governance Act (DGA) aims to foster data availability and voluntary data exchange in the EU by building trust in data sharing and data intermediaries, strengthening exchange mechanisms, laying the ground for and encouraging data altruism practices, and addressing technical obstacles. It prescribes conditions for the re-use of certain data held by public sector bodies for purposes beyond the original collection, lays down a notification and compliance procedure for data intermediation services providers, introduces a voluntary registration mechanism for data altruism organisations, and establishes the European Data Innovation Board (Art 1(1), DGA). Under DGA, data holder public sector bodies have discretion on whether to grant the reuse of the data they hold but must fulfil certain standards and measures both when processing (Art 5(2), DGA) and allowing requests for access and reuse (Art 5(3), DGA). Regarding data intermediation services (Art 12, DGA) and data altruism organisa-

tions (Art 21, DGA), DGA lays down a series of conditions to ensure data protection, transparency, fairness, security, and interoperability. That said, such discretionary measures contingent on personal initiative have so far achieved limited (M. Finck & M. Mueller, 2023), and DGA might face the same fate.

The Data Act (DA) complements DGA with new obligations, standards, and safeguards on data access and sharing, which transcend beyond the traditional notion of data ownership. It sets out a path to remove the barriers to data-sharing while granting individuals and businesses more autonomy over their data. Both personal and non-personal data fall within DA (Art 1(2), DA), with a particular emphasis on those generated through the Internet of Things technology (Art 1(2)(a), DA). It applies to all sectors and numerous actors spanning manufacturers and users of IoT devices, public sector bodies, data holders and recipients operating in the EU, data processing service providers, and those involved in smart contract applications (Art 1(3), DA).

DA imposes an obligation to make product and service data directly and easily available to users under certain conditions facilitating their use (Art 3, DA), establishes the rights and responsibilities of users and data holders of such products (Art 5, DA), and sets down some essential requirements regarding data interoperability, data sharing mechanisms and services, and common European data spaces (Art 33, DA). Furthermore, it requires data holders to make data available to public sector bodies, the Commission, European Central Bank, and Union bodies when there is an exceptional need to carry out their statutory duties in the public interest (Art 14, DA). Although the obligation may allow the access of otherwise undisclosed data to be utilised for certain environmental purposes, such as natural disaster and climate change management, the narrow scope of application and onerous conditions may hinder the potential benefit to be derived from the provision.

While DGA and DA would ultimately foster the green transition to some degree by facilitating data sharing and reuse, both instruments fail to establish a strategic link between the increased data availability and environmental sustainability. In addition to their secondary contribution to the green transition, they present some terminological ambiguities and conceptual interoperability issues regarding some critical aspects of data regulation. Both legislations rely on a generic concept of data without any terminological distinction, such as based on the reference point or collection purpose, apart from the one between personal and non-personal data (M. Finck & M. Mueller, 2023). This broad terminology may result in confusion and incoherence in the understanding and application of the respective concepts of different data legislation, GDPR in particular, in overlapping situations. Given that both DGA and DA cover personal data, an interaction between them and GDPR is inevitable. While GDPR prevails over DGA and DA where there is a dispute concerning personal data protection and privacy (Art 1(3), DGA; Art 1(5), DA), interoperability issues on certain matters persist.

In comparison, the Directive 2019/1024 on open data and the re-use of public sector information (Open Data Directive) displays a more targeted and coherent picture regarding data sharing and reuse, with a focus on public data. The Open Data Directive (ODD) sets forth the minimum rules facilitating the reuse of publicly available data held by public sector bodies and public undertakings, and certain research data (Art 1(1), ODD). ODD stipulates several obligations on data reuse for public sector bodies, such as timely processing of requests (Art 4(1), ODD), communicating reasons for refusal for a negative decision (Art 4(3), ODD), and making data available in an open, machine-readable, accessible, findable and re-usable format where possible and appropriate (Art 5(1), ODD). Public bodies are prohibited from imposing any conditions for the reuse unless those are objective, proportionate, non-discriminatory, and justified

based on public interest (Art 8(1), ODD).

To ensure the easy and free-of-charge availability of public information that has the potential to yield significant socioeconomic, environmental, or innovative benefits (Art 14(2)(a)), ODD instructs the Commission to issue implementing acts that formulate data sets on specified categories (Art 14(1), ODD), including “geospatial,” “earth observation and environment,” “meteorological,” and “mobility” (Annex I, ODD). Following the mandate, the Commission adopted the Implementing Regulation 2023/138 laying down a list of high-value datasets and the arrangements for their publication and use.

Still, as an EU directive, the enforcement of ODD will depend on how it is transposed into national laws, which may result in divergences in the transcription of rules and standards. The discretionary approach of ODD on data formatting, licensing, terms of use, and technical standards, and the lack of an EU supervisory authority monitoring enforcement compound the risk of disparities in application. The narrow scope of ODD, which excludes the private sector and some research data, and the gaps in metadata quality and standardization are among the other limitations of ODD in the green transition context.

Overall, the current EU data strategy and its legislative pillars currently seem to prove insufficient for effectively cultivating the power of data as a catalyst for the European green transition. The EU data strategy does not embrace the green transition as a key objective, and the role of data in the process has not been properly addressed. While the new focus of maximising data-driven value creation is likely to serve the green transition to a level, such contribution would be auxiliary rather than direct and structured.

The strategy is heavily centred on boosting the economic value of data rather than following a balanced approach between economic goals and innovation, sustainability, human rights, and EU legal principles. Despite presenting an ambitious change of approach on data, it does not clarify

how this new approach will operate in practice with the existing rules and safeguards. There is a lack of systematic alignment between the legislative instruments on data, which boils down to a regulatory cluster with little compatibility.

4. Final remarks

Despite embracing the green transition of Europe as a priority and recognizing the role of data in fostering the process, the EU appears to have faltered in properly incorporating this knowledge into its data strategy. To address this challenge and establish a concept of ‘data for the environment,’ the first step is to better align the data strategy with green transition goals by focusing on the regulatory synergies between data sharing and environmental progress. When cultivating the synergies, promoting cross-sectoral coordination of law and policy instruments and establishing harmonized standards for data handling, with a gradual transition away from the discretionary approach, is paramount for regulatory interoperability.

For interoperability, it is further crucial to clarify the legal boundaries between openness, sustainability, and legal considerations such as privacy and data protection to ensure that the “open approach to data” does not jeopardise fundamental rights and legal principles protected under EU law. Developing EU-level guidelines or harmonisation laws that clarify how data can be shared openly and reused freely in ways that remain fully compliant with GDPR would be a step toward that end. The Commission’s newly proposed Digital Omnibus package tries to coordinate the conflicting overlaps between important data regulation concepts, with a series of legislative amendments spanning the Data Governance Act, Data Act, Open Data Directive, and the General Data Protection Regulation.

The Digital Omnibus proposes to merge the Data Governance Act’s

provisions on the reuse of protected data and the rules of the Open Data Directive in a single framework on the reuse of publicly held data under the Data Act to reduce legislative fragmentation. The package also introduces changes to the data intermediation services mechanism and the data altruism framework of the Data Governance Act. It proposes to turn the regime for the data intermediation services into a voluntary one and considerably reduce the provider obligations while repealing the reporting and transparency obligations for data altruism organisations.

These changes aim to incentivise data sharing by reducing the compliance requirements and streamlining the rules, and may significantly contribute to increasing data sharing, facilitating the data-driven green transition. The Digital Omnibus, however, fails to adopt a balanced approach to data sharing and compromises some important data protection safeguards by prioritising competitiveness over European values and principles. As such, the proposed changes have caused more contradiction than achieving consolidation, being perceived as an attempt at deregulation rather than harmonisation. Since the legislative package is still in the proposal stage and has already encountered a backlash, some proposed amendments are unlikely to see the daylight. Still, the ambitious agenda of the Digital Omnibus package suggests that the EU data regulation framework is likely to undergo a transformation in accordance with the new Data Union Strategy, which will inevitably affect the course of the EU's data-driven green transition.

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